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बालाजी श्रीवास्तव, भा.पु.से.
महानिदेशक

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FOREWORD

At the core of the Digital India Mission is a profound understanding that technology should touch every aspect of a common citizen's life. It should be a means to empower the masses through universal digital literacy and bridge the digital divide. In a world where technology has been monopolized by few, it is time to break barriers and make technology accessible to one and all.

As the theme of India's G20 Presidency is 'One Earth One Family Ong Future', the process of democratizing technology is confronted with the challenge of cyber security. Cyber threats are complex, borderless, and constantly evolving thereby necessitating agile, collective, collaborative, and multi-pronged responses. Recognizing the emerging threat of cybercrime and its potential consequences is of utmost importance for an ever-growing digital economy like ours. The need for safe and secure cyberspace is ineluctable as there has been an exponential surge in the number and types of cybercrime, particularly in critical infrastructure and digital public platforms.

Cyber Security mitigation is the application of policies, technologies and procedures to reduce the likelihood of a successful cyber-attack. This demands a concerted effort at the national, international, organizational, and even individual levels. Nations need to collaborate to combat cyber-attacks, fostering a global cyber-secure space. Cyber hygiene and awareness must be a mantra for everyone.

In the recently held G-20 Conference on Cyber Security, the Hon'ble Union Home Minister and Minister of Cooperation Shri Amit Shah, striking a perfect balance between technology and security, summed up by stating, "Our Internet vision should neither be one of excessive freedom threatening the very existence of our nations nor one of the isolationist structures such as digital firewalls".

The articles in the present issue of IPJ delve into the complexities of the cyber world, providing insights and emphasizing the importance of awareness in this rapidly evolving landscape.

(Balaji Srivastava)
Chief Patron

"Promoting Good Practices and Standards"

अनुपमा निलेकर चंद्रा, भा.पु.से.

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EDITORIAL

IPJ is a flagship publication of BPR&D dealing with subjects ranging from Policing, Police Administration and Management, Correctional Administration and Prison Management, forensics including digital evidence to sharing of good practices and standards among the Police forces amongst others. In its own limited way, IPJ seeks to contemporize traditional policing wisdom with the tools of the day.

We have tried our level best to get the finest articles for an informational and educational standpoint from the serving officers, the retired officers, prison officers, judicial members, academicians, and other eminent personalities from law enforcement agencies.

The articles have covered a plethora of new and complex challenges for the forces to tackle with the help of technology along with the traditional way of policing.

As always, it is a pleasure to introduce the latest edition of the IPJ. Our eminent contributors have authored several well researched articles on various subjects and I am happy to introduce them.

The article, "Online Trading in Drugs and Digital Drugs: Technology, A Boon or Bane?", discusses the internet becoming the most preferred mode for procurement of drugs and its ramifications.

In the article "Predicting Property Crimes in Railways: A case of Bihar Rail Network", the authors endeavor to show how predictive analytics can be successfully used to reduce different crime rates.

The article "Bharat Open Platform for Police Capacity Building (BOPCB)-Empowering capacity building ecosystem", dwells upon a decentralized digital infrastructure which helps participants of capacity building to engage, exchange, benchmark and enable data driven policymaking.

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In the article "Scientific Criminal Investigations: Structured Formulation of Hypothesis and Testing in Police Investigations", the author attempts to explain and discuss the relevance and practicality of hypothesis.

K.V. Thomas's article, "Scientific – Criminology' & Uthra murder case", tries to give an insight into how a complex ingeniously executed murder case without any direct evidence could be successfully investigated using various scientific aids for investigation.

The article "Effect of Air Pollution on Cardio-respiratory Health of Traffic Police Personnel in Northern part of the Kolkata", looks into assessing the effect of pollution on the cardio-respiratory health of Traffic Police Personnel.

The article, "An Exploratory Study to assess Lung Efficiency of Traffic Police Personnel based on their Age and Quetelet Index", aims to look into the level of role stress and role stressors and recommends methods to curtail them in order to manage high level of occupational role stress in Police personnel.

Prof. Beulah Immanuel and Saleel Kumar in their article, "Assessing mental health issues of convicted female prisoners in India", delve into the mental health issues of female prisoners.

In the article "Stop- Road traffic crashes", the author has tried to address the importance of road signs in preventing accidents and fatal injuries.

In his article "Evidence Based Policing in India: A Quest for Quality", Mainul Islam Mondal highlights the importance of evidence as a basic force of detection of a crime through his personal experiences.

The article "Measures for Improvement of Childcare Institutions under Juvenile Justice (Care and Protection) Act 2015: A Multi-Centric Empirical Study", discusses serious issues concerning structure, function, and quality child care management for the proper implementation of the Juvenile Justice Act, 2015.

In the article "Innovations in Traffic Management- Case study of Santragachi Railway Over Bridge Kona Expressway, West Bengal", the authors explain ways to quickly reduce congestion on traffic prone roads and areas.

The article "Job stress of Central Armed Police Force personnel during Covid-19: a study of Delhi-NCR" , tries to draw one's attention towards the stress level experienced by the personnel during the Pandemic.

I wish this publication will be useful to all stakeholders who aspire to bolster the functioning of the Police forces. I wish we will get your support in the future as well. Your invaluable suggestions are always solicited.

Anupama Nilekar Chandra, ADG
Editor-in-chief

"Promoting Good Practices and Standards"

Contents

Online Trading in Drugs and Digital Drugs: Technology, a Boon or Bane?

Anupama Nilekar Chandra, IPS*

Abstract

The objective of innovation in technology is always betterment of human life. It is the misuse of technology that has a detrimental effect in multiple ways. The online commercial platforms were created to ensure doorstep delivery of goods of luxury as well as essentials, to customers and enhance satisfaction levels by ensuring timely delivery, range of choice, hassle free return policy on being dissatisfied with the quality of goods etc.

Using the same online framework for trading of narcotic drugs and psychotropic substances has expanded the outreach of traders in this field. The access to mobile phone and internet among the population in general and the youth in particular has serious implications if the same is misused. Online trading in drugs involves sale and purchase of illicit narcotics in the physical form, whereas another concept of digital drugs which involves no substance but only sound frequency to alter brain waves is a subject matter of research. The article throws light on how technology has redefined these activities.

Keywords: *Online transaction, illicit drug market, bitcoins, internet, darknet, modulation of frequency, binaural beats, brain entrainment, I-Doser, Capacity building*

Role of technology in transforming human lives remains undisputed. Technology has redefined the world view in terms of thought process, behaviour, habits and social relations of human beings. E markets were no less than a boon in the Covid 19 pandemic times. Groceries and other essentials were efficiently delivered without the risk of physical contact. With physical markets identity of the buyer and seller and the market place is not only well established but clearly identifiable as well. Physical space gives it tangible dimensions. Moreover, transactions in the physical space do not have the potential of traversing large spaces and remain largely confined within

Author's Introduction:

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reasonable spaces.

On the other hand when a similar transaction is done in the virtual space, the dimensions get transformed entirely. Online sale and purchase of essentials and licit articles facilitates the index of ease of living of the citizenry. But when the same is used for illicit purposes, it entirely upsets the social-economic fabric of society posing hazards to a range of factors of any nation, be it health, wellness, economy, order or internal security.

Physical movement of persons remained restricted during the pandemic times. Re-strategizing trade protocol became imperative across businesses. Trading in narcotic drugs and psychoactive substances did not remain untouched. Technology became the facilitator cross cutting almost all activities of mankind in general and the trade and service sectors, in particular. Detrimental use of technology was unleashed as well. The internet became a medium for trading in drugs. Of late, drone is another tool used by traffickers for trafficking of illicit drugs.

The first infamous online marketplace for illicit drugs came to be known as the 'Silk Road' came into existence in 2011 and aimed to spread its outreach across geographical boundaries. Consumer experiences on '*Silk Road*' were described as '*euphoric*' due to the wide choice of drugs available, relatively easy once navigating the Tor Browser (encryption software) and using '*Bitcoins*'

for transactions, and perceived as safer than negotiating illicit drug markets.[1] From the time it came into existence in January 2011 to over two and a half years, until October 2013, the 'Silk Road' in the dark web was to drug users what Amazon and eBay was to retailer shoppers in the clear web. The site's users spent around USD 200 million (Flitter, 2015) on a range of drugs: cannabis, prescription drugs, MDMA, LSD, heroin, crystal meth; in fact, every illicit drug.[2]

An investigative journalist collected through interviews – in-person or telephonically, eliciting narratives through email, private forum messages or encrypted chat mode, data from drug users who were buyers on the 'Silk Road'. The project spanning over three years provides an insight on the behaviour of 'Silk Road' users in terms of what they purchased, the reasons driving their choice as well as their preference for the online mode of purchase of dugs vis-à-vis the tradition offline one.[3] It was found that buyers on the Silk Road already were drug users and that none of them started using drugs because of Silk Road.

The purported vision propagated by the creator of the Silk Road was that of building a free-market system to that would resist and abolish the coercion by the state. A few users of the cohort interviewed accepted this position of the free-market system, but all the persons interviewed had libertarian views when it came to the right to choose what to put in one's own body.[4] Factors

1   Marie Claire Van Hout a, Tim Bingham 'Silk Road', the virtual drug marketplace: A single case study of user experiences, International Journal of Drug Policy; Volume 24, Issue 5, September 2013, Pages 385-391

2   Eileen Ormsby; *Silk Road: Insights from Interviews with Users and Vendors; Chapter 6 The Internet and Drug Markets* (EMCDDA)

3   Eileen Ormsby; *Silk Road: Insights from Interviews with Users and Vendors; Chapter 6 The Internet and Drug Markets* (EMCDDA)

4   Ibid

such as ease of acquiring the drugs, personal safety in terms of absence of contact with the seller and anonymity. The libertarian views and the right to choose what one wants to consume or put into one's own body merits a separate and an in depth discussion. At the same time this right cannot be unrestricted apprehending the perils caused to society due to non-exercise of social obligation by an individual consuming illicit drugs. Right to what music to listen to or what substance to put inside the body can be granted to an individual only if the outcome of exercising this right by the individual does not jeopardise the safety and security concerns of the society.

The challenge posed by Dark Net drug markets for the law enforcement agencies was analysed by Associate Dean and Professor Julia Buxton and Tim Bingham at the Swansea University. The concern that has been highlighted in the report is that online sales of illicit substances on Dark Net markets will grow exponentially in the coming years due to increased internet access, new "secure" technologies, expanding use of social media and continued demand for illicit drugs.[5] The authors opine that "an acknowledged lack of technical capacity, legal constraints, and poor international enforcement coordination"[6]are impediments in the effective functioning of the Law Enforcement Agencies by while traditional coercive and covert response of the LEAs to handle this category of offence, has catalysed mushrooming of new sites

and further innovation in technology. Marijuana transactions date as far back as 1971 between students at Stanford University and MIT using technology at the artificial intelligence laboratories date as far back as 1971. This came to be regarded as the foundation of the internet.[7]

In the foreword to the compilation *The Internet and Drug Markets,* Alexis Goosdeel, Director European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) elucidates that although at present, it appears that only a minority of drugs are purchased in this manner, it seems likely that online drug markets have the potential of disrupting the dealing in drugs in near future and revolutionising the retail experience in ways similar to that of eBay, Amazon and PayPal.

Another qualitative study was undertaken to understand and correlate the influence of the social media platforms as facilitators of online trading in illicit drugs in the sub-Saharan Africa state. The cohort was undergraduate students in a few selected institutions in Lagos, Nigeria. The findings reflected that online accessibility to drugs was facilitated by friends, although the process by itself was technical in nature. The process is organized with the aid of online commerce. The commonly used social media networks were Facebook, Twitter, Instagram, and WhatsApp, while delivery is done with motorcycles, bicycles, and walking across the street without law enforcement agents being able to

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5   *Buxton and Bingham Analyze Challenges in Controlling Dark Net Drug Markets;* Central European University; Department of Public Policy, 2015; https://dpp.ceu.edu/article/2015-01-15/buxton-and-bingham-analyze-challenges-controlling-dark-net-drug-markets

6   Ibid

7   Judith Aldridge and David Décary-Hétu; *Cryptomarkets and the Future of Illicit Drug Markets*

track them.[8] The study also indicated the likelihood of the drug user being victimised by both the vendor and the online platform intermediary. The reason attributed to this was the illegal nature of the activity of consumption of illicit drugs.

This raises a multitude of issues such as exploitation of the drug user who is the weakest link in the entire chain of online trading of drugs. Be it physical trading or online trading of drugs, the drug user remains the most vulnerable entity.

The lockdown restrictions during COVID-19 may have accelerated drug trafficking using the Internet, according to the United Nations Office on Drugs and Crime's World Drug Report-2021.[9] The report mentions that China and India are the countries frequently mentioned on darknet markets. In 2021, there were 5,000 cases of online drug trafficking. Drug transactions have evolved away from mainstream chat systems towards niche social tools, second-hand trading platforms, gaming websites, and the dark net.[10] Drug trafficking and weapons smuggling by terror organisations and insurgent groups based on novel technologies has directly impacted security landscape of not only of the member countries of the Shanghai Cooperation Organisation (SCO) but that of the whole Eurasian expanse as well.

Efforts initiated at the international level

The seriousness of the challenge of trade in illicit drugs over the internet as an international activity was recognised by the countries across the globe, in the early years of the twenty first century and the intent to counter the same commenced in all earnest. At the international level, based on the Single Convention on Narcotic Drugs, 1961, the International Narcotics Control Board (INCB) was established in 1968 as an independent and quasi-judicial monitoring body and was tasked with the implementation of the international drug control conventions of the United Nations. It has been mandated to promote and monitor compliance by the Member States, of the resolutions of the three international drug control conventions, namely the Single Convention on Narcotic Drugs of 1961, the Convention on Psychotropic Substances of 1971, and the Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988.

Prior to this, the Economic and Social Council (ECOSOC) established the Commission on Narcotic Drugs (CND) in 1946 through its resolution 9(1), to assist the Council in supervising the application of the international drug control conventions. The CND formulated several resolutions after intensive deliberation with the purpose of tackling internet based trading in drugs.

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8   Samuel Ojima Adejoh, Waziri Babatunde Adisa, Osigbe Onome, Chizoba Anyimukwu and Adetayo Olorunlana; The Influence of Social Media on Illicit Drug Sale and Use among Undergraduates in Lagos, Nigeria; Journal of Alcohol & Drug Education(Vol. 64, Issue 2); American Alcohol & Drug Information Foundation ; Aug. 2020; https://go.gale.com/ps

9   Devesh K. Pandey; COVID-19 restrictions may have accelerated drug trafficking via Internet; https://www.thehindu.com/news/national/; June 24, 2021

10   Ayjaz Wani, Lakshita Khemani; India's SCO Presidency: Leading global action against drug trafficking; https://www.orfonline.org/expert-speak/indias-sco-presidency/https://www.orfonline.org/expert-speak/indias-sco-presidency/April 2021

In its resolution 54/8 of 2011, Member States were called upon by the Commission invited Member States to ensure appropriate measures to collaborate and cooperate at the international level for sharing of information regarding the changing modus operandi of illicit drug trading cartels, tracking of routes of such illicit trade, which included the use of the internet for these purposes of trading in these items.

The resolutions also make it incumbent upon the Member States to share such information with the International Narcotics Control Board (INCB). Further, the Commission in the year 2017, involved all stakeholders, namely the Member States, INCB, the United Nations Office on Drugs and Crime and relevant international organizations through its resolution 60/5, and for multifarious activities such as collection of data, analysis of evidence and mutual sharing of information pertaining to internet based criminal activities related to precursors. It also encouraged them to continue to strengthen legal, law enforcement and criminal justice responses, based on national legislation, as well as international cooperation, to curb such illicit activities.[11]

Another initiative of the INCB to combat illicit trading of drugs on the internet is that it has urged the nations to adopt the concept of 'voluntary public-private partnerships' to encourage intermediaries who are online service providers to share relevant data with the law enforcement agencies about activities that arouse suspicion so that the same could be analysed and corrective measures could be taken timely to curb this menace that is silently gaining roots. It is only through collaborative efforts and sharing of information across geographical boundaries and international borders that the borderless crime of internet based trade in illicit narcotics and psychotropic substances. Hence at the international level the effort has already been initiated and spearheaded by the international bodies for over more than the last two decades.

In its 137th session that concluded in May 2023 at Vienna, the International Narcotics Control Board (INCB) reviewed the status of implementation of the three international drug control conventions. INCB also has the mandate of ensuring achievement of the Sustainable Development Goals, in particular SDG 3 on health and well-being and SDG 16 on peace, justice and strong institutions by supporting Member States in achieving the same. An issue of relevance that the Board deliberated upon was the role of the Internet and social media and consequences for drug trafficking and use, which would be the focus of a thematic chapter of the INCB 2023 Annual Report, to be released in early 2024. Views and opinions of representatives of the civil society working in various areas across the globe were elicited through a dialogue on this subject matter. The Board held consultations with a number of partner organizations, including: the President of the Economic and Social Council, the Chair of the Commission on Narcotic Drugs, the Executive Director of the United Nations Office on Drugs and Crime, and representatives of the World

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11   E/INCB/2018/Alert.8 *Internet Facilitated Trade in Precursors*

Health Organization and the World Customs Organization.[12]

Efforts at the national and state level in India

The challenge of online trading in drugs has been attempted to be addressed in India as well. The Government in Uttar Pradesh has constituted an Anti-Narcotics Task Force (ANTF) which has prepared a road map for complete demolition of the dark web based drug trade in the State. A special team is being constituted which will include IT specialists, cyber experts and software developers tasked with checking supply of synthetic narcotics and psychotropic drugs through the medium of dark web, social media in which there is use of crypto currency and misuse of technology.[13] Similar structure is in place in all States and Union Territories to effectively check drug trafficking and drug addiction. At the national level, the Narcotics Control Bureau is the nodal agency at the national level on drug law enforcement in India. Technology is the tool being misused by drug traffickers to challenge the drug law enforcement agencies across the world.[14] These include use of darknet to sell drugs, use of untraceable internet technology for drug related communications.[15]

Binaural Beats Technology

The second part of the paper discusses use of sound technology and modulation of frequency to alter brain waves resulting in a calming or arousal effect.

A subject of medical research over the last two decades, the Binaural Beats Technology (BBT) is based on stimulating each ear with a differing auditory frequency resulting in brainstem responses leading to states of reduced anxiety, anger and other negative emotions. Slow modulations called binaural beats are perceived when tones of different frequency are presented separately to each ear. The sensation may show how certain sounds are processed by the brain.[16] When the brain is subjected to auditory stimulus of sounds of two different frequencies measured in Hertz, the brain waves produce a beat, after alignment of the two beats and the frequency of this beat is equal to the difference in frequencies of the two beats.

The superior olivary complex located in the brain is the crucial part that not only receives the auditory stimulus from both the ears but also processes the same. This complex is tasked with synchronizing the various activities of billions of neurons in the brain. As a response to the stimulus of two close but differing frequencies, it creates a binaural beat which has the potential of altering brain waves. The process of synchronization of the neural activities across the brain is called entrainment. Not just related to binaural beats entrainment is a common part of functioning of the brain. Some researchers opine that certain binaural beats can enhance or dissipate the strength

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12   https://unis.unvienna.org/unis/en/pressrels/2023/unisnar1472.html

13   Anti-Narcotics Task Force to Curb Trade on 'Dark Web.' http://timesofindia.indiatimes.com/articleshow/93939834.cms?utm_source=contentof interest&utm_medium=text&utm_campaign=cppst

14   narcoticsindia.nic.in

15   Ibid

16   Gerald Oster Auditory *Beats in the Brain*; October 1973; scientificamerican.com/article/auditory-beats-in-the-brain/

of certain brain waves. This can accelerate or slow down different brain functions that govern thoughts and emotions.

Numerous studies have indicated positive benefits of the use of the technique of brainwave entrainment by modes of light or sound stimulation as an intervention in treating diseases such as cognitive dysfunction, headache/migraine, and premenstrual syndrome and promoting relaxation and recovery.[17] Auditory beats that are monaural (e.g. physical beats to both ears) or binaural (different sinusoidal waves with similar frequencies presented to each ear separately) are new instruments in the non-invasive method.[18] A study was conducted in which linear and nonlinear electroencephalogram (EEG) changes due to long-term audio-visual stimulation (AVS) were investigated.[19] The study concluded that repetitive training with audio-visual stimulation does induce changes in the electro-cortical activity of the brain.[20]

The brain is capable to recognize the difference in the two auditory stimuli upon simultaneous application of two sound waves of closer frequencies in the left and right ears. Furthermore, a virtual third wave is perceived by the brain as a binaural beat with the frequency difference between the two sounds.[21] For instance, when a sinusoidal 250-Hz pure tone is supplied to the left ear and a 256-Hz tone is simultaneously presented to the right ear, the brain perceives an amplitude variation with a frequency rate of 6 Hz.[22]

The concept of binaural beats was first explained by Heinrich Wilhelm Dove in 1839 that by providing two slightly different tone frequencies, one in each ear, a third phantom frequency was perceived by the difference of these two frequencies, which was called binaural beats. In the latter half of the twentieth century, Robert Monroe commenced systematic research on the clinical application of Binaural Beats, thereby explaining that the dissimilarity of both frequencies must be within the range of electroencephalographic (EEG) spectrum that would lead to brain entrainment.[23]

Fifteen mildly anxious patients were identified in the Clinique Psyche, Montreal, Quebec[24]. A post test pilot study was conducted at their home settings The objective of the study was to determine whether mildly anxious people would report decreased anxiety after the effect of auditory stimulus of binaural beats embedded tapes for a duration of one month, and whether they would express

17   Roya Dabiri et al ;The Effect of Auditory Stimulation using Delta Binaural Beat for a Better Sleep and Post-Sleep Mood: A Pilot Study; Published online 2022 May 20. doi: 10.1177/20552076221102243 PMID: 35615269

18   Ibid

19   M Teplan, A Krakovská, S Stolc; *EEG responses to long-term audio-visual stimulation*; Institute of Measurement Science, Slovak Academy of Sciences, Dúbravská cesta 9, Bratislava 842 19, PMID: **15936103** DOI: 10.1016/j.ijpsycho.2005.02.005

20   Ibid

21   Roya Dabiri et al ;The Effect of Auditory Stimulation using Delta Binaural Beat for a Better Sleep and Post-Sleep Mood: A Pilot Study; Published online 2022 May 20. doi: 10.1177/20552076221102243 PMID: 35615269

22   Ibid

23   Berger and Turow, 2011.

24   R P Le Scouarnec , R M Poirier, J E Owens, J Gauthier, A G Taylor, P A Foresman *Use of binaural beat tapes for treatment of anxiety: a pilot study of tape preference and outcomes* Affiliations Clinique Psyché in Montreal, Quebec PMID: 11191043; pubmed.ncbi.nlm.nih. gov/11191043

preference for a particular tape among 3 tapes they were exposed to. The conclusion was that listening to binaural beat tapes in the delta/theta electroencephalogram range may be beneficial in reducing mild anxiety.[25]

Commercial availability of Binaural Auditory Beats for subscribers has been made possible through online platforms. One such platform is the I-Doser. I-Doser is both an application and the name of a company that provides access to a set of purchasable Binaural Auditory Beats (BABs), some of them named after existing recreational drugs. The i-doser.com official website of I-Doser claims that they are the leading provider of artisan brainwave doses and software and further mentions that may people use binaural brainwave audio for relaxation, enhancing meditation, yoga and holistic balance.

There is a perceptible lack of experimental research on commercially available binaural beats which has confirmatory results demonstrating the health benefits of a specific C-BAB. While there are numerous C-BAB customers worldwide, the relevant C-BAB research is scarce. Reviews of experiences of users who have subscribed to specific commercial BABs are a prerequisite for such kind of an experiment.

Customers subscribe to paid C-BAB from the I-Doser application which have been named on drugs like, Marijuana, Cocaine, or Gates of Hades. This notoriously painful C-BAB of thirty minutes duration is made up of four independent BABs of differing delta-frequency amplitude modulation and is widely known to cause intense feelings, hallucinations, and anxiety.[26] Hence, instead of investigating C-BAB which targets mild health outcomes, C-BAB that aims to elicit intense emotional experience could be studied in priority, as it is more urgently required and, if lucky, may gain more academic attention.[27] Apprehensions and concerns have been repeatedly expressed by parents, which were reflected in the media time and again. Binaural beats offered by sites as the 'Gateway Drug' and highlights the concern and apprehension of parents that their children engaging in this activity which may be 'seemingly benign may lead their children down a more dangerous path.'[28] The concern of the Oklahoma Bureau of Narcotics and Dangerous Drugs Control has also been reflected in the report that kids showing interest in exploring this may have likelihood of ending up smoking marijuana or 'looking for bigger things.' The author further states that while binaural beats may actually not be a "gateway" drug inducing its subscribers to experiment with harder substances, the websites that sell i-doses may be seemingly encouraging sex and drugs. The sounds - which retail for about $19.95 (£13) for four "doses" - are given names like "alcohol", "opium", "marijuana", "peyote" and "orgasm".[29]

25 Ibid

26 Changhyuk Seo *Health Implications of Binaural Auditory Beat (BAB): Its Perils and Applications*; Perils Of Commercial Binaural Auditory Beat; Department of Psychology, University of Toronto

27 Ibid

28 Katie Connolly *Can 'Digital Drugs' Get you High?;* BBC News, Washington 22 July 2010

29 Ibid

Another report elaborates on the functioning of the player, called an I-Doser, which is a binaural beat generator by the name I-Doser that produces sounds that have been named after drugs like crack and crystal meth.[30] Subscribers of I-Doser are informed that those listening to the rhythm named Marijuana could ultimately lead to the high users experience when they smoke the actual substance marijuana. Each dose of the musical input is charged at about three dollars with a word of caution by experts against using anything that could be seen as a gateway into harder drugs.[31] The fact that the musical beats are named after narcotic drugs and psychotropic substances is reason enough for concern of the possible ill effects on the user of the Binaural Auditory Beats. It is only after intensive research in this area that the apprehensions could be confirmed or negated regarding the effect caused by the BABs.

Apart from lack of research, the legal framework worldwide still remains inadequate to address the issues of online trading in illicit drugs and digital drugs, the commonly used parlance for binaural beats. The Narcotic Drugs and Psychotropic Substances Act, 1985 defines the legal framework in India to handle offence related to narcotic drugs and psychotropic substances. Its preamble states that it is 'An Act to consolidate and amend the law relating to narcotic drugs, to make stringent provisions for the control and regulation of operations relating to narcotic drugs and

psychotropic substances to provide for the forfeiture of property derived from, or used in, illicit traffic in narcotic drugs and psychotropic substances, to implement the provisions of the International Conventions on Narcotic Drugs and Psychotropic Substances and for matters connected therewith.'

The Prevention of Illicit Traffic in Narcotic Drugs and Psychotropic Substances Act, 1988 aims to check trafficking in illicit drugs. Its preamble states that it is 'An Act to provide for detention in certain cases for the purpose of preventing illicit traffic in narcotic drugs and psychotropic substances and for matters connected therewith.'[32] The Information Technology Act, 2000 has been enacted to provide legal recognition for transactions carried out by means of electronic data interchange and other means of electronic communication, commonly referred to as ─ electronic commerce, which involve the use of alternatives to paper-based methods of communication and storage of information, to facilitate electronic filing of documents with the Government agencies and further to amend the Indian Penal Code, the Indian Evidence Act, 1872, the Banker's Books Evidence Act, 1891 and the Reserve Bank of India Act, 1934 and for matters connected therewith or incidental thereto,[33] as stated in its preamble.

Legislations related to narcotic drugs and psychotropic substances have provisions related to substances traded physically or in the offline mode. Special provisions catering

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30   The Indian Express written by the ANI, Las Vegas, dated November 30, 2010
31   Ibid
32   The Prevention of Illicit Traffic in Narcotic Drugs and Psychotropic Substances Act, 1988
33   The Information Technology Act, 2000

to online trading of drugs with requisite definitions, procedures and adequate penalty need to be included. Similarly, digital drugs are a topic of further in depth research. There is no denying the possibility that the tech savvy youth population could be a vulnerable target to online procurement of drugs as well as digital drugs. The Information Technology Act, 2000 which was later amended in 2008 has categorised offences against individuals, organization and society at large. Not only does the offence of online trading in illicit drugs causing harm to individuals, family and society at large need specific provisions in the law but the role and liability of intermediaries also needs to be defined and appropriately penalized. Awareness of society at large regarding this menace and capacity building of law enforcement agencies are the need of the hour with a view to prevention of misuse of technology in online trading of illicit drugs and digital drugs. Collaboration and cooperation among the multiple stakeholders at the domestic and international level, which includes the law enforcement agencies and other wings of the Interoperable Criminal Justice System will act as a facilitator in checking the misuse of technology in illicit drug trafficking.

References

1. Adejoh S. O., Adisa W. B., Onome O., Anyimukwu C. and Olorunlana A. (2020). The Influence of Social Media on Illicit Drug Sale and Use among Undergraduates in Lagos, Nigeria. *Journal of Alcohol & Drug Education*, 64(2).

2. Aldridge J., Decary-Hetu D. and EMCDDA U. (2015). *Cryptomarkets and the future of illicit drug markets*. Publications Office of the European Union pp. 23-32, Vol. 21.

3. Colzato L.S., Barone H., Sellaro R. and Hommel B. (2017). More attention focusing through binaural beats: evidence from the global–local task. *Psychological Research*, 81, 271–277

4. Connolly K. (2010, July). Can 'Digital Drugs' get you High? *BBC News.*

5. Dabiri R. Monazzam E.M.R., Salmani N. M, Khaneshenas F. and Zakerian S.A. (2022). The effect of auditory stimulation using delta binaural beat for a better sleep and post-sleep mood: A pilot study. *Digit Health*. (2022)

6. E/INCB/2018/Alert.8 *Internet Facilitated Trade in Precursors*

7. Le Scouarnec R.P., Poirier R.M., Owens J.E., Gauthier J., Taylor A.G. and Foresman P.A. (2001).Use of binaural beat tapes for treatment of anxiety: a pilot study of tape preference and outcomes. *Altern Ther Health Med*, 7(1):58-63

8. Oster G. (1973). Auditory Beats in the Brain. *Scientific American*.

9. Pandey D.K. (2021, June). COVID-19 restrictions may have accelerated drug trafficking via Internet. *The Hindu.*

10. Seo C. (2021). Health Implications of Binaural Auditory Beat (BAB) Its Perils and Application. *PsyArXiv Preprints.*

11. Smuggling in India – Report by Directorate of Revenue Intelligence

12. Teplan M., Krakovská A. and Stolc S. (2006). EEG responses to long-term audio-visual stimulation. *Slovak Academy of Sciences*, Dúbravská cesta 9, Bratislava 842 19, Slovak Republic

13. TNN. (2022, September). Anti-Narcotics Task Force to Curb Trade on 'Dark Web. *The Times of India*.

14. UNIS Vienna. https://unis.unvienna.org/unis/en/pressrels/2023/unisnar1472.html

15. Van Hout M.C. and Bingham T. (2013). 'Silk Road', the virtual drug marketplace: A single case study of user experiences. *International Journal of Drug Policy,* Volume 24, Issue 5, Pages 385-391

16. Wahbeh H., Calabrese C., Zwickey H. and Zajdel D.J. (2007). Binaural Beats Technology in Humans: A Pilot Study to Assess Neuropsychologic, Physiologic and Electroencephalogic Effects. *Altern Complement Med*, 13(2):199-206

17. Wani A. (2022, October). India's SCO presidency: Leveraging opportunities. *Orfonline*

18. World Drug Report 2023

19. www.narcoticsindia.nic.in

Predicting Property Crimes in Railways: A Case of Bihar Rail Network

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Abstract

Numerous policing outfits across the globe are adopting Predictive policing to contain different types of crime. Indian Police Forces are also using predictive policing in various areas, except railways. This study is an attempt to showcase the usage of predictive policing tools in Indian railways by implementing it to predict property crimes in Bihar rail network. This study uses visualization, cluster analysis and hot spot analysis for predictions. The results show that there are several places where predictive analytics can be successfully used to reduce different crime rates.

1. Introduction

With increasing population and limited Police force, Indian Law Enforcement Agencies must put extreme effort to reduce the ever-increasing crime rates. Technology has come to the rescue by giving policing new means to deter and prevent the crimes before it happens. Though the benefits of predictive policing have been debated, yet its usage has been increasing worldwide (Meijer and Wessels, 2019). India too is leveraging on technology and data analysis to reduce crime rates in various areas viz., women's safety (Patil et al., 2021), burglary (Ferguson, 2016), theft (Ferguson, 2016), etc. But there is still not much done in few other areas. One such area is railways. Indian railway is the largest rail network in Asia (Indian Railways, n.d.). Therefore, asssssment of such a vast area is quite difficult to incorporate in a single study. Moreover, railway crimes are mostly unique as the location and timing of crime might not be certain in many cases. This makes crimes in railway hard to predict and consequently harder to use predictive policing measures. In the light of aforementioned arguments, it does not come as a surprise that no study has been performed on using predictive policing in the area of Indian railways. This study is an endeavour to instigate the usage of predictive policing in railway network by attempting to predict property crimes in Bihar rail network. Moreover, property crimes have been chosen for the study as it has the highest share of the total crimes

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reported in any selected period.

Property crimes refer to crime targeted at properties rather than persons. According to National Institute of Justice, U.S.A. (n.d.), "In a property crime, a victim's property is stolen or destroyed, without the use of threat of force against the victim. Property crimes include burglary and theft as well as vandalism and arson". Property crimes in Indian railways have been divided into eight categories, viz., running train theft with passenger (RTTP), platform theft (PT), pick pocketing (PP), motor vehicle theft (MV), burglary, dacoity, robbery and other miscellaneous cases. The same classification has been used in this study.

Rest of the paper has been divided into five sections. Section 2 contains the literature review and section 3 contains the methodology adopted for this study. Section 4 of the paper deals with the data analysis and findings of the study. Section 5 deals with the discussions of the results obtained and implications of those results. Section 6 contains the conclusion and the future scope of the study.

2. Literature Review

Prediction is not something new in policing. What has changed is the adoption of technology in doing the prediction which was previously done manually by Police officers. Police in various countries are using predictive techniques to prevent crimes from being committed. United States of America was among the first few countries to implement predictive policing in California, Washington, South Carolina, Arizona, Tennessee and Illinois (Friend,

2013). Similar implementation in New York helped NYPD to improve their strategies to tackle crimes (Levine et al., 2017). One can also find similar implementations in Europe (Neslen, 2021) and China (Allen-Ebrahimian, 2019). According to McCarthy (2019), countries like Germany, Denmark, Netherlands, United Kingdom and India have also implemented predictive policing at the local level.

The horizon of predictive analytics utility is rapidly expanding. With the passage of time these tools are getting implemented to predict crimes of a diverse nature. According to Pearsall (2010), Richmond's Police Department successfully used predictive technique to reduce gun fires on New Year's Eve. Haberman and Radcliffe (2012) also studied usage of predictive techniques to ascertain the future armed street robberies. Ferguson (2016) mentioned the use of predictive techniques by Santa Cruz Police department to forecast the location and days of car and home burglaries using eight years data. Similar initiatives have been taken in other cities of United States of America to predict the likely offenders and victims of gun violence (Ferguson, 2016). Piza and Carter (2017) in their study attempted to analyse residential burglary and motor vehicle theft using predictive techniques. Although, lot many studies were taken up in diverse criminal areas, predictive techniques were rarely used to predict property crimes in railways. This study attempts to mitigate this gap and find ways to implement predictive technique in Indian railways.

Haberman and Radcliffe (2012) used near

repeat phenomenon along with hot spot analysis to predict armed street robberies. Chainey et al. (2008) compared different hotspot mapping for their accuracy in predicting future crimes. Moreover, they mentioned that different prediction techniques suits to predict different types of crime. Drawve (2014) made similar comparisons while predicting robberies in short-term and long-term. Piza and Carter (2017) used near repeat analysis in their study to predict residential burglary and motor vehicle theft. Moreover, they used multinomial logistic regression to predict the first event of the near repeat chain. While this might not be an exhaustive list, the other techniques used in predictive policing are data mining, crime mapping, geospatial prediction and social network analysis (Pearsall, 2010). In this study, we have demonstrated use of different techniques ranging from hot spot analysis, visualizations and cluster analysis to forecast the property crime in Indian railways using Bihar rail network as a case.

While our study would be the first endeavour to showcase the utility of predictive policing in rail networks in India, several works of smart policing have been done in other policing areas of India. Chauhan and Sehgal (2017) suggested usage of data mining techniques and algorithms for crime analysis. Marda and Narayan (2020) attempted to assess the biases and performance of CMAPS (Crime Mapping, Analytics and Predictive System) implemented by Delhi Police in 2015. Patil et al. (2021) suggested usage of predictive techniques for women's safety. Davies (2020) focused on the usage of IOT (Internet of Things) as a road ahead for predictive policing in India. Wanchoo and Desai (2022) suggested usage of Big Data for improving the predictive policing approach by reducing its inefficiencies. Many more theoretical as well as empirical papers have been published on usage of predictive techniques in India, but scarcely work have been found on crimes in rail networks in India.

3. Methodology

The biggest challenge faced was to get the electronic data in a meaningful format, which can be utilized to the fullest. A format was developed and provided to the lower-level staffs to store electronic data in Microsoft Excel. These staffs were instructed to fill the details from the pre-existing records starting from the year 2010 to 2019 for the four rail districts of Bihar (Patna, Muzaffarpur, Jamalpur and Katihar). The data gathered and the database thus formed contained various typological errors which were later identified and rectified to ensure meaningful interpretations of the analysis to be performed. Moreover, the missing data was removed to the extent that it has minimum impact on the results obtained. In the next step, few variables like nature of crime (NOC), occurrence month (OM), occurrence day (OD) have been coded to be used for quantitative analysis. Since time is a continuous variable, it was divided into slots a.k.a. Prahar to have meaningful implication. Each Prahar is of 3 hours with first Prahar starting from 3 A.M. Following this, several analytics and predictive tools have been ascertained with the consultation of various experts in this area. While there are number

of methods adopted across countries, we chose hot spot analysis, visualization, and cluster analysis to demonstrate its usage in the Indian rail network.

4. Data Analysis and Findings

Based on the data obtained from the Bihar Rail Police, the following description has been prepared after data cleaning process.

Table 1: Number of crimes for each rail district in past 10 years

Rail Districts	Number of Crimes reported (Last 10 years)
Patna	5617
Muzaffarpur	1794
Jamalpur	1621
Katihar	1537

Source: Author's Compilation

As can be seen from Table 1, most of the property crimes in Bihar rail network in the past ten years took place in Patna rail district, followed by Muzaffarpur and Jamalpur. Katihar had the lowest number of property crimes among all four rail districts. In the next step various charts and graphs were obtained for the analysis. Moreover, figure 1 suggests that highest number of crimes were reported for RTTP cases followed by PT cases and lowest for burglary followed by dacoity.

