

INTERNATIONAL JOURNAL OF ETHICS, TRAUMA & VICTIMOLOGY



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7th Conference of
**Indo Pacific Academy of
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INPAFNUSCON-2021



6th-7th Nov. 2021



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International Journal of Ethics, Trauma & Victimology released by Dr. Nishtha Jaswal, Vice-Chancellor Himachal Pradesh National Law University, Simla H.P. Online at the 7th conference of INPAFNUS

INTERNATIONAL JOURNAL OF ETHICS, TRAUMA & VICTIMOLOGY

Journal supported by

Society for Prevention of Injuries and Corporal Punishment (SPIC)
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AIMS AND SCOPE

This journal is published to expand the academic activities and spread the knowledge, ideas and latest research in the field of ethics, trauma, and victimology. This journal publishes original research papers, review articles, case reports, letters to the editor and review of books on ethics, trauma, and victimology. This journal is supported by the Society for Prevention of Injuries and Corporal Punishment (SPIC) and Indo Pacific Academy of Forensic Nursing Science (INPAFNUS). This journal is supporting the aims of the SPIC and the INPAFNUS. This journal also highlights the achievements of the SPIC, INPAFNUS and their members.

This journal covers the various aspects of ethics, evidence-based medical ethics, ethical dilemmas and various dynamic issues related to ethics. It also covers the ethical issues related to Forensic Nursing Science, Forensic Odontology, and Forensic Psychiatry. It also covers the ethical aspects of Toxicology including Environmental Pollution. It covers issues related to all sorts of corporal punishment and their prevention, particularly in schools. It covers physical as well as psychological aspects of trauma and clinical forensic medicine related to all types of injuries and prevention of injuries. It covers all aspects of