Figure 1: Number of crimes for each crime type in past 10 years
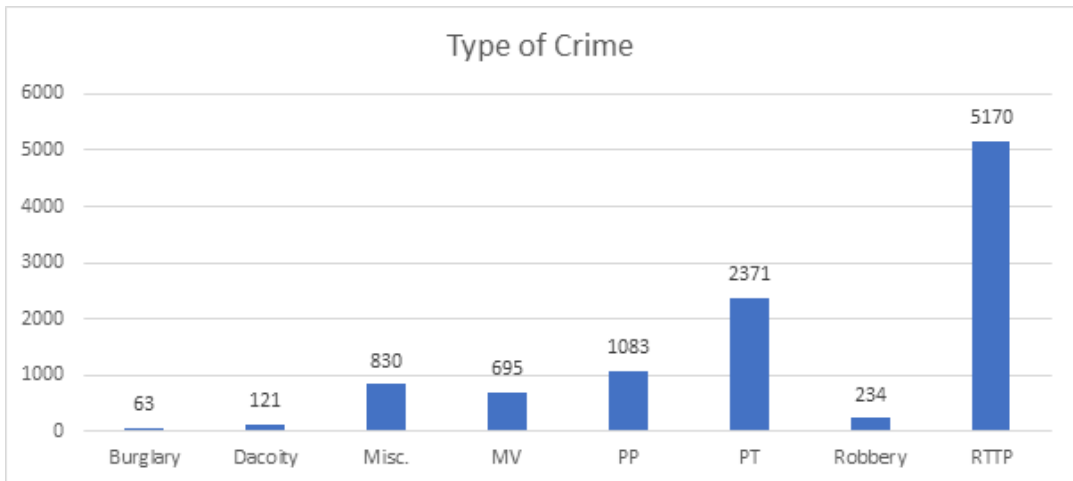
Source: Author's Compilation

Visualization for the number of crimes reported on various days and time slots (Prahar) clearly shows a trend of having highest crimes reported during last Prahar of the night i.e., between 12 AM to 3 PM (see figure 2).

Figure 2: Number of crimes on different time slots (Prahar) and day in Patna
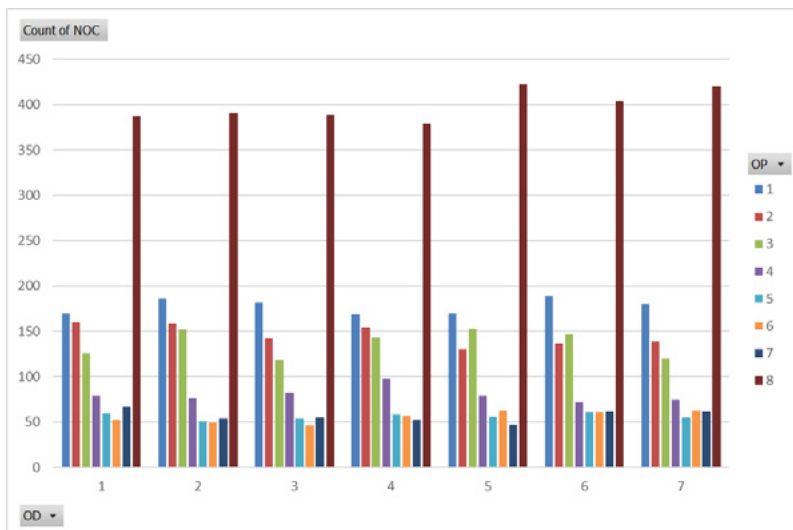
Source: Author's compilation

Careful examination of next graph (Figure 3) shows an increase in crime reported during vacation periods like May and June.

Figure 3: Number of crimes during different months from 2010-2019 in Patna
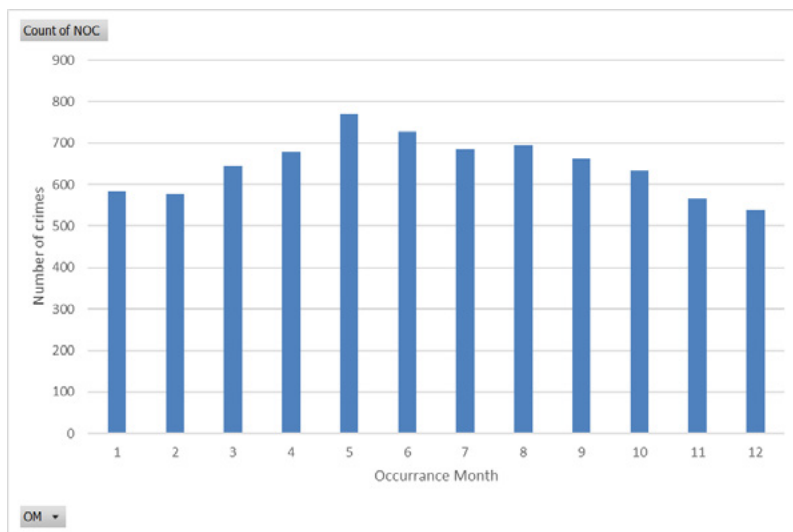
Source: Author's compilation

The below figure 4 shows that the number of crimes reported on each day of a week shows very low deviation, but it was found to be highest on Mondays and lowest on Tuesdays.

Figure 4: Number of crimes during different days from 2010-2019 in Patna
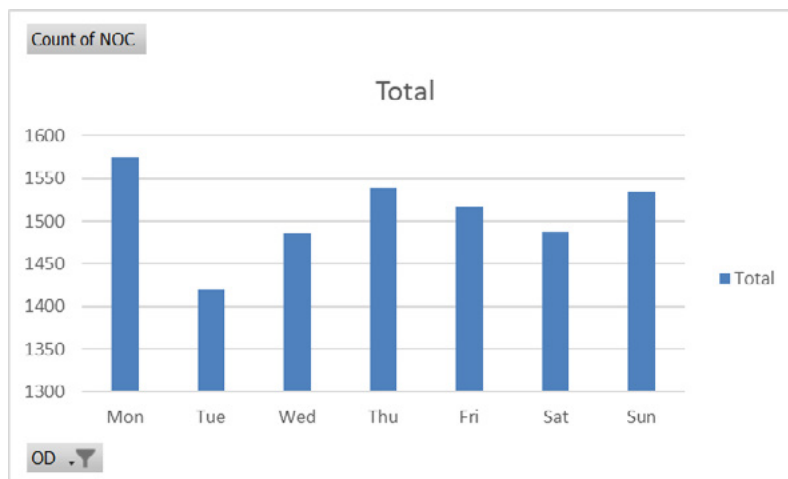
Source: Author's compilation

These figures give the information regarding the month, day, and time of recurrence of crimes.

Results from Cluster Analysis

The data obtained were used for two step cluster analysis for each of the districts. Tables thus obtained from SPSS are presented in the appendix.

Jamalpur Rail District

Cluster quality for this district was found to be fair and four clusters were formed. Results show that for Jamalpur rail district, two of the clusters reported only RTTP cases while for one of them all these reported cases were committed during the last Prahar i.e., 12:00 AM to 3:00 AM. In cluster 3 RTTP cases were extremely low in comparison to other clusters, which make this cluster different from other three. In cluster 4 all crimes take place during the time slot of 6 A.M. to 9 A.M.

Katihar Rail District

Similar to Jamalpur rail district, cluster quality for Katihar rail district was also found to be fair and four clusters were formed. Three out of four clusters formed in this rail district reported almost all cases as RTTP except for cluster 2 where almost negligible RTTP cases were reported. For cluster 1 only RTTP cases were reported, and all were during 9 P.M. and 12 A.M. No other unique features were detected for this rail district.

Muzzafarpur Rail District

Unlike previous two rail districts, cluster quality for Muzzafarpur rail district was poor. So, the results further obtained were not so meaningful. Even then it can be easily seen that cluster 2 has all its crimes reported in 8th Prahar or between 12 A.M. and 3 A.M.

Patna Rail District

Cluster quality for Patna rail district was found to be fair and five clusters were formed. Results show that for Patna rail district, cluster 1 reported only RTTP cases and all during last Prahar of the day (12 A.M.

to 3A.M.). Cluster 3 contains only PT cases all reported during 12 A.M. to 9 A.M. Cluster 5 also contains only RTTP cases while they occur at different times during the day. Cluster 2 contains only RTTP and PT cases all reported during 9 A.M. to 12 A.M.

Hot spot analysis

Another tool used was hot spot analysis. As crime is ubiquitous, only locations (latitude and longitude) having frequencies of crime more than 20 during the chosen period of study have been ascertained and plotted on Google maps (see Figure 5).

Figure 5: Hot Spots using Google maps.
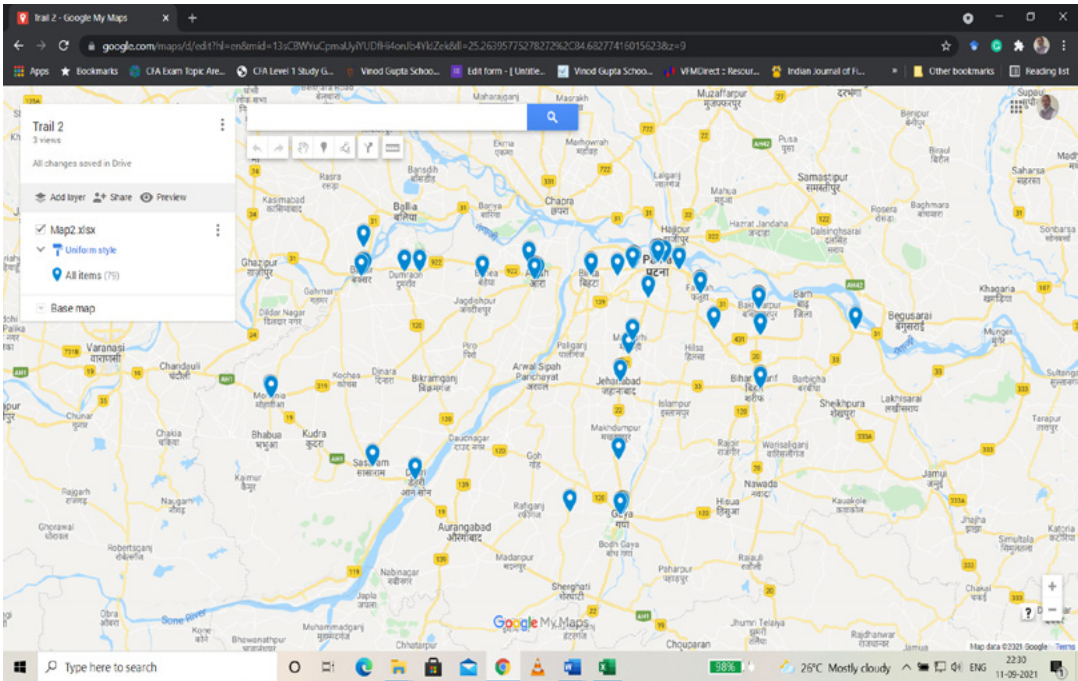
5.   Discussion and Implications

Predictive policing is bringing all sorts of changes in policing all over the world. Indian Police is also adapting to this change and implementing the same in various policing areas in several states of India. While many studies have been conducted in this area nothing useful has been done in railways. This study is one of the first attempts to showcase the ways in which predictive policing can be implemented in railways to

deter property crimes in railway network of Bihar.

With several tools like visualization, cluster analysis and hot spot analysis some results were found. The results showed that Patna had the highest crimes reported among all the rail districts in Bihar. This might be due to Patna being the largest railway station with highest footfall among all the rail districts. So, we can attribute this result to the base effect of highest passengers boarding at

this station. Results further showed that most of the crimes reported were of RTTP. This might be because it is easy for an offender to escape after committing this kind of crime. Further analysis shows that most of these crimes happen during the last Prahar of the day i.e., between 12 A.M. and 3 A.M. Since most of these crimes are RTTPs, it is easy for offenders to conduct their nuisances when passengers are in deep sleep. Results also suggest increase in property crimes during May-July, which might be attributed to more family leisure tours during these months as schools and colleges remain closed.

The results from cluster analysis can be largely used for predictive policing. For example, one of the clusters of Jamalpur rail district reported all its cases as RTTP, occurring during last Prahar of the day. Thus, cases in this cluster can be reduced by increase patrol by railway Police in the trains passing the location (latitude and longitude) contained in this cluster during the last Prahar. Similar strategies can be implemented in other rail districts for the clusters obtained. For the clusters which have all types of cases except RTTPs, there are chances that the location is nearby a large station or most the trains pass from this cluster during daytime. So, patrolling for these stations should be on the platforms during the daytime. The cluster analysis helped in determining both geographical and temporal nature of crime held in various rail districts during the chosen period. This supports the administration by providing necessary information for deployment of Police in future to reduce the number of crimes committed in the area. Similar analysis has been performed for all the rail districts. The hot spot analysis shows the locations with frequency of cases higher than 20 which indicates the place of reoccurrence of crimes in Bihar rail.

6. Conclusion and Future Scope

The results obtained can be used to time the deployment of Police in a particular area on a specific day and time. The results can be utilized to plan such deployment to reduce the frequency of most recurring crimes. This will consequently reduce the overall crime rate in the districts. While a lot is still left to be done, we have made our first step towards predictive policing. Similar or more advanced studies could be carried by railway Police in future. Moreover, similar study can also be carried out in other policing areas.

References

1. Allen-Ebrahimian B. (2019). Exposed: China's operating manuals for mass internment and arrest by algorithm. *International Consortium of Investigative Journalists*.

2. Chainey S., Tompson L. and Uhlig S. (2008). The utility of hotspot mapping for predicting spatial patterns of crime. *Security journal*, *21*(1), 4-28.

3. Davies A. (2020). IOT, smart technologies, smart policing: the impact for rural communities. *Smart village technology* (pp. 25-37). Springer, Cham.

4. Ferguson A. G. (2016). Policing predictive policing. *Wash. UL Rev.*, *94*, 1109.

5. Friend Z. (2013). Predictive policing: Using technology to reduce crime. *FBI Law Enforcement Bulletin*, 82(4), 1-4.

6. Indian Railways (n.d.), extracted from https://indianrailways.gov.in/railwayboard/view_section.jsp?lang=0&id=0,1#:~:text=By%201880%20the%20Indian%20Railway,second%20largest%20under%20one%20management.

7. Levine E. S., Tisch J., Tasso A. and Joy M. (2017). The New York City Police department's domain awareness system. *Interfaces*, *47*(1), 70-84.

8. Marda V. and Narayan S. (2020, January). Data in New Delhi's predictive policing system. *Proceedings of the 2020 conference on fairness, accountability, and transparency* (pp. 317-324).

9. McCarthy O. J. (2019). *AI & Global Governance: Turning the Tide on Crime with Predictive Policing*. United Nations University Centre for Policy Research.

10. Neslen A. (2021, October). Pushback against AI policing in Europe heats up over racism fears. *Reuters*.

11. Patil P, Mehta K., Gosalia V. and Kotecha R. (2021). *Predictive Policing for Women's Safety*.

12. Pearsall B. (2010). Predictive policing: The future of law enforcement. *National Institute of Justice Journa*l, 266(1), 16–19.

13. Piza E. L. and Carter J. G. (2018). Predicting initiator and near repeat events in spatiotemporal crime patterns: An analysis of residential burglary and motor vehicle theft. *Justice Quarterly*, *35*(5), 842-870.

14. Shapiro A. (2017). Reform predictive policing. *Nature news*, *541*(7638), 458.

Jamalpur Cluster

Model Summary

Algorithm	TwoStep
Inputs	4
Clusters	4

Cluster Quality

Poor   Fair   Good

-1.0   -0.5   0.0   0.5   1.0
Silhouette measure of cohesion and separation
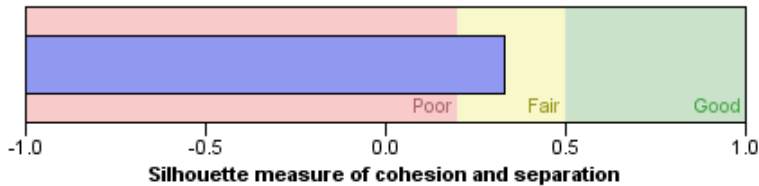
Centroids		latitude		Longitude	
		Mean	**Std. Deviation**	**Mean**	**Std. Deviation**
Cluster	**1**	25.0434	.23391	86.3298	.29428
	2	25.1089	.20792	86.3591	.35190
	3	25.1924	.22116	86.5583	.45627
	4	25.1395	.19383	86.4128	.38116
	Combined	25.1119	.22678	86.4077	.38002

Crime_type	RTTP		PT		PP		MV		Misc.	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	886	49.50%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Cluster 2	743	41.50%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Cluster 3	3	0.20%	153	85.50%	229	86.10%	87	75.70%	217	90.00%
Cluster 4	158	8.80%	26	14.50%	37	13.90%	28	24.30%	24	10.00%
Combined	1790	100.00%	179	100.00%	266	100.00%	115	100.00%	241	100.00%

Prahar																
	1st		2nd		3rd		4th		5th		6th		7th		8th	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	886	80.80%
Cluster 2	382	78.60%	0	0.00%	126	48.60%	77	51.00%	36	34.00%	60	54.50%	62	56.40%	0	0.00%
Cluster 3	104	21.40%	0	0.00%	133	51.40%	74	49.00%	70	66.00%	50	45.50%	48	43.60%	210	19.20%
Cluster 4	0	0.00%	273	100.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Combined	486	100.00%	273	100.00%	259	100.00%	151	100.00%	106	100.00%	110	100.00%	110	100.00%	1096	100.00%

Katihar Cluster

Model Summary

Algorithm	TwoStep
Inputs	4
Clusters	4

Cluster Quality

Silhouette measure of cohesion and separation
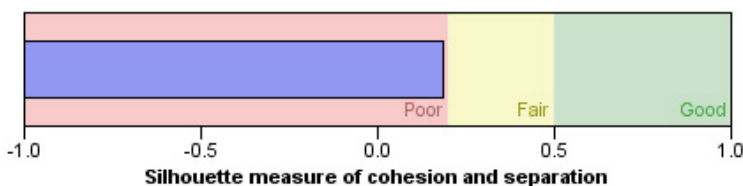
Centroids		latitude		Longitude	
		Mean	Std. Deviation	Mean	Std. Deviation
Cluster	1	25.5657	.22829	86.7193	.78556
	2	25.6631	.30146	86.8067	.64528
	3	25.4812	.09573	86.3966	.61627
	4	25.4885	.11095	86.3833	.59614
	Combined	25.5635	.23026	86.6126	.69815

Crime_type												
	RTTP		PT		PP		MV		Misc.		Burglary	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	641	41.4%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cluster 2	1	0.1%	157	100.0%	123	100.0%	197	99.0%	157	94.0%	69	100.0%
Cluster 3	389	25.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cluster 4	516	33.4%	0	0.0%	0	0.0%	2	1.0%	10	6.0%	0	0.0%
Combined	1547	100.0%	157	100.0%	123	100.0%	199	100.0%	167	100.0%	69	100.0%

Prahar																
	1st		2nd		3rd		4th		5th		6th		7th		8th	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	641	72.7%	0	0.0%
Cluster 2	54	20.7%	71	38.0%	77	43.5%	40	31.7%	48	52.7%	47	54.7%	241	27.3%	126	27.9%
Cluster 3	207	79.3%	0	0.0%	100	56.5%	0	0.0%	43	47.3%	39	45.3%	0	0.0%	0	0.0%
Cluster 4	0	0.0%	116	62.0%	0	0.0%	86	68.3%	0	0.0%	0	0.0%	0	0.0%	326	72.1%
Combined	261	100.0%	187	100.0%	177	100.0%	126	100.0%	91	100.0%	86	100.0%	882	100.0%	452	100.0%

Muzzafarpur District

Model Summary

Algorithm	TwoStep
Inputs	4
Clusters	2

Cluster Quality

Silhouette measure of cohesion and separation
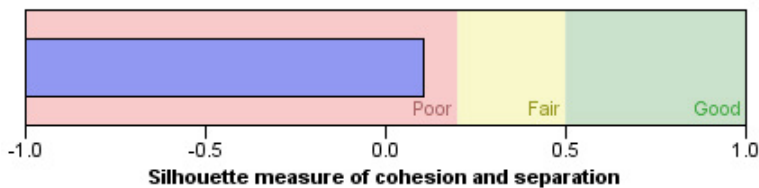
Crime_type																
	RTTP		PT		PP		MV		Misc.		Robbery		Burglary	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	607	50.2%	325	100.0%	253	100.0%	110	16.3%	125	28.9%	42	100.0%	52	100.0%
Cluster 2	603	49.8%	0	0.0%	0	0.0%	566	83.7%	307	71.1%	0	0.0%	0	0.0%
Combined	1210	100.0%	325	100.0%	253	100.0%	676	100.0%	432	100.0%	42	100.0%	52	100.0%

Prahar																	
	1st		2nd		3rd		4th		5th		6th		7th		8th	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	334	100.0%	193	100.0%	273	100.0%	178	100.0%	91	100.0%	125	100.0%	108	100.0%	212	12.6%
Cluster 2	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1476	87.4%
Combined	334	100.0%	193	100.0%	273	100.0%	178	100.0%	91	100.0%	125	100.0%	108	100.0%	1688	100.0%

Patna District

Model Summary

Algorithm	TwoStep
Inputs	4
Clusters	5

Cluster Quality
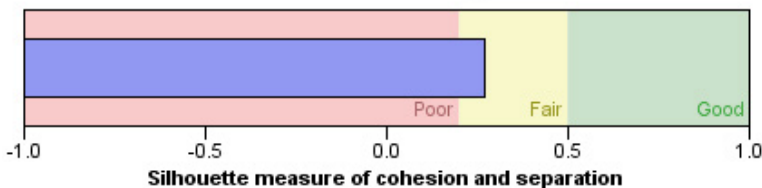
Silhouette measure of cohesion and separation

Centroids		latitude		Longitude	
		Mean	Std. Deviation	Mean	Std. Deviation
Cluster	1	25.3365	.32083	84.8929	.51804
	2	25.3682	.30433	85.0023	.48579
	3	25.3424	.33503	84.9764	.39713
	4	25.2967	.34251	84.9589	.45223
	5	25.3494	.30683	85.0268	.56230
	Combined	25.3368	.32334	84.9680	.49160

Crime_type	RTTP		PT		PP		MV		Misc.		Robbery		Burglary		Dacoity	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	1773	45.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cluster 2	594	15.4%	908	43.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cluster 3	0	0.0%	1187	56.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cluster 4	0	0.0%	0	0.0%	604	100.0%	456	100.0%	568	100.0%	106	100.0%	1	100.0%	65	100.0%
Cluster 5	1497	38.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Combined	3864	100.0%	2095	100.0%	604	100.0%	456	100.0%	568	100.0%	106	100.0%	1	100.0%	65	100.0%

Prahar	1		2		3		4		5		6		7			
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	1773	63.50%
Cluster 2	0	0.00%	0	0.00%	704	73.50%	216	38.50%	245	62.20%	236	60.40%	101	25.30%	0	0.00%
Cluster 3	303	24.30%	302	29.60%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	582	20.90%
Cluster 4	231	18.60%	270	26.50%	254	26.50%	198	35.30%	149	37.80%	155	39.60%	107	26.80%	436	15.60%
Cluster 5	711	57.10%	448	43.90%	0	0.00%	147	26.20%	0	0.00%	0	0.00%	191	47.90%	0	0.00%
Combined	1245	100.00%	1020	100.00%	958	100.00%	561	100.00%	394	100.00%	391	100.00%	399	100.00%	2791	100.00%

Bharat Open Platform for Police Capacity Building (BOPCB)-Empowering Capacity Building Ecosystem

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Abstract

This abstract is intended to provide a brief overview of the core challenges in capacity building of any organization, state or nation. The abstract aims to share an approach to address the problems through open digital platform which catalyse the building of a network beyond the boundaries of existing constraints of owned or known capability. This, when adopted by various participants of capacity building network, can fundamentally take off the constraints of silo nature of existing structure, hence its associated challenges. It also shares a brief technology approach, how it can be implemented and the benefits that it may results in.

Introduction

Capacity building is a strategic phenomenon of any entity, be it an individual, institute, department, state, nation or for that matter at global level, to address/serve the existing state or future readiness for the future state of the population. When looked at the civil servant, they too have been following the existing framework of building capacities through the available capabilities e.g. owned training centres, central training institutes or through collaboration. Policies have been existing, their implementation too has been taken in accordance. However, due to the very nature of existing ecosystem evolved over decades, such implementation is limited by the constraints of available resources or network build in silos. Hence, irrespective of the model one imposes, the resultant approach to build capacity is based on the results driven by the rules constrained by the available resources. For example, a department is limited to curate and execute their vision constraints which are offered by the owned training centres, network they have established over the years through coloration or an individual's knowledge responsible. To overcome such silos nature, a framework is needed which offers a platform to various participants involved in building capacity. This platform helps to engage, exchange, benchmark and act as data source for nation's capacity building policy makers.

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Network

Network, in context of capacity building is referred as various participants who are part of the value chain and contribute into building capacities. At broader level, there exist three key participants groups which form part of network.

1. Policy maker/facilitators : The set of entities who define the end objectives and may set out guiding principles for civil servant capacity building for present and future.

2. Consumers/Seeker : The set of participants who are seeking some kind of services from the network to help build the capacity e.g. required services for strategic direction for a particular capability, designing a program, faculty to conduct, infrastructure etc.

3. Provider: The set of participants who have one or multiple services to offer to the consumer. The service could be any component which could be part of capacity building as described in point 2 such as loaning infrastructure, subject matter experts, specialize program curator, certification agency etc.

A participant of the network can act as one of the defined participant group. Some of the envisaged key participants of capacity building network are as follows:

Participants	Description
1. Departments	Various government departments, with their respective role to support or serve the citizens.
2. Central Institution/ Facilities	Various government institution/facilities created to provide common service to seekers.
3. Education/Research Institution	National or International education/research institution offering knowledge and program to train individuals for future trends through MoU, specialized programs, general programs etc.
4. International Bodies	Various international bodies setting standards for future.
5. Private bodies	Various private institutions and corporates offering their services for building training e.g. skills, infrastructure.
6. Individual	Nationally/Internationally felicitated individuals in various fields, offering advisories.
7. Certification agency	Certifying agencies offering various certifications to the other providers for benchmarking.

Problem Statement

In the current state of network, most participants both on Consumer or Provider side are limited by their own capacities. For e.g. consumers are limited to their known

network to curate and execute its programs, similarly the providers are limited to offer their services only to their network operating in silos, resulting into underutilization of available capabilities. Picture 3.1 depicts a current engagement model across various participants.
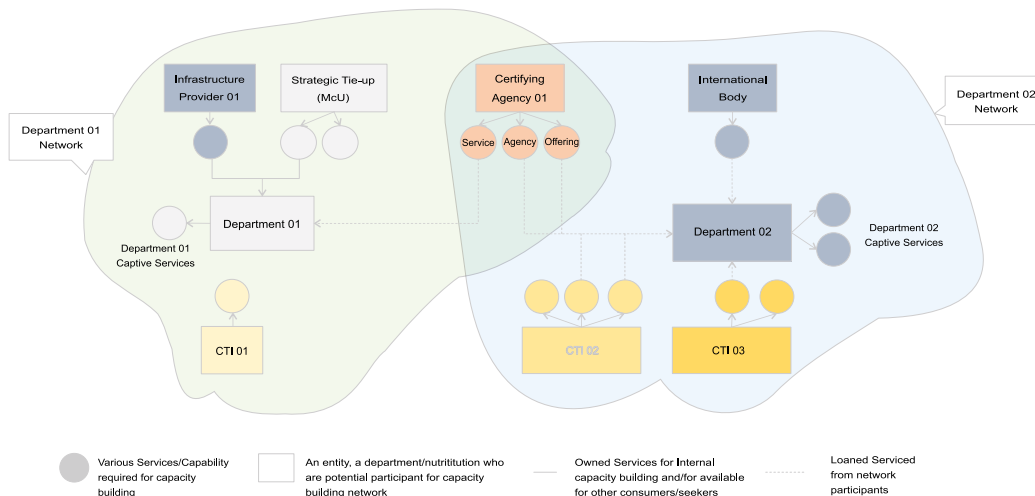
Picture 3.1 Silos operation of various participants of capacity building.

Moreover, in space of such silos ecosystem system, it is extremely difficult to even benchmark or compare the standard of one's curation and gauge the competency level at global standards. With the described backdrop of problem of silos, an approach is framed to address the following key problems:

1. Constraint resulting due to the access of limited participants of the nationally/ internally available network.

2. Underutilization of available facilities of the service providers.

3. Lack of visibility into the national or international level benchmarking of a participant.

4. Disintegrated data/information across silos network participant for policy making decision makers.

Approach

The problem described above isn't new to the world. When looked back in era of early 2000s in India, similar was the state of commerce industry, be it retail, travel, mobility, entertainment. All were limited by their individual connects or local network operating in silos both for buyers and sellers. In last two decades, Digital Commerce has completely transformed the experience of both buyers and sellers limiting it to available resources on network operated by a network (e.g. Amazon in retail, Travelocity in travel, Uber in mobility, Netflix in entertainment).

The approach of BOPCB is inspired by today's digital commerce ecosystem and open standards to build digital commerce defined by Beckn[1].

BOPCB is a digital platform built on open standards. It is envisaged to catalyse the phenomena of de-siloisation of capacity building provider and consumer side participants.

Beckn is a set of open standards defining the specification that when adopted by digital platforms, enables creation of decentralized network.

BOPCB will act as one of the core technology pillars for capacity building. Two founding principles of BOPCB approach are:

1. First, a platform that helps network participants to on-board similar digital commerce platform, and helps them to engage, exchange and benchmark with respect to the other participants. Through the platform, the consumers and providers are discoverable across the networks, exchange to transact to fullfill a need, know the relative offering, feedbacks, and settlements.

2. Secondly, unlike today, most of digital commerce platforms are controlled by network owners. BOPCB will be an open network i.e. the platform conceptually will be open and interoperable w.r.t technology implementation and built on open standards definition of Beckn. It would be similar to the open standards like HTTP, TCP/IP, SMTP. This helps in democratising the network and encourages faster adoption through freedom of technologies and digital channels to participants as long as the standards are followed and are interoperable.

When adopted across networks, it has potential to eliminate the de-siloisation, hence resulting into constraint free adoption of role-based definition of training offered for various civil servants, to meet the needs for today as well as prepare for the future. Picture 4.1 shows how BOPCB shifts the silos networks to de-siloisation, empowering participants to exchange services disrupting the traditional interactions.
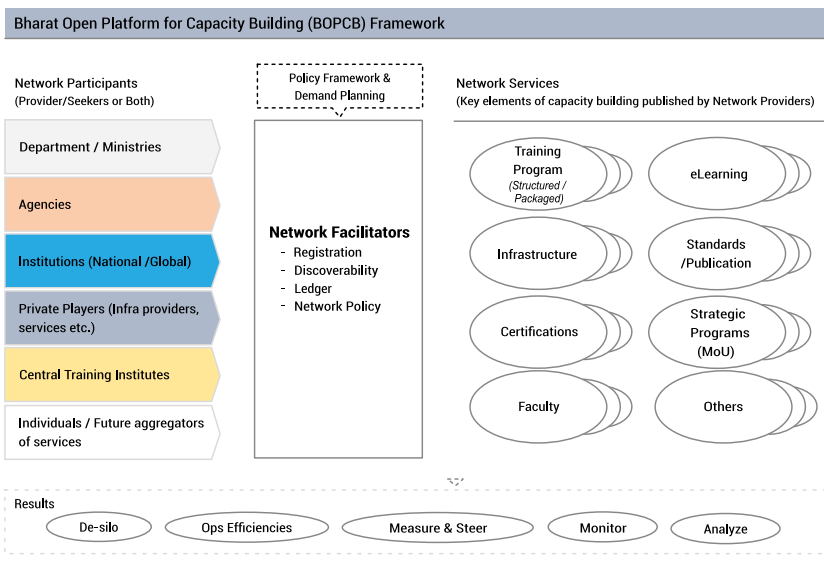
1. Audience: The network participant who is the part of the provider or consumer or acts as both (i.e. has services to offer as well as is seeking/consumer of services). The audience on platform can host their offerings through the platform, which are transparently discoverable by the consumers i.e. in principle a consumer on platform seeking a service can discover all the providers' services limited only by the providers side constraints.

2. Elements of Capability Building: The elements are all the service offerings hosted by an Audience acting as provider which are discoverable by consumers. The elements of capacity building are controlled, orchestrated and fulfilled by the specific providers and not the network operator.

3. Network Facilitator: They are the owners of an instance of platform gatekeeper. Facilitator is not the owner of network, rather just a gatekeeper responsible to transparently facilitate the network participant, to communicate and transact rule defined by participants while facilitator maintains network policies, communication network ledger and maintaining the authenticity of partner driven participants data.

Implementation

By design, the BOPCB platform approach is open, leading to decentralization, hence democratic. Its implementation is not restricted to any one entity. However, the success of the approach is determined by the confidence the participants will have on the platform. So to initiate the implementation of proposed approach, it is envisaged to create all required components of BPOCB as reference and initiate the participation from various capacity building participants (may be initially through controlled set of participants on both consumer and provider side).

The refence technology implementation of BOPCB will be a digital asset i.e. set of technology components, each responsible for its function when participating into interaction results into a meaningful transaction. In order to implement, it is imperative to define the underlying components of platform and the role it plays to empower capacity building network. For the purpose of approach note, BOPCB will embark on a journey to build these technology components. It will help in building a pilot network with the capability to register, driven by digital policies, discover and transact using the platform. The platform will consist of three key components.
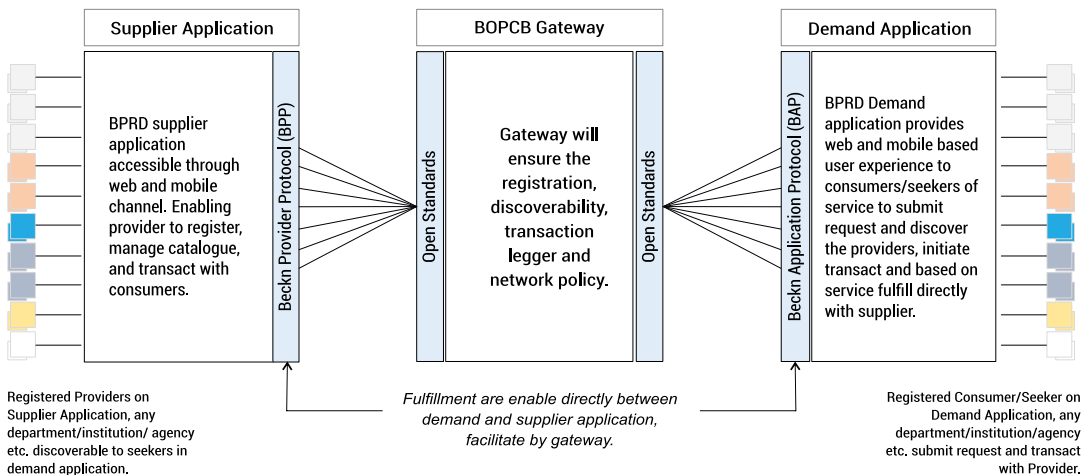
Implementation approach of BOPCB framework.

Supplier Application

BPRD supplier application accessible through web and mobile channel. Enabling provider to register, manage catalogue, and transact with consumers.

Beckn Provider Protocol (BPP)

Open Standards

BOPCB Gateway

Gateway will ensure the registration, discoverability, transaction legger and network policy.

Open Standards

Beckn Application Protocol (BAP)

Demand Application

BPRD Demand application provides web and mobile based user experience to consumers/seekers of service to submit request and discover the providers, initiate transact and based on service fulfill directly with supplier.

Registered Providers on Supplier Application, any department/institution/ agency etc. discoverable to seekers in demand application.

Fulfillment are enable directly between demand and supplier application, facilitate by gateway.

Registered Consumer/Seeker on Demand Application, any department/institution/agency etc. submit request and transact with Provider.

1. BOPCB Gateway: It is an application which enables common services to network ecosystem through registry, network policy, managing network ledger and may offer value added services in the future. It is an application which plays the role of facilitator rather than the owner. The gateway is responsible for ensuring transparent registry capability of participating audience, implement the network policies, transparently help the discovery of providers services to the consumers side based on the various rules/criteria each participating agency may have defined within the framework of network policies and also facilitate transactions. Note, that the transaction between participating audience is fulfilled directly, and gateway acting as facilitator may be having transaction ledger, authenticity and risk score.

2. Supplier Application: This is a technology application built

independent of the gateway technology. It offers features to the providers to register, publish the services, define its rules and transact with the consumers and follows Beckn Provider Protocol (BPP).

3. Demand Application: It is an application which offers a digital channel in form of web based and mobile based interface to consumers of network to discover the provider's services, defined by various participating providers on supplier application. Application can adopt any technology platform, offer features to transact, while following Beckn Application Protocol (BAP).

In addition, the technology platform will also publish standard interfaces which anyone can consume by creating their demand side and supplier side application, following BAP and BPP protocol standards.

As the BOPCB platform will be built on open standards, all technology components

are open to be owned by any entity and application will be interoperable as long as the future gateway providers, demand side and/or supplier side are following the same standard, resulting into interoperable across different gateways. As the concept of BOPCB matures, it is envisaged that the scale of Globe multiple gateway providers will come into existence with independent service offerings in the network with an increased scale of transactions.

Future envisaged state of BOPCB Framework
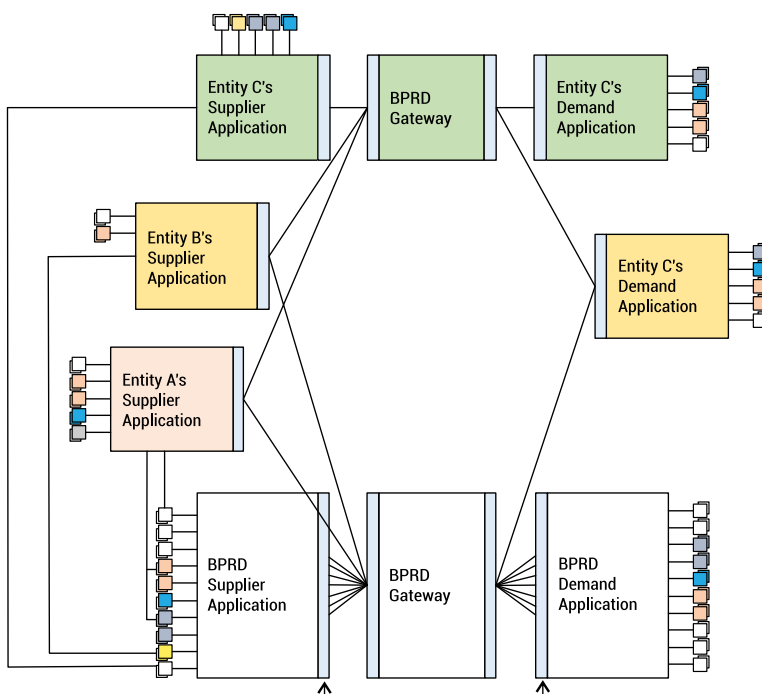
Statutory and Regulatory challenges

Among the many challenges of policing in India, apart from other structural and manpower problems, are the fundamental, structural and statutory challenges of Police being a state subject and not a federal one. This is the reason why population scale applications in policing are rare. CCTNS and ICJS are having federal and state inputs and takeaways separately. Balancing state and federal issues in policing in India, requires effective coordination and collaboration between the central and state governments. Some of the ways where Central government will have to on-board and delicately manoeuvre the BOPCB can be multipronged strategies like Establishing National Standards, Collaboration and Sharing of Best Practices, Handholding Training Curriculum Development, Resource Allocation, Monitoring and Evaluation, Inter-State Task Forces etc. The stakeholders will have to allay any fears of states and factor in requirements of the new

Digital Data Protection Act whenever it is in place. Such networks exists in the case of commerce (Amazon, Flipkart, ONDC), hotel bookings (AirBNB, Oyo) and learning and experiences from them can be borrowed to develop the same.

Conclusion

The existing silos nature of capacity building participants is limited to their owned capacities as well as silo network. In order to disrupt the existing approach, Bharat Open Platform for Capacity Building (BOPCB) is envisaged. The approach aims to develop a decentralized digital infrastructure which helps various participants of capacity building at the scale of nation and in principal at the global level, where participants can engage, exchange, benchmark and enable data driven policy making. The BOPCB will catalyse the phenomena of de-siloisation of various participants involved in capacity building, resulting into role based approach for capacity building, increased utilisation of national assets, relative benchmarking across network and also resulting in data for policy makers for future policy directions.

In order to initiate the implementation of BOPCB the following are imperative:

1. All required technology components are proposed to be built by BPR&D as stimulus to building network.

2. The implementation will on-board pilot set of participants on the network. Such pilots set will be controlled group which will be pilot groups for the network building.

3. Publishing open standards and network API to prompt the platform as market led growth.

Technology implementation of BOPCB is just one step to enabling capacity building. The success of BOPCB exists in building networks. It is envisaged that the future of BOPCB would be into on-boarding of network participants, their participation on the network, technology freedom through standardization, technology enablers for faster technology adoption, and promoting community driven innovation.

'Scientific – Criminology' & Uthra Murder Case

K V Thomas*

Abstract

With the increased ingenuity and sophistication in the commission of crimes, scientific aids have become an essential component of successful criminal investigations. The investigation of Uthra murder case, one of the 'rarest of rare cases' in the criminal history of India is the best example. Uthra, a 25 year old differently-abled house wife from Kerala was brutally murdered by her husband using poisonous snakes as a weapon of murder- the first attempt of murder with a Russell viper and then the murder with an Indian cobra. Initially, everyone including the parents of Uthra treated it as death due to snake bite. Once the Crime branch took over the investigation, the scenario had drastically changed. Their investigation was so well-planned, professional and scientific that the Trial Court had awarded double life sentence, besides 17 years of imprisonment and a fine of Rs. 5 lakhs to Sooraj, the husband of Uthra. The writer, based on the interaction with some members of the investigation team and experts associated with the case unfolds as to how a complex ingeniously executed murder case without any direct evidence could be successfully investigated using various scientific aids to investigation.

Key words: *Investigative tasks**, Herpetologists, necropsy, Forensic experts, DNA-Test, witness-interview, digital -footprints, natural bite & 'induced bite', fang-width'**, Dummy-test*

Ever since the creation of Universe, crime or violations of different nature had crept into the world. From time immemorial, human beings had killed each other for various reasons. Perhaps, it was Cain who committed the first murder, when he 'rose up against his brother, Abel, and killed him 'for lust of power and blessings from the Lord'. Over, the centuries, the world of crime had attained considerable ingenuity and sophistication. Anything from innocuous looking toys to highly advanced Robotic devices controlled by Artificial Intelligence (AI) can be used for committing murders or

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striking well-protected dignitaries or even state Heads, posing serious challenges to investigators and Law Enforcement agencies.

One such innovative method of using poisonous snakes to commit murder has posed serious challenge to criminal investigators in reaching the real culprit (s) and bringing them before law, ensuring conviction. The task of investigators becomes more arduous in view of the ingenuity of the crime, dearth of physical witness, evidence or complexities connected with the actual commission of offense. Very often, the close relations of the victim or the investigators get confused as to whether the death of the victim was due to natural snake-bite or 'induced bite' using the snake as a 'murder weapon'.

Such confusion or dilemma is natural considering the fact that India is one of the countries with the largest number of snakebite deaths. The General Million Death study on the premature mortality in the world revealed that, over 58000 persons die every year in India due to snakebites, as against the global figure of 125000. Epics, mythology, legends and mystic stories, on many occasions, glorify such tragedies, attributing 'divinity' or 'supernatural powers' to 'Nagas' (Snakes). When such legends and stories mystify and influence the 'mass-psyche' especially of the rural s legends and stories mystify and influence the 'mass-psyche' especially of the rural population, majority of 'snake-bite deaths' have been interpreted as 'natural 'or the result of the anger or vendetta of 'divine forces '

Leading cases using poisonous snakes as 'weapon of murder'

There were a few leading cases in which poisonous snakes were used to commit murder. In 2011, a 'contract killer' used a poisonous snake (common cobra) to murder an elderly couple Ganpatrao and his wife Sarita Ballewar of Nagpur, Maharashtra by way of direct snake bite. The accused son, snake charmer and contract killer with his two accomplices who were charged under Sections 302, 364, 120-B, 506 and 34 of the Indian Penal Code (IPC) were acquitted by the Trial Court, as the prosecution failed to prove 'snakebite theory' beyond doubt.

In another case of June 2019, one Subodh Devi, an elderly woman from Jhunjhunu district, Rajasthan was killed by her daughter-in-law and her lover, to hide their illicit relations. They bought a poisonous snake from a snake charmer for Rs.10, 000 and committed the offense. The accused were arrested by Police in January 2020. The Supreme Court in October, 2021 denied bail to the key accused holding that 'use of poisonous snakes to kill people has become a new trend 'with serious implications, All the 3 accused of the case who were arrested in January 2020, are currently in jail awaiting trial.

Almost on the lines of the Apex Court's observation, one Prabhakar Bhimaji Waghchaure of Ahmednagar in Maharashtra used the murder weapon of snake to perpetrate an insurance fraud. The subject who had been living in the US for the past 20 years, on return to India in April, 2021 staged his own death by killing a destitute man in order to claim a life insurance policy

worth $5 million (Rs. 37.5 crore) with a US-based insurance firm. He along with his accomplices used a cobra as a murder weapon for faking his death.

Uthra murder – 'the rarest of rare case' in Indian criminal history

The most sensational of snake bite cases in the criminal history of India was the Uthra murder case of 2020. Uthra a differently-abled 25 years old housewife, who was married for two years, and had a one-year-old son was found motionless by her mother in the bedroom of her parent's home at Anchal in Kollam district of Kerala on the morning of 7 May, 2020. She was declared dead when the family took her to the nearest hospital. A large Indian cobra was found in the bedroom that she shared with her husband, Sooraj, a bank employee. The victim was recuperating from a previous snake bite (Russell viper) inflicted on March 2, 2020, at Sooraj's home near Adoor in Pathanamthitta district. She was completely bed-ridden for around 52 days to recover from the viper-bite.

Just like any other 'snake bite tragedy', Uthra's family members and neighbours initially treated it as natural snake bite. The gullible neighbours attributed it to 'Sarppa Kopam' (wrath of snakes) that was haunting the family. What the viper could not do was done by a dreaded cobra, they strongly believed. Sooraj, the 'bereaved husband' could easily exploit such sentiments by taking the lead to arrange 'Sarppa Pooja' (special rituals to please the snake-god and escape the wrath of snakes). Even the Police had initially stumbled upon such

belief/ theories and interpreted it as a natural snake bite death. **Anchal Police, in Kollam district lodged a FIR in Cr No1540/2020 u/s. 307, 328, 302 and 201 IPC and conducted initial investigation**. When the Crime branch took over the investigation of the case, the scenario had drastically changed. Perhaps, it is a unique case in which investigators made meticulous planning and used various investigation tools- both conventional and scientific- to build up a fool proof prosecution case of murder against Sooraj. **They submitted an exhaustive charge sheet of around one thousand pages to the Additional District & Sessions Judge-IV of Kollam district who conducted the trial of the case (SC. No.820/2020).** The investigation was so well-planned, professional and scientific that the District and Sessions Judge of Kollam on October13, 2021 awarded a double life sentence, besides 17 years of imprisonment and a fine of Rs. 5 lakhs to Sooraj. **It was yet another feather on the cap of Kerala Police, particularly the Crime Branch in successfully undertaking the investigation of a sensational case with maximum conviction to the accused. Just after the judgement, Harishankar, IPS who was supervising the investigation had given a detailed interview to the media explaining the thorny path of investigation in which forensic science and other scientific aids were used.**

A closer analysis of the different phases of investigation, based on the interaction with the members of the investigation team and experts associated with the case demonstrates as how a complex 'rarest

of rare murder case' without any physical witness can be successfully investigated using various scientific aids to investigation.

As there was no direct evidence in the case, the task of the investigators was to make a strong chain of circumstantial evidence by linking spatial relationships between the suspect/accused, victim, timeline and the criminal offense. In order to establish the spatial relationships without an iota of doubt, the investigators could bring out that the accused had a combination of factors such as motive, intent, opportunity and/or means to commit the offense. They successfully undertook these sensitive tasks by properly blending investigative tasks and investigative thinking or analysis. The tasks included identification of physical evidence, gathering information, evidence collection, evidence protection, witness interviewing and the interviewing and interrogation of the suspect/accused. The evidence or inputs so gathered were analysed and based on the findings alternate possibilities were explored to strengthen the links of the evidence -chain beyond any doubt. In that process, the investigators availed the services of medical specialists/surgeons, Forensic experts, Forest/wildlife officials, zoologists, veterinarians and herpetologists (experts on reptiles and amphibians), besides using scientific and technical tools such as DNA test, toxicological/ chemical tests, Call Data Record (CDR) analysis, digital data interpretation, recreation of crime scene and dummy experiment.

Unravelling the mystery through interview of persons/ suspects

To begin with the investigation, the Crime branch team meticulously examined the inputs available with the State Special Branch and other specialized wings of the Police regarding the occurrence of the offense. Further, the interview of the close relatives of the victim or persons who had direct or indirect information pertaining to the offence or the key suspect catered concrete leads. Uthra's parents who suspected foul play in their daughter's tragedy and filed a complaint with the Police were found to be most resourceful. The sequence of events that led to the death of Uthra such as the viper- bite of the victim when she was at Sooraj's house, his reluctance and indifference in taking her to the hospital, his expertise in handling venomous snakes and his hasty move to kill and bury the cobra had enabled the investigators to reach specific conclusions. Their revelations on the money and jewellery given to Sooraj at the time of marriage, harassment meted out to her in Sooraj's house, Uthra's parents' move for divorce of her daughter with the demand to return all the assets he had received from them and the subsequent compromise on the request of Sooraj etc. had thrown enough light on the intent or motive of the accused to commit the crime. During interview, other relatives of Uthra had corroborated such pieces of circumstantial evidence through their disclosures that Sooraj didn't want her to live with him, because of her disabilities. It is significant to note that the Crime branch team interacted with a large number of persons of which

87 were listed as witnesses and produced before the Court during the trial.

Among the various persons contacted and interviewed by the investigating team, Vava Suresh, the noted snake expert from Kerala could clear many grey areas connected with the offense. It was Suresh, who after visiting the homes of Uthra and Sooraj, advised the victim's parents to lodge a complaint to the Police, as he was certain that the first viper-bite and the subsequent cobra-bite which led to her death were not natural, but 'induced'. Later, Suresh gave his expert testimony and statement to the Police. In the first snakebite incident, he said that a Russell's viper would have been unable to reach the second story room in her husband's home, where Uthra received the first snake bite. With regard to the second, fatal bite, Vava Suresh also noted that it would have been difficult for the cobra to enter the air-conditioned room in Uthra's parents' home, unaided

Vulnerable suspect turns 'Approver '

The investigators' efforts to identify the source which provided the tools or weapons (snakes) to commit the offence led them to Chavarukavu Suresh, a local snake rescuer. Around 3 months prior to the commission of offense, Sooraj acquainted with Suresh posing as his admirer, after watching his videos and of Vava Suresh, the famous snake expert. To strengthen their relations, Sooraj made a plea that he was in need of some snakes to scare away the rodents and rat which used to damage his agricultural crops. During initial questioning, Suresh took a consistent line that he had handed over the snakes to Sooraj without knowing

the true purpose Once the Crime branch team was fully convinced that Suresh was not directly involved in the commission of crime; nor was aware of the actual intent of the accused in getting snakes from him, the investigators used him as a prime witness to extract maximum useful leads connected with the case. The CCTV footage of the meeting between Sooraj and Suresh on a couple of occasions and the WhatsApp chats had given added leverage to the investigators to effectively tackle him for strengthening the prosecution evidence. Initially arrested as an accused, Suresh was later turned into an approver. The investigators and the prosecutors, on the basis of the studies made in respect of the judgment of a similar case of Nagpur in 2011, felt that Suresh's proper deposal before the Court is vital to strengthen the prosecution findings. In the above case, all the five accused were acquitted on the ground that the prosecution failed to prove that the murder was due to 'induced snake bite' as the investigators ignored the use of scientific aids especially the opinion of experts. Besides, a key witness whom the prosecution felt good about as an approver, turned hostile during the trial. The investigators in consultation with the Prosecutors tried to plug such loopholes in Uthra case.

In search of evidence- Analysis of digital footprints

The surfing history and the analysis of the digital footprints of the online searches of the accused not only corroborated his transactions/ linkages with Chavarukavu Suresh, but also helped to unravel a clear

pattern demonstrating his planning and preparation to execute the crime. Since October 2019, he was engaged in frequent online searches on various poisonous snakes like viper, cobra etc. which were common in the state, besides, watching videos on catching/rescuing deadly snakes by 'snake-charmers'. An analysis of such searches and other digital activities revealed that till March 2020, the accused was keen to gather as much information as possible about vipers. Once Sooraj established contacts with Chavarukavu Suresh in February 2020, he requested him to share videos on vipers and other snakes, in order to enhance his understanding about the manner of rescuing/ handling snakes, the sensation of touching snakes, the position of the venom glands in the body of the snakes, etc. Significantly, it was just five days before the first attempt of murder, that Sooraj bought a viper from Suresh for Rs. 10,000 on the plea that there was frequent rat menace in his compound. Once he got the viper, his chat messages had abruptly stopped. But when he failed in his 'viper-operation', he resumed his searches and messages to Suresh exploring details of more poisonous snakes on an alibi of continued rat-menace in his farm. His demeanour and actions during this period were demonstrative of his actual intentions. The investigators established that prior to the first murder attempt, Sooraj had opened Uthra's bank locker and the next month he had pledged her gold ornaments for a loan of Rs. 1,00,000.

Scene of crime inspection yields crucial leads.

Though the Crime branch took over the investigation after a gap of 3 weeks of the commission of crime, a thorough inspection of the scene of crime and the findings that were interpreted with the help of experts could lead to crucial leads. The first attempt of murder using a viper was made in the house of Sooraj. It was a two storeyed building. Uthra was sleeping in the bedroom on the first floor of the house. His version was that the viper bit her in that bed room. During interview, Sooraj's mother said the snake must have entered the room through a tree branch leaning inside, but the local persons pointed out that the branch was not jutting out that way until that day. The investigators physically confirmed that there were no supporting structures such as slanting branches of trees adjacent to the house when the incident took place.

The wild life experts engaged by the investigators found many inconsistencies in the claims made by Sooraj. They were of the view that usually the habitat of the Russell-viper is dry area and seldom had they found vipers in wet areas like the house compound of Sooraj. Similarly, they would not easily move through the wall or the smooth tile-surface of the staircase landing of the house in question. Moreover, Russell's viper is non-arboreal (not climbing or residing on trees). Thus, the investigators ruled out the possibility of the viper sneaking into the bedroom of Uthra, which meant that it was brought there.

The second place of occurrence of crime was the ground floor room of Uthra's

parents' house, where she was bitten to death by a cobra. It had 2 windows and three ventilators beside the door. The windows were at a height of 150 cms. As it was an air-conditioned room, all the windows and ventilators remained closed. There was a small gap of 2-4 mm between the door and ground. The bedroom drains (in the bathroom attached to the bedroom) were fixed with a cover. The crucial question before the investigators was whether a cobra of 152 cm which had bitten Uthra can naturally come into the room or not? The experts on the basis of authentic studies could find answer to the question. According to them, cobras can only raise themselves vertically to one third of their length. Thus, a cobra of 152 cm long could have raised itself only around 50 cms from the ground against a vertical wall. Therefore, the cobra involved in the case could not have entered into the bedroom through a window. As the bathroom drains were fully covered, its entry through the drains was ruled out. Similarly, the gap between the door and floor of Uthra's room was so minimal that a snake cannot pass through such a small aperture. Moreover, as the bedroom and bath room had the smell of phenyl and kerosene, which are snake repellents, no snake would come on its own to such places. Thus, the Crime Branch team could arrive at the conclusion that somebody should have brought the cobra into bedroom of Uthra.

'Hidden hand of God' intervenes to preserve crucial evidence

Even in meticulously planned and executed crimes, the hidden hand of God leaves some sensitive clues which on many occasions enable the investigators to unravel the crime and reach the real perpetrators. In this case, the weapon of murder (snake) had turned to be such a vital clue. Once the hospital authorities confirmed the death of Uthra, Sooraj along with his close friends caught the cobra from the bedroom cupboard and killed it instantaneously. As everyone including the local Police assumed that the death of the victim was due to natural snake bite, none had attached any significance to the carcass of the snake. Initially, the decision was to burn the carcass. But, the hidden hand of God had intervened and someone in haste had buried the corpse in Uthra's house compound. Had the carcass been burnt, the investigators should have lost some valuable evidence to establish that it was the same cobra that Sooraj has brought from snake rescuer Suresh that had bitten her to death. The crime branch team, immediately after taking over the investigation exhumed the carcass from the compound in presence of veterinary surgeons and Forensic team. A 3 member team comprising of veterinary surgeons/ forensic experts conducted necropsy (autopsy) of the carcass which was partially decomposed. It was established that the snake was of the species Naja, commonly known as Indian cobra which was 152 cms. long. Its bowl was empty which indicated that the snake was kept in a plastic container without being fed for many days. The experts were of the view that the bite of such snakes in hibernation or without food for many days is fatal. The fangs were 0.6 cm long. The fangs, bone and brain of the snake were collected and sent to the laboratory for further examination. Just

as the case of carcass, the investigators recovered the plastic container in which Sooraj kept the cobra for around two weeks. The forensic experts collected particles from the container, which on DNA test matched with that of the snake- carcass.

The necropsy of the cobra and the views of experts and zoologists on some key features of the poisonous snakes commonly seen in India have enabled the investigators to fill many missing links in the investigation of the case (some of these traits are delineated in Table-I

Table-I- Characteristics of common Indian Poisonous snakes

Name with family	Common habitat	Structure of fangs	Venom (Fatal dose)	Venom/ per bite	Fatal period
King cobra/ Elapidae	Hills, forest/ bushes, old buildings	Grooved and short covered with mucous membrane	1.50 mg/ kg	25mg/ kg	12 minutes
Indian Cobra/ Elapidae	Hills, forest/ bushes, old buildings	Almost same as King cobra -	0.28mg/ mg	35 mg/ kg	12-15 minutes
Russell's viper/ Viperidae	Dry hilly area	Long canalized and movable	0.06mg/ kg	200mg/ kg	Less than 3 hours
Indian Krait/ Elapidae	Fields/ jungles/ brick-piles, bushes/ earth-pits/ rat holes/old houses	Grooved, short, fine and fixed.	0.07mg/ kg	500mg/ kg	Less than 3 hours.

(Based on data compiled by herpetologists & researchers)

Firstly, the cobras are active during evening time (1700 hrs. to 2000 hrs). Normally, they remain inactive during night time. Uthra had fatal snake bite late night allegedly in sleep, which in normal situation is most unlikely. Usually, cobras bite the enemy on sudden provocation to scare away the enemy. Even if they strike under provocation or for self-protection, they would immediately escape from the spot and seldom bite the enemy again. If they are forced to resort to multiple bites to escape from the enemy, the bites would be at different places. In the case of Uthra, there were two successive bite marks between her knee and foot, 2 mm apart from each other. The distance

between the two fangs, known as fang width, was 2.3 and 2.8 cm respectively. In a grown up cobra, this fang width ranges from 1cm to 2cm. The increased fang-width, according to experts indicated 'induced' or 'forced' bite, when force is applied on the cobra's head to eject venom. As the skulls of cobra or similar snakes are made up of flexible joints, the upper jaws where fangs are concealed expand under any force or pressure. The medico-legal autopsy of the victim confirmed that Uthra's blood samples had traces of the snake venom, specifically cobra's venom. The samples also contained excess sleep inducing drugs/chemicals such as cetirizine, indicating that she had been given sedatives/ excess sleeping pills before the snake attack.

The investigators with the help of experts could arrive at other crucial findings in respect of the viper- bite of Uthra which resulted in her hospitalization for over 50 days. Rarely, Russell Vipers bite dead animals, they attack their prey only when they detect thermal radiation and/or movement. This led to a major finding that the vipers would not voluntarily bite a sleeping person without provocation, indicating that viper-bite too, was an induced one by Sooraj. It was found that she had sustained the bite when she was lying down. The bite (fang) marks which were found between her knee and feet were in vertical position. In normal circumstances, when a snake bites a person, the bite mark would be on the ankle or foot horizontally. As there would be excruciating pain from a bite by a Russell viper, the victim- even in sleep- is bound to know it. The fact that Uthra did not immediately respond to

the bite, indicated that she was sedated and the bite was inflicted on her

"Natural bite or 'induced bite'? – The most crucial evidence & Dummy Test.

The investigators felt that the expert opinion affirming that the fatal cobra-bite is induced did not suffice to establish the offense in the Court. Thus, an Expert Committee under Dr K. Sasikala, the Head of Department of Forensic Medicine, and Medical College Trivandrum was constituted to explore scientific and forensic evidence to strengthen prosecution findings. The Committee conducted a 'Dummy test' to recreate the scene of crime and ascertain how the cobra would have bitten the victim.

A dummy similar to Uthra's size was laid down on a cot. A fresh broiler chicken piece was tied on the dummy's hand. A cobra was let loose on top of the dummy. It didn't make any attempt to bite the dummy. Instead, it crawled down to the ground and tried to hide out. This reaffirmed the expert opinion that usually, cobras do not bite unprovoked, and they bite only moving objects, after displaying various defensive mechanisms, like raising its hood, hissing, etc. Then the team removed the arm of the dummy with the chicken piece on it, and provoked the cobra. After several attempts and provocation, the cobra bit the chicken piece tied to the arm of the dummy twice. Before biting, the cobra displayed defensive mechanisms. Then the team measured the fang width of natural bites on the chicken piece. Both were 1.7 cm. Then, the expert held the cobra by its head and induced two bites on the chicken piece. The fang width

of these bits were 2 and 2.4cm. more than that of natural bites. This proved that the cobra hadn't struck Uthra of its own volition, but was held by Sooraj in his hands by its head. Similarly, the first attempt to eliminate Uthra by using a viper was also cross-checked through a dummy test with a rat and a Russell's viper. The team tied a dead rat and then a live rat to the dummy's leg, and found that vipers attack their prey only when they detect thermal radiation and/or movement. This proved that the vipers would not voluntarily bite a sleeping person without provocation, indicating that this too, was an induced bite by Sooraj. Both the 'dummy tests' were videographed for submission to the Court during the trial of the case.

The investigators could effectively use the tool of interrogation in confronting the accused as they were in possession of crucial pieces of circumstantial evidence including a vital Approver, As rightly commented by eminent criminologist Guðjónsson, 'the stronger the evidence, the greater be the chances of confession'. Though accused Sooraj was educated, Tech-savvy, intelligent and was successful in meticulously planning and executing one of the rarest of rare crimes, he could not withstand the systematic questioning of the investigators bringing out digital and forensic evidences establishing his role in the commission of offense. They hindered his initial Defence Mechanisms (DMs) to counter the statements/evidence of 'approver' or other witnesses on matters like the purchase of poisonous snakes from the snake rescuer or the dislike of Uthra because of her disabilities. Perhaps,

Sooraj's conviction that such DMs or pleas would not help him to get out of the dragnet of investigation, prompted him to break down and publicly confess to the murder while informally speaking to the media, while the investigation was in progress.

The prosecution case, so established was clear: the accused Sooraj, with the intent and motive to own the assets and wealth of his wife having some disabilities committed the brutal and cruel murder of Uthra using poisonous snakes as weapon of murder- first with a Russell viper and then with an Indian cobra. The unfortunate Uthra wasn't able to walk, was in a bed-ridden situation for 52 days and had to undergo a plastic surgery after getting bitten by the viper. Getting her bitten again with a more venomous snake while she had still not recovered from the earlier attempt amounted to brutal murder only. The investigating team could build up a fool proof case by closely connecting varied and crucial pieces of evidence such as witnesses' evidence describing criminal conduct/intent on the part of the accused before, during, or after the offence, expert-opinion and forensic/scientific and medico-legal evidence corroborating such views and digital and electronic evidence. Thus, the trial Court, fully endorsing the findings of the prosecution convicted the accused describing the case as' the rarest of rare'.

References

1. Bose S.S. (2011, August). Accused in snake bite murder case acquitted. *The Times of India*.

2. Krishnaraj R. (2021, October). Uthra murder case opens a new chapter —

Homicidal Snakebite — in Criminology. *OnManorama*

3. Kumar A. Raina S. K. and Raina S. (2021). Snakebite profile from a tertiary care setup in a largely rural setting in the hills of North-West India. *Journal of Family Medicine and Primary Care,* 10(8): 2793–2797.

4. PTI. (2021, October). Murder Via Snake Bite New Trend, Says Supreme Court While Denying Bail to Accused. *Yahoo News*.

Effect of Air Pollution on Cardio-respiratory Health of Traffic Police Personnel in Northern part of the Kolkata

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Abstract

The job of the Police is highly stressful and risky in terms of occupational demands. Traffic Police Personnel works in exposed to open environment due to job demands, thus being vulnerable to various pollutants. They are exposed to pollutants almost 16 hours a day. Occupational hazards, thus, affect the physiological system of traffic personnel. The study is aimed to assess the effect of pollution on the cardio-respiratory health of Traffic Police Personnel. The study is carried out in North Kolkata. Air Quality Data for 24 hours is collected by the National Pollution Control Board from November 2018 to March 2019. Physical data is collected via interview method and physiological parameters via the appropriate instrument. "Increase in Systolic blood pressure and pulse rate is observed with the rise in duration of exposure duration in the exposed group, indicating a proportional relationship between them." Long duration of disclosure to ambient air pollutants imparted damage in the respiratory system, but did not possess any significant effect on the cardiovascular system.

Keywords: *Occupational health, Particulate Matter, Traffic Police, Pollution, Respiration*

Introduction

Policing is a very vital aspect of the existence of society. A Policeman often has more than a 16-hour workday and barely gets any time for his family, which affects his job profile and work efficiency . Law enforcement is recognized as a highly stressful and risky job, which creates physiological and psychological health effects among Police cops. The traffic department is one of the most

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important sections of the Police department, in charge of traffic management and vehicle movement. Limited road space, large number of traffic, slow vehicular movement makes a daunting task for traffic cops and exposes them to different occupational hazards. Various researches had studied the occupational health effects on traffic Police personnel. The highest severe effect on health was found due to environmental pollution. The majority of studies have reported a declined pulmonary function and increased respiratory health morbidity. Exposure to air pollutants increased the number of respiratory morbidities which leads to increased admissions in hospitals in many countries, including India.The Maximum number of metropolitan cities of India contain respirable suspended particulate matter above national air quality standards. Traffic Police are occupationally exposed to pollutants like vehicular exhaust for an extended time. Carbon-di-oxide, carbon monoxide, benzene, toluene, oxides of nitrogen, sulphur and different types of particulate matters play a critical role in the pathogenesis of the respiratory disease. These particles cause irritation and injury to the air passages and bronchioles, which decrease the respiratory compliance and might influence the development of asthma and rhinitis. Evidence is found that, long term exposure to pollutants is associated with deaths from the cardiopulmonary disease. Researchers found a significant association between black smoke and NO_2 exposure with respiratory mortality [12,14]. WHO considered a 7% increase in overall mortality for each increase of 10 μg/m^3 in an annual average particulate matter 2.5

(PM 2.5) value. Studies on the effect of pollutants on cardiovascular health showed an association with short-term increased risk of cardiovascular deaths with some lag effects. Cold weather was found to show having had an antagonistic effect with PM 2.5 value. Karita et al., (2004) found that Police officers performing duty in heavy traffic zones had an increased risk of frequent cough or phlegm, though smoking status was also an important factor.

Saha et al., 2014 and Saha et al., 2016 assessed occupational stress among Police officers where they found an increased level of mental stress and increased risk of cardiovascular as well as respiratory diseases.

Any systematic surveillance study has not been performed so far to investigate whether any intervention could be possible to reduce the exposure among the traffic cops. This study is aimed to observe the following:

1. To come across the most effective air pollutants in study area.

2. To sort out the effect of pollutants on respiratory health of Traffic Police personnel

3. Effect of Occupational stress on the cardiac health of Traffic Police personnel

4. Find possible interventions to reduce the problems

Materials and methods

This research is conducted in northern Kolkata traffic zones. At first, ambient air

quality data is collected by the Central Pollution Control Board (CPCB). Data was collected from the Rabindra Bharati University Zone in the northern area in the form of the Air Quality Index (AQI).

Study Population

Total sixty six participants voluntarily participated from different traffic zones, in the age group of 20-50 years and a minimum of two years of work experience in the traffic department. Officers performing desk jobs for at least two years were selected for the control group.

Inclusion and Exclusion Criteria

Subjects having the following complications were excluded from the study-

- Any surgical operation in respiratory organs

- Inability to perform Pulmonary Function Tests

- Diabetes Mellitus

- Tuberculosis

- Drug addicts

Subjects were interviewed with a set of general health questionnaire for Traffic Cops. Anthropometric measurements were collected by weighing machine and Martin's anthropometer.

Blood Pressure data is collected via a sphygmomanometer and blood pressure monitor (Omron, HEM – 8712). Pulse rate data is collected accordingly. State of pulmonary health was evaluated by using Modified European Community Respiratory Health Survey II questionnaire.

Statistical Analysis:

Acquired data is presented as Mean ± Standard Deviation. Variables are analyzed via the Student's t-test and correlation coefficient analysis. The analysis is performed by SPSS v20.

Results and discussion

Data is collected through questionnaire and physiological parameters were obtained via instruments available for this study from Police personnel. Air quality data is obtained from the Central Pollution Control Board. The AQI value is calculated from different parameters of pollutants. A 24-hour average is presented as the AQI value of a day. Variation of data is presented in figures and further analysis from obtaining primary results is presented in tables. The following results are presented below-

Dominant Pollutant in North Kolkata
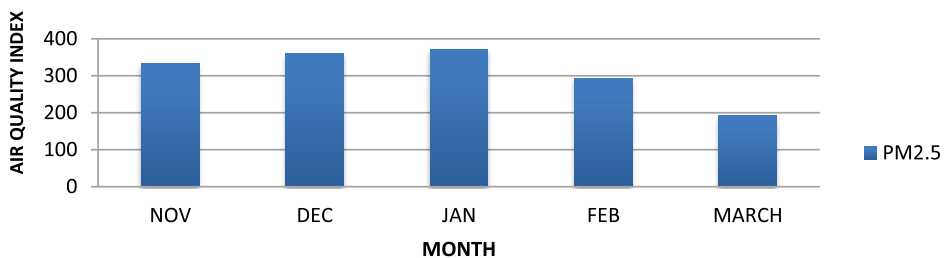
[Fig 1: Comparison of the amount of dominant pollutant in North Kolkata (PM 2.5)]

Dominant Pollutant in North Kolkata
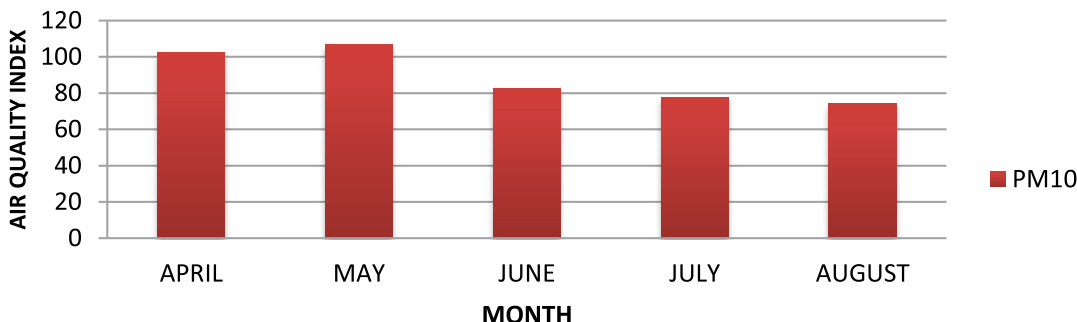
[Fig 2: Comparison of the amount of dominant pollutant in North Kolkata (PM 10)]

Figure 1 represents the variation of Air Quality Index in RBU zone during five months from November 2018 to March 2019, where Particulate Matter 2.5 (PM 2.5) is dominant in this period, whereas figure 2 represents the variation of Air Quality Index in RBU zone during five months from April 2019 to August 2019, where Particulate Matter 10 (PM 10) is more dominant from April to August. Particulate Matters are found most dominant in the study zone, affecting the respiratory health of Traffic cops.

Table 1: Comparison of Physiological parameters among Traffic Police Personnel

PARAMETERS	Exposed (N=35)	Control (N=25)	p Value(t Value)
Age (Years)	38.13±7.64	37.1±7.52	0.6226(0.4948)
Height (cms.)	172.88±5.68	172.4±5.65	0.7583 (0.4800)
Weight (kg)	73.43±11.10	74.85±10.69	0.6381 (0.4728)
Years of Exposure (Years)	8.20±6.54	9.05±6.71	0.6397 (0.4705)
Data is presented as Mean±SD, Significance level <0.05 **N= Number of subjects**			

Table 1 represents the Student's unpaired t-test analysis of physiological parameters between the exposed group and the control group of subjects. It can be seen that there is no significant difference found in parameters between the two groups, thus collected data is accepted for further study.

Figure 3 represents the beverage drinking habit of exposed and the control group of Police officers, where it is found that maximum subjects are pursuing habit of drinking beverage one to five times a day, which is higher in the control group. Any case of addiction over six times per day is not found in the exposed traffic group.

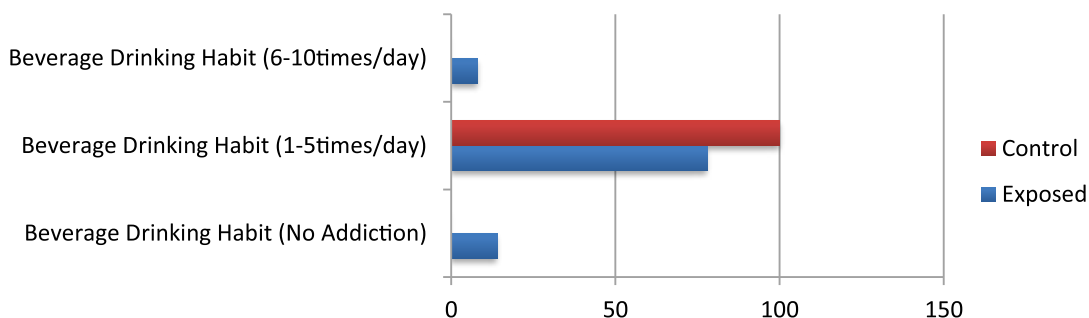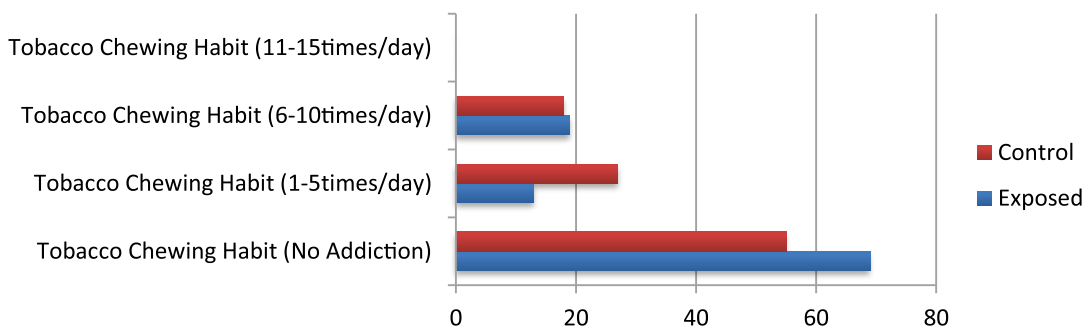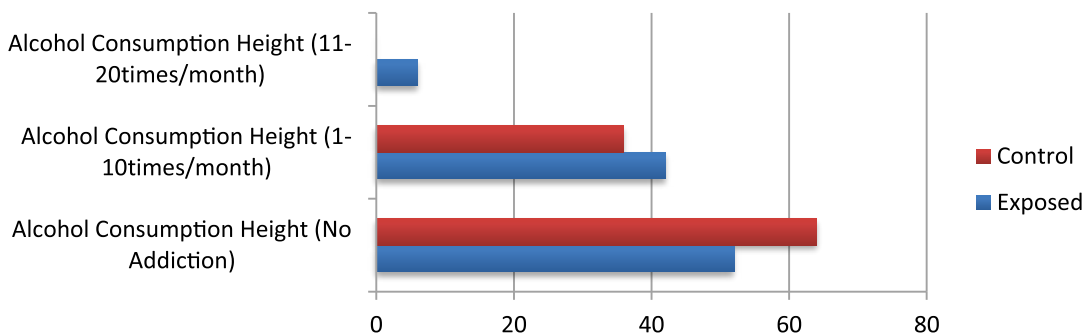
Figure 4 represents the tobacco chewing habit of the exposed and the control group of Police officers, where it is found that few subjects are pursuing the habit of chewing tobacco six to ten times a day, which is higher in the exposed group. Most cases are found with no addiction in both groups.

[Fig 5: Comparison of Alcohol Consumption Habit among two groups of Traffic Police Personnel]

Figure 5 represents the alcohol consumption habit of the exposed and control group of cops, where there is no case of high consumption in case of the control group, whereas exposed group has higher addiction in alcohol consumption from one to ten times a day.

[Table 2: Comparison of Cardiovascular Parameters among Traffic Police Personnel]

PARAMETERS	Exposed (N=35)	Control (N=25)	p Value(t Value)
Systolic Pressure (mm/Hg)	128.35±8.89	125.65±9.92	0.2904(1.0670)
Diastolic Pressure(mm/Hg)	81.35±4.45	78.95±5.38	0.0716(1.8354)
Pulse Rate (beats/min)	78.43±5.09	76.8±6.11	0.2789(1.0931)
Data is presented as Mean±SD, Significance level <0.05 **N= Number of subjects**			

Table 2 represents the Student's unpaired t-test analysis of cardiovascular (CVS) parameters between the exposed group and the control group of subjects. It can be seen there is no significant difference found in blood pressure and pulse rate between the two groups, thus representing no effect of exposure changes in cardiovascular parameters of Traffic Police personnel.

[Table 3: Comparison of the correlation coefficient between the exposed and control group of Traffic Police Personnel]

Parameters	Years of Exposure	
	Exposed (N=35)	Control (N=25)
Systolic Pressure	0.043	-0.008
Diastolic Pressure	-0.146	-0.190
Pulse Rate	0.081	0.022
Comparison of the correlation coefficient between exposed and the control group of subjects **N=Number of subjects**		

Table 3 represents the comparison between the correlations among cardiovascular parameters with the duration of exposure correlations between the two groups. Diastolic blood pressure (D.B.P) of the exposed group is found negatively correlated with duration of exposure, whereas Systolic blood pressure (S.B.P) and pulse rate has been found negatively correlated with the duration of exposure

in the control group. It can be seen D.B.P decreases with an increase in the duration of exposure in the exposed group, whereas S.B.P and pulse rate decreases with an increase in the duration of exposure in the control group.
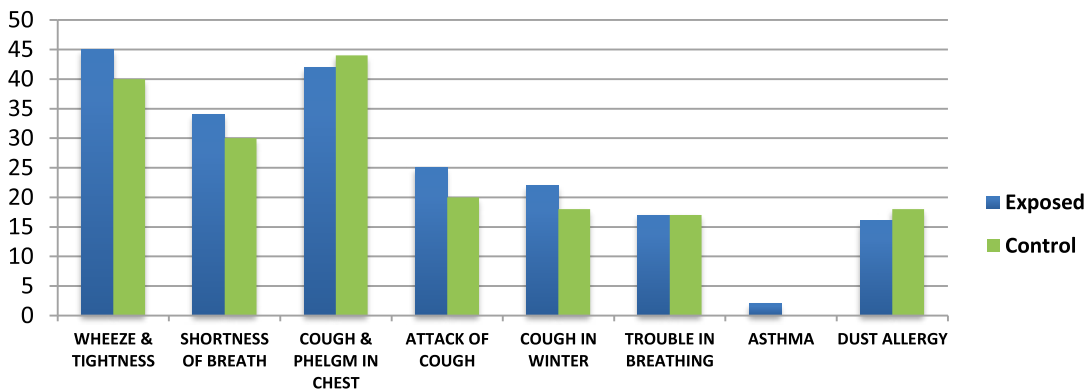
[Fig 6: Comparison of Respiratory Problems among two groups of Traffic Police Personnel]

Figure 6 represents the comparison of respiratory problems between the exposed and control group of traffic Police. A higher percentage of symptoms of wheezing and tightness, shortness of breath, attack of cough and cough in the winter season can be seen in the exposed group of subjects. The appearance of asthma is found only in the exposed group, whereas cough and phlegm in the chest and exposure to dust allergy is found high in case of the control group of subjects.

Discussion

According to CPCB (Central Pollution Control Board) , AQI value, more than 100 may bring breathing discomfort, whereas an AQI value of more than 301 can bring respiratory illness on prolonged exposure. It is seen that during November to January, a high level of pollutants take place, which tends to increase the damage to respiratory health. PM 2.5 and PM 10 are harmful to respiratory health. PMs are major sources of pollutants found in road traffic. PMs have been proved to have an association with their concentration respiratory system disease. They penetrate deeply into the lung, causing irritation and scars in alveolar walls causing impairment of lung function. Table 1 represents the physiological parameters of the two groups, where no significant difference is found, which states sampling of the population under study might eliminate other error factors from the study.

Figure 3, 4 and 5 represented beverage, tobacco and alcohol consumption habits, which did not show any significant difference between the two groups.

The cardiovascular parameters of two groups of traffic cops did not vary significantly, though the exposed group's parameters displayed a little increase in table 2. In table 3, the Blood Pressure is found to be negatively correlated with exposure duration in the exposed group, that is, diastolic blood pressure decreases with an

increase in the duration of exposure. In the control group, systolic and diastolic blood pressure is found negatively correlated with an increase in the duration of exposure. Pulse rate is weakly correlated with the duration of exposure. The correlation among parameters and exposure duration is weak, therefore it may be concluded that there is no significant effect of duration of exposure is present on cardiovascular parameters.

Figure 6 represented variation of different respiratory problems between two groups. Wheeze and tightness, shortness of breath, attack of cough and cough in the winter season are early symptoms of lung impairment, which can further be studied via pulmonary function test. The case of asthma is found only in an exposed group of workers, which is the extreme case of respiratory impairment.

Conclusion

The impact of pollutants on the cardio-respiratory health of Police officers has been shown in the study. The most prevalent pollutants in the study area were found to be PM 2.5 and PM 10. Systolic blood pressure and pulse rate increased with the rise in duration of exposure in exposed group, which indicates a proportional relationship between these factors. From the comparison of respiratory problems, it can be concluded that exposure to pollutants is seriously causing more damage to the respiratory system.

Therefore, the following recommendations are suggested to minimize or reduce the damages of respiratory and cardiovascular health due to air pollution:-

1. Use of Personnel Protective Equipment such as masks, respirators will prevent the entry of pollutants such as PMs in respiratory organs.

2. A regular healthy food intake will reduce the damage caused by pollutants in the body, causing a decrease in the chance of being overweight, reducing the change of high blood pressure and further cardiovascular impairments. Intake of Vitamin-rich foods, avoiding junk food or fried food helps to stay healthy and fit and reduce further cellular damage.

3. Habit of regular physical exercise and yoga helps in the betterment of physical, cardiac and respiratory health of the human body.

4. Due to nature of work, regular health inspections are vital.

The government may guide the concerned department for adopting mandatory remedial measures to minimize the physiological and respiratory damage on the victim Police personnel engaged in Traffic control job.

References

1. Brunekreef B., Beelen R., Hoek G., Schouten L., Goldbohm S.B., Fischer P. et al. (2009). Effects of Long-Term Exposure to Traffic Related Air Pollution on Respiratory and Cardiovascular Mortality in the Netherlands: The NLCS-AIR Study. *Res Rep Health Eff Inst*, 139:5-71, pp. 73-89

2. Dey A., Majumdar P, Saha A. and Sahu S. (2020). COVID-19 pandemic lockdown-induced altered sleep/wake

circadian rhythm, health complaints and stress among traffic Police personnel in India, *Chronobiology International*, 38(1),140-148

3. Dey A., Mishra T., Sahu S. and Saha A. (2020). Evaluation of impact of ambient air pollution on respiratory health of traffic Police in Kolkata. *BLDE Univ J Health Sci*.

4. Dey A., Mishra T., Sahu S. and Saha A. (2020). Occupational Heat Exposure of Female Police Personnel: Its Implication of Climate Change and Undermine Issue. *Indian Police Journal*, 67(3),52-57.

5. Gupta P., Makhijani S.D. and Meenakshi C. (1988). Pulmonary function tests on rubber factory workers exposed to poly-nuclear aromatic hydrocarbons. *Indian Journal of Physiology*, 52, 71–5.

6. Imhof D., Weingarter E., Ordonez C., Gehrigt R., Hill N., Buchmann B. and Baltensperger U. (2005). Real world emission factors of fine and ultrafine aerosol particles for different traffic solutions. *Environ. Sci. Technol*, 39,8341-50

7. Iriti M., Piscitelli P., Missoni E. and Miani A. (2020). Air Pollution and Health The need for a Medical Reading of Environmental Monitoring Data. *Int J Environ Res Public Health*, 17(7):2174.

8. Karita K., Yano E., Tamura K. and Jinsart W. (2004). Effects of working and residential location areas on air pollution-related respiratory symptoms in Policemen and their wives in Bangkok, Thailand. *European J of Pub Health*,14, 24-26.

9. Kumar R., Sharma S.K., Thakur J.S., Lakshmi P.V., Sharma, M.K. and Singh T. (2010). Association of air pollution and mortality in Ludhiana city of India: a time-series study. *Ind. J Pub Health,* 54, 98-103

10. National Air Quality Index. Central Pollution Control Board, Ministry of Environment, Forests and Climate Change.

11. Patil R.R., Chetlapally S.K. and Bagavandas M. (2014). Global review of Studies on Traffic Police with Special Focus on Environmental Health Effects. *IntOccup Med Environ Health,* 27(4), 523-35

12. Proietti L., Mastruzzo C., Palermof I., Yancher C., Lisitano N. and Crimi N. (2005). Prevalence of respiratory symptoms, reduction in lung function and allergic Sensitization in a group of traffic Police officers exposed to urban pollution. *Med Lav* , 96(1),24-32(PMID: 15847105).

13. Rajarathnam U., Sehgal M., Nairy S., Patnayak R.C., Chhabra S.K. and Ragavan K.V. (2011). Time-series study on air pollution and Mortality in Delhi. *Res Rep Health Eff Inst.*, 157, 47-74(PMID: 21648204).

14. Saha A., Sahu S. and Paul G (2009). A Comparative Study on Physiological and Biochemical Activities between Police Officers and School Teachers. *Journal of Environmental Physiology*, 2(2), 45-52.. (Reviewed ISSN: 0974-7036).

15. Saha A., Sahu S., and Paul G. (2010). Study of Oxidative Stress among Police Officers of West Bengal Police Services. *Journal of Environmental Physiology*, 3(1, 2),34-43.Published by University of Kalyani. (Reviewed ISSN: 0974-7036).

16. Saha A., Sahu S. and Paul G. (2012). An Ergonomic Questionnaire Study on the Job Stresses of Police Officers. *The Indian Police Journal,* LXI (3): 70-81. Published by Home Ministry Govt. of India. (Reviewed, ISSN: 0537-2429)

17. Saha A., Sahu S, Paul G. and Ghosh P. (2014). Assessment of Occupational Stresses among Police Officers who impart Teaching in Police Training College, West Bengal. *International Journal of Recent Scientific Research*, 5(1),277-284(Reviewed ISSN: 0976-3031).

18. Saha A. (2016). Evaluation of Association between Occupational Characteristics and Mental Stress among Police Officers. *World Journal of Pharmacy and Pharmaceutical Sciences*, 5(12), 1726-1732.

19. Samet J.M., Dominici F., Curriero F.C., Coursac I. and Zeger S.L. (2000). Fine particulate air pollution and mortality in 20US Cities, 1987-1994. *N Engl J Med*., 34, 1742-1749.

20. Singh S. and Singh R. (2008). Towards People Friendly Police In India. *The Indian Police Journal*, LV (2), 28-35.

21. The European Community Respiratory Health Survey Steering Committee*.* (2002). The European Community Respiratory Health Survey II. *Eur Respir J*, 20:1071–1079.

22. Tian Q., Li M., Montgomery S., Fang B., Wang C., Xia T. et al. (2020). Short-Term Associations of Fine Particulate Matter and Synoptic Weather Types with Cardiovascular Mortality: An Ecological Time-Series Study in Shanghai, China. *Int J Environ Res Public Health*, 17(3), 1111.

23. Zhang Y.X., Wei Q.Y., Wang J., Qiao T.H., Bai H.B. and Cai L.N. (2007) Automobile tyre colloidal particle induced allergic damage of respiratory system in traffic Policemen and its allergenicity. (Article in Chinese) *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing ZaZhi*, 25(6), 346-9(PMID: 17723191).

An Exploratory Study to assess Lung Efficiency of Traffic Police Personnel based on their Age and Quetelet Index

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Abstract

The most significant challenge that traffic officers face as a result of their job is health issues, specifically related to the lungs. The primary causes of impaired lung inefficiency are air pollution emissions and constant exposure to environmental contamination. Since the primary causes are uncontrollable factors, an individual can only take proactive preventive measures to optimize the lung's capacity. Age and Quetelet Index are considered the major factors for this study to evaluate and comprehend the lung efficiency of traffic Police officers. Voluntary participation was asked and 100 non-smoking traffic cops agreed to provide the data for the research purpose. Computerized spirometry was used to determine Forced Vital Capacity. Based on their age and Quetelet index, the participants were divided into four groups (strata), Young Professionals with Normal Weight (YPNW), Young Professionals with Overweight (YPOW), Aged Professionals with Normal Weight (APNW), Aged Professionals with Overweight (APOW). The arguments relevant to the existing literature in the field that a Quetelet index higher than the normal range will lead to a deterioration in the lung capacity of non-smoking traffic Police officers backed up the findings of this study. APOW has a lower lung capacity than APNW. As a result, it was discovered that maintaining a healthy body weight improves lung capacity and efficiency.

Keywords: *traffic Police personnel, lung efficiency, aging, Quetelet index, non-smoker, automobile emission, FVC.*

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Introduction

The researchers have extensively conducted studies on traffic Police over the last three decades, and one of the major threats to their health is air pollution, as they are heavily exposed to vehicular emissions due to the nature of their profession, particularly in India, where the population and vehicle ratio is high. The negative impacts on health, due to vehicular emission are increased oxidant stress, decreased antioxidant levels, and nitric oxide (Suresh and Devi et al., 2000), pulmonary function impairments (Makwana and Solanki et al., 2015) acute asthma, allergy, and other respiratory diseases were also evident (Ghose and Paul et al.,2005), Furthermore, it tends to increase mortality rate, chronic bronchitis, respiratory tract infections, ischemic heart disease, and stroke (Sydbom and Blomberg et al., 2001),the falls in various lungs capacities: forced vital capacity, forced expiratory volume was also recorded (Pramila and Girija, 2013, Sodhi and Singh et al.,2009) decreased functional capacity of the lungs (Pal and Robert et al., 2010), and respiratory dysfunction were also evident in the traffic Police personnel (Gupta and Mittal et al., 2011, Patil and Thakre et al., 2013). Hence, the effect of vehicular emission on the respiratory function of the traffic Police is massive. The studies which were conducted in different cities of foreign countries also concluded the similar findings (Wongsurakiat and Maranetra et al., 1999, Thippanna and Lakhtakia, 1999). Consistent evidence from both epidemiological and experimental studies has shown that cardiopulmonary dysfunction and systemic diffusion are correlated with short and long-term exposure to particulate matter, particularly fine particles (Losacco and Perillo, 2018).

However, the researchers made several suggestions and recommendations, such as traffic Police personnel should wear personal protective equipment (nose masks) during their duty hours and that they should be subjected to mandatory health screenings regularly (Ingle and Pachpande et al., 2005, Sayyad and Yadav et al., 2013). Despite these suggestions and recommendations, traffic cops rarely use personal protective equipment (Sabale and Tripathi et al., 2019, Dhakal and Shah et al., 2017). It could be due to a lack of awareness or discomfort by wearing a mask or other protective equipment for an extended period.

However, the question arises: "Is vehicular emission the only real threat to traffic Police officers' respiratory function, or there are other threats that impact their health?" Therefore, this study was conducted to find out the other threats which may hamper the health of the traffic Police.

The researcher discovered two independent variables, age, and Quetelet Index can be two additional pertinent factors that may have an impact on the health of traffic Police in the current study. In the process of investigation, three research questions were formed.

1. Does age have a significant impact on Forced Vital Capacity?

2. Does Quetelet Index have a significant impact on Forced Vital Capacity?

3. Is there any interaction effect of Age and Quetelet Index on the Forced Vital Capacity?

Methods

Procedure

The proposal for this study was reviewed and approved by the Ethical Committee of Rashtriya Raksha University Gandhinagar, Gujarat. The proposal was also presented to the Vadodara city traffic Police higher authority.

Subjects

Initially, 300 traffic Police personnel were informed regarding the study's objectives, and the terms of volunteer participation were provided to them along with prior informed consent. Out of that, 179 traffic Police personnel were included in the study whereas, 121 got excluded based on the exclusion criteria.

Parameter

Forced Vital Capacity (FVC) was preferred to examine the lung capacity of traffic Police officers, and it was measured in litres using a digitalized spirometer (SpiroTech).

Study Design

The study employed a 2*2 factorial design, which resulted in the formation of four sub-groups based on two independent variables: Age and Quetelet Index. The Quetelet Index was calculated using the formula (Weight in kg/Height in meter^2), it is also known as Body Mass Index (BMI) (WHO, 2021). The four different categories (aged professional with normal weight, aged person with overweight, young professionals with normal weight, young professional with overweight).This categorization of the group was based on World Health Organisation (WHO) guidelines and norms.

Table 1: Grouping of participants according to Age and Quetelet Index

Groups	Criteria	Nomenclature	Samples n
Group-1	Age >35 Quetelet Index (18.5 to 24.99)	Aged Professionals with Normal Weight (APNW)	25
Group-2	Age >35 Quetelet Index (24.99 and above)	Aged Professionals with Overweight (APOW)	25
Group-3	Age <35 Quetelet Index (18.5 to 24.99)	Young Professionals with Normal Weight (YPNW)	25
Group-4	Age <35 Quetelet Index (24.99 and above)	Young Professionals with Overweight (YPOW)	25

Figure 1: Selection Procedure of the Traffic Police Personnel

Initial Identification of Sample

(300 Traffic Police personnel)

Inclusion = (n –179)

Exclusion = (n – 121)

- Healthy Individual
- Non - Smoker
- Male Traffic Police Personnel

- Underweight (n = 13)
- Smoker (n = 24)
- Common Ailment (n = 30)
- Less Experience (n = 20)
- Age below 20 and above 55 years (n = 34)

Strata, YPNW, YPOW, APNW, APOW

(based on Age & Quetelet Index)

YPNW (n = 50)

10 Outlier Identified out of 4 strata

Outliers = 4

II Test of Normality &Homogeneity

YPNW (n = 46)

Random Selection (n =25)

YPOW (n = 42)

Outlier = 1

YPOW (n = 41)

Random Selection (n =25)

APNW (n = 39)

Outliers = 3

APNW (n = 36)

Random Selection (n =25)

APOW (n = 48)

Outliers = 2

APOW (n = 46)

Random Selection (n =25)
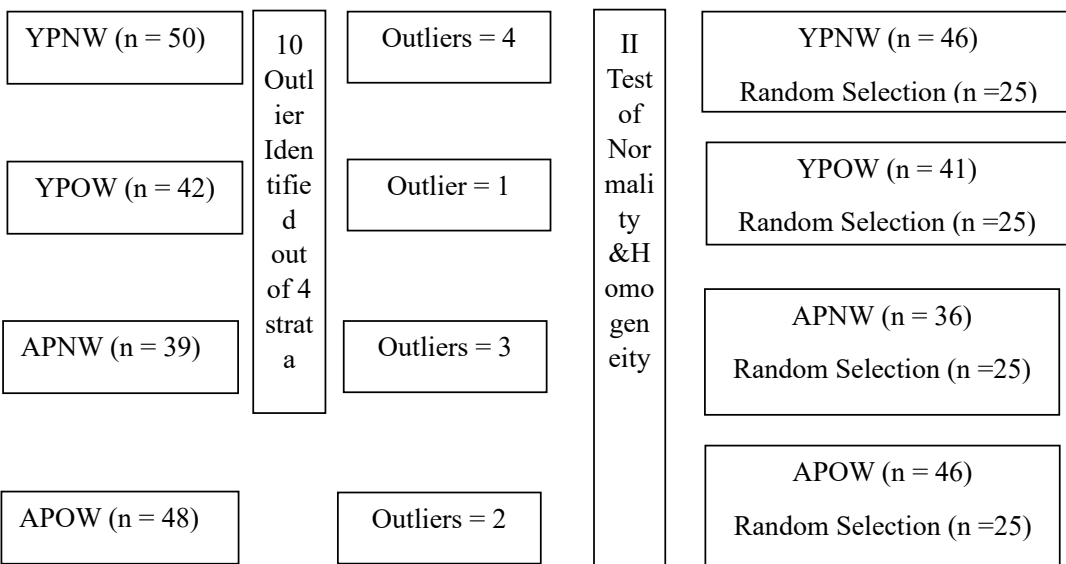
Normality Test

The Forced Vital Capacity (FVC) data were analysed to see if the parametric test's prerequisite assumptions were met or not by using SPSS version 22. The ShapiroWilk's was used to test normality and Levene's for homogeneity of variance. The Shapiro Wilk Tests indicated a violation of normality (0.078) and the box plot brought to light 10 outliers: YPNW (n = 4), YPOW (n = 1), APNW (n = 3), and APOW (n = 2). The outliers from all four strata were removed, and Shapiro Wilk's test was again used to determine normality for YPNW (n = 46), YPOW (n = 41), APNW (n = 36), and APOW (n = 46). The assumption of the parametric test was completed by using Shapiro Wilk's Test (0.264) and Levene's (0.544) to test homogeneity of variance, after the removal of the outliers. 25 Traffic Police personnel were then randomly selected from each stratum for the study.

Collection of data

All the instruments used for the study were calibrated before the data collection and were taken from the research lab of Swarnim Gujarat Sports University, Gandhinagar, Gujarat, India. The data was collected at different traffic junctions of Vadodara City. The researchers first explained to the subject, the purpose of the study and then obtained their informed consent form. A demonstration was given to the subject before the test and sufficient trial and practice time was given to them to learn how to use the spirometer.

Statistical Technique

As a descriptive analysis, the mean and standard deviation were used to describe the Sample population of Traffic Police personnel. In addition, the inferential statistical technique two-way analysis of variance (ANOVA) was used.

Results

The data collected were statistically analysed and it reveals that the forced vital capacity (FVC) was highest in YPNW (3.83 ± 0.235), followed by APNW (3.42 ± 0.210), YPOW (3.41 ± 0.200), and least in APOW (2.93 ± 0.248). All the prerequisite assumptions (normality and variance)of the parametric test were fulfilled consequently, and two-way ANOVA was applied, which is described below in Table 2.

Table 2: Two-way Analysis of Variance of Forced Vital Capacity (FVC) based on Age and Quetelet Index

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Age	5.171	1	5.171	103.046	.000
Quetelet Index	5.117	1	5.117	101.962	.000
Age * Quetelet Index	.029	1	.029	.576	.450

Error	4.817	96	.050	-
Total	15.134	99		-

In non-smoker traffic personnel, Table 2 shows that there was no interaction effect between age and Quetelet Index. However, age (p=0.000) and the Quetelet Index (p=0.000) each had a significant main effect.

Discussion

The study's main goal was to analyse the main effect of age and Quetelet index on FVC, along with the interaction effect.

Many Indian researchers have been drawn attention to the deteriorating health of traffic Police officers (Pal and Robert et al., 2010, Makwana and Solanki et al., 2015, Gupta and Mittal et al., 2011), since the country's population is constantly growing, from 1.36 billion in 2019 to 1.38 billion by 2020 (World Population Prospect, 2019). Similarly, associated challenges are also constantly increasing at the same rate, and vehicular emissions have been a major threat for years for the traffic Police personnel while discharging their daily duties.

The major impact of pollution on the health of traffic Police personnel can be seen in the deterioration of their pulmonary functions. This deterioration rate increases along with the aging process (Pruthi and Multani,2012). In humans, deterioration in the lung capacity starts approximately from the age of 35 (Turner and Mead et al., 1968, Bode and Dosman et al., 1976). The findings of the present study show similar results as quoted in the above-mentioned research. The FVC of young professionals (< 35 years), who

were having normal weight were having an FVC of 3.83 l/min whereas the FVC of aged professionals (> 35 years) was found to be comparatively low, (3.41 l/min). Also, drastic deterioration was observed in the FVC of overweight young professionals (3.42 l/min) and overweight aged professionals (2.93 l/min). The reason might be the obesity level among the traffic Police, since the obesity may interfere with the chest wall of the lungs, and diaphragm that suppress the lungs work efficiency and ultimately reduces the vital capacity, total lung capacity, and maximal voluntary ventilation (Ray and Sue,1983). It was suggested that lifestyle modifications are a must to improve the cardio respiratory capacity (Wammer and Haberberger et al., 2021).Our findings also indicate that aging could be a reason for the deterioration of pulmonary functions in non-smoker traffic Police personnel and the risk furthermore aggravates when the person is overweight. These facts find evidentiary support in the research studies based on similar research questions conducted by (Forno and Han et al.,2018, Jones and Nzekwu, 2006, Melo and Silva et al., 2014) in different locations around the globe.

Conclusion

The research conclusively demonstrates that aging and the Quetelet index have a significant impact on the deterioration of non-smoker traffic Police officers' lung capacity (FVC). Automobile emissions, poor eating habits, and/or a lack of physical

fitness are also significant threats to the respiratory health of traffic Police. Since it will take a long time to reduce automobile emissions and control the country's rapidly growing population. As a result, it is advised that keeping the Quetelet index in a normal range in relation to age is the best approach. Additionally, traffic officers should participate in regular physical activities and aerobic workouts, go for periodical health check-ups as well as consume a healthy diet.

Recommendations

1. To use protective masks and headgears while performing the duty.

2. To reduce the designated working hours of traffic Police personnel, especially of those who are above 35 years of age.

3. To avoid assigning duty on the crossroads where pollution emissions are high to traffic Police personnel who are above 35 years of age.

4. To indulge the overweight traffic Police personnel in physical fitness training to reduce their weight and increase their lung efficiency.

References

1. Bode F. R., Dosman J., Martin R. R., Ghezzo H. and Macklem P. T. (1976). Age and sex differences in lung elasticity and in closing capacity in nonsmokers. *Journal of applied physiology*, *41*(2), 129-135.

2. De Bourdeaudhuij I., Lefevre J., Deforche B., Wijndaele K., Matton L. and Philippaerts R. (2005). Physical activity and psychosocial correlates in normal weight and overweight 11- to 19-year-olds. Obesity Research, 13(6), 1097-1105.

3. Dhakal M., Shah R., Sainju N. and Manandhar N. (2017). Health Status of Traffic Police in Kathmandu Valley. *Int J Occup Saf Health* 7(1): 2-6.

4. Dutta T. and Pal G. (2010). Pulmonary function test in traffic Police personnel in Pondicherry. *Indian J Physiol Pharmacol*, *54*(4), 329-36.

5. Forno E., Han Y. Y., Mullen J. and Celedón J. C. (2018). Overweight, obesity, and lung function in children and adults-a meta-analysis. *The Journal of Allergy and Clinical Immunology: In Practice*, *6*(2), 570-581.

6. Ghose M.K., Paul R. and Banerjee R.K. (2005). Assessment of the status of urban air pollution and its impact on human health in the city of Kolkata. Environmental monitoring and assessment 108(1): 151-167.

7. Gupta S., Mittal S., Kumar A. and Singh K. D. (2011). Respiratory effects of air pollutants among non-smoking traffic Policemen of Patiala, India. *Lung India: Official Organ of Indian Chest Society*, *28*(4), 253.

8. Ingle S.T., Pachpande B.G., Wagh N.D., Patel V.S. and Attarde S.B. (2005). Exposure to vehicular pollution and respiratory impairment of traffic Policemen in Jalgaon City, India. Industrial health 43(4): 656-662.

9. Jones. R. L. and Nzekwu M. M. U. (2006). The effects of body mass index on lung volumes. Chest, 130(3), 827-833.

10. Losacco C. and Perillo A. (2018). Particulate matter air pollution and respiratory impact on humans and animals. *Environ Sci Pollut* R *25* (34): 33901-33910

11. Makwana A.H., Solanki J. D., Gokhale P.A., Mehta H.B., Shah C.J. and Gadhavi B.P. (2015). Study of computerized spirometric parameters of traffic Police personnel of Saurashtra region, Gujarat, India. *Lung India* 32(5): 457.

12. Melo, L. C., Silva M. A. M. D. and Calles A. C. D. N. (2014). Obesity and lung function: a systematic review. Einstein (Sao Paulo), 12(1), 120-125.

13. Pal P., Robert J., Dutta T., & Pal, G. (2010). Pulmonary function test in traffic Police personnel in Pondicherry. *Indian J Physiol Pharmacol*, 54 (4): 329-36

14. Patil, P.J., Thakare, G.V., Patil, S.P. (2013). Comparative study of lung function test of Policemen in traffic control with those in general duty. *Natl J Physiol Pharm Pharmacol* 3 (2): 162-166.

15. Pramila T. & Girija B. (2013) Study of pulmonary function tests in traffic Policemen exposed to automobile pollution in Bangalore City. *Nat J Basic Med Sci* 3, 35-8.

16. Pruthi N. and Multani N. (2012). Influence of age on lung function tests. Journal of Exercise Science and Physiotherapy, 8(1), 1–6.

17. Ray, C. S., Sue D. Y., Bray G., Hansen, J. E. and Wasserman K. (1983). Effects of obesity on respiratory function. *American Review of Respiratory Disease*, *128*(3), 501-506.

18. Sabale R.V., Tripathi S.N. and Velhal, G.D. (2019). Morbidity profile and use of personal protective equipment amongst traffic Police of Mumbai. *Int J Community Med Public Health* 6(12): 5277-5282.

19. Sayyad R., Yadav P.K., Sekhar M., Aliyaraj A. and Kar S.K. (2013). Evaluation of pulmonary function tests on non-smoking traffic Policemen at Tirupati, AP, *India. Int. J. Physiothe,. Res*, Res 1(5): 279-82

20. Sodhi C., Singh S. and Dandona P.K. (2009). A study of the effect of yoga training on pulmonary functions in patients with bronchial asthma. *Indian J Physiol Pharmacol* 53(2): 169-174.

21. Suresh Y., Devi M.S., Manjari V. and Das U.N. (2000). Oxidant stress, antioxidants, and nitric oxide in traffic Police of Hyderabad. *India. Environ Pollut* 109 (2): 321-325.

22. Sydbom A., Blomberg A., Parnia S., Stenfors N., Sandström T. and Dahlen S.E. (2001). Health effects of diesel exhaust emissions. *Eur. Respir. J*. 17 (4): 733-746.

23. Thippanna G. and Lakhtakia S. (1999). Spirometric evaluation of traffic Police personnel exposed to automobile

pollution in twin cities of Hyderabad and Secunderabad. *Indian J Tuberc* 46: 129-132.

24. Turner J. M., Mead J. and Wohl M. E. (1968). Elasticity of human lungs in relation to age. *Journal of applied physiology*, *25*(6), 664-671.

25. United Nation Population Division. (2019). Department of Economic and Social Affairs Population Dynamics: revised prospect (2019).

26. Wammer F., Haberberger A., Linge A. D., Myklebust T. Å., Vemøy S. and Hoff D. A. L. (2021). Lifestyle modification for weight loss: Effects on cardiorespiratory capacity in patients with class II and class III obesity. *Obesity Science & Practice*.

27. WHO. Regional Office for Europe, Body Mass Index – BMI. https://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi

28. Wongsurakiat P., Maranetra K.N., Nana A., Naruman C., Aksornint M. and Chalermsanyakorn T. (1999). Respiratory symptoms and pulmonary function of traffic Policemen in Thonburi. *J Med Assoc Thai* 82(5): 435-443.

Assessing Mental Health Issues of Convicted Female Prisoners in India

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Abstract

Prisons in India play a pivotal role in restoring and reforming the attitude, behavior and the anti-social feelings of individuals. Restructuring the deviant behavior in the personality of individuals is considered important. The UN (2011) standard rule to treat females in prison gives direction vide rule 6, as health screening to measure mental healthcare needs including post-traumatic stress disorder, risk of suicide and self-harm is a mandate in prisons. Review of literature reveals gaps in the existing body of knowledge. Aim of present study is to measure the mental health issues such as anxiety, depression, insomnia, stress, post-traumatic stress and suicidal ideation experienced by convicted female prisoners in their incarceration period. In order to fulfill the objectives, the study adopted quantitative method. Descriptive research design was used. A sample of 350 convicted women prisoners were chosen from 9 women prisons drawn from various regions of India with a population size of 1302 convicted women prisoners. Probability sampling method is used to draw samples. Self-administered tool was used to collect background profile of participants. Scales such as depression, anxiety and stress scale, PTSD symptoms scale, Suicide behavior questionnaire - revised Insomnia index were used. Approval from research ethical committee in Academy of Prison and Correctional Administration was obtained. The key results obtained from study are, only 5 (1.42%) of them reported they had mental health problems before entering prison. 98.6% women prisoners reported they had developed symptoms either mild, moderate or severe of mental health problems after entering prison. Research suggests mental health services to extend with priority to convicted women prisoners in India.

Keywords: *Convicted women prisoner, Mental health problems, Post-traumatic stress disorder*

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Introduction

The Prison Statistics India, 2020 records the presence of 1306 prisons in the country which includes 29 Women Jails. The women prison in India has a total capacity of 6,179 and is spread across the country in 14 states. The report also records the presence of 4, 88,511 prisoners among which female constituting 20,046 and 70 transgender (Prison Statistics India, 2020). Report also throws light on the presence of 1,427 female prisoners living with 1,628 children. Report also records 7524 people diagnosed with mental illness (Prison Statistics India, 2020).

Prison is now treated as a place for correction which indicates the reformation of prisoners rather than punishment. Mulla Committee recommends Prisons and Corrections administration as part of Criminal justice, committed for safeguarding public safety by aiding law-breakers to be law-abiding citizens and implements safe, secure and humanitarian control. An indispensable part of the society is prisons and is considered to be an organization that promotes justice.

Mental health is essential for convicted individuals in prison. The UN (2011) directs through its rules to determine mental healthcare needs like posttraumatic stress disorder, suicide ideation and self-harm as priority in women prisons. Rule 12 re-emphasizes and recommends gender-sensitive, trauma-informed mental healthcare. However, mental health problems especially among the convicted women prisoners is a matter of grave concern and the researcher feels that provisions need to be strengthened in light of the research.

Existing Knowledge Pertaining to Mental Health Issues in Convicted Women

Few studies across the globe have been in existence to provide theoretical background knowledge around mental health issues among the prisoners. Studies from the west found that imprisonment leaves a negative effect on the psychological and physical health of the prisoners and weakens their mental balance. Some of the negative effects are depression (Singh, Verma 1971) anxiety, emotional withdrawal (Clements, 1979), suicidal thoughts or actions (Flanagan, Keeley and Blashfield, 2008) and increasing levels of hostility (Bolton et al, 1976). Stress and depression are two common problems in the prison population (Lafortune, 2010). Both stress and depression are often associated with imprisonment experiences among inmates, especially among women and more so among female inmates (Birmingham, 2004; Gunter, 2004).

Lamb and Weinberger (1998) found that psychiatric disorders are highly prevalent among the prisoners for a long time. Maniyar (2004) made an attempt to understand the lifestyle of women criminals and suggested therapeutic approaches which would be useful for their rehabilitative programmes for female offenders. Hurley and Dunne (1991) conducted a study on the Psychological distress and psychiatric morbidity in women prisoners with 92 women prisoners as the sample of the study. The findings of the study were that 53% of the prisoners were diagnosed to have had a current psychiatric disorder and the majority of them had adjustment disorders with depressed mood

and personality disorders. Studies have also found that the mental health problems in women inmates are more frequent and serious than their male counterparts.

Rickford (2003) in her survey report for Penal reforms International says that "Most women prisoners will at some point have mental health issues to deal with, caused by incarceration and separation from their families. Many women are the main carers for their children, and the separation and loss of control and care for them can have devastating effects on both the women and the children. Bloom (2006) stated that women entering the correctional system represent a population at high risk of substance use disorders and mental health problems. It was also found out that women in prison have mental health problems to a much higher degree than both the general population and male prisoners.

James and Glaze (2006) in the Bureau of Justice Statistics in its special edition had published the survey report of the Prevalence of symptoms of mental disorders among prison and jail inmates in the United States of America. Survey concludes that female inmates had higher rates of mental health problems than male inmates. Fazel and Benning (2009) studied in England and Wales and suggested that suicide could be the result of high levels of mental health and substance misuse problems in women prisoners. Khan et al., (2012) reported the prevalence of depression among women prisoners in Pakistan. The study revealed that out of the 64 female prisoners, 38 (59.4%) were found to be suffering from depression.

Available forms of existing knowledge around mental health issues are broadly prison based and scanty literature from the west lays its thrust on the women prisoners. Literature also reveals that the specific mental health problems are dealt by researchers for the purpose of their research. Studies reveal that the prevalence of psychiatric disorders among women is perceived to be higher in female than male prisoners. Studies conducted in Indian prisons are with lesser sample size and feasibility for generalization is too narrow. Reviews reveal there are no recent studies especially in the field of mental health of women convicts in Indian prisons available for raising awareness about the mental health issues to the policy makers. Considering the research gap stemming out from reasons specified above the researcher aims at conducting a comprehensive research covering all mental health issues, outlining the scope for generalization in the Indian context and exploring the mental health issues surmounting our convicted women in Indian prisons. This paper augments the gap existing in the body of knowledge by its attempt to fulfill following objectives.

Aim

To assess mental health issues encountered by convicted women in prison in their period of incarceration. Effort is taken by researcher to investigate mental health issues listed as depression, anxiety, stress, insomnia, suicidal ideation and post-traumatic stress.

Specific Objectives

1. To record the socio-economic status of

2. To measure the level of depression, anxiety, stress, insomnia, suicidal ideation, post-traumatic stress in the convicted women prisoners.

Materials and Methods

With the aim of fulfilling the earlier mentioned research objectives, this research adopted the quantitative research methodology. Researcher applied the descriptive research design to describe the factors responsible for the occurrence of mental health issues like anxiety, depression, insomnia, stress, post-traumatic stress, suicidal ideation, in the convicted female in prison. There were a total of 9 special prisons for women included in this study with a total population of 1302 convicted women prisoners that constitute the universe of this study. The research represents all the convicted women prisoners diagnosed with mental health problems during their period of incarceration. A sample of 350 respondents was chosen using probability sampling method after obtaining their consent to be engaged in the study.

Self-administered interview schedule was used to collect respondents' data on their socio-economic status. Standardized rating scales such as the Depression, Anxiety and Stress Scale (DASS-42), Post-traumatic stress disorder symptom scale, suicide behavior questionnaire and Insomnia severity index were used to measure the magnitude of mental health problems in respondents. Reliability was checked with Cronbach's Alpha value. The internal consistency of the DASS scale

for the anxiety attributes was .897, 933 for the stress scale, .947 for the depression scale, .966 for the DASS scale total score respectively. The Cronbach's alpha value for Insomnia Severity Index is .879 for 7 items, .987 for the Depression, anxiety and stress questionnaire for 42 items, and for suicide behaviour questionnaire for 4 items .939 and for PSSI post-traumatic stress Inventory the value is .949 for 17 items. All these values are within 0.7-0.9 which is an acceptable value for Cronbach's alpha.

Necessary approval and permission on the administration of the tool was obtained from the research ethical committee of Academy of Prisons and Correctional Administration (APCA) and the University of Madras. Data was collected from respondents through interviews. Analysis of data was done using Statistical Package for Social Sciences (SPSS). Data collected in tested against its normal distribution. Parametric tests were administered to all those data adhering to the norms of normal distribution and non-parametric test is administered to all those data non-confining to the norms of normal distribution. Results in the form of numerical values obtained from the statistical tools were interpreted to provide appropriate and meaningful findings.

Results and Discussions

This graph reveals the age of the respondents. 33 per cent are equally distributed in the age group 22 – 31 and 32 – 41 respectively. It is also seen that 24 per cent are in the age 42 – 51 years and only 10 per cent are in age 52 – 61 years. This reveals that significant number of

women convicts in prisons belong to their productive age in life.
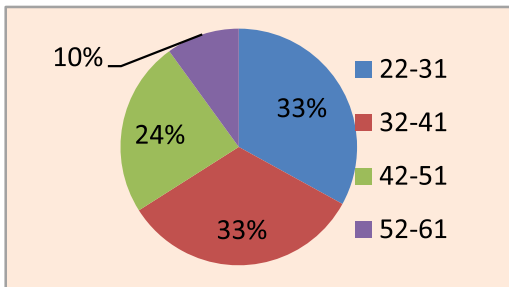
This figure reveals the educational qualification of the convicted women prisoners. It is seen that 36 per cent of the convicted women prisoners are illiterates, while 25 per cent of them are educated up to primary, 21.7 per cent of them have gone to high school and only 7.2 per cent of the women are graduates. This reveals that most convicted women prisoners are either illiterate or in their basic schooling.
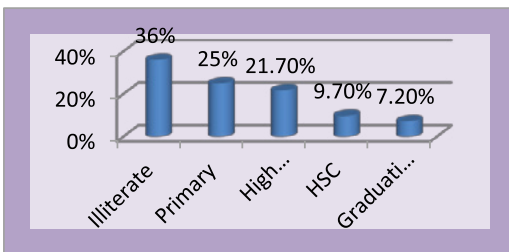
Marital status of the convicted women prisoners can be seen in this graph. Data reveals that 74.6 per cent of the convicted women prisoners were married. This shows that a significant proportion of the convicted women prisoners were married.
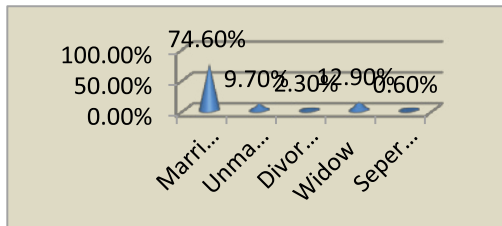
With regard to the number of children dependent on the convicted women prisoner, it is observed in this graph that 50.8 per cent of the women had less than 2 dependent children, whereas 27.1 per cent of the respondents reported of having 3 to 4 dependent children and only 2.2 per cent of them reported having 5 to 6 children dependent upon them. This reveals that a significant proportion of the convicted women prisoners have children who are dependent on them.
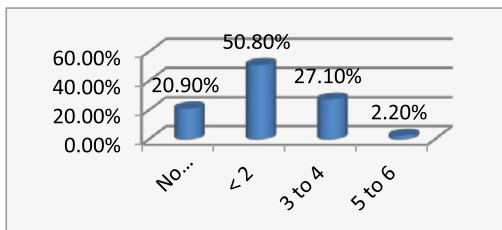
Since data reveals that significant proportion of convicted women prisoners have their dependent children, it is important to know the living status of the children. The study unveils the fact that only 8.5 per cent of the dependent children lived with them in the prison, whereas 23.7 per cent of the children lived independent life and 32.9 per cent of them lived with their relatives or friends. Data reveals that a significant number of children who were dependent on the convicted women prisoner led a stranded life with unsupervised or less supervised living environment. This increases the risk

of these children to show deviant behavior in their future.
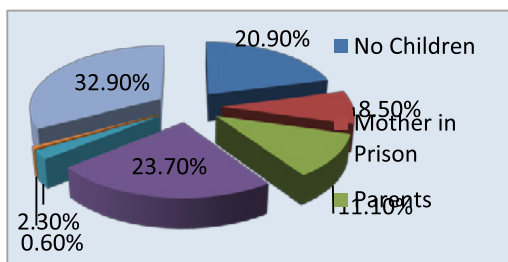
Nativity of the convicted women prisoner is observed in this graph. It is seen that 43.1 per cent of the respondents were from urban nativity, whereas 40.3 per cent of the respondents were from rural and the remaining 16.6 per cent of the respondents were from semi urban. This reveals that considerable number of convicted women prisoners were either from urban or rural origin.
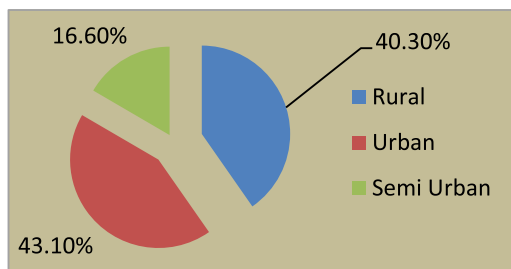
Occupation of the convicted women prisoner prior to their arrival in prison is observed in this graph. It can be seen that 42 per cent of the women were home makers, while 23.4 per cent of them were engaged in salaried jobs, 21.4 per cent of them were daily wage labourers and the remaining 13.4 per cent of them were agricultural laborers. This shows that all the convicted women prisoners were engaged into some occupational engagements or engaged as home makers prior to their conviction.

Monthly income of the respondent is seen in this graph. It is observed that only 4 per cent of the convicted women prisoners earned a monthly income above Rs.10001 and all the other women earned a monthly income less than Rs.10, 000 and that 33.7 per cent of them earned less than Rs.2000, while 29.7 per cent of them earned a monthly income of Rs.4001 – 6000 and 25.1 per cent of them reported of earning a monthly income of Rs.2001 – 4000 before their conviction. This reveals that a significant proportion of the convicted women prisoners earned lesser monthly income prior to their conviction.
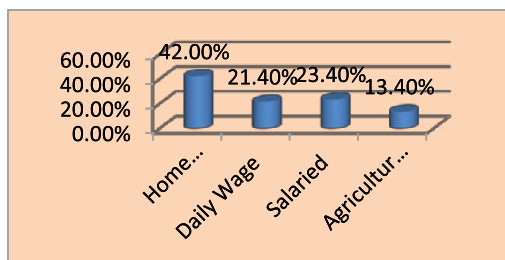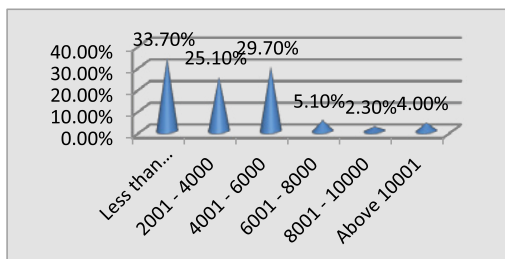

Number of years convicted women spent in prison is observed in this graph. It can be seen that 27.1 per cent of them had been in the prison for 3 to 4 years, while 26.3 per cent of them had been in the prison for 4 to 6 years, 18 per cent of them lived in the prison for 7 to 9 years, 9.7 per cent lived in prison for 10 to 12 years. This reveals that significant number of convicted women prisoners were living in prison for more than

one year.
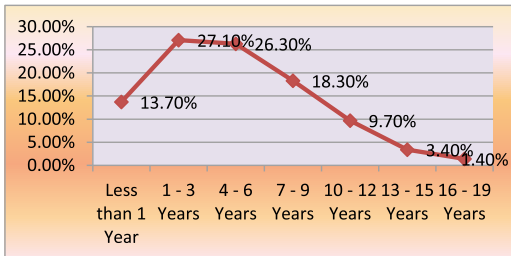
Medication used by the respondents to sleep is seen in this graph. It can be seen that 70 per cent of the convicted women prisoners reported of using medication to forcibly put them in to sleep at night, whereas the remaining 30 per cent of the women reported of not using medication for sleep. This shows that regular sleep is affected in the convicted women prisoners and they need to use medication to get sleep.

Depression commonly affects the convicted women prisoners. The level of depression experienced by these women is measured and given in this graph. It is observed that 56.6 per cent of the women had extremely severe depression and 21.4 per cent of the respondents had depression at a severe level. This reveals that a significant proportion of the convicted women prisoners suffered from depression at severe to extremely severe levels.

Family members make visit to the prison to express their love for their loved ones in the prison. This visit to the convicted women prisoner is a great source of improvement on their mental health. Period of visit is seen in this graph. Data reveals that 56 per cent of the convicted women prisoners reported that their family members visited them once in a month and 26.3 per cent of the women reported that their family members visited them once in every two months.

In this graph the level of anxiety experienced by the convicted women prisoners is shown. It is disclosed from the graph that 76 per cent of the convicted women prisoners experienced extremely severe anxiety. This shows that a significant proportion of convicted women prisoners experienced extremely severe anxiety.
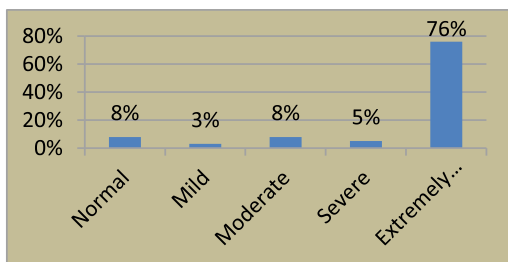
Stress experienced by the convicted women prisoners is shown in this graph. It is seen that 37.7 per cent of the women experience extremely severe stress, while 23.7 per cent of them experience severe form of stress and 19.7 per cent of them experience moderate form of stress. This reveals that a considerable proportion of the convicted women prisoners experience stress.
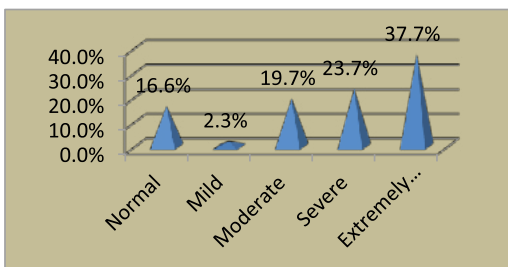
Suicidal ideation is commonly seen among the convicted women prisoners. It is observed from this graph that 29.3 per cent of the women had no suicidal ideation whereas the remaining experienced suicidal ideation ranging from one time to five or more times. This reveals that a significant number of convicted women prisoners experience suicidal ideation for one to five or more times.
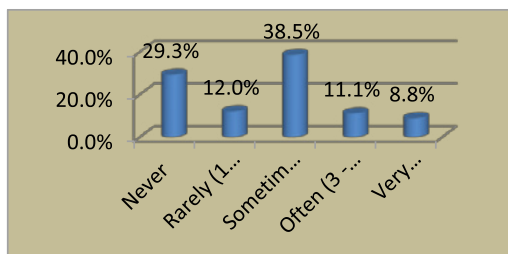
Experiences of insomnia by the convicted women prisoners is reported in this graph. Data reveals that 26 per cent of the women had no clinically significant insomnia, whereas all the other women had experienced insomnia at varying levels. Among the women experiencing insomnia, 45.6 per cent of the women had sub-threshold insomnia while 20 per cent of them had clinically diagnosed insomnia at moderately severe level and 9 per cent of them had clinically diagnosed insomnia at severe level.
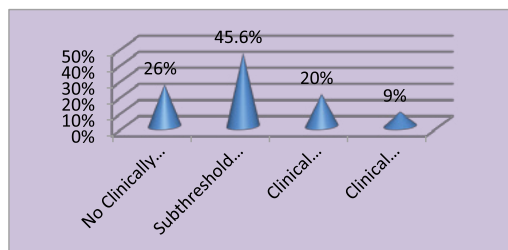
Post traumatic stress disorder is also commonly seen among the convicted women prisoners. Data reveals that 49 per cent of the women suffered from severe form of post traumatic stress disorder, whereas 38 per cent of the women had moderate level of post traumatic stress disorder and only 13 per cent of the women had mild level of post traumatic stress disorder.
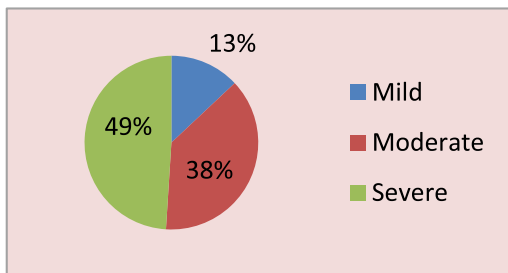
Findings

In the light of the present research following findings are obtained.

1. It is obvious that as the age of the inmates increases crime decreases. 57% of women convicts in prisons belonged to their productive age in life.

2. A significant proportion of the convicted women prisoners were illiterate or had primary level of education. As the level of education increases, the number of people committing crime decreases.

3. 74.6% of the convicted women prisoners were married. It is also observed that 79% of the convicted women had dependent children either of their own or adopted or their nieces or nephews under their care due to family situation. The study unveils the fact that 23.7% of these children lived on their own, unsupervised and without any other guardian or adult care. 89% of them were with the convicted mothers in prison. Data also reveals that a significant number of children who were dependent on the mothers led a standard life with unsupervised or less supervised living environment, increasing the risk of those children to probably exhibit delinquent, deviant behaviour.

4. As the monthly income increased, the investment of women in crime decreased. Only 4% of the convicted women were earning 1.2 lakes per annum. The remaining were earning less than1.2 lakhs per annum. This reveals that more the financial needs of the women, there are more chances of women getting into crime.

5. A very significant finding is that 70% of the convicted women prisons reported of using medicine to sleep at night. It is not necessarily sleep medicine but psychologically they trained themselves to take some medicine to put them to sleep, including Paracetamol.

6. Regarding the family visiting the convicted women in prison, it is found out that 85% of the convicted women were visited by their families in prisons. This includes their lawyers, NGOS and others eligible to visit them. Around 15% of them expressed that their families rejected them, which included their children, sponsors, parents, siblings and their in-laws, if married.

7. Data reveals that across the prisons in India, 56.6% of the convicted women's experienced depression and 21.4% had a score of severe depression which reveals that 78% of the convicted women were extremely depressed in prisons. 76% of the convicted women prisoners have 2-3 clinically significant symptoms of anxiety. All these mental health problems need either medical

or psychological interventions or both.

8. Regarding suicidal ideation, 70% of the convicted women prisoners experienced suicidal ideation one to five or more times. It is also observed that less than 8% have attempted to commit suicide and the remaining always wanted to live to care for their children.

9. Only 26% of the convicted women prisoners have reported to not to have clinical depression or any kind of insomnia. Whereas the rest of 74% have some form of insomnia except sleep walking. When the reason for such condition was qualitatively analyzed, it was unanimously found that the women were worried about their children, aged parents, some had flash backs about the crime they had committed.

10. 81% of the convicted women prisoners had experienced either severe form of post traumatic stress disorder or moderate level PTSD. It may be due to remembrance of the crime committed, avoidance, arousal and re-experiences of the act committed.

Suggestion and Conclusion

Overall the study reveals that the convicted women prisoners were identified to have mild, moderate or severe form of mental health issues like Anxiety, depression, Insomnia, Stress, and Post-traumatic Stress Disorder. Unanimously throughout India, female in prisons have similar problems and are deeply concerned and worried about

their family which is the major causative factor for their mental health problem. Women's needs are different, therefore gender sensitive approach needs to be drafted in consonance with the international guidance documents with special reference to the Bangkok Rules. A significantly larger outcome of this study revealed that the consequences of imprisonment of mothers leaves a ripple effect on the family, especially the children, which spontaneously increases the risk of the possibility of future incarceration of such children (Women & Imprisonment, 2014)

References

1. Bastick M. (2005). Women in Prison: a commentary on the Standard Minimum Rules for the Treatment of Prisoners. Quaker United Nations Office, Geneva,

2. Birmingham L. (2004). Mental Disorder and Prisons. *Psychiatric Bulletin*, 28, 393-397.

3. Bolton N., Smith F., Heskin K. and Banister P. (1976). Psychological correlates of long-term imprisonment: IV. A Longitudinal Analysis. *The British Journal of Criminology*, 16(1), 38-47. Retrieved from http://www.jstor.org/stable/23636251

4. Clements C. B. (1979) 'Crowded Prisons: A Review of Psychological and Environmental Effects'. *Law and Human Behaviour,* 3 (3): 217-225.

5. Fazel S. and Benning R. (2009). Suicides in female prisoners in England and Wales, 1978-2004. *The British journal of psychiatry: the journal*

of mental science, 194. 183-4. 10.1192/ bjp.bp.107.046490.

6. Flanagan E.H., Keeley J.W. and Blashfield R.K. (2008). An alternative hierarchical organization of the mental disorders of DSM-IV. *J. Abnorm. Psychol*, 117:693–98

7. Gunter T.D. (2004). Incarcerated women and depression: A primer for the primary care provider. *J Am Med Womens Assoc*, 59(2):107-112.

8. Hurley W. & Dunne M.P. (1991) Psychological Distress and Psychiatric Morbidity in Women Prisoners. *Australian and New Zealand Journal of Psychiatry*, 25,461–470.

9. James D. J. and Glaze E. (2006). *Mental health problems of prison and jail inmates*.

10. Khan G.S., Hussain H., Khan A., Badshah A., Sarwar N. and Khan T.M. (2012) Incidence of substance abuse among inmate at Peshawar Prison, Pakistan. *Health Med J*, 3(4).

11. Lafortune D. (2010). Prevalence and screening of mental disorders in short-term correctional facilities. *International Journal of Law and Psychiatry*, 33(2), 94-100.

12. Lamb H.R. and Weinberger L.E. (1998) Persons with severe mental illness in jails and prisons: a review. *Psychiatr Serv*. Apr, 49(4):483-92.

13. Maniyar M. (2004), Women Criminals and their Life Style, Kaveri, New Delhi.

14. Prison Statistics India (2020), National Crime Records Bureau, Ministry of Home Affairs, Government of India.

15. Rickford D. (2003). Troubled Inside: Responding to the mental health needs of women in prison (Prison Reform Trust, 2003).

16. Singh G. and Verma H.C. (1971). Depressive equivalents -pain as a symptom of depression. *Indian J Psychiatry*, 13:49-55.

17. United Nations Office on Drugs and Crime. (2011). Global study on homicide: trends, context, data.

18. United Nations Office on Drugs and Crime (2014). Handbook on Women and Imprisonment: Criminal Justice Handbook Series. New York.

STOP-Road Traffic Crashes

Pawan Srivastava, IPS*

There has been a phenomenal increase in the road network in India over the decades so much so that the road network in the country is the second largest[1] in the world, only after the United States. The Indian roads are very busy, transporting 64.5% of freight and 90% of passengers[2]. The global status report on road safety 2018[3] observes that road traffic injuries are the leading reason for deaths of children and young adults, and that more than half of global road traffic deaths are amongst vulnerable road users namely pedestrians, cyclists and two wheeler drivers. The report also observes that Road Traffic Accidents (RTAs) are the 8th major cause of deaths for people of all ages and the fatalities are 3 times higher in low and middle income countries.

SOURCE: WWW.CEICDATA.COM | Ministry of Road Transport and
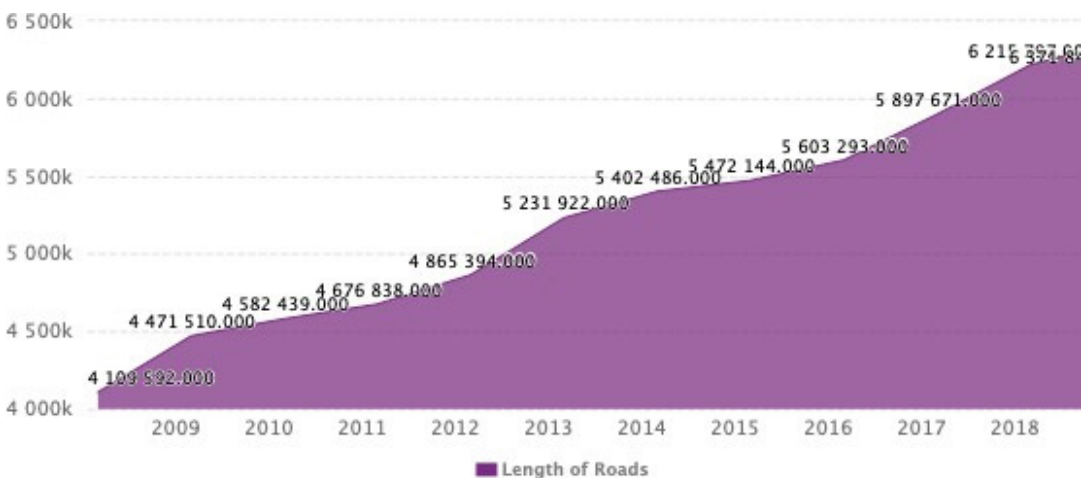
A World Bank report[4] titled - Traffic Crash Injuries and Disabilities: The Burden in Indian Society - observes "As the world navigates through the COVID-19 pandemic, the road crash pandemic continues to fester the socio-economic landscape in

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1 https://www.cia.gov/the-world-factbook/field/roadways/country-comparison
2 https://www.ibef.org/industry/roads-india
3 https://www.who.int/publications/i/item/9789241565684, https://apps.who.int/iris/rest/bitstreams/1164010/retrieve
4 https://documents.worldbank.org/en/publication/documents-reports/documentdetail/ 761181612392067411/main-report

India. India tops the world in road crash deaths and injuries. It has 1% of the world's vehicles but accounts for 11% of all road crash deaths, witnessing 53 road crashes every hour; killing 1 person every 4 minutes." This is an unfortunate situation. As the chart below depicts, China, India, Brazil, United States, Indonesia and Nigeria are the primary contributors towards road fatalities. The average of World Bank Lower Middle in come group contribution is over 450000 fatalities which is roughly one third of the average global fatalities of about 1.2 million deaths annually. The United Nations has fixed the Sustainable Development Goal Target 3.6 as halving the total global road deaths by 2030 to about 65000 deaths.

Road traffic deaths, 1990 to 2019

Total number of deaths from road traffic incidents, including vehicle drivers or passengers, motorcyclists, cyclists and pedestrians. SDG Target 3.6 is to halve the global number of deaths from road incidents
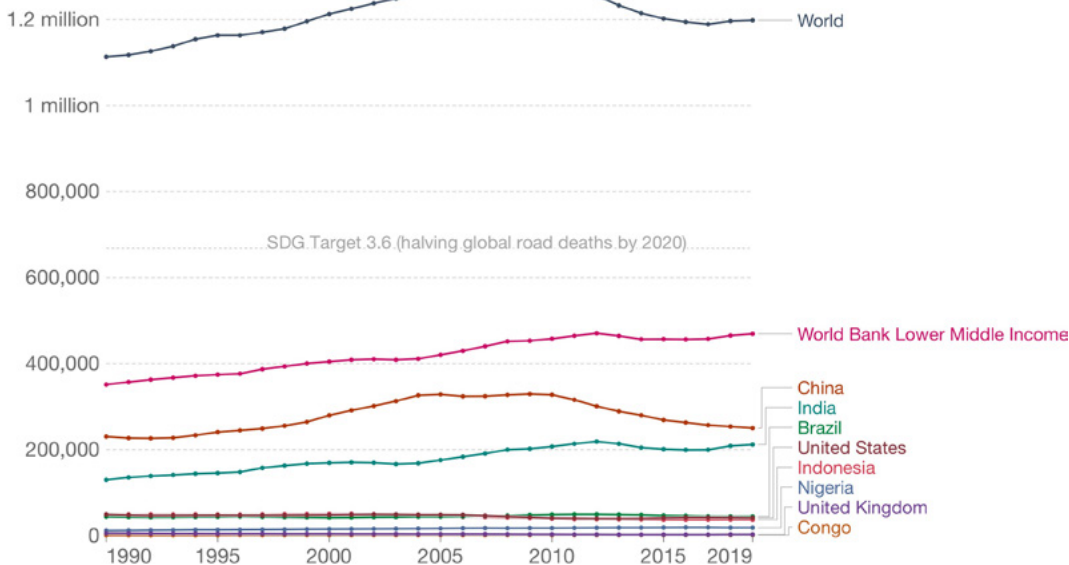
Source: IHME, Global Burden of Disease (2019)   CC BY

Road Traffic Crash (RTC) is the major cause of death for Children between the age of 5 and 14 followed by Cancers and Diarrheal diseases. The earlier decades had seen Malaria and Diarrheal diseases as the primary cause of death in the same age bracket. While earlier the cause of death were natural now the leading cause of death is Human and hence preventable.

Causes of deaths for children between 5 and 14, World, 2019

Annual number of deaths – by cause – for children between 5 and 14 years old.

Our World in Data

Cause	Deaths
Road accidents	55,268
Cancers	54,877
Diarrheal diseases	52,552
Lower respiratory infections	42,387
Malaria	39,550
Drowning	36,657
HIV/AIDS	27,492
Digestive diseases	19,844
Cardiovascular disease	17,949
Tuberculosis	15,444
Homicide	11,890
Liver disease	9,324
Nutritional deficiencies	8,611
Suicide	8,327
Kidney disease	8,118
Protein-energy malnutrition	6,948
Hepatitis	6,640
Respiratory disease	5,897
Fire	5,844
Diabetes mellitus	2,683
Natural disasters	977
Heat-related deaths (hot or cold exposure)	783

Source: IHME, Global Burden of Disease (2019)

OurWorldInData.org/causes-of-death • CC BY

There have been numerous studies on road safety. World Health Organisation lists[5] 10 major facts about road safety as

1. Pedestrians, cyclists, and riders of motorized 2 and 3-wheelers and their passengers are collectively known as "vulnerable road users" and account for half of all road traffic deaths around the world. A higher proportion of vulnerable road users die in low-income countries than in high-income countries.

2. Controlling speed reduces road traffic injuries- As average speed increases, so too does the risk of having a road traffic crash and the severity of the consequences should a crash occur. For every 1% increase in mean speed, there is a 4% increase in risk of a fatal crash. A pedestrian hit by a car at 65km/h faces more than 4 times the risk of death than if the car were driving at 50km/h.

3. Drinking alcohol and driving increases the risk of a crash- Drinking and driving increases the risk of a crash dramatically when the driver has a blood-alcohol concentration (BAC) of above 0.05 g/dl. WHO recommends a BAC limit of ≤ 0.05 g/dl for the general driving population, and ≤ 0.02 g/dl for young and novice drivers. Only 45 countries have national drink–driving laws that meet best practice.

4. Wearing a good quality helmet can reduce the risk of death from a road traffic crash. Wearing a good quality

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5   https://www.who.int/news-room/facts-in-pictures/detail/road-safety

helmet can reduce the risk of death by 42% and severe injury by approximately 70%. Only 44 countries, representing 17% of the world's population, have motorcycle helmet laws that meet best practice: this means making sure the law applies to drivers and passengers, all roads and engine types, requires the helmet to be fastened and to meet a specified standard.

5. Wearing a seat-belt reduces the risk of death among front-seat and rear-seat passengers. Wearing a seat-belt reduces the risk of injuries and deaths among front seat occupants by 45-50% and rear-seat car occupants by 25–75%. 105 countries, representing 71% of the world's population, have seat-belt laws that cover both front and rear seat occupants, in line with best practice.

6. Mobile phones are a risky distraction. Telephone use while driving (whether hand-held or hands-free) increases the risk of a crash by 4 times, while texting increases the risk by around 23 times. Driver reaction times are 50% slower while using a telephone than without.

7. Child restraints considerably reduce the risk of serious injury and death. Placing children in child restraints reduces the risk of death by at least 60%, particularly for children aged less than 4 years. For children aged 8-12 years, booster seats can reduce the risk of injury by 19% compared to using a seatbelt alone. Best practice laws restrict children sitting in the front seat and require appropriate restraints for age/height/weight.

8. Rapid response saves lives and reduces disability among the injured. Lives can be saved with timely care at the scene, prompt transport to hospital for emergency and surgical care, and early access to rehabilitation services.

Bystanders can help to save lives by activating the emergency care system and performing simple first-responder actions until professional help arrives.

9. Vehicles sold in 80% of all countries worldwide fail to meet basic safety standards. The safety of vehicles plays a critical role both in averting crashes and reducing the likelihood of serious injury in the event of a crash. The United Nations World Forum for Harmonization of Vehicle Regulations recommends 7 vehicle safety standards including electronic stability control, front- and side- impact protection and pedestrian front protection. Only 40 mainly high-income countries have adopted all 7 or 8 regulations.

10. Unsafe road design increases the risk for all road users. Roads should be designed for the safety of all road users. This means ensuring adequate facilities for pedestrians, cyclists and motorcyclists. Measures such as footpaths, cycling lanes, safe crossing points and traffic calming measures are critical to reducing the risk of injury among these road users.

The Ministry of Road Transport and Highways (MoRTH) publishes a yearly document called Road Accidents in India. Based on the police data collected through

various formats by the ministry, the latest version of the document[6] records that in the year 2020, over speeding was the major cause of RTC contributing to 72.5% accidents and 69.3% fatalities. The next major cause of RTC was driving on wrong side/lane indiscipline resulting in 5.5% RTC and 5.6% fatalities. Drunken driving and use of mobile phones contributed to 2.3% and 1.8% of RTC. Clearly, over speeding is a major cause of concern for RTC.

One of the primary reasons for this abnormal high rate of accidents and corresponding injuries and fatalities is due to the fact that traffic and transport is a multi-disciplinary part of governance, where no government department is either accountable or responsible. As custodian of order on the streets that is working 24x7, police remains the fall guy. In a study on Jawaharlal Nehru National Urban Renewal Mission, IL&FS Eco smart Limited reviewed[7] Road Network and Transport System and found out that in Delhi the main agencies involved in managing the transport sector are -

- State Transport Authority --- registration of vehicles, routing of public transport services

- P.W.D., M.C.D. --- Construction and maintenance of roads,

- D.T.C. – operating public bus transport system,

- D.D.A. --- Construction of roads in newly planned areas

- N.H.A.I. --- Construction and maintenance of National Highways

- D.M.R.C. is responsible for Metro Rail

There are other smaller organisations such as JJ and Slum department, Police, Delhi Vidyut board, MTNL, Delhi Jal Board, Gas Authority of India Ltd., Irrigation and Flood Control Department, Indian Railways, State Transport Authority, Delhi Transport Corporation, Inland Waterways Authority of India, Delhi Multimodal Integrated Transport System Ltd., Ministry of Urban Development, GNCTD Transport Authority, etc. involved

in various activities on and along the roads like- Construction & Maintenance of roads, flyovers/ROB/RUB, Pedestrian subways etc. Protection of Right of Way from encroachment, Shifting & Rehabilitation of services and structures from footpaths

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6   https://morth.nic.in/sites/default/files/RA_2020.pdf

7   https://ccs.in/sites/default/files/files/ Ch11_Review%20of%20Road%20Network%20and%20Transport%20System.pdf

and roads, Detailed Planning for Road & Infrastructure Dept., Regulation and control of mass transport system, Control of ribbon development, etc. The situation is same in all urban and rural areas all over the country. Multiplicity of agencies results in numerous activities being performed on road. The PWD may build a road one day but the other day some other agency like the MTNL may again dig the road to address a faulty cable.

Yet, speaking about Roads and its immediate environment, it can be safely assumed that the custodian of the road is the road builder, whether it is NHAI for National Highways, PWD or State Road Development Corporations for State Highways, Rural Road Development Corporations or PMGSY officials for rural roads or the respective municipal corporations or municipalities or other local self Government authorities who

Road deaths over the long-term, 1900 to 2016

Annual number of reported deaths resultant from any type of road accident. This includes vehicles, pedestrians and cyclists.

Our World in Data

India

140,000

120,000

100,000

80,000

60,000

40,000 — United States

20,000

France
Germany
United Kingdom
Switzerland

0

1900   1920   1940   1960   1980   2000   2016
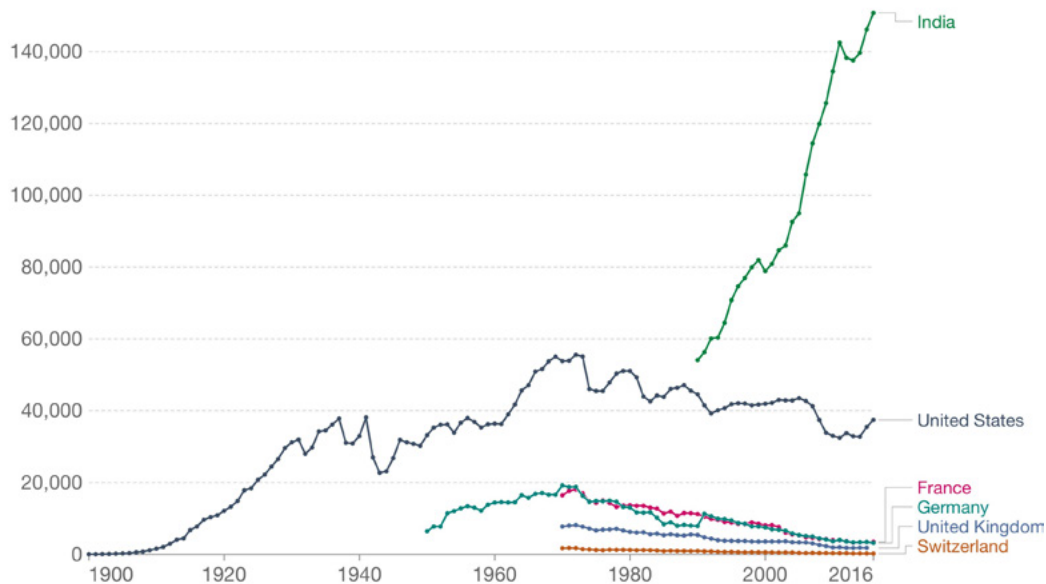
Source: OECD & National Statistic Divisions

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remain responsible for the creation and upkeep of roads. What is surprising is that there is a tremendous disconnect between these bodies and road engineers with scant respect towards road safety. The road infrastructure in the country is not only unsafe but utterly slow due to congestion especially in the city. They are also the major culprits for pollution.

The Indian Road Congress as the apex body of Highway Engineers in the country is a registered society. Set up in 1934 it has a clear mission to advice regarding planning and design, transportation, legislation and research connected with development and maintenance of roads and road transportation in the country. Consequently, the congress regularly creates and updates

manuals and documents to fulfill this goal. Some of the major publications are Manual of Specifications and Standards for four laning of Highways- IRC:SP:84-2019, Manual For Planning and Development of Urban Roads and Streets- IRC:SP:118-2018, Manual on universal accessibility for urban roads and streets - IRC:SP:117-2018, Guidelines for Traffic Calming measures in urban and rural areas- IRC:99-2018, GEOMETRIC DESIGN STANDARDS FOR URBAN ROADS AND STREETS- IRC:86-2018, RECOMMENDED PRACTICE FOR ROAD DELINEATORS- IRC:79-2019,

MANUAL ON ROAD SAFETY AUDIT- IRC: SP: 88-2019, just to name a few.

This apex body has already looked into almost all aspects of road engineering and has already come out with solutions that need to be adhered to by the road designers and urban planners. However, the recommendations and manuals are almost never adhered to resulting in abnormally high accidents and fatalities on Indian roads.

THE MOTOR VEHICLES (AMENDMENT) ACT, 2019 (NO. 32 OF 2019)

received the assent of the President on the 9th August, 2019, in which a major aspect insofar as unsafe road environment is concerned is addressed to as- After section 198 of the principal act, the following section shall be inserted, namely:—

198A. (1) Any designated authority, contractor, consultant or concessionaire responsible for the design or construction or maintenance of the safety standards of the road shall follow such design, construction and maintenance standards, as may be prescribed by the Central Government from time to time.

(2) Where failure on the part of the designated authority, contractor, consultant or concessionaire responsible under sub-section (1) to comply with standards for road design, construction and maintenance, results in death or disability, such authority or contractor or concessionaire shall be punishable with a fine which may extend to one lakh rupees and the same shall be paid to the Fund constituted under section 164B.

(3) For the purposes of sub-section (2), the court shall in particular have regard to the following matters, namely:—

(a) the characteristics of the road, and the nature and type of traffic which was reasonably expected to use it as per the design of road;

(b) the standard of maintenance norms applicable for a road of that character and use by such traffic;

(c) the state of repair in which road users would have expected to find the road;

(d) whether the designated authority responsible for the maintenance of the road knew, or could reasonably have been expected to know, that the condition of the part of the road to which the action relates was likely to cause danger to the road users;

(e) whether the designated authority responsible for the maintenance of the road could not reasonably have been expected to repair that part of the road

before the cause of action arose;

(f)   whether adequate warning notices through road signs, of its condition had been displayed; and

(g)   such other matters as may be prescribed by the Central Government.

Explanation.—for the purposes of this section, the term "contractor" shall include sub-contractors and all such persons who are responsible for any stage in the design, construction and maintenance of a stretch of road.'

This amendment gives a major fillip to the law enforcement agencies to ensure that the guidelines already provided by the Indian Road Congress are adhered to by the road construction contractors and to bring them to book in case any rule has been flouted by the contractor. This may require certain additional study by the law enforcement agencies but it certainly provides them enough teeth to discipline and ensure abidance of IRC guidelines by the contractors.

Continuing with the argument of adherence to the road safety standards of the road design, construction and maintenance as prescribed by the Central Government (IRC) it is incumbent on the contractor to provide adequate road signage. Inability to provide warning signs by way of road signage and road markings shall attract severe penalty.

Britannica[8] cites that in the modern road, "road managers must be concerned not merely with lines on maps but also with the number, type, speed, and loading of individual vehicles, the safety, comfort, and convenience of the traveling public, and the health and welfare of bystanders and adjoining property owners." During the planning process "The various alignment options are drawn, considering the local terrain and conditions. The economic, social, and environmental benefits and costs of these options are discussed with relevant official and community groups until an acceptable specific route is determined." The other important aspects of road design, alignment and profile, inclusion of pavement and adequate drainage has to be made, financing has to be worked out, and then construction has to start. Once constructed, the road has to be maintained too. So far as road operation is concerned, traffic management, traffic control by way of road markings, road signs and traffic control has to be inbuilt in the design of the road. Traffic police helps only in enforcing driving regulations. "Road safety can also be built into the road. Divided roads are many times safer than two-way roads. Crash severity can be reduced by the use of "soft" signs and light poles and by guardrails and impact attenuators in front of fixed roadside objects such as bridge piers and the noses at the exit ramps of a freeway. Better road surfaces, alignments, signing, and marking improve driving conditions and increase road safety."

Road signs are pictorial or written boards along the roads providing information, directing or prohibiting the road user to certain activities. Similarly road markings are the markings made on the road

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8   https://www.britannica.com/technology/road/The-modern-road

again, providing information directions or prohibitions for the road user. In effect, both road signs and road markings are a guide on the road, communicating with the road users- whether a pedestrian, a cyclist or the truck driver. The importance of these signs can never be underestimated. Road signs and markings provide consistent rules for all drivers. They are easy to understand as most of the time they are extremely simple and mostly pictorial. Road signs and markings provide road users adequate warnings about not so obvious things like a winding road or school ahead. They keep the road users - both the drivers and pedestrians and cyclists safe. These signs help manage traffic flow. Prior to the Google maps and navigation era, these markings and signs were the indicators and helpers to find your destinations. In fact the road signs and markings are the simple way in which the road and the team behind the construction,

maintenance and enforcement on the road communicate with the road user.

In a study 'The impact of traffic sign deficit on road traffic accidents in Nigeria' published in the International Journal of Injury Control and Safety Promotion Volume 26, 2019 - Issue 1[9] it was found that "that the failure of government to provide and maintain traffic signs in order to guide road users through the numerous accident black spots on the highways is the major cause of road accidents in Nigeria. The study argues that provision and maintenance of traffic signs present opportunity to promoting safety on the highways and achieving the sustainable development goals."

A similar study titled 'Influencing driver behaviour through road markings'[10] has explained "how road marking can be used to influence driver behaviour in order to improve road safety and traffic flows, citing

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9   https://www.tandfonline.com/doi/full/10.1080/17457300.2018.1456470? scroll=top&needAccess=true
10   https://researchcommons.waikato.ac.nz/bitstream/handle/10289/3437/influencing%20driver%20behaviour.pdf?sequence=
     1&isAllowed=y

examples on overtaking lane design, speed change management, managing speed around curves and improving the safety of high risk sections of roads. The research included both on-road and driving simulator-based measurements." The researcher argues in favour of self-explaining road as the means to avert RTC due to speeding.

In yet another study 'Effect of Road Markings and Traffic Signs Presence on Young Driver Stress Level, Eye Movement and Behaviour in Night-Time Conditions: A Driving Simulator Study'[11] which investigated how the presence of traffic signaling elements (road markings and traffic signs) affects the behaviour of young drivers in night-time conditions. "The study provides a clear confirmation of the importance of traffic signaling for the behaviour of young drivers in night-time conditions, and thus for the overall traffic safety. Road markings and traffic signs provided the drivers with timely and relevant information related to the upcoming situation, thus enabling them to adjust their driving accordingly."

The importance of road signage and markings cannot be underscored more significantly. However, in the Indian context, despite these studies and the IRC guidelines, road engineers undermine the usage of road signs and markings. Even if used, they are sparse and generally confined only towards distance indication. At times even these indications are abjectly silly and wrong as indicated in the pictures.

What is required is a communication between the road and the road user by way of correct signage. What is unfortunate is that no one who is responsible towards road safety- the builder and custodian of the road is involved in implementation of road signage to communicate with the road user. We may find randomly the speed restriction sign boards but hardly find a board indicating that the speed restrictions are over. Similarly we may find silence or school ahead signage but never ever the closure or finish of the mandatory/cautionary restrictions. The result is a confused driver

11   https://www.mdpi.com/2313-576X/6/2/24/html

who is just wading through the jungle of traffic.

The Government of India has embarked on an ambitious project of development of road infrastructure in the country. It is a clarion call to all road designers, engineers, contractors to adhere to the IRC guidelines and use road signage and markings to the hilt so as to make Indian roads safe and achieve the United Nations Sustainable goal 3.6 and also to comply with the Supreme Court guidelines. Otherwise, it shall not take the Law Enforcement agencies to comply with the MV Act (as amended) and hold these agencies responsible for every RTC occurring in their area of responsibility.

Job Stress of Central Armed Police Force Personnel during Pandemic Covid-19: A Study of Delhi-NCR

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ABSTRACT

Central Armed Police Forces play a crucial role in internal security as well as external security of the country. Due to diversity in caste, religions, etc. in India, Central Armed Police Forces and Police have to play multifarious roles. Due to extreme climatic conditions and 24X7 job requirements, deployment in far furlong areas, away from family and home during Covid-19, these force personnel have to face a lot of physical and emotional challenges due to which their stress level increase manifold.. These forces applied various techniques and practices to minimize the stress level of their force personnel. The aim of this paper is to explore the job stress due to Covid-19 in Central Armed Police Forces personnel in Delhi-NCR. The data was gathered from 26 officers of Central Armed Police Forces personnel deployed in Delhi-NCR, using an online platform in which participants responses were gathered using an interview schedule of open-ended questions. The findings suggest that long hours and strenuous duties, leave issues and threats due to Covid-19 were the various factors that were increasing the job stress level of these force personnel. Various techniques and remedies were being adopted by Central Armed Police Forces to minimize the stress level of their personnel. Future research is required to find out other techniques/ practices which will help to minimize the stress level of force personnel. These will certainly boost the morale and motivation of these force personnel and help them to perform their best for the security of the nation.

Keywords: *Job stress, Central Armed Police Forces, Stressor, Remedies for Covid-19.*

Introduction

The Covid-19 pandemic created new challenges, not only for civilians but also for the security forces. Covid-19 pandemic started from late December 2019 and continued till mid 2021 Till date, no

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substantial medicine has come up for the treatment of Covid-19 and still the whole world is struggling with it in various ways. Central Armed Police Forces are trained for various duties i.e. internal security, terrorism, naxalism, election duties, riot control and natural and man-made disasters during their training period. But this pandemic created a big challenge in front of them as this type of emergency duty was not part of their regular job profile. During the pandemic, the life of these force personnel was to being stuck in the campuses as movement was restricted. Only those personnel were allowed to move from campuses that were deployed for maintaining law and order duties. Covid-19 was life threatening and made life very tough. Lockdowns and quarantine rules have led to less conversations or communication, daily sensitization of weapons and equipment, vehicles and duty places, away from home for duty/ deployment which ultimately made the life of Central Armed Police Forces personnel more complicated. To boost up the morale of the force members, recreational activities with guidelines of Covid-19 were arranged at regular intervals. Yoga, meditation sessions, follow up with doctors, proper medication, interactions etc. were done to boost up morale and motivations of these personnel.

Front-line workers, particularly Police officers, perceived health risk, work stress, and psychological discomfort, according to a study done during the Covid-19 outbreak in China. It also suggests that old age, long working hours and a chronic illness contributes in Police officers psychological distress. By in-depth understanding of the Police officers concerns during the pandemic outbreak, the managers/leaders may develop management strategies/ practices to enhance/improve individual psychological wellbeing. This study opens up many new avenues for researchers for future study to manage front-line personnel during a pandemic.

The COVID-19 pandemic has had a significant influence on the general public's mental health, increasing feelings of isolation and fear, as well as symptoms of anxiety, despair, and stress As already known, mental health problems are more frequent among law enforcement personnel The study conducted in Peru reveals that high demand of work to keep the public safe, risk of COVID-19 infection, and scarce resources are factors that also have consequences on the psychological wellbeing of individuals working in the law enforcement field. Fear of infection, fear of infecting relatives, and concern that family members would become ill are all reported in studies focused on pandemic consequences.

Central Armed Police Forces

Central Armed Police Forces (CAPFs) is a common nomenclature for seven Central Armed Police Forces of the India. These forces work under the Ministry of Home Affairs. The main role of these forces is to defend the national/internal security. These forces include Central Reserve Police Force (CRPF), Assam Rifles (AR), Border Security Force (BSF), Indo-Tibetan Border Police (ITBP), Central Industrial Security Force (CISF), Sashastra Seema Bal (SSB) and the National Security Guard (NSG).

BSF, ITBP, SSB are assigned with the primary role of border guarding. AR conduct counter insurgency operations in the north-east. CISF deals with Security of vital and sensitive establishments. CRPF assists Police in tackling law & order, counter-terrorist, counter insurgency and counter naxal operations. NSG deals with anti-terrorist activities in all its manifestation and used only in exceptional circumstances to thwart serious acts of terrorism. In addition to their basic duties, all CAPFs assist the Army in counter-terrorism operations as well as the Police in maintaining law and order. The BSF and CRPF have in the past supported the army during external aggression. CAPFs perform several responsibilities that have been allocated to them along with Army and Police.

Personnel from Central Armed Police Forces also serve in various important organizations on deputation and attachment and undergo trainings which include National Disaster Response Force (NDRF), Research and Analysis Wing (RAW), National Investigation Agency (NIA), Special Protection Group (SPG), Central Bureau of Investigation (CBI), Narcotics Control Bureau (NCB) Intelligence Bureau (IB), State Police and State Armed Police Force.

Due to their significant role, dedication and performance in serving the country, these forces are always in demand to aid the civil power/Police to perform different task in adverse/challenging circumstances.

Job Stress

The most prominent stress factor in Central Armed Police Forces and Police is job stress.

Central Armed Police Forces and Police are perhaps one of the most stress prone occupations in today's world. These forces not only act as a law enforcing agency but also instrumental in social services, social change and the protector of the rights and duties of the people. These force personnel have very diversified role in maintaining law and order and internal security of the Nation. To perform their duties and serve the Nation, they come across various challenges which cause distress amongst them. The job of Police personnel has many challenges and adversities in the form of long duty hours, inadequate facilities, long distance traveling, without proper time and place to rest, and an over burden of work and accountability. Various researches have also shown that the job of force personnel is an extremely stressful one. These stress imbalances result in high rates of mental illness and found to be major cause for high suicide rates, divorce, alcoholism, decreased job satisfaction and performance.

Occupational or job-related stress refers to "a situation wherein job-related factors interact with the worker to change his or her psychological and/or physiological condition in such a manner that the person is forced to deviate from normal functioning." It implies that the impact of stress at work may be multifaceted (psychological or physiological or both). According to research studies on the impact of occupational stress on mental health, stress negatively affects a number of mental health factors, including emotions of self-worth, accomplishment, personal effectiveness, success, and enjoyment in life.

Job stress is an expected part of Central Armed Police Forces and Police personnel but many of them are unaware of the amount of stress they are facing. A lot of studies have been conducted in various parts of the world to better understand the nature of stress among Police personnel. Long working hours, poor living conditions, adverse working environment, irregular eating habits, lack of time for family, need to take tough decisions, sleepless nights, disturbed personal life and the dwindling confidence of public in the Police are some of reasons for stress in Police forces. (Water and Ussery, 2007; Malach- Pines and Kienan, 2007, McCarthy et. al, 2007).

Aside from the aforementioned variables, stress can be caused by organizational issues such as management style, poor communication, a lack of support, insufficient resources, office hieracrchy and work overload (Kop et. al, 1999).

Objectives of The Study

The present study is based on the facts that Covid-19 has increased the stress level manifold in Central Armed Police Force personnel. The study is conducted on the Central Armed Police Force personnel who were dealing with Covid-19 duty/ deployment. The aim of this study is to explore the reason for increase in stress level due to Covid-19 and the solution to deal with them.

Research Methodology

The participants in this study were Central Armed Police Force personnel who were deployed for Covid-19 duties in Delhi-NCR

region. Data was collected from 26 officers of Central Armed Police Forces who were deployed in Delhi-NCR of India. Data was collected using an interview schedule of open-ended questions which was aimed at exploring the physical and psychological problems encountered due to challenges faced during COVID-19 epidemic duties e.g., extra or long hours duties, denial of leave, fear of losing near and dear ones, fear of infection and illness etc. It also covered questions related to coping with challenges which caused stress due to pandemic duties. Questions like what problem is being faced by them during Covid-19, solutions to cope up with Covid-19 etc. were asked from respondents. The data is gathered online and interview schedules were emailed to the respondents. The qualitative approach was applied to analyse the data collected from the interviews.

Findings and Discussion

The purpose of this research was to study job stress of Central Armed Police Force personnel deployed in Delhi-NCR due to Covid-19 and identify the possible solutions to minimize their stress level. The responses from the officers indicated impact of Covid-19 on the life of Central Armed Police force personnel and their families which are described as under. According to the organization's policy, the names and other personal information of respondents were not disclosed.

1. Long hours of Duty/Deployment and hostile working environment

The responses from these force personnel

indicated that there is a big issue of long/ extra hours of duty and hostile working environment. Due to less number of manpower and over commitment of duties many of these force personnel have to work extra hours in difficult environment. They have to perform their duties with more alertness and for long hours which made them stressed and demotivated.

Describing the problems faced by Central Armed Police Forces, 34 years old officer J. explained:

"Deployment is very hectic due to Covid-19 and they are being deployed in tough localities and sometime in narrow streets which increase threat. Due to less strength/ manpower they remain deployed for long hours. Besides this, during duty and deployment they have to sanitize the area of deployment for their safety which increase their work manifold."

Similarly, 39 years old officer A. explained:

"They have to work with more alertness for Covid-19 precautions and for long hours. Leisure time is decreased due to extra duty and there is always threat of Covid-19 during duty/deployment."

It should be understood however, that Central Armed Police Forces operate according to certain rules and norms. Besides these, they also have to follow Covid-19 protocols. In an exploratory study conducted in China in 2021, it was revealed that Police officers who worked longer shifts/time reported having a higher health risk perception, work stress, and psychological distress. In a study conducted by Singh S, et al. it was observed that various stressors contribute

to the stress experienced by the Police personnel at the workplace. These include the nature of job in relation to work overload, environmental stressors, traveling away from organizations, organizational structure, role conflict, interpersonal stressors, and private and personal stressors.

2. Leave related problems/issues

Force personnel who were not able to proceed on leave and those who were already on leave couldn't report back on duty, both get stressed due to above reasons. Besides this, those who were on leave get stressed as to how their leave will be regularized or whether allowances will be deducted. Due to lockdown transportation facilities were not available. A large number of force personnel got stuck in their home/in transit which created a lot of stress to report back on duty.

A 40 years old Officer K. mentioned:

"Force personnel were unable to meet their family members for or more than 5 to 6 month which creates panic in force personnel as well as in their families".

34 years old officer M. explained:

'Less availability of leaves hence getting less time/days to remain with family at home, which increased mental stress to high level."

42 years old officer D. mentioned

"Members of some Central Armed Police force personnel were infected by Covid-19 but they could not proceed on leave due to administrative and other reasons and felt much stressed."

Similarly, 34 years old officer B. explained

"Due to lock down and unavailability of transport many personnel had to travel a long distance to reach their home and many had to take illegal modes of transportation or means or pay huge amount to reach their home."

The stress level was increasing as the transportation facilities were not started or started with lot of restrictions. Besides this lockdown period was extended due to increased cases of Covid-19.

3. Hostile / Fearful Workplace Environment

The other issue is unknown fear of getting diseased by individual himself and also by their family members or death of some family member. As Covid-19 was spreading very fast, there was environment of fear that they might get infected or lose their near and dear ones. The concerns about carrying the infection to the family members was also a source of stress. The Central Armed Police Forces that are playing vital role for Containment of Covid-19 are more prone to be infected during performance of their duties.

34 years old officer C. explained:

"After return from deployment they cannot meet with their families due to safety precautions and have to live in isolation."

Similarly, 29 years old officer L. explained:

"Troops panicked during deployment because this disease Covid-19 was very new and no one had any idea about the recovery from this disease. As the death cases due to

Covid-19 were increasing every day, the big cause of concern was low medical category personnel (personnel with health issues) who were more prone to this new virus."

It was observed that lack of awareness and specific knowledge of COVID-19 prevention, inadequate or inappropriate use of protective gear like sanitizers, mask and gloves substantially increase the risk of exposure to COVID-19 among the Police personnel. The concern of getting infected from the community and during deployment in workplace may also be a major potential source of fear among the Police personnel.

4. Scarcity of Food and Other essential items and domestic Issues

Central Armed Police Forces personnel also have to deal with the stress of scarcity of food and other essential items which also increased their efforts to manage the things as initially there was scarcity of these items. Besides this they also have to solve other domestic issues.

31 years old officer F. mentioned:

"Due to lock down and stoppage of all transport means and closing of market force, personnel have lot of stress to manage food and other items for their families."

34 years old officer S. explained:

"After return from deployment they cannot meet with their families due to safety precautions."

39 years old officer N. explained:

"Force personnel could not able to reach at his residence to help their near and dear ones in emergency."

Similarly, 28 years old officer F. explained:

"The families who were living in cities alone and the force personnel are deployed in far flung areas have fear that how his family will be able to manage services and treatment and other essential items."

The other issues which these personnel had to deal were scarcity of food items for themselves and for their family members as initially all the shops were closed. Food items were not easily available which negatively affected them. Besides, when they returned from their duties, they couldn't meet with their family members due to safety reason. They could meet them only after essential quarantine period. In emergency these personnel couldn't help their near and dear ones by reaching at their locations. All these factors also contributed in increasing their stress level.

5. Isolation/Quarantine issues

The other type of stress was which felt during Covid-19 was isolation. Isolation from family members and living isolated during 15 days of quarantine increased the stress level of many force personnel.

34 years old officer R. explained:

"After reporting from leave they are put in mandatory quarantine and have to undergo rapid test that was very challenging. They have to live in isolation without their families and colleagues"

31 years old officer A. explained:

"Force personnel were put on self-quarantine after return back from duty during Covid-19."

39 years old officer G. responded

"Some force personnel who proceeded on leave, they are kept in quarantine at their home town by their village / City members. One big portion of their leaves was wasted in completing mandatory quarantine period."

Another factor contributing to psychological distress may be concerns about infecting family members. In addition, social stigma and the fear of quarantine are additional potential sources of distress. As a result, there may be a higher chance that Police officers would experience a variety of psychological issues, including burnout, emotional issues, psychological distress, sleep issues, anxiety, depression, substance abuse, and post-traumatic stress disorder.

To enhance their capabilities and strength, it is important to encourage Police officers who work away from home or are in quarantine to stay in regular contact with their families via audio/video modalities. Police officers who already have mental health issues may be more prone to developing new symptoms like anxiety or sadness. It should be encouraged to prompt referrals for serious psychological problems to get psychiatric assistance. [14]

6. None/Less Availability of Medical Facility

Medical facilities were not available due to fear of Covid-19 as many hospitals were closed. Those hospitals which were providing treatment during this pandemic were charging very high fees from patients. The hospital staff was not taking proper care of patients due to fear of spreading

of Corona virus. If anyone from troops got infected then all would have to undergo Covid-19 test and keep themselves in quarantine.

34 years old officer P. explained:

"Troops were also facing fear of unknown disease. Common cough and cold has no differentiation with Covid-19. If a single man got positive, entire troops would come under the risk of getting infected."

Remedies to Deal with Job Stress

Various remedies and precautions were taken by Central Armed Police Forces to deal with Covid-19 and to keep their force personnel motivated. These precautions were very much required for the wellbeing of force personnel. Physically and mentally healthy force personnel can serve better and perform their best. Stress management, yoga, counselling classes and giving them more time for themselves and their families would help in lowering down their stress level.

34 years old officer T. acknowledged:

"Force personnel who did extraneous duties during Covid-19 should be given more time to recuperate themselves so that they feel motivated and in future if there is some urgency of duty, they can give their best."

As explained by 41 years old officer Q.:

"The solution for stress is indoor games music, yoga, stress management classes and motivational and other counseling classes."

39 years old officer H. acknowledged:

"Those personnel who are isolated or undergoing quarantine should be encouraged to maintain regular communication with the families through audio/video modalities to strengthen their primary support system".

Suggestive Measures/Remedies Adopted by Security Forces

Central Armed Police Forces instructed their personnel to keep themselves and their family members safe from Covid-19. These forces also took various measures to stop spreading of Corona virus and adopted some remedies and techniques to keep their force personnel motivated. Some of them are:

1. Those personnel who were not able to proceed on leave were given priority for leave.

2. Safety precautions for prevention of Covid-19 communicated to all force personnel and also to their families so that all are aware about the precautions to be taken. Directions were given to strictly adhere to precautions/ guidelines issued by government of India from time to time.

3. All force personnel were motivated so that they take all precautionary measures for Covid-19.

4. Rotations of duty of force personnel were done.

5. If any individual could not reach his home and there is some problem at his home. Commanders were given responsibility to brief the individual regarding this and sort out his problems.

6. The solution for stress release i.e. indoor games, music, yoga, stress management classes and motivational and other counseling classes were conducted.

7. These personnel were motivated to socialize with colleagues, talk and seek help from seniors and communicate with families.

8. Diet in mess menu changed according to the threat of Covid-19 virus and to increase immune system of force personnel.

9. Mask, sanitizer, gloves, PP kit, spray and hand wash were used for their safety.

10. All personnel were briefed about symptoms and precautionary knowledge about Covid-19

11. Those force personnel having symptoms of disease, were quickly shifted to hospitals for treatment. "do gaj ki duri mask hai zaroori" followed in letter and spirit.

12. In some institutions, morning roll marker and evening roll call were closed and proper distancing were maintained for the roll call and marker.

13. Keeping in view of emergency situation, special vehicles, arrangements were made for these force personnel to send them to their home town.

14. Special care was given to the personnel who fell ill during Covid-19

17. Force personnel who were isolated or undergoing quarantine were encouraged to maintain regular communication with the families. Through audio/video modalities they were dealing with stress in better manner.

Initiatives taken by Central Armed Police Forces for The Society

Various measures were taken by Central Armed Police Forces for the welfare of the society to protect the people and environment from deadly Corona virus and motivate them to keep themselves and people around them safe. These forces helped public and needy people by taking various initiatives.

31 years old officer I. mentioned:

"Besides taking steps/measures for their force personnel, Central Armed Police Forces also took the social responsibility and conducted various precautionary measures and activities. Sanitization of common places by our force and spreading of health awareness were the new initiatives.

Similarly, 28 years old officer W. explained:

" Distributions of masks, sanitizers, hygiene and sanitations items, Civic Action Programme (Praudhsiksha, Plantations, distributions of food items) and, setting up of special control room helped a lot of civilians/public to fight with Covid-19 virus and also motivated them to help others."

Limitations and Future Directions

The online platform used to collect interview responses from Central Armed Police Force personnel is a major limitation of the study. Although online platform allows

the researcher to study a population that is usually hard to approach or interview face-to-face, it restricts the richness of the data acquired as online platforms do not have the option of direct probing, which is a crucial way to collect in-depth data. The other limitation is relatively small size of sample. Face-to-face interviews with a bigger sample size can be used to undertake future research in this type of study. Also, the impact of Covid-19 and increase of stress in Central Armed Police Force personnel may be extensively studied through interview/questionnaire of these forces' personnel belonging to different Central Armed Police Force and deployed in different areas/ locations. The impact may be different for different forces and areas. Different forces have different patience level which directly impacts the stress level of individual. More importantly, in the security forces, Covid-19 appears to be a significant contributor to increase stress level and effect morale, motivation and performance. Therefore, research should be directed at identifying the various stress management techniques/practices as it can help to decrease stress level and increase personal and professional development of force personnel.

Conclusion

In conclusion, this study was aimed to study job stress of Central Armed Police force personnel in Delhi NCR due to Covid-19 and identify the possible solutions to minimize the stress levels among them. The findings suggest that there is an increase in job stress due to Covid-19 in Central Armed Police Force personnel. The stress level increased due to strenuous and long hours duties, imposing of lockdown and other related problems arising due to Covid-19. This study also suggests that there is need for more research work in future for identifying stress management techniques/ practices as these have numerous implications on the morale and motivation of force personnel which directly impacts their performance during duty/deployment.

References

1. Guo X., Wu L., Yu X., Sun Z. and Liu W. (2020) Mental Health Care for Military Personnel in the COVID-19 Epidemic. *Mil Med*, 185(9-10):e1401-5.

2. Huang Q., Bodla A. A **and** Chen C. (2021). *An Exploratory Study of Police Officers' Perceptions of Health Risk, Work Stress, and Psychological Distress during the COVID-19 Outbreak in China.*

3. Khadse P. A., Gowda G. S., Ganjekar S., Desai G. and Murthy P. (2020) Mental Health Impact of COVID-19 on Police Personnel in India. Indian Journal of Psychological Medicine. SAGE Publications Ltd.

4. Mehra G. and Mishra P.C. (1991). Mental health as a moderator variable of intrinsic job satisfaction and occupational stress. Psychol Stud, 36:198–202.

5. Newman J.E. and Beehr T.A. (1979). Personal and organizational strategies for handling job stress: A review of research and opinion. Pers Psychol, 32:1–43.

6. Singh S. and Kar S. K. (2015). Sources of occupational stress in the Police personnel of North India: An exploratory study. Indian Journal of Occupational and Environmental Medicine, 19(1), 56–60.

7. Singh S., Gupta B., Sharma D. and Mishra P.C. (2019). A Study of stress, coping, social support, and mental health in Police personnel of Uttar Pradesh. Indian J Occup Environ Med, 23:73-8.//.00.

8. Souadka A., Essangri H., Benkabbou A., Amrani L. and Majbar M.A. (2020). COVID-19 and Healthcare worker's families: behind the scenes of frontline response. E Clinical Medicine, 23: 100373.

9. Srivastava A.K. (1991). A study of role stress-mental health relationship as moderated by adopted coping strategies. Psychol Stud, 36:192–7.

10. Stogner J., Miller B. L. and McLean K. (2020). Police Stress, Mental Health, and Resiliency during the COVID-19 Pandemic. American Journal of Criminal Justice, 45(4), 718–730.

11. Syed S., Ashwick R., Schlosser M., Jones R., Rowe S. and Billings J. (2020). Global prevalence and risk factors for mental health problems in Police personnel: a systematic review and meta-analysis. Occup Environ Med, 77:737-47.

12. Telangana State Police. Reference Handbook for Covid-19 Policing: Telangana State Police. Indian Police Foundation, (2020).

13. Torales J., O'Higgins M., Castaldelli-Maia J.M. and Ventriglio A. (2020). The outbreak of COVID-19 coronavirus and its impact on global mental health. Int J Soc Psychiatry, 66(4):317- 20.

Innovations in Traffic Management- Case study of Santragachi Railway Over Bridge Kona Expressway, West Bengal

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Abstract

This paper attempts to provide a workable, field-tested system for all congestion prone road stretches in the world where wide road changes into narrower roads. This scenario is faced by large number of traffic officers where there is a similar structural issue on road e.g. wide road meeting a narrow bridge, narrow stretches of road with installations like religious buildings, historical places etc. The learning from this initiative may be easily replicated to quickly reduce congestion on such points. This system can save lots of man-hours and other issues being faced by road users and traffic officers.

Keywords: *Rail Over Bridge, Road Congestion, Road Safety, Traffic Innovation, Traffic Challenges, , Single Lane Experiment, Vehicle Channel, National Highway*

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Introduction

Kona Expressway (KE) i.e. National Highway 117 is one of the most important roads of West Bengal, connecting 6-lane Expressway of NH-6 to 2nd Hooghly Bridge (Vivekanand Setu). K.E. caters to more than 60% population of this state including districts like Howrah, Purba Medinipur, Paschim Medinipur, Hooghly, Burdwan, Birbhum, Bankura, and Purulia.

K.E.'s traffic composition consists of diverse vehicle types. It is used for a large number of inter-state and long distance traffic with significant number of local traffic (as shown by the number of motor cycles using it everyday), including port bound vehicles.

Santragachi ROB is considered the nerve point of this important road. This ROB is a 757 mtr bridge with 2-lanes. It is a perpetual congestion point of K.E. where 4-lanes of NH merge into 2-lanes of this ROB. It also has steep gradient causing major break-down of heavy goods vehicles.

Location of Santragachi Railway Station (RS) near this bridge adds to the passenger and goods traffic to the area.

Some newspaper clippings showing the challenges in connection with this bridge are attached below.

Priorities of the Initiative

While the basic purpose of the initiative was to minimize traffic congestion at Kona Expressway with increase in user safety on roads, following priorities were targeted-

1. The foremost objective was to ensure that traffic is smooth and congestion free on K.E.through special focus on Santragachi ROB.

2. Saving of precious time of lakhs of commuters using this NH on daily basis.

3. Minimize break-down of vehicles by ensuring a reasonable and steady speed for most of the vehicles. This was achieved by creating separate channels at both ends of the bridge.

5. A dedicated traffic control room was set up with live CCTV coverage of whole K.E. through 125 cameras for real time feel of the developing pressure points.

6. Traffic engineering analysis and study of all accidents of K.E.

7. Illegal bus parking on K.E. was totally eliminated by making service road as dedicated bus channel.

8. Dedicated lanes for goods vehicles has ensured that slow moving traffic does not come into conflict with fast moving passenger traffic. This made prioritizing passenger vehicles easier. Heavy goods vehicles are assured reasonable speed and less break down by removing conflict with passenger vehicles.

9. Alternate and safer pedestrian path which reduced number of accidents and increased the speed of vehicles at ROB.

10. Special lane wise auto manual traffic signals were installed for controlling traffic on ROB.

13. Provision of bright lights at important junctions of KE.

Strategies adopted for transformation and positive impact

Scientific methodology was adopted to bring out the transformation in the system and create a positive impact benefitting huge number of commuters at K.E.:-

i. Study of existing system

ii. Discussion with Stakeholders

iii. Preparation of model

iv. Trial and validation: The system was tested after creation of one lane on Kolkata bound road as a pilot project.

v. Implementation

vi. Evaluation: Evaluation was based on quantifiable and non-quantifiable (psychological) factors before and after introduction of traffic engineering interventions.

vii. Standardization: The channel based traffic management system with segregation of heavy goods and passenger vehicles may be a standard solution to all congested stretches of roads where a bottleneck like situation causes severe traffic jam.

Phases of the Initiative

Phase I

As a background to the main initiative, it started w.e.f. September, 2011 when Howrah Police Commissionerate was formed. During this phase following steps were taken with a view to improve traffic on K.E.:-

• Repair of this NH was undertaken

• Many auto-manual signals were installed for reducing manual intervention

• The traffic unit was strengthened with additional manpower.

- Small traffic engineering changes were made, like speed reduction of vehicles near accident prone areas through placing of guard rails

- A new sub traffic guard viz. Unsani STG was formed for closer supervision

- During this phase, traffic diversion from 2nd Hooghly Bridge was the main tool of controlling traffic on Santragachi ROB but it had significant limitations.

Phase-II

Traffic improvements brought by the changes in Phase I were quickly nullified because of two factors:-

- Regular commuters found K.E. to be a better option to reach Kolkata. Above traffic improvements popularized the route causing it to be saturated soon

- Santragachi ROB, as a perpetual congestion point, was not affected by any of these changes

Phase-III

This phase started from March, 2015 when Shri Ajey Mukund Ranade, Commissioner of Police, took the issue of severe congestion on Kona Expressway with utmost seriousness. He started pushing for a pedestrian pathway under Santragachi Bridge to stop crossing over of pedestrians and vehicles at the mouth of this bridge. Shri Sumit Kumar, DCP Traffic pursued with PWD to get it designed, implemented and operationalised.

The movement to decongest Kona Expressway and revival of Santragachi ROB received a massive push with joining of Shri

D. P. Singh, as Commissioner of Police on 28th June, 2015. He started emphasizing on policing basics among which he felt that communication is key in traffic dynamics. Hence, work was started to establish radio communication systems in all traffic units and to force traffic officers for using radio sets. This went a long way in ensuring smoother traffic.

CP, DCP (Traffic) and traffic team spent hours together to study the problems at Santragachi ROB with many on-road meetings. Following salient points were finalized after such discussions:-

- To effectively regulate traffic on ROB, control should start from feeder roads. Many important roads were identified:-
  - o NH-6
  - o NH-2
  - o Kolkata Metropolitan Area

- Controlling goods vehicles is the key. If these vehicles are restricted from K.E., ROB will easily afford passenger vehicles

- Key officers at key points are important. Intelligent officers with initiative taking capability can be a great asset in crisis situations.

- Holding points for goods vehicles were created:-
  - o NH 6 Service Roads
  - o Nibra
  - o Kona Truck Terminus
  - o KCBT Service Road
  - o Andul Road

- Effective and regular communication was established with neighbouring police units like:-

  o Kolkata PC

  o Barrackpore PC

  o Howrah Rural

  o Hooghly

One Lane Experiment- Stage 1

In order to give effect to above principles, only one lane of vehicles on both bounds of the bridge was allowed. Hence two lanes of the ROB were separated using traffic cones. As this was done without controlling the feed before the ROB, bottleneck was formed at both ends of bridge and long traffic jam ensued.

One Lane Experiment- Stage 2

This stage was marked by a momentous incident in the form of accidental death of Piyush Ganguly, a famous television actor,

during Durga Puja holidays at Santragachi ROB. State government put tremendous pressure on traffic officers to reduce congestion/accidents on ROB and required resources were expeditiously sanctioned after that.

In the above background, the first step taken was to stop overtaking by vehicles at ROB. Traffic cones were used to divide the ROB into two neat lanes. In this stage, apart from making lanes on ROB through cones, two more major steps were taken:-

- **Pedestrian path way-** Thousands of pedestrians used to cross the road at Garage More located at the foot of ROB. This used to cause serious accidents and vehicles on both bounds of ROB. PWD was persuaded to construct an alternative route for pedestrians and local motor cycles under this ROB by Oct, 2015. This removed one major cause of congestion at ROB. Daily data of pedestrians and motor cycles is given below-

Daily Average Traffic - Plying on Santragachi Overbridge					
Time	Pedestrian Path Users		Ambulance	Pilot Car	Total
	Pedestrians	Two Wheeler			
8/00 -9/00 hrs.	683	30	17	4	733
9/00 -10/00 hrs.	902	43	39	12	996
10/00 -11/00 hrs.	518	44	33	14	609
11/00 -12/00 hrs.	442	42	46	15	545
12/00 -13/00 hrs.	270	24	30	8	330
13/00 -14/00 hrs.	264	24	48	5	340
14/00 -15/00 hrs.	183	15	42	5	245
15/00 -16/00 hrs.	238	16	52	2	308
16/00 -17/00 hrs.	194	14	39	3	249

17/00 -18/00 hrs.	191	21	20	2	234
18/00 -19/00 hrs.	163	19	21	2	205
19/00 -20/00 hrs.	137	25	19	1	182
Total	**4183**	**315**	**404**	**71**	**4973**

New Pedestrian Path Way removed load of around 4k pedestrians and hundreds of motor cycles from overbridge

- **Vehicle Channels-** Attempt was made to segregate goods and passenger vehicles through long channels. First such channel was made on Kolkata bound road. After the success of first channel, another channel was made on Nibra bound road. In both these channels, right channel was used for goods vehicles while left was used for passenger cars and buses. Then another step was taken to solve illegal bus parking problem of Santragachi old bus stand on Kolkata bound approach by enforcing buses to service road.

To ingrain the new system into the muscle memory of traffic personnel, senior traffic officers had to spend hours on road on a daily basis for briefing and constant improvement. SOP was prepared for diversions, if required. Another component of the SOP was to hold goods vehicles at KCBT Service Road and Kona Truck Terminus. All this reduced congestion at ROB to an extent.

After operating the two channels, a third channel was started from Bablatala to Balaji Petrol Pump before Panchvati Bridge, the second congestion point of K.E. (western end). This had three lanes where the middle lane was supposed to be kept free for movement of emergency and important vehicles. Another purpose was to create a

holding point for goods vehicles which may be used to restrict traffic to ROB in case of need. Cones were again used to create two lanes on Panchvati Bridge.

Further special lane wise auto-manual signals were installed for lane wise release of vehicles. Initially guard rails and later concrete blocks were used to construct channels

Many small traffic engineering projects were undertaken to complement the above system:-

1. Bus bay for Nibra bound buses was created at Garage More using guard rails.

2. Bus bay for Kolkata bound inter-state/local buses was created at Welcome Lodge.

3. One extra lane and a bus bay was created at Jana Gate

4. PWD constructed concrete median dividers (5' height) all over KE.

5. Crash barriers were constructed by PWD at Garage More and Service Road.

6. Median divider at Nibra side of Garage More was trimmed to facilitate U-turn of vehicles going towards NH 6/NH 2

Municipality was persuaded to install 10 mini high mast lights from Carry Road to Garfa. Further PWD installed 6 high mast lights on Santragachi service road.

One Lane Experiment- Stage 3

This stage was marked by technological intervention in traffic management of K.E. through- 125 high quality CCTV cameras, a traffic sub-control room.

Benefits of one lane experiment

- The biggest benefit was that the average time of a vehicle in crossing ROB reduced drastically from more than 30 minutes to around 2 minutes

- Goods and passenger vehicles could be segregated. This enabled in prioritizing of passenger vehicles.

- The waiting time at Santragachi ROB has been reduced and overtaking of vehicles has been eliminated.

- The feedback from passengers is very encouraging. Feedback from other stakeholders like railways, transporters, bus/truck drivers etc. are also very encouraging.

- The average speed of vehicles increased because of avoiding mixing of slow moving with fast moving ones.

- One lane resulted in clear funnel mouth for the bottleneck i.e. ROB

- Break down of vehicles reduced drastically due to increase in speed

and also because of reduction in conflicting points between different types of vehicles.

- One lane eliminated overtaking because of regulated flow of vehicles

- Reduction in accidents

Improvement in measurable indicators

The above experiments led to sharp reduction in the number of accidents on Santragachi overbridge, which resulted into saving of precious lives and also much lesser numbers of injuries to the users. Following table shows the data from the years 2011-16:-

Accident figures of Santragachi Overbridge for the period 2011-16			
Year	No of Accidents	Dead	Injured
2011	9	0	0
2012	18	2	18
2013	14	4	13
2014	13	3	10
2015	16	2	10
2016 (upto 31/03/16)	1	0	1

Further, earlier the average waiting time for any vehicle before crossing the overbridge used to be around 27 minutes. This got reduced to 9 minutes, hence saving thousands of man hours on daily basis.

Change in Average Waiting Time (per vehicle) for crossingSantragachi overbridge		
	Earlier	**Now**
Average Waiting Time (per vehicle)	27 minutes	9 minutes

Survey Report

An independent and reputed agency conducted a random survey of Kona Expressway during the period April 2-8, 2016, focusing on Santragachi ROB. During this survey, 1000 road users were questioned during daytime regarding their prior and present experience in this stretch. The results are given below:-

1) When asked about the reasons for traffic improvement at Santragachi overbridge, 55% people recognised and mentioned that the separate lanes for heavy vehicles contributed to it while 45% mentioned other reasons

Users (in%) mentioned 3 main reasons for Traffic Improvement, out of which separate lanes for heavy vehicles had majority
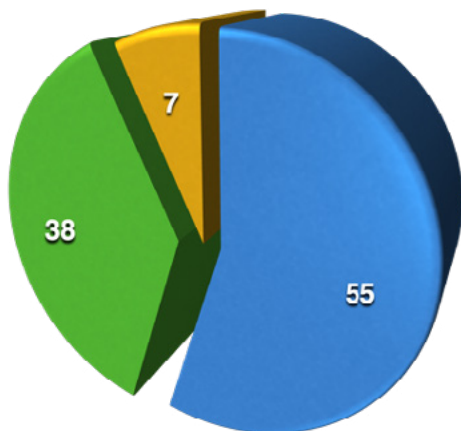
● Separate Lanes for heavy vehicles
● Repair work on ROB
● Separate Lane for pedestrians

2) When asked about the time taken for crossing Santragachi overbridge before the changes, 64% of the users said that they used to take more than 25 minutes while none used to take less than 5 minutes.

Users (in%) mentioned time taken to cross the overbridge- before the improvements
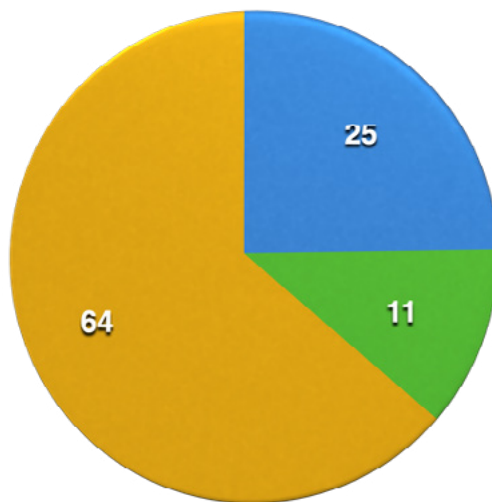
● 5-15 mins ● 15-25 mins ● >25 mins

3) When asked about the time taken for crossing Santragachi overbridge after the changes, 57% of the users said that they are taking less than 5 minutes while none is taking more than 25 minutes.

Users (in%) mentioned time taken to cross the overbridge- after the improvements
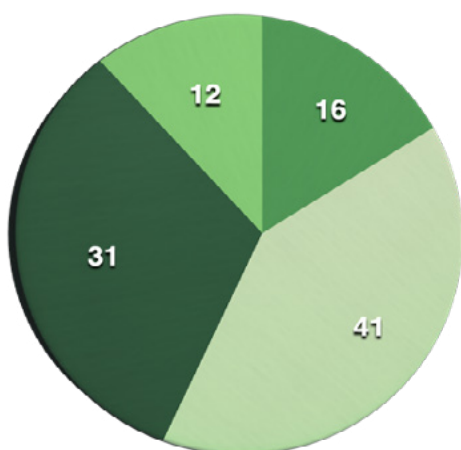
The changes in the time taken for crossing Santragachi overbridge (before and after the improvements) are shown in tabular format. Here, around 25% of the vehicles said that they used to take less than 15 minutes in crossing the overbridge. After the improvements, around 87% of the vehicles reached this category:-

Comparison of time taken to cross Santragachi ROB— Before vs. After

Average Time Duration	Percentage of Vehicles (%) - Time taken to cross ROB	
	Before	After
< 5 minutes	NIL	55.4
5-15 minutes	24.9	31.9
< 15 minutes (total)	24.9	87.3
15-25 minutes	11.4	12.7
> 25 minutes	63.7	NIL
Total	**100**	**100**

Challenges

There are many factors which pose challenge to the traffic management of this ROB:-

♣ Regular congestion is experienced on feeder roads to Kolkata during no entry relaxation time i.e. 22/00 hrs.

♣ There are many crossings on K.E. like Betor, Jana Gate, Carry Road, and Sundarpara where heavy crossover of pedestrians, slow vehicles takes place.

♣ Expansion plans of Santragachi Rly. Station will lead to heavy flow of passenger and goods vehicles to this area.

♣ Full operationalization of Kolkata Central Bus Terminus with large number of inter-state buses and attendant large number of ancillary vehicles will again increase pressure on K.E.

Conclusion

There are many learnings from this study which may be replicated by traffic managers all over the world. There are many places which face regular traffic congestion due to bottlenecks created by structural issues like merging of wide roads into narrow roads/bridges, presence of congestion causing heritage structures on road. There lane wise movement of vehicles can be a feasible solution. Traffic improvements come due to incremental changes brought over a period of time, after constant study by field

officers. Traffic officers, including senior officers, need to spend time on the field to understand the vehicle dynamics before introducing changes. Technology like radio sets, CCTV, drones act as force multipliers and must be used to the full extent.

Pictorial representation of the improvements in Kona Expressway (in the form of before-after pictures) is attached herewith:-

Garage More- Before/After pictures showing change in traffic management and flow after improvement

Before

After

Jana Gate- Before/After pictures showing removal of traffic obstructions and smooth flow after improvement

Before

After

Siristala- Before/After pictures showing separation of lanes and better flow after improvement

Before

After

Bablatala- Before/After pictures showing the lane management system and controlled flow after improvement

Present

Measures for Improvement of Childcare Institutions under Juvenile Justice (Care and Protection) Act 2015: A Multi-Centric Empirical Study

Dr. D.C. Nanjunda*
Dr. Ramesh Rangappa**

Abstract

The current multi centric study in ten Indian states has the objective of revealing the functions and measures for improvement of childcare institutions for the Juvenile Justice Act, 2015. Child delinquency is one of the burning issues that may be associated with several social, cultural, political, and economic difficulties. Children from disadvantaged families are at a high risk of becoming delinquent as a result of both avoidable and unavoidable circumstances. Certain Indian states have become the epicentre of escalating rates of delinquency. The current study has been using the mixed method and found that childcare institutions have serious issues with respect to structure, function, and quality child care management for the proper implementation of the Juvenile Justice Act 2015. The paper concludes that the Government should implement additional improvements with the cooperation of other stakeholders in a PPP module to bring reforms to the reforming centres like childcare institutions. This is the time to handle child delinquency issues as a serious public issue.

***Keywords:** delinquency, childcare institutions, inmates, JJ Act-2015, juvenile justice system*

Introduction

Child delinquency is a major social issue in any society that seeks both short-term and long-term solutions. Experts feel delinquency is a by-product of society's malfunction. Juvenile delinquency is a multi-faceted problem that requires an integrated solution (Bajpai, 2019). Child delinquency is a growing issue in the world, including India. All unlawful behaviour outlined by the law or social norms is referred to as delinquency (Sharma and Rai, 2012). For monetary and other gains, juvenile delinquents engage (intentionally or unintentionally) in theft, rape, robbery, dacoity, assault, and drug trafficking. All of these behaviors are prohibited by the Indian Penal Code and undesirable (Nagaraja

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and Saisudeer, 2011).The parenting style, poverty, family issues, school issues, social exclusion, and faulty society are some of the reasons for Child delinquency as per the studies (Navpreet, 2003; Ganguly, 2010; Vijay and Jose, 2010).The number of child delinquents is also increasing in certain states, as per the National Crime Record Bureau Report (2018). After the Nirbhaya case, the government of India implemented the Juvenile Justice Act of 2015 to bring major reforms to the juvenile justice system. Although the Juvenile Justice Act of 2015 is not a revolutionary one, it is a key instrument in bringing much-awaited reforms to the juvenile justice system in the country (Malvika, 2016).

Meanwhile, the structure and functions of the Indian childcare institutions, including children's homes, observation homes, and special homes, are also under question. While the JJ Act 2015 is critical in bringing about transformations in the structure, function, and management of childcare institutions throughout the country, some studies have revealed that there is a disconnect between reality on the ground and policy execution (Ganguly, 2010). The majority of childcare institutions in India (children's homes, observation homes, and special homes) are experiencing structural and service problems today (Malvika, 2016). The children are fleeing from the child care centres. The number of repeat offenders discharged from child welfare institutions is increasing. Today's child care establishments are likewise suffering from fundamental issues like staffing and financial shortages. The effectiveness

of the Juvenile Justice Board and child welfare committees is also being called into question (Bajpai, 2019). The current study was done in ten Indian states to find out the functioning and measures for improvement of childcare institutions under the Juvenile Justice (Care and Protection) Act 2015. The study is funded by the BPRD, New Delhi.

Methodology

The current study has been done in ten Indian states, including Tamil Nadu, Maharashtra, Odisha, Madhya Pradesh, Karnataka, Manipur, Assam, Delhi, Haryana, and Jharkhand. We have visited all types of child-care facilities, including 20 children's homes, 20 observation homes, and 10 special homes (both Govt. and NGO-managed) in ten Indian states during 2021–2022. We discussed it with all stakeholders, including superintendents, Juvenile Justice Board, probation officers, counsellors, and the wardens of the childcare institutions. We had a discussion with around 483 children/inmates from the three types of childcare institutions (CCIs) during the study. We gathered both qualitative and quantitative data from the various stakeholders using standard schedules/survey questionnaires to reveal the structure and functions of the CCIs and measures for improvement. The data has been analysed using appropriate software.

Results

a. Human Resource Management

According to section 47(3) of the JJ Act, every childcare institution must have a sufficient number of staff to run the

institution successfully. According to the results of the current survey, human resource management is one of the most important drawbacks of implementing the JJ Act 2015 in childcare institutions across the country. This is a common occurrence, and every childcare institution should have qualified and sufficient staff to run the program successfully. Due to a lack of funds and other issues, a permanent appointment at a childcare institution has become a distant dream today and we have heard that the government has not taken any steps in the last 10 years to appoint full-time staff to childcare institutions. Almost all of the childcare institutions under study have issues with staff management because they lack permanent staff. Even the district Child Protection Unit and the state Child Welfare Society are not interested in filling the position at their offices (Malvika, 2016).

According to our findings, in some cases, the superintendent serves as both a probation officer and a counsellor. Counselling is an important aspect of juvenile reform and integration. However, the availability of qualified counsellors has become the most serious issue that the authorities have undermined. The majority of counsellors are recent university graduates with no relevant expertise or experience. Almost all of them are inexperienced. They have no idea how to deal with the juveniles. What kind of counselling can a child expect from these personnel? Also, sweeper and cook positions are both vacant in the majority of childcare facilities. As a result, children are being used to cook, clean the floor, and do other tasks at CCIs. The regular transfers of

the superintendents and probation officers are one of the major impediments to the proper operation of childcare institutions. The superintendent is sometimes given a short period of tenure in a children's home or an observation home. He/she will be transferred to some of the departments before fully comprehending the function of the CCIs he/she had. It creates a barrier to the smooth operation of childcare institutions today.

We found that the majority of staff members, including superintendents, counsellors, probation officers, and wardens, were employed on a contractual or temporary basis. We should understand that the superintendent is the most key official in the institution, but this may not be the case if the position is tenured. How can one expect quality service from people appointed temporarily for a small and irregular salary? The main issue is that people will come and serve for a few months and then find another job. We found that more than 25% of staff will come and go within a year. This is very common in all childcare institutions covered by the study. The second major issue is that the authorities working in childcare institutions are neither fully qualified nor have any special training in child management. We also revealed that the majority of probation officers and the superintendent have additional responsibilities for other government departments. In some cases, we found that the superintendents' and probation officers' services had been borrowed from other government departments that had nothing to do with childcare issues. Staff from the

other departments may lack the necessary commitment, knowledge, and dedication to working with disadvantaged children in child-care institutions (Malvika, 2016).

During the interview, we also learned that contractual employees are subjected to harassment by regular employees. Also, they are constantly undervalued by regular employees. It is also advised that the probation officers must be provided adequate security while visiting the juvenile's parents in their hometown to prepare a social investigation report (SIR). Separate government quarters must be provided nearby for the CCIs staff. All childcare facilities should immediately appoint educators, art and craft teachers, physical education instructors, yoga trainers, sports teachers, caretakers, kitchen helpers, housekeeping, drivers, and gardeners(not in 77% cases). We found that over 95% of childcare facilities lack these posts. Internal quality control measures headed by the children and the local NGOs must be implemented in all aspects of CCIs.

b. Infrastructural Issues

The most pressing issue in any childcare facility is providing basic infrastructure and other facilities. As we found in the survey, the majority of CCIs are still operating in old buildings in deplorable conditions with few or no facilities. Some CCIs look like graves that are too far away from the city centre. Some institutions continue to operate in rented or abandoned buildings. In some cases, CCIs lack adequate power and water supply. A significant number of CCIs don't have proper restrooms, kitchens, dormitories,

and so on. Overcrowding is a problem in some of the children's homes. The recent COVID-19 has revealed the infrastructure issues with childcare institutions throughout the country. The provision of infrastructure to the institution should be an integral part of the ICDS program. There should also be special provisions for differently abled children at all CCIs'.

The significance of encountering difficulties in obtaining an internet connection for digital services. Some institutions require immediate scaling up of various infrastructure issues. We also found that there is no separate room for counselling and recreational activities, nor is there a separate room for the child welfare committee or the Juvenile Justice Board to meet. According to the survey, some CCIs have separate kitchen and dining areas in Jharkhand, Maharashtra, and Tamil Nadu. We saw a scarcity of school rooms in the special and observation homes in all states. There is insufficient space to run the school within the childcare premises. Also, there is no separate chamber for the warden, the counsellor, and the probation officers.

As per the JJ rule, each CCI should have one dormitory for every 15 children, but we found more than 30 in each dormitory in most of the CCIs. There is a segregation unit with a capacity of five children and a separate toilet and bathroom. There is also a mandatory issue of having 5 bathrooms and 8 toilets in every childcare institution, which we revealed is not being followed in any childcare institution across the country. A proper reception room is required to welcome the child into the home for the

first time. As we have seen, there are no proper tables or other facilities in some of the reception homes. A proper graphic display about the childcare institutions should be installed in the reception areas. Every childcare institution (not found in 65% of cases) must have a visiting area where parents and other visitors can meet the staff. In almost all government-run CCIs, the kitchen, cooking, and storage areas are in disarray and require immediate attention. We found NGOs run CCIs have some better infrastructure in Manipur and Delhi. A good playground with play equipment is also required.

All CCIs must have audiovisual equipment for the children. Childcare institutions should have a few separate study rooms for the children, but we found none in the majority of childcare institutions across the country. The majority of childcare institutions lack separate medical rooms. District officials should focus on this shortcoming. There was no quarantine room for the children who were infected with communicable diseases. Here, immediate attention is required. There is a drinking water facility, but the water must be properly disinfected before use. The restrooms and toilets are in disrepair and require renovation at all CCIs especially in Jharkhand and Tamil Nadu . All CCIs must have a vocational training room with modern equipment.

In addition, we would like to draw your kind attention to Section 49 of the Act, which states that if no separate place is available in an earmarked area, an observation home or a special home can be designated as a "place of safety where there should be no mingling of the children and the staff." However, most of the staff stated that they were unable to avoid child intermingling. As a result, it is preferable to build a separate building away from other childcare facilities. We recommend additional CCIs based on the needs of each state, including the 'fit facility'. We also found none of the CCIs are ready to face disaster reduction management issues and evacuation routes for children and staff in the event of an emergency, or riots of aggravated inmates, or attempting to kill staff and the guard and flee. This is a critical issue. As a result, we recommend that the government install and train staff to manage emergencies.

We also noticed that there aren't many observation homes, particularly for girls, in any state. Furthermore, it has been observed that only a few girls have been accused of committing crimes and are now being placed in children's homes, which is a bad precedent. In any case, the government should make an effort to build more observation homes for girls in each state. We also recommended that every childcare facility have a good protocol in place to maintain health and hygiene on the premises. We also recommended that a proper modern security system be installed, particularly in observation homes with former servicemen if possible. Every Sunday, CCI staff and children must participate in the cleaning of the outside premises. We also noticed that the majority of childcare institutions are not maintaining a cash book, budget statement file, case file , housekeeping, and sanitation register, handing over register, library register,

logbook, nutrition diet plan, minutes register of the children's committee, personal belonging register, production register, and staff movement register. The district child protection units have to take cognizance of the issue.

According to Section 49 (1), each state must establish the necessary number of 'places of safety'/'after care' and 'open shelters' with adequate facilities. We found hardly few such centers in all states. Also, the District Child Protection Unit should take interest in the case of 'aftercare' (children beyond 18) as per section 46 and 'fit facility' as per section 52(1) of the JJ Act. DCPUs are acting as if they have had no connection for some time with these two establishments in most of the states. We believe that the state authorities have failed to provide the necessary infrastructure and the proper attention to these centers. According to the state authority, every state has a sufficient number of childcare institutions based on the state's crime rate, but it is not true. However, we strongly advise having more CCIs in all states in tune with the child rights act. We strongly believe that more special homes are needed in every state. We strongly recommend that special homes (SH) be handed over to NGOs for better management and progress if possible. Furthermore, the state should encourage more non-governmental organizations (NGOs) to open special homes with grants that provide long-term rehabilitation issues.

c. The Quality of the Childcare Management

The most important issue in any childcare institution is quality. CCIs are doing a good job despite various problems, but the issues are accessibility and quality. How much quality they can afford for the poor children who attend a childcare facility is now a million-dollar question. We found almost all CCIs provide low-quality service due to infrastructure issues, staffing, and grant shortages. We found in the first issue that the shortage of dedicated and committed staff is the most significant barrier to providing quality service to children, particularly in children's homes and observation homes. We advise all CCIs to follow the procedure to be adopted during the first 14 days of receiving the new child, the procedure to be followed at the expiry of those 14 days, and the procedure to be adopted after 3 months without fail in the child's best interest.

Starting with food, children are not getting enough nutritious food in all CCIs. As experts stated during the interview, nearly all CCI children are served low-quality food, which is why 30 to 40% of children have stunted growth at the children's homes, as we found in the survey. Children are getting food 3 times a day, but it is of low quality in most cases. Providing non-veg items in most of the CCIs is rare, as we found. Second, there is a scarcity of qualified counselors in most CCIs. Children are not receiving adequate and high-quality counseling which is critical in changing their minds. The government should immediately appoint a qualified and experienced trainer, especially to the observation homes. There should also be a plan in place for a clinical psychiatrist to visit the children's homes at least once a month to assess each child's mental health. In

most CCIs, we found that the majority of the children are severely disturbed due to the situation inside the CCIs. The government is neglecting 'place of safety, 'after 18 care' and 'open shelter'. These three structures have more problems when compared to observation homes and children's homes in many states.

The following issue is the vocational training programmes for children (section 53). Almost all vocational education programmes giving at CCIs are traditional. What are inmates supposed to do with that? Can they make a living after leaving childcare facilities? According to the children, it has no market value today. This is due to three major factors: the first is a lack of proper infrastructure for the training programme within the homes, the second is a lack of qualified training staff to provide advanced training to the children, and the third one is the shortage of grants. This is a bad scenario. We feel CCIs should establish a connection with outside experts to invite them and provide advanced training programmes to the children. On one hand, we can change the mind-set of the children, on the other hand, we can divert the children to the job sector, and finally, once they leave the home, they can work somewhere else without getting involved in any crimes again. Next, we strongly feel that there should be separate approaches for first-time offenders and repeat offenders in the part of the mental health profiling and counselling process at all care institutions. We have also observed that in all cases, counsellors are using the same type of method and technique for both first-time offenders and repeat offenders. So

we advise that the duration and technique of the treatment for repeated offenders must be modern and advanced (Lober, Farrington, Petechuk, 2003).

Most of the CCIs are not observing 'adoption procedures' violating sections 38(5) and 64 of the JJ Act. We are dissatisfied with the rehabilitation and reintegration programmes for children in childcare facilities. Most childcare institutions are particularly interested in the children's rehabilitation and reintegration programmes. They are simply following the procedures for the sake of the name, as we feel at the end of the day. Adoption and foster care issues have a small amount of success at CCIs. The district child protection unit is not very interested in the adoption process. Section 61(2) of the Act requires all children's homes to receive clear applications from the parents for adoption as per the given norms in the new Act. However, most CHs are acting according to their convenience, not as per the norms.

Another issue with those childcare institutions is their failure to provide quality healthcare according to the JJ act Section 34. (3). What we found is that none of the CCIs have proper in-house healthcare facilities, at least a separate medical room to retrieve the children in emergency cases and that doctors only visit the home on-call. We were told that there is no regular doctor to visit the children's homes- this is one of the key issues. We advise that the DCPUs must work with the individual CCIs here. According to Sections 92 and 93 of the Act, any child suffering from communicable diseases that require long-term treatment

should be immediately transferred to a hospital/comfort centre. All CCIs must have de-addiction centre facility (section 53). There must be a medical officer from 8 am to 8 pm in all CCIs (section 53) but none of the CCIs' has that facility (Bajpai, 2019).

We also found that formal education (section 53) provided in childcare institutions, including bridge education, continuing education, and skill education, is of very low quality. We recommend that all childcare institutions appoint a qualified educator and provide quality formal and informal education to the inmates. We have been told that there are no such good education facilities within the premises, particularly in observation homes where juveniles are unable to attend formal schooling. If trials drag on for more than a year, he/she will be out of school. In some cases, children had to walk more than 3 to 4 kilometres to get to nearby government schools, and it must be avoided. Furthermore, all CCIs must separate children based on their age, and mental and physical status as per the Act. This is critical in every childcare management situation. Improper categorization is one of the biggest issues when compared to their social and psychological background. We also found that there is no quality counselling in any of the childcare facilities. The first reason is that there are no quality qualified counsellors at any of the institutions, and the second is that there is no separate room for counselling purposes. Additionally, the counsellor is still using the only traditional method of counselling inmates; there has been no advancement in their approach or mechanism and needs attention here.

We also found that while the establishment of various children's communities is a fundamental issue at every childcare institution, the majority of CCIs have not established all types of children's committees as required by Section 53 of the JJ Act. Some institutions have formed one or two such committees, while the majority have not. We recommend that the district Child Protection Unit ensure that all childcare institutions have established separate children's committees within the home. CCIs must be very serious about this. Section 7 (1) of the Juvenile Justice Act of 2015 states unequivocally that all decisions, trials, and proceedings should be child-friendly to the greatest extent possible, respecting the child's rights. Juveniles should not be treated in the same way as adult offenders. Even the Juvenile Justice Board should not accuse or repeat the crime/s he committed in front of him/her. According to this clause of the JJ Act, all procedures must be carried out in a pleasant and cool environment. The trial should be simple, clear, and appropriate to the juvenile's mental state. In this regard, the justice board should examine its working procedures and run the trail in a time-bound and child-friendly manner (Muhammad, et al., 2015).

In certain cases, we also observed the functioning of both juvenile homes and childcare institutions in the same building. This is against the JJ Act-2015. We also observed in Delhi that the observation home and the place of safety are functioning in the same building, with one wall bifurcated between these two places, which is a really

bad issue. We also observed attaching observation homes to special homes in most of the cases. The government should overcome all these issues immediately. It is happening due to the shortage of infrastructure and manpower, a strong political will and grants. In some states, because of a shortage of observation homes for girls, juveniles are placed in the children's homes, which might influence the other children. Serious attention is needed here.

Children should be provided with good, nutritious food, including non-vegetarian items. CCIs should follow the model rules 2016 brought by the Ministry of women and child welfare regarding food and other issues for children as per the JJ Act 53. No CCIs are following the menu chart as per the Ministry of women and child welfare guidelines. CCIs must have sanitation and hygiene protocols as per section 53 of the Act. The superintendent should work with legal cum probation officers in the district of the state legal service authority to ensure that every child receives free legal aid when needed. According to the Act, every childcare institution should have a rehabilitation and placement officer with 5 years of experience in the field of rehabilitation (section 55). His job should be to identify skills among the inmates and the need to collaborate with other establishments to provide vocational training formats to organize workshops and rehabilitation programmes (Muhammad, et al., 2015).

And we unofficially learned that children in all three types of child-care institutions are occasionally exposed to intoxicating materials such as liquor, drugs, gutkha, tobacco, and so on. During the interview, the staff categorically denied that such things had occurred at their cell care institution (section 53). However, the local media reports that such incidents occur on occasion in government institutions. We also advise staff not to consume alcohol, gutkha, or cigars in front of the inmates. This is a widespread issue in the CCIs of Jharkhand and Maharashtra. Furthermore, as per Section 53(P) of the JJ Act 2015, the authorities should make provisions for giving gifts and other incentive schemes to inmates who exhibit outstanding and exceptional behaviour within the home.

We also recommend that the management committee (section 53(2)) meet at least once a month to discuss infrastructure issues, individual problems of the children, the quality of the vocational training programme, pre and post-release plans, and community participation, minimum standard of care, and individual care plans. No one has taken it as a serious issue. We also recommend that every childcare facility establish a redressal mechanism, including a suggestion box in appropriate locations. Section 53 requires that a monthly meeting should include a discussion of the suggestions made by inmates during the meeting. The management committee should also be extra cautious about the abuse and exploitation of innocent children by the staff members. Every childcare institution should take measures to prevent exploitation against children, and in that case, immediately register an FIR against staff at the local police station as per section 76/77/78 which has not been seen in most

of the CCIs. CCIs are doing amicable settlements here, which is against the law. According to Section 74 (1) of the JJ Act, no CCI should reveal the inmates' identities at any cost. However, some of the children told us that their photos and names had appeared in local newspapers on several occasions. It must be stopped (Bajpai, 2019).

While speaking with the children from all three types of homes, we found that there was a significant difference between the authorities' response and the children's response. The children believe that they are being treated unfairly by the staff. Children believe that there will be times when there will be insufficient food and even a blanket. Children have complained of eating food of poor quality. They also said that they have to do the staff's work every day. They are always subjected to corporal punishment by the staff. Children have stated that they are not receiving high-quality vocational training. Some children claimed that the inspection authorities would not listen to their complaints. They also stated that sexual harassment occurs on occasion. As a result, both the government and childcare institutions should reconsider their approach.

We also recommend that all CCIs hold regular workshops on the JJ Act 2015 and child rights, with a focus on children for its staff. We also recommend that all CCIs be placed under a centralized control authority, as some government officials have suggested. All CCIs should encourage the children and their parents to meet regularly. In addition, CCIs should also provide counselling to parents as needed and encourage parents to come forward to provide bail for their children as needed. Special infrastructure for differently-abled children is also required. The probation officer/warden must be in touch with the parents of the children regularly. We also strongly recommend that every childcare institution create a range of annual photographs of each inmate according to Section 53 of the JJ Act. We advise all CCIs to submit annual reports as per section 71 of the Act. Most of the CCIs are not doing this, as we found in the survey. In the event of an inmate's unnatural death (section 53), we recommend that a separate inquiry committee be formed under the supervision of the district health officer and comprised of one private doctor/NGO.

d. Financial Management

The Government of India established the concept of CCIs in 1963. Financial management is a critical issue for every CCI. According to the literature, 42.3 percent of CCIs receive government grants, while 23.4 percent and 14.8 percent receive funding from foreign sources and non-governmental organizations, respectively. Surprisingly, individual donations account for 56.8 percent of all grants (MoWCD, 2018). The central government provides all assistance to the state government through the Integrated Child Protection Scheme (ICPU) fund. The primary responsibility for managing childcare institutions in their jurisdiction rests with the state governments. The most pressing issue is that the central government is not releasing grants to the states on time. State governments, on the

other hand, do not have a reserve fund to run childcare institutions. The state government is required to spend money on women's and children's development programs, but they are the last to manage childcare facilities in the states, as we found in the study.

The central government is releasing funds to states under the ICPU scheme, including child maintenance grants, salary increases, and grants to construct new childcare facilities. The first issue is that the central government is providing grants to the state government for the construction of a new building at a rate of Rs. 1000/- per square foot through the State Public Works Department. According to the officials, this amount is insufficient to build a new CCI building. Sometimes they have to buy the land from private individuals. We found that some state Governments have identified the land for the new CCIs but are unwilling to pay for it out of their own pockets due to a lack of funds. However, Rs.1000/- per square foot is insufficient to construct or expand existing child-care institutions. Today, childcare facilities should not be built like jails, with high fences surrounding them. The new building should adhere to the aesthetic issue while keeping the juvenile mentality in mind. The building should be beautiful, with a new structure and design, as well as pictures and facilities, so that every child will enjoy it and its interior design as a part of the reformation. The second issue is that the central government provides Rs.2000/- per child under a child maintenance grant, which is insufficient today. They cannot provide quality services to the inmates with this funding. Wardens claim that with this little money, they can't even provide good

food for the children. Urgent enhancement of the grants is required here.

On the other hand, we have been told that district child protection units must compete for funding from the state child protection society. The state child protection society is responsible in each state for managing and releasing grants to district-level child protection units under the integrated child-protection scheme. Then the funds will be redistributed to individual childcare facilities by the district child protection units. Every quarter, the district child protection units have to request that the money be released by the state child protection society. A need for reform is required here. Every time, the district child protection units must submit a request in a specific format, to the state authorities, and the state authorities will take a long time to scrutinize and release the funds. Individual childcare institutions may not receive funds when they are most needed, causing significant hardship. The majority of the time, the staff will spend their own money. Sometimes there is no ration at children's homes due to a lack of funds, which is quite unbelievable (Sharma, and Rai, 2012).

We strongly urge the government to increase grants and release DCPUs on time under the ICDS program. We also recommend having a useful mechanism in place to receive grants and send expenditure details as well as the utilization certificate. Instead of offline, the online mode can be used here so that none of the childcare institutions suffer from a lack of funds. Greater flexibility and eligibility criteria should be implemented to streamline financial management.

Furthermore, under the CSR Act, childcare institutions can receive funding from private companies or corporations. Furthermore, DCPU can reach an agreement with the experienced private sector to improve financial reporting and auditing.

There should be no miscommunication between individual childcare institutions and the District Child Protection Units in terms of receiving and releasing grants on time. CCIs and DCPUs will both be helpless sometimes. Every DCPU and CCI is required to have an emergency fund. Every DCPU must submit an audit report as per section 73 of the Act. The funds made available by the central government are insufficient to cover staffing needs. As a result, the state government has only appointed staff on a contractual/temporary basis. In many childcare institutions, the superintendent and other key staff are also on a contractual basis. Over the last decade, many key positions in childcare institutions have gone unfilled due to repeated denials from the state finance department. The first and foremost issue is that the central government should release the grant to the state government. If not, state governments should first provide funds from their sources and must receive reimbursement from the central government soon. When we inquired about it with state officials, they stated that they had received the funds from the center, but some time ago, they had been diverting the grants to other urgent purposes. The state shouldn't divert the grants for any other purpose. We found a mismatch, misunderstanding, or lack of coordination between the state and the central authority about the issue of the grant. Finally, individual childcare institutions and marginalized children are ultimately the losers. We strongly urge all governments, following Section 105 of the Act, to establish a separate Juvenile Justice Fund for the welfare and rehabilitation of children subject to the Act.

e. Monitoring and Evaluation

Monitoring and evaluation is the key process in the successful implementation of the program. According to Section 54(1) of the Act, the state government should form a different level of inspection committee to visit the various childcare institutions in the given jurisdiction and conduct a third part evaluation as per the Act 16(2) and 55(1), but this is happening in every state and requires immediate attention. As each state has a large number of childcare institutions, it is best to use information and communication technology (ICT) and geographic information systems (GIS) so that an effective mapping and real-time assessment of the institution is possible. The DC must visit CCIs regularly.

If it is necessary, the authorities can conduct a teleconference survey with the CCIs. Digital technology will be useful in managing large amounts of data and tracking other logistical issues in childcare facilities. We may recommend that all childcare institutions be digitally linked to state authorities to address grievances as soon as possible, especially fiancé issues. They should also concentrate on the operation and assessment of foster care, aftercare, and open shelter systems. We found that no state authority has visited a district child protection unit at least once

to date in most of the states. The juvenile justice board and child welfare committees have not been evaluated (section 35) even once to date and need more attention. As we found, no inspection has taken place in several CCIs over the last 5-7 years. Most states have neglected the special homes as we heard from many officials. The state authorities admitted that an urgent focus is required here. The major limitation of the study is that the studies were conducted in an Indian state with a small sample size. We strongly advise future studies to be conducted with a larger sample size in the remaining states, including the 'place of safety' and 'open shelter', which are not covered in the current study.

Conclusion

All childcare institutions should serve as reformative rather than punitive centers. A new JJ Act-2015 should only serve as a guideline. If it is necessary, new and increasing number of clauses/sections must be added to the current JJ Act as and when it is required. Age should not be a deterrent to being punished. The children must be punished based on the gauge of their crime. If a child has enough sense to commit a heinous crime, he must not seek a safety net under the age of 18 criteria from the law. This is not the way to provide victims with natural justice. In the long run, society has to face the consequence and anti-social elements may use innocent children to commit crimes. We must continue to bring reforms to the state's "*reforming system itself.*" in terms of space and time.. Hence, we strongly advise using modern approaches to improve the living conditions and reforming children/inmates in childcare institutions like handling public health issues.

References

1. Bajpai, G.S. (2019). *Juvenile Justice Impact and implementation in India*, Bloomsbury: Delhi.

2. Ganguly D.K. (2010). *Commentary on the Juvenile Justice (Care and Protection of Children) Act- 2000*. Dwivedi Law Agency: Allahabad.

3. Hansaria V. and Jose P.I. (2010). *Juvenile Justice System.* Universal Law Publishing Co. Pvt. Ltd: New Delhi.

4. Muhammad N. S. U., Madad A. and Sadiq. A. (2015). Juvenile delinquency- The Influence of family, peer and economic factors on juvenile delinquents. *Applied Science Reports*, 9(1), 34-40.

5. Nagaraja. T.V.T. Saisudeer T. (2011). A medico-legal study of juvenile crimes in Rayalaseema zone in Andhra Pradesh. *International Journal of Biological & Medical Research,* 2(4), 67-70.

6. Navpreet (2003). *Childhood Crisis, Child Neglect and Juvenile Delinquency*. Discovery Publishing House: New Delhi.

7. Sharma R. and Rai R. (2012). A Study of Creativity among Delinquent Children at Secondary Level in Meerut. *International Journal of Scientific and Research Publications*, 2(10), 45-50.

8. Tyagi M. (2016). Understanding juvenile crime- Notes from the field. *Economic and Political Weekly*, 51(2), 34-36.

Evidence Based Policing in India : A Quest for Quality

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Abstract

The human society since its beginning has experienced the need of controlling evil deeds committed by a few of its own members, because these are manifested in the form of various crimes. With the progress and increase of human populace, the society has started to face the challenges of law and order problems as well. In fact, the crimes and law & order disturbances are the social maladies that adversely affect the social fabric, its peace and harmony and even try to disrupt the functions of legitimate administration.

Since our society is a coherent body of human beings, we can treat the social maladies as we treat physical ailments in a human body. In fact, evidence based policing (EBP) is a concept borrowed from Medical Science, wherein the same is referred to as Evidence-Based Medicine. Evidence based medicine is defined as a "process of systematically reviewing, appraisal and using clinical research findings to aid the delivery of optimum clinical care to patients". Similarly, EBP is an endeavour to use clinical research to deliver optimum, cost-effective, people-friendly and transparent model of policing.

How and why the "evidence" is considered as the basic force of detecting the root cause of an offence and remedy thereof, is tried to be highlighted in this article through the personal experience of the author.

In this paper, the evidence based policing is endeavoured to make it easy to understand besides focusing on its merits and relevance in India.

Keywords: *Evidence, Police and policing, investigation and logical conclusion, research, cost effective crime reduction strategy, tracking, targeting and arresting of the actual culprits, pro-active policing, prevention and detection of crime, law & order and human society.*

Author's Introduction:

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Understanding policing through Police Station experience

It was a fine and most probably the first morning just few days after the author's joining for district training in December 1994. A lady complainant rushed in as the author was sitting at Kokrajhar Police Station in Assam with the Officer-in Charge on his left. Before the author could understand anything about the complain the lady was trying to narrate, the Station House Officer shouted fiercely at the lady which caused the author to sweat even in the midst of a cool bridge blowing through his chamber. That day the author realized that it was not easy to become a Police officer in practical field despite having the basic training in a Police Training College or Academy. To the author's surprise, the furious Station House Officer, in no time, sent one Sub-Inspector of Police accompanied by few constables with the complainant to the alleged place of occurrence for preliminary enquiry before registration of a case but the complaint was found to be false and fabricated as presumed by the SHO.

After completion of author's tenure in the rank of Deputy Superintendent of Police including probation period in Kokrajhar District, he was posted in Jorhat District in the month of December 1999. After couple of months a six-year old boy of a joint family in the middle of the town was found murdered and the dead body was lying at the basement of the building owned by the said household. Since the author was tasked to evaluate answer scripts of a state-wise test for selection of candidates for the erstwhile vacant post of Circle Observer,

Village Defence Organization in Assam, the author could not visit the PO immediately and after 72 hours the author could see the corpse in a still photograph. Later on, while supervising the investigation of the case as Additional Superintendent of Police (HQ), the author could sense that something was fishy within the ill-fated family itself. The author brought all the male members including paternal uncles of the victim boy to the Police station for interrogation that increased the author's doubts but before the author could gather proper scientific evidences for drawing logical conclusion, he was transferred to another distant district.

After serving few months in North Lakhimpur as Additional SP (HQ), the author encountered a case of looting of rupees five lachs in the daylight from the middle of the town. Although two master-roll employees were sent to withdraw and bring money from bank, only one person was carrying the bag full of cash in his own bicycle towards the office and another came late from the bank. Since the entire money was meant for Master-Roll employees who were waiting at the office of PWD Executive Engineer for their wages they made a hue and cry about the looting incident and the aggrieved employees gheraoed the Sadar PS as if it was total Police failure of protecting public money. As such, local people also tried to create law & order situation in the town because for them master-roll's money was more important than the reason how the incident could happen. Moreover, the district situation was such that people did not like to raise voice against the armed miscreants who might be the members of the militant

groups like ULFA or NDFB. At that time the author was about a hundred kilometers away from the District HQ. The author heard in his VHF set about the snatching of money by some miscreants who fled in a white ambassador. All Police stations and Police check posts of Lakhimpur and neighboring Districts were alerted and pressed into service but to no effect. The author came back immediately, visited the PWD office, assured the officers and men gathered there of the recovery of money as early as possible and searched for the person from whom the cash was looted. The author was told that due to fear of aggrieved employees' fire he straightway went home from the spot and the author also learnt that the person was a regular carrier of money from the bank in his bicycle. Without wasting time the author visited his home and brought him again to the PO with his bicycle. He showed the author the spot where he was reportedly challenging two armed miscreants before looting of the cash. As told he fell down with the bicycle and when he tried to stand, one person with a gun pushed him down to the ground again and another person snatched the bag full of cash from his possession. The author keenly examined the spot but the author could not find anything abnormal there. The shrubs and vegetation were fresh and undisturbed. There was neither the sign of falling of a person with bicycle nor that of a tussle between 2-3 persons. Both photography and videography of the place of occurrence were made and properly recorded as evidence. The evidence of the spot so recorded and observed clearly indicated that the cash carrier was blatantly lying. With this little evidence as the basic

capital of the author's investigation, the author interrogated the "cash carrier" and the accompanying Master-Roll employee, who came late to the PWD office from the bank and narrated the incident in public, in a closed cabin at the PS. The author personally grilled them both jointly as well as separately for few hours after which they finally divulged the details. Thus, the author recovered the entire money in less than 12 hours' time from the cash carrier's home in a village about 5 Kms from Lakhimpur Sadar PS.

The above three incidents of three different Police stations in three different districts of Assam indicate three significant points in the context of general policing to ponder upon.

The first incident at Kokrajhar PS tells about experience and harshness of a Police officer that usually helps in investigation and day to day policing. In fact in the nineties, the service experience coupled with fierceness was the desired quality of a Police officer as he could get work done easily by his toughness and harsh behaviour. Capability of shouting left and right for threatening or frightening and thereby deterring others especially the wrong doers was considered as the main tool in possession of a good Police officer. Actually the Police and Police posts in many parts of India are still considered as an entity to be afraid of. A few years back when the author was listening to a District & Session Judge in an awareness meeting conducted by State Police Accountability Commission (SPAC) in Sonitpur district of Assam the judge disclosed how and why he was scared to

look into and therefore avoided to pass beside a Police Station before his joining in Judicial Service. Still in India many a times a good man is considered and called--if not a bad Police officer-- a man of soft personality, unbecoming of a Policeman.

The second case at Jorhat PS actually clarifies the author's inability to gather evidence due to which he could not interrogate the doubtful members of the aforesaid joint family the way the author wanted to and as the author did in the third incident in North Lakhimpur district.

The third incident of the alleged robbery of five lacs of cash in North Lakhimpur district reveals how a little evidence, if solid, can lead to logical conclusion of the investigation of a difficult case. Unlike the investigation of Lakhimpur robbery case, in the Jorhat murder case the author could not counter the statements of and extract the truth from the household members whom the author suspected. This is because evidence is the power of an investigating officer by which the officer can proceed further for obtaining actionable intelligence. However, the author does not like to disclose the facts of author's investigation of the Jorhat murder case except the fact that during the investigation he found that a trusted worker employed by the father of the victim was missing since the very day of the incident but according to the family members he had gone home in other state for his domestic urgency and before he returned the author got transferred. It is a fact there can be no murder without a motive or mens rea and in that case he could not find any such motivating factor, even distantly connected to the outsiders.

Author's doubt upon the family members increased when they tried to mislead author's investigating team. Although the author's suspicion was growing more and more as the author was examining the family members of the victim boy, the author could not extract the truth due to lack of evidential proof from the very family members who, the author still believes, knew the truth.

Thus, in brief we can understand the value and significance of evidence in investigation of a crime. Although prevention and detection or investigation of isolated crimes too comes under the purview of policing, by the term we generally mean not a mere individual offence but we leverage it into broader perspectives than what we have perceived in above three examples. Police forces typically are responsible for four kinds of functions like maintenance of public order & safety, enforcement of law, prevention & detection of crime and investigation of criminal activities. These functions are known as policing.

"Independent India is a welfare State and the Police constitute a vital element of the welfare of people" but policing in India is still alleged to be in rudimentary stage. Actually policing does not mean mere prevention and detection of crimes and maintenance of public order, it also draws all such issues to its domain that besides facilitating it are also factored into recruitment of Police and force personnel, their accommodation & welfare, their deployment and postings including that of SHOs, SPs & other key officials, utilization of conveyances, communication tools and techniques, collection of intelligence and so on & so forth. Again, simply goodwill of

political leaderships in a particular country does not hold good in making policing of such country better and befitting to the expectation of general masses who have now access to advance kind of policing in other developed countries. The people at large want prompt, corruption free, unbiased and non-intrusive policing that is less visible and interfering but more effective. Most of the ruling governments in any country expect inter alia, a cost effective policing. However, in India, policing is alleged to be largely, if not intrusive, but interfering in nature. For example, in problematic or law and order situation a large number of Police, paramilitary and sometimes even military forces are deployed at the expense from the government exchequer and in some occasions movement of such forces itself creates chaos & inconvenience to and becomes unnecessarily interfering with common populace.

Therefore, it is high time to go for evidence based policing in India as well. But both of our people and Police community are not fully aware of what actually evidence based policing means.

Evolution of evidence based policing

To know about the evidence based policing we need to dive into the past. In most of the professions in the past, people had based their job - related practices on the knowledge & information derived from experiences handed down to them in the form of traditions, customs or religious norms. Although they were in vogue actually many of such individual practices were not justifiable by evidence and many of them

led to quackery and poor performance. Fortunately with the development of progressive human society, policing has also developed.

In fact, policing was known by other forms and names in different countries. Most probably, the first centrally organized and uniformed Police force was created by the government of King Louis XIV in 1667 in Paris, the then largest city in Europe. Thereafter efforts have been made from time to time in different parts of the world for finding better policing system because policing—formal or informal has remained everywhere in the world as the core issue of maintaining public peace and order, the basic societal requirement.

With the progress of science & technology in the nineteenth century, human society became more complex with both cooperative and competitive human minds with exploring and utilizing natural as well as material resources. This in turn has given rise to the increase in good and evil thoughts and individuals too who, sometimes collectively led their competitive community into big or small communal and bigoted force in various outlets.

By the end of the 20th century, the study on policing system began and actually took momentum with **Lawrence W. Sherman**, an American experimental criminologist who consequent upon his own exhaustive studies on contemporary policing outlined the concept of "evidence-based policing" and it made public in his 1998-Police Foundation Lecture titled "Ideas in American Policing".

The core of his ideas included such Police practices that could be far more effective in terms of time, energy and resources than conventional policing system if tactics proven to work during controlled field experiments were prioritized in the practical field. Professor Lawrence W. Sherman who devised the definition of evidence-based policing in 1998 also established the Cambridge Centre for Evidence-Based-Policing in 2013, which subsequently became a global hub of Police training on this subject. Gradually, Evidence Based Policing has become a global concept and Professor Sherman has come to be known as the "father" of evidence-based policing.

In 1970 in the United States of America, an independent organization named Ford Foundation created a Police foundation headquartered in Arlington, Virginia with the mission of **advancing policing through innovations and science**. This has since then become the National Police Foundation of USA and started to conduct researches in Police behavior, policy & procedure, and continues its efforts in evidence-based-practices and innovations in policing. Interestingly in the same year on 28 August, the Bureau of Police Research and Development (BPR&D) was set up with the aim of modernization of Police forces through science and researches in India.

Evidence based Policing in the context of India

Thus, India has its own idea about evidence based policing and truly speaking evidence based policing may be called Research Based Policing. With globalization and development in the field of science, information and technology, general masses have not only come to know the real facts of their day-to-day life in the context of their nation but also learned to compare those in international perspectives. Today a rural individual residing in a remote village tries to understand their local issues of crimes or law & order situation in global perspective. Harshness or toughness of Police officers or third degree method of policing if not obsolete, are of little use now. The elected governments across the world including India have also nowadays realized that the majority of the masses, voters or non-voters do not prefer any kind of intervention from any corner in policing. So, rather than being guided by assumptions, tradition, convention, or subjective impressions which many a time prove to be unjustified or unethical, we should rather go for our own condition-crafted evidence based policing, combining the existing knowledge, skill and experience of Police personnel with crime problem-solving and testing, crime-science and findings of research studies in our local perspective.

As researches have been an integral part of BPR&D since its inception, it has already undertaken initiatives in popularizing and implementing evidence based policing in India. The BPR&D has been doing this through its Research & Correctional wing, which is exclusively devoted to develop research-based guidelines for, deter policing in India. For this, R&CA division of BPR&D undertakes researches on various Police related topics and involves the best academicians and experts of the renowned

universities and institutions across the country.

Since a research study focuses on and represents knowledge, information and human experience available in a particular subject or issue, it can bring about the clarity in place of unawareness and uncertainty thereby highlighting what is the reality of facts and what really works. Therefore research-based or Evidence-Based Policing (EBP) is growing globally so as to ensure that policing strategy, operations and tactics are not randomly selected and executed at the cost of public convenience and people's money. In fact there are many advantages that the formal researches can add to the law enforcement system and facilitate the agencies involved.

Evidence Based Policing is also cost-effective since it seeks to raise awareness for increased application of scientific testing, targeting and tracking of Police resources for better utilization of time, energy and funds available for Police. It is really important during the time of budget cuts and greater public scrutiny in lean periods. To understand this we may take the instances of national festivals in India.

On the eve of and during different festivals like Durga Puja, Eid etc we are to establish number of Police check points across the country and keep them active round the clock which stops vehicles of civilians and thereby disturbs their free movement. Such deployment of forces is most of the time found mechanical and with little desired ends. In fact, the deployment of forces during election time or any other mega programme is largely dependent upon the will, ideas or experiences of SHO of a PS or at best of the district Superintendent of Police. During the period of Assembly or Parliamentary election in India we make mammoth movement and engagement of armed and unarmed forces, election officials, observers etc. in the country at the cost of huge public money. There are no research-based facts about such exercises carried out or to be carried out by Police and paramilitary forces in particular and by the Election Commission in general. For example there are no readymade research based tools with SHO or district SP on the way to categorize the sensitivity of polling stations according to which number of armed personnel are deployed in them on the day of poll. The Election Commission of India therefore finds every election as a new election for its execution as if their election drills are based on trial and error policy. Thus policing, especially during election time in India, provides for ample scope for resorting to evidence based policing.

Day-to-day successful policing is seen carried out in our society by some unique Police officers having extra-ordinary skills. These instinctive individual capabilities, indeed, have constituted the art and craft of present day law enforcement system. Again, this kind of successful policing or art and craft of law enforcement is largely based on building relationships and trust of Police force both internally in the concerned Police unit itself and externally with the people or society it serves. Such instinctively outstanding officers usually become the blue-eyed boys to their seniors and many a times cross the limit of legal or

organizational periphery which may bring bad name to the Police organization in general or legal action against the erring officer in particular. The evidence based policing can be of substantial help in this aspect for fine-tuning these instinctive skills and intuition of such unique officers for better results and greater public acceptability. Since the practice of evidence-based policing is a decision-making phenomenon supported by assessing and analyzing data & scientific evidences available in the field of investigation about what kind of approach works and what does not, the capable Police officers become more cautious, successful and acceptable.

It is a matter of common sense that in case of a crime there must be three things, namely a likely offender, a suitable target that is called victim when the offence is committed and the absence of a capable guardian to care enough or of some observers to intervene. Here Police can function as the third element. The proactive policing as an intervening factor in preventing crimes from happening are considered everywhere as the best Police practice. But without the knowledge of the other two parameters of a crime such policing in the form of Police patrol, Naka-checking, Route- March etc. may turn to be in excess or inadequate than what is actually necessary. The proactive policing that targets hot places and people is based on knowledge garnered from crime analysis which is a cost-effective crime-reduction strategy. This is because crime risks vary consistently from place to place and are typically concentrated by the time of day, the day of the week or season, type

of holiday and even weather conditions. Today, climate change that has happened globally and impacted squarely upon crime scenario, has become a hot topic of discussion, research and studies in different parts of the world.

It has been found that only a few offenders commit most of the crimes. Some estimates show that just 3-5 percent of the population commits 50-60 percent of crime. Additionally, based on the "power few" or loosely connected 20/80 rule, 80 percent of all crimes might be committed by 20 percent of the population. So, if modus operandi of those few can be learned, detection of criminals and prevention of crimes become easy for Police. Therefore, of late under the direction of MHA, New Delhi a Modus Operandi Bureau (MOB) has been established in BPR&D and made a part of Research & Correctional Administration Division.

Brighter Perspectives Of Evidence Based Policing

The EBP means the use of the best available evidences related to an offence or issue in policing for preparation of policies, their subsequent implementations in the field and finally drawing logical conclusions and decisions. Everyone involved in criminal justice system especially in the field of direct policing or law & order can use this EBP approach effectively, though the latter cannot provide definitive answers every time in all situations. For countries like India where international borders are porous, populations are largely illiterate & waywardly huge with diversities in respect of caste,

creed, religion, ethnicity etc. and where demographic data bank is yet incomplete, evidence based policing shall be a difficult task. But it is not impossible and can be made successful if all the stakeholders are committed to work sincerely and people are aware of its meaning and intent as well as its dividends and efficacy in having a safer society, almost crime free.

Evidence Based Policing (EPB) shall require collection of facts & information that actually work in the field before a Police officer goes for practical policing like search, seizure and arrest of offenders. Collection of information or data for research studies means involvement and active participation of commoners. Furthermore, the best possible findings in research studies require involvement of brilliant minds as well as academic pursuits. All these finally may lead to the tripod of social viability amongst Police, academic institutions and people and thereby yield to a people friendly policing.

The evidence if collected and used purposefully shall not only help tracking, targeting and arresting the actual culprits or mischief mongers but also sentencing them and deterring other potential criminals at large from commission of similar offences. Criminal justice system also clarifies that 'conviction can be based on sole evidence if it inspires confidence'. On the other hand, today's conventional policing in India are seen mostly fire-fighting in nature and largely influenced by mass opinion, societal interfaces and popular media pushing off the accumulation of evidence in tertian line. So, Police usually comes under excessive

pressure to go on arresting accused on priority instead of gathering evidence first. This exercise leads to unethical harassment of innocent citizens and many a times creates space for the actual culprits to escape.

It is a common allegation that Police force is easily invoked and used promptly by moneyed man and their political peers or that the former inclines to work only at satisfaction of the ruling Government. Lower ranks or cutting edge level officials are said to be seen as helpless in delivering justice to the poor and under privileged because of contradictory instructions from hierarchical bosses. These kind of allegations are not only irritating for Police community but also damaging in nature for their credibility. On the other hand, as science, logic and laws are three integral parameters that actually built the bases of EBP and it seeks scientific testing, targeting and tracking of Police resources to be used in policing so it will be free from any kind of external interventions-- political or hierarchical. Thus it will obviously help us having a non-intrusive policing in our country. The evidence based and non-intrusive policing should be, indeed makes, a right of all denizens in a democratic and near developed country like India where rule of law is said to be the bedrock of all policy decisions and implementations. This EBP is, therefore, not only logically but also ethically and legally correct.

Conclusion

The basic Police powers, as we all understand since independence, are those of arrest and detention including powers

of bail, investigation, search of person & premises as well as declaring a crowd unlawful. It is noteworthy that all these powers are vested in Police station level officers who practically work in fields. But qualitative recruitment of such officers, their training for capacity building and sensitization in service delivery through evidence driven policing have still remained shrouded by a big 'question-mark' in the minds of common masses. On the other-hand, besides many more merits of EBP, when the Police personnel engaged in the field are aware of the realistic evidences they require to collect for a particular crime they are investigating into for drawing logical conclusions, they can investigate the same more confidently and coolly without tension or stress. Thus evidence based or research based policing will not only help getting a healthy Police force but a healthy society as well.

Scientific Criminal Investigations: Structured Formulation of Hypothesis and Testing in Police Investigations

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Abstract

Scientific Criminal Investigation (SCI) is an emerging field requiring criminal investigators to employ scientific tools and techniques to solve crimes. It is significantly different from Forensic Science where lifting, processing, and validating evidence are the main objectives. SCI is initiated from the time of registration of the FIR and goes on till the conclusion of the trial. Several factors have contributed to the scientific orientation of criminal investigations. Availability of scientific tools and technology, developments in forensic sciences, public scrutiny, judicial oversight and ever-increasing understanding of police officers themselves that their efforts would be better rewarded if they follow the spirit of scientific temper are some of the factors. The root cause of all this is the way evidence is being appreciated and adjudged by the courts. The Indian Evidence Act places overwhelming reliance on oral evidence, nevertheless, the material, and documentary evidence (also called secondary evidence) are adjudged against the strict yardstick of reason tempered by scientific evaluation and validation of such evidence.

However, the journey of Scientific Criminal Investigation would be a futile endeavour if the first and necessary condition is not met. This first and necessary condition is the formulation of a hypothesis against the data set which is collected during the preliminary phase of the investigation. This article is an attempt to explain and discuss the relevance and practicality of this first and necessary condition.

Keywords: *Criminal Transaction (CT), Scientific Criminal Investigation (SCI), Hypothesis, Hypothesis Statement, Hypothesis Testing, Structured Hypothesis Development (SHD), Investigative Psychology, Information Management, Call Data Record Analysis (CDR-Analysis), Big Data Analysis, Confirmation Bias, Accused Profiling, Bomb-Scene Investigation, Base*

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Transceiver Station (BTS), Crime Scene Management (CSM), Brainstorming, Indian Evidence Act (IEA), Mobile Telephone Tower Dump Data (TTDD), Over-Ground Worker (OGW).

What is a Hypothesis?

Simply speaking, a hypothesis is a tentative explanation of an occurrence or phenomenon proposed to be studied or researched. It is the tentative explanation that is scheduled to be tested through further research. In Scientific Criminal Investigation, a hypothesis is formulated based on data and evidence collected. Hypothesis in SCI is significantly and qualitatively different from mere hunches or gut feelings based upon experience alone. It is structured, objective, precise and variable centric (variables that are proposed to be evaluated for their causal relationships in the researched Criminal Transaction).

Salient Characteristics of a Hypothesis:

- *Objectivity*: a hypothesis has no place for personal feelings and opinions. The hypothesis must arise from facts and are built around facts. Judgemental words must be avoided. Never make an untestable assertion and don't assume things unless there is corresponding evidence to substantiate your assertion.

- *Specificity*: brevity and specificity are important criteria for the testability of a hypothesis. A vague and unstructured hypothesis is bound to create difficulties during the testing/validation phase. It must be clear and precise.

- *Explanation:* It must explain the phenomena under investigation: explanation entails description/ suggestion of causal relationships between variables. In a criminal investigation, this might include the relationship between persons and crime, between incriminating articles and persons and between incriminating articles themselves.

After the case is registered and evidence is collected (crime scene investigation), steps are required to commit oneself to Structured Hypothesis Development (SHD). Structured Hypothesis Development aims at the formation of leads and objectives in a criminal investigation.

Value of Investigative Psychology in Hypothesis Formulation and Testing

Investigative Psychology is an emerging field, it covers all aspects of psychology that are relevant to the conduct of the criminal investigation. In other words, Investigative Psychology is an applied field wherein information retrieval, drawing of inferences, role of biases in information processing and its management, decision making etc are relevant to formulation of hypothesis.

Information Management

After an investigator has acquired preliminary testimonies, and other data sets (CCTV footage, phone numbers for CDR analysis, intelligence reports and reports from your sources, media inputs,

indications from available evidence etc.), an investigator must classify and categorise them. The data acquisition process aims to acquire as much relevant data as possible.

A major criminal investigation is a very comprehensive task from the data point of view. Classification and categorisation entail questions such as: Where do I place this data? What's the relevance of this information? How this information can be used? etc. A sound information recording/ storage system ensures that an investigator will get the document or the data whenever he needs it. Information access and its retrieval can be enhanced by keeping soft copies of all relevant data sets so that these can be accessed whenever necessary. If an investigator cannot get the required information within 5 minutes, there is something seriously wrong with the way data/documents are being kept.

Drawing inferences

The process of drawing inferences should be necessarily linked to what is allowed by the data sets. Draw an inference only when it's supported by an acquired data set, especially a data set that can be further substantiated by evidence. For example, all inference drawn from the CDR reports should be based on established contact chaining, time-stamps and location stamps of calls made and shall be further corroborated. If an investigator knows that '000X' phone number has been used by accused 'Y' then he must connect it by either a document based (KYC document, Subscriber Data Register etc.) or testimony based validation (a positive assertion by B_party person that

'Y' is the actual user of '000X'). There must not be a doubt between the phone number and the actual user.

Conjectures and Biases

Biases can prove damaging to the process of formulation of hypothesis. A good way to prevent the seeping in of biases in the hypothesis is to ensure that each assertion is supported by indications from the acquired data sets and nothing else. The investigator must instil a sense of teamwork where the opinion of every team member is equally respected. At the same time, it must be made clear that every assertion and opinion shall be accompanied by support from present data sets or with data/evidence that can be acquired. In this way, team members can be discouraged and made aware of the pitfalls of idle story construction.

Accused Profiling

It is a job that must be done on expeditious basis. Sometimes, it starts from just a phone number (which is reliably linked to the accused). A phone number can be immensely helpful in building upon the profile of the accused person. A detailed profile/bio-data must be made of each of the accused person and suspects.

Decision Making:

It is the line of action that is decided by the investigator that determines how the investigation will proceed. Hypothesis aids decision making by establishing contours of investigation, who will do what, what all evidence will be required to test the hypothetical threads and other decisions.

Example Case: 'Terrorist Attack by 'Al-Jabbar' at Galleria Restaurant.

Before the SHD method to form a hypothesis is discussed, let us understand and keep in mind a hypothetical case of a terrorist attack:

(Note: words in quotes in the example are fictional and have been used exclusively for illustrative purposes only)

Let us suppose that certain terrorists belonging to a banned terrorist organization 'Al-Jabbar' have detonated a high-intensity bomb in one of the swanky restaurants in the central district of Delhi. The responsibility has already been taken by the representatives of 'Al-Jabbar' by email to the popular daily 'Times of Bharat'. 18 people have died and 72 have sustained serious injuries and 33 of these injured are critical. 39 persons have sustained minor injuries and were discharged after receiving first aid. Extensive damage was caused to the property and surrounding rooms and considerable damage has happened to the building. The sound of the massive explosion was heard from as far as three kilometres.

Data Collection and its analysis

I. Collect all the information available: However Remotely Relevant to the investigation

- Collect CCTV footage of the entry and exit points of the restaurant. Survey the surrounding areas and collect CCTV footage of all relevant points.

- Collect the identity data of all persons injured, died or who entered the property at that date. Also, collect legacy data about the entry of any individual who entered the property on dates preceding the incident. Several restaurants collect phone number details of the persons entering or enquiring about reservations for their property. Such a register must be acquired as evidence.

- A survey of the surrounding BTS (Base Transceiver Station) of mobile towers must be made. A sufficient radius (let us say 200 metres) of the property be earmarked on the Google Map, coordinates noted and be sent to all the Telephone Service Providers (TSPs) to provide Tower Dump data (this comprises of all the phone numbers who got connected to those towers within a specific date range).

- Collect data regarding all the occupants in hotels, inns etc. about persons who left their rooms on the day of the explosion.

- Interview the staff who was posted (if their condition allows) on the property regarding anything unusual about anything or any individual entering the property on the day or the preceding days of the explosion. Sufficient time of composure must be granted to such individuals since they would be suffering from considerable psychological trauma from the

blast. Rather than asking leading questions, let the interview be open-ended, where they should be encouraged to speak as much as they can.

- Lead investigator must leave at least two policemen in civilian clothes who must mix in public and roam around in surrounding areas (especially pan shops and small eateries), to gather whatever information from gossip or talks among the general public. For a member of the public, it is oftentimes not a pleasant experience to converse with a uniformed policeman.

- Police staff on patrolling duty must be interviewed regarding their knowledge about the happenings in the area before the explosion and on the date of the explosion. Try to find out if they suspected anything unusual that day.

- Give wide publicity to the intention of the investigation team that they are open to receiving inputs from members of the public. A separate email address and phone number (WhatsApp number) can be declared and the inputs sought. It should be made clear that secrecy would be maintained about the identity of the informant.

II. Crime Scene Management

- In case of a terrorist attack, Crime Scene Management (CSM) has a

uniqueness of approach. Forensic Laboratory assistance is a must and several experts (ballistic, chemical, biological) must be involved in the lifting, packing and processing of evidence.

- A dedicated team of officials must be formed to analyse the CCTV footage procured. CCTV drives must be seized following due process and Section 65(b) Indian Evidence Act certificates shall be obtained from the owners of this CCTV equipment. After the drives have been obtained, these must be sealed and only the image copy received through the computer forensics lab must be used. This is to make sure that no subsequent allegations of impairment of CCTV data are levelled against the investigation team.

- Providing medical care to the victims of terrorist crime has to be the first and foremost priority. Police officers must therefore liaison well with the hospital staff. In their zeal to collect evidence and investigation, they must never forget medical needs of the injured as the absolute imperative and everything else is secondary.

- Maintain strict perimeter security, do not allow anyone whose presence is not required. Install a security camera to record everyone's entry and exit. Ask everyone to record their presence

in the in and out register opened specifically for this purpose.

III. Brainstorm and Plan

- After the initial processes have been accomplished (Crime Scene Management, primary data and evidence collection), the lead investigator must call a meeting of the entire investigation team and brainstorm with them about the *what, how and why* of the incident. It has been seen that brainstorming accelerates the formation of hypotheses by the synthesis of ideas and knowledge. It is important that in this stage the lead investigator does not express his gut feelings or hunches about the case. It is very important to listen and note. Noting down important points uttered by supervisory officers, subordinates, forensic experts, intelligence officers and other sources is very important.

- **Incubation stage:** At this stage, the lead investigator must keep his mind open and let the information flow in. Do not be judgemental of the incoming information at this stage. It is necessary to keep calm and maintain mental composure. The lead investigator must spend some time alone and consult his notes and critical information received from sources (official and informal both).

- Seek Planning inputs from the team: brainstorming with the team-mates would result in planning inputs. Note down the points and formulate the plan in consultation with the superior officers. Once a plan is formulated, fix the responsibility of the execution of the plan among team members and delegate tasks.

- Take stock of the execution of the plan on daily basis. It is important to personally supervise the achievement of each task and make sure the team-mates are constantly engaged.

- **Emergence of ideas:** incubation upon the information gathered and preliminary analysis of data gathered would lead to the emergence of patterns. For example, details regarding suspicious activity and persons might emerge. In this scenario when the responsibility has already been taken by a particular terrorist group, leads must be generated about the people involved.

- At this stage clarify, analyse and develop information on these tangents:

1. What is unusual about the evidence gathered? What does not connect?

2. Why the particular location and date was chosen? What message does the terrorist organization want to give?

3. Who is the originator of the email? When did it reach the newspaper in which it was published?

4. What is the age profile of the people who frequent this restaurant?

5. Is there anything unusual in the interview reports of the staff posted at the restaurant?

6. What are the architectural peculiarities of the bombing device, is it unique or there is an established modus operandi? (Bomb explosion database with the National Security Guard can also be used and their experts consulted).

7. Chemical/Explosives experts should be asked about the probable yield of the explosive device and the types of chemicals used in the explosion.

8. What kind of batteries, time device, quality of the components, and encasing of the bomb were used?

IV. *Write a Thesis Statement: Hypothesis: by this stage, a picture must emerge from the following:*

• Data extracted, leads generated from the Interview Statements.

• Intelligence reports.

• Call records, telephone records, analysis of the Telephone Tower Dump Data (TTDD).

• Opinions and supervisory officers, forensic experts, and investigation team members.

• Indications, leads from the evidence gathered.

• Information from the other relevant sources.

At this stage, the lead investigator must write a *hypothesis statement* of his understanding of the crime under investigation. This thesis statement can look like this:

Suggested Hypothesis

Based on investigative leads as mentioned above, by now the lead investigator must have a picture in his mind of *what, how* and *why* of the incident. Although a significant determination of the Criminal Transaction would not be possible at this stage, nevertheless tentative reasoning of the objectives and intentions of the terrorist act must be made based upon the above sources.

Hypothesis Statement(s)

(Note: This Hypothesis Statement has been assumed for illustration that it is constructed from available information, which chiefly comprises of Intelligence Report and Statement of certain witnesses whose identities have been protected from disclosure due to obvious reasons).

• In October, 2020, Al-Jabbar's Chief Maulana Abu Hamza tasked Nasir M. (resident of Mohalla xx, city: xxx of district: XXXX) and other members of a sleeper cell to survey the central district and decide on a suitable time to cause an explosion in a busy

restaurant where important people come. *(Source: Int Report).*

- An amount of 5 Lakh Rupees was sent through XYZ company (address: FFY) which deals in visa/immigration services in November 2020. The proprietor of the company Mr Abdul Hamid is related by marriage to the extended family of Chief Maulana Abu Hamza. His company has never been used earlier as a conduit for the transfer of terrorist funds. The money was routed through Dubai where a significant number of family friends of Abdul Hamid reside. *(Source: Int Report).*

- Plastic explosives were procured through one Mr FFD who originally belongs to the Gujranwala district of Pakistan but surreptitiously entered the Indian territory through Sir Creek area in Kutch, Gujarat and used several persons for supplying this explosive and other material to Nasir. *(Source: Int Report and Protected Witness: 'X').*

- 'Nasir' used other persons who are his schoolmates and were radicalized by a certain Mufti (now staying in Jeddah, Saudi Arabia). This Mufti is a friend of Abdul Hamid and was in contact with him till August 2020 and there is abrupt discontinuation between them ever since. *(Int Report and Protected Witness: 'X').*

- Nasir was staying in Madrasa ZZZY since January 2019 ostensibly to study advanced Islamic literature in a seminary organized by one Maulana 'Atiq-uz-Zaman'. Other members of the sleeper cell were staying in different places and used to meet every Friday after prayers in Delhi's Jama Masjid to discuss the progress of their activities. *(Source: Int Report).*

- Bomb-making manuals and other materials were arranged by FFD using the services of one CCFD who is unknown and a resident of Meerut. FFD also arranged 6 country-made pistols through CCFD for members of sleeper cells for their protection. *(source: Protected Witness 'X').*

- Bomb was placed in one black backpack made of Puma brand and placed at approximately 19:13hrs near the northern wall of Galleria. Nasir himself placed the bomb and exited the restaurant at 19:47 yhrs without finishing his order. *(Source: Protected Witness: 'Y').*

- At 19:59 the bomb went off using a remote-controlled device.

A peculiarity of this hypothesis is that it looks more like an intelligence report than a strict 'few words hypothesis' as seen in the scientific projects. The reason is that the hypothesis is indeed a result of an intelligence report and deposition by witnesses whose identities are protected. The remarkable fact is significant congruence between intelligence reports and the deposition recorded by the protected witnesses. In a criminal investigation, evidence is further used to substantiate the hypothesis whereas in intelligence domain the information is supplied on a preventive basis. There

is a significant difference in approach in investigative and intelligence domains.

Certain determinations need to be made at this stage:

- What evidence is already available to substantiate the hypothesis points?

- What additional evidence is required to substantiate the hypothesis points?

Next Step: Evaluation of Hypothesis and Analysis of Evidence Gathered

In a true sense and practice, the SCI starts from the evaluation of the hypothesis after it is made. Each point of the hypothesis is now subjected to the evidence available and potential evidence. It is assumed that a significant part of this hypothesis is a result of intelligence reports and interview statements of certain arrested persons. Because of the tentative nature of the hypothesis, it might require further adjustments in light of new evidence. Let us find out what are the evidentiary requirements in the investigation when each point of this hypothesis is subjected to the rigours of scientifically oriented investigation:

I. **Hypothetical Statement 1:** *"In October, 2020, Al-Jabbar's Chief Maulana Abu Hamza tasked Nasir M. (resident of Mohalla xx, city:xxx of district: XXXX) and other members of a sleeper cell to survey the central district and decide about a suitable time to cause an explosion in a busy restaurant where important people come."*

    - What do the contents of seized mobile phones (of arrested persons) indicate to substantiate

this assertion? Is there anything that points out the conspiracy of Nasir or Abu Hamza to bomb a place in Delhi? If yes, who has pointed them out? Have the recovery proceedings been done u/s 27 of the Indian Evidence Act as required? Who are the other members of this sleeper cell? is there any content on the seized cell phones that points to their identities?

    - At this stage the evidence required would be: identities of other members of sleeper cells from the communication logs found in the seized phones, recovery of anything from the arrested persons u/s 27 Indian Evidence Act, analysis of the pattern of communication between Nasir and others (from the CDR analysis). Find out if the arrested person is ready to record his statement before a Magistrate u/s 164 of the CrPC as it then can be used as evidence to substantiate the conspiracy.

II. **Hypothetical Statement 2:** "*An amount of 5 Lakh Rupees was sent through XYZ company (address: FFY) which deals in visa/immigration services in November 2020. The proprietor of the company Mr Abdul Hamid is related by marriage to the extended family of Chief Maulana Abu Hamza. His company has never been used earlier as a conduit for the transfer of terrorist funds. The money was routed through Dubai where a*

significant number of family friends of Abdul Hamid reside."

- What were the account details through which this amount of 5 lakh rupees was sent? How many accounts does the company XYZ maintain and get a forensic accounting analysis done from an expert to substantiate the routing of money through the accounts?

- Find out business dealings and persons involved with Abdul Hamid. Find out who his other business partners are. Look-Out-Notices may be issued through INTERPOL for the detention of these persons. Follow guidelines issued by the superior courts before such notices are issued.

- Identities of the persons who recently availed of the visa/immigration facilities. Available phone numbers from the identity documents must be looked for in the CDR database for a match with suspected accused persons.

- Find out the personal accounts of Abdul Hamid, family members and staff. Check the phone numbers linked with these accounts and run a check against the CDR database for matching with any suspect.

- Call for CDRs of numbers used by Abdul Hamid, family members and staff and analyse the common linkages between these numbers and those of the suspected accused. Common linkages may denote involvement in the conspiracy. Develop further intelligence by requesting the intelligence agency/branch concerned.

- Check for all the incoming money transfers from Dubai based accounts. Amounts in the range of 5 Lakh must be looked into. These accounts came from which account numbers? At this stage, an MLAT (Mutual Legal Assistance Treaty) Request needs to be sent to UAE authorities for providing customer identity (KYC) details and account statements of account numbers through which amounts were sent in November 2020.

III. **Hypothesis Statement 3**: *"Plastic explosives were procured through Mr 'FFD' who originally belongs to the 'XXx' district of 'X' Country but surreptitiously entered the Indian territory through a particular border area and used several persons for supplying this explosive and other material to Nasir".*

- Check if FFD's details are available in any seized mobile phone. Interview suspects persons about any lead to FFD.

- Ask the source of an intelligence report about the details of FFD in their database. What phone number was being used by FFD while in the 'XXx' district? Does this number reflect in any of the

CDRs of suspected persons?

- FFD must have called someone while he was in the 'XXx' district. If an investigator has the phone number of that district, obtain the India-Hit of the number from the TSPs. The India-Hit is the Indian phone number that was connected to any foreign number that either received or made a call to someone in India. By this, an investigator might be able to get the phone number of the persons he was connected with. Find out these persons and interview them. Good liaison with other police/intelligence agencies is the key here. This exercise might result in the apprehension of FFD's helpers and sympathizers. These kinds of accused are generally called OGW (Over Ground Workers).

- Run the India-Hit numbers against the Tower Dump Data (around Galleria restaurant). If a positive hit is found, then it's a strong indication of such a person being a part of the conspiracy. Use the services of the Technical Interception/Surveillance team to get this person apprehended. Necessary approval of your senior officers needs to be taken.

- If an investigator gets the identification of FFD (intelligence might provide it, or if any of the arrested suspects recognizes him a sketch can be made), advertise the sketch/photo and give it wide publicity. It might be instrumental in the apprehension of FFD.

- Traces of plastic explosives used must have been collected by the swab method. Contact the FSL (chemical expert) for his expert opinion regarding the chemical composition and unique chemical signatures. Sometimes, unique chemical signatures of plastic explosives can be instrumental in identifying the source country from where the explosives came. Plastic explosives are generally made by defence corporations (Government and private). If the plastic explosive was made in a neighbouring country the chemical examiner would be able to opine.

IV. **Hypothetical Statement 4:** *"Nasir used other persons who are his schoolmates and were radicalized by a certain Mufti (now staying in 'YY' Town, 'Y' Country). This Mufti is a friend of Abdul Hamid and was in contact with him till August 2020 and there is abrupt discontinuation between them ever since".*

- If Nasir's schoolmates are his co-conspirators, then their identities are easy to establish. Find out their identities from the school where Nasir studied.

- Suppose they are absconding, find out their details like phone numbers, interview persons they were in frequent contact with, and

find out all the relevant details that would help in their apprehension.

- By now, an investigator would have their telephone numbers. Call and analyse their CDRs and place top five (or more) frequent call numbers on active technical surveillance. This might give an investigator further leads.

- Interview Atiq-uz-Zaman. He should be considered a suspect. Try to make him understand so that he cooperates with the investigation. His statement might give an investigator, pertinent details about Nasir and his network.

- Find out phone numbers belonging to 'YY' country from the CDR of Abdul Hamid. Check those numbers with the CDRs of Nasir and his associates.

V. Hypothetical Statement 5: *"Nasir was staying in Madrasa 'ZZZY' since January 2019 ostensibly to study advanced Islamic literature in a seminary organized by one Maulana Atiq-uz-Zaman. Other members of sleeper cell were staying in different places and used to meet every Friday after prayers in Delhi's 'XJ' Mosque to discuss the progress of their activities".*

- Find out who others were teaching Nasir in the madrasa? How did he get the admission? Who were his co-classmates? Statements of the head of the Madrasa and teachers and other students

who studied with Nasir must be recorded.

- Find out the background of Atiq-uz-Zaman. His mobile device may be seized immediately and contents are copied following the procedure. Study the contents of the seized mobile phone to see anything incriminating or anything that can provide a lead between him and Nasir.

- Identify every member of the sleeper cell. Take out the CDRs of numbers that they were using. Thoroughly search the rooms that they were staying in to find out anything that can be used as evidence and can give possible leads.

VI. Hypothetical Statement6:*"Bomb-making manuals and other materials were arranged by FFD using the services of one 'CCFD' who is unknown and a resident of Meerut. FFD also arranged 6 country-made pistols through CCFD for members of sleeper cell for their protection".*

- As the only available information about CCFD is that he belongs to Meerut, ask Atiq-uz-Zaman what he knows about Nasir that connects him to Meerut. Search for CDRs of Atiq and Nasir for numbers that are registered in Meerut.

- Separate the numbers that are registered in Meerut and call their CDRs (this bundle of CDRs

should be called 'set_Meerut'). Now, make a fresh set of CDRs of all suspects (excluding Atiq and Nasir and call this 'set_X'). Look for common numbers. The common numbers (also called 'common B_Parties) are the link between Atiq/Nasir and other suspects. There is a high likelihood that these 'common B_Parties would know something about the identity of CCFD. Once CCFD is identified, it would be possible to arrest him.

- It is possible that some of these common Parties were involved in providing material and other assistance to CCFD. Confirm, from the intelligence sources their background and likelihood of their involvement. Ask the local police for assistance in their background verification.

VII. Hypothetical Statement 7: *"Bomb was placed in one black backpack made of Puma brand and placed at approximately 19:13hrs near the northern wall of Galleria. Nasir himself placed the bomb and exited the restaurant at 19:47hrs without finishing his order".*

- Traces of biological residue like hair fibre particles etc. can be found on the black backpack. When an investigator formats the request for forensic examination includes a question in this regard. Also, obtain biological samples of suspects to enable possible

matching. A positive match would be a big help. Also, find out from the arrested accused wherefrom they bought the bag. Tracing needs to be done from the shop wherefrom the bag was bought. The shop might have CCTV footage of the date on which the bag was bought. Look for identification from the footage.

- Chemical residue (trace amounts) of the RDX would be found on the bag. Include a question in the requisition format of questionnaire for forensic validation.

- By now an investigator would have a photograph of Nasir and some other suspects. Show these photographs to the staff posted at the restaurant. In case of identification, an investigator can use the testimony as evidence of the involvement of Nasir in placing the bomb.

- CCTV footage analysis: CCTV footage of the cameras installed in the restaurant and around should be thoroughly analysed to substantiate entry/exit of accused persons and placement of bomb.

The Importance of Hypothesis and Its Formulation

I. Hypothesis acts as a foundation: if the criminal investigation is the edifice, then the initial hypothesis is the foundation on which it is built and tested. Without the foundation,

there can be no structure and a solid foundation is instrumental for the stability and strength of an edifice. After the preliminary processes of evidence collection and its appreciation, the structure of the hypothesis can be discerned after brainstorming with peers, seniors, consultants and subordinates. A structured hypothesis goes a long way in keeping the investigation on track and each statement can then be used to link evidence and potential evidentiary substantiation. As illustrated in this article each statement of a structured hypothesis then becomes the marker for which a particular axis of investigation can be planned in a focussed manner.

II. *Hypothesis provides a framework for investigation:* a major investigation is necessarily a collaborative endeavour. Hypothesis formulation provides a framework within which the investigative team and others associated with it can find where they fit in and where they can help.

III. *Structured Hypothesis Brings Scientific Vigour to the Investigative Process:* Oftentimes, investigation agencies grapple with the problems of unstructured investigative models. Sometimes, the investigation officers are bombarded with competitive theories and disjointed hypotheses coming from every corner. Brainstorming and subsequent hypothesis formulation in a structured way ensures that the investigation

gets a sound footing which is firmly planted for the subsequent leap. A scientific research process that a criminal investigation truly is demands formulation of a hypothesis after the preliminary data and collection are collected. Armchair theorization is of no value here since a lot of data and indicative evidence is collected just after the registration of the case when the crime scene has been researched and evidence is lifted.

IV. *Hypothesis Formulation brings Synergy Among the Investigation Team and Makes the Task of Supervision Efficient and Effective:* there is an inherent element of commitment in the formulation of the hypothesis and subsequent evaluation processes attached to it. When an investigation team formulates a hypothesis and then focuses its energies on the evaluation of the same, it commits itself and knows in advance what needs to be done. This process brings synergy to the team because of an enhanced understanding of what needs to be looked into and what evidence to look for. For supervisory officers, the hypothesis is a good starting point to assess the evidentiary requirements of the ongoing investigation and to appraise themselves of the challenges and needs of the investigation team. This also gives the opportunities to the supervisory officers to advise and guide the Investigative Officers due to their superior knowledge and

experience. No matter how intelligent and experienced an investigator might be, a supervisory officer's sound guidance and advice should always be welcomed and proactively sought.

V. ***Hypothesis acts as a reference point***: the hypothesis is the vantage point from which the actual scientific journey begins. It is the reference point to come back periodically and evaluate the progress of the investigation from the vantage point of the initial premises. The practicality of this approach lies in the fact that from time to time the investigation team needs to evaluate the progress of the investigation about each axis (point) of the hypothesis. Initial premises (the point of hypothesis) can then be modified/extended whenever the subsequent investigation reveals facts.

VI. ***Hypothesis acts as a ladder that leads to the revelation of Criminal Transaction***: Scientific Criminal Investigation can also be equated to threadbare analysis and substantiation of the criminal transaction. We must unearth 'what' has happened, then 'how' it happened and also look into the 'why' (motive side) it happened. A well-structured hypothesis streamlines an investigation and provides the necessary focus.

VII. ***It enhances team effectiveness***: the structured hypothesis is no doubt a result of intensive brainstorming by the team that should lead to team commitment towards substantive validation of the hypothesis proposed

by it. All doubts, presumptions, gut feelings, and conjectures must be validated within the four corners of information/evidence available and the possibility of further information/evidence. A structured hypothesis enhances the team's effectiveness if major assumptions of the hypothesis are distributed among team members (or smaller teams if feasible). This ensures that a modular approach is followed for the specific assumption. If a team component is dedicated to a specific assumption or hypothesis in the early part of the investigation, it has a much better chance to join the dots and search for substantive evidence. For example, a three-person team dedicates itself to finding out how Al-Jabbar created the sleeper cell, who were the members of it, how and where the conspiracy came into being, etc. (let's call it the '*conspiracy team*'), then due to their focus towards one part of the hypothesis they have a better chance of finding the missing pieces of the puzzle.

References

1. Andersen S. and Fossdal J.P. (2021). *Crime Science and Digital Forensics: Modelling Criminal Investigation, Process, Quality & Requirements*. CRC Press

2. Anderson T. Schum D. and Twining W. (2005). *Analysis of Evidence*. Cambridge University Press.

3. Devery C. (2010). Criminal Profiling and Criminal Investigation. *Journal*

of Contemporary Criminal Justice, Volume 26, Issue 4, pp. 393-409

4. Donalds C. M. and Osei-Bryson K. (2006). *Criminal Investigation Knowledge System: CRIKS*. Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06), pp. 155b-155b.

5. Fahsing I., Rachlew A. and May L. (2021). Have you considered the opposite? A debiasing strategy for judgment in a criminal investigation.

6. Ferrara E., De Meo P., Catanese S. and Fiumara, G. (2014). Detecting criminal organizations in mobile phone networks. *Expert Systems with Applications*, Volume 41, Issue 13, Pages 5733-5750.

7. Hu J. (2018). *Big Data Analysis of Criminal Investigations*. 5th International Conference on Systems and Informatics (ICSAI), pp. 649-654.

8. Kumar M., Hanumanthappa M. and Kumar T. V. S. (2017). *Crime investigation and criminal network analysis using archive call detail records*. Eighth International Conference on Advanced Computing (ICoAC), pp. 46-50.

9. Ladham S., Koehler S. A., Woods P., Huston R., Dominick J., Fochtman F.W. and Wecht C. H. (2005). A case of death by explosives: the keys to a proper investigation. *Journal of Clinical Forensic Medicine*, Volume 12, Issue 2, ,Pages 85-92,

10. Osterburg J.W. (1981). Scientific Method and Criminal Investigation.

Journal of Police Science and Administration, Volume: 9 Issue 2, Pages: 135-142.

11. Pena M. S. (2000). *Practical Criminal Investigation*. Custom Publishing Company, 5th Edition.

12. Raskin D. C. (1989). *Psychological methods in criminal investigation and evidence.* Springer Publishing Company.

13. Rossi D. and Vorpagel R.E. (1982). Psychological Profiling and Crime Scene Behavioural Analysis. *Journal Police Chief*, Volume: 49 Issue 1, Pages: 152-159.

14. Sonja et.al. (2016). To analyse a trace or not? Evaluating the decision-making process in the criminal investigation. *Forensic Science International*, Volume 262, Pages 1-10.

15. Sunde N. (Structured Hypothesis Development in Criminal Investigation: A method aimed at providing a broad and objective starting point for a criminal investigation. *The Police Journal*, 95(2), 276–295.

16. Tapia A. H. and LaLone N. J. (2014). Crowdsourcing Investigations: Crowd Participation in Identifying the Bomb and Bomber from the Boston Marathon Bombing. *IJISCRAM* vol.6, no.4, pp.60-75.

17. Thurman J.T. (2017). *Practical Bomb Scene Investigation*. CRC Press.

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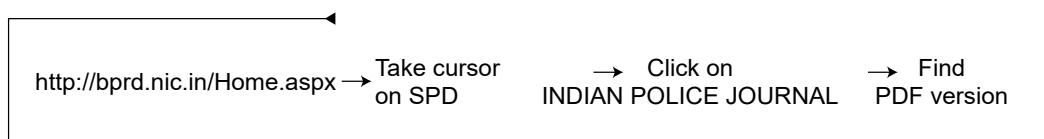
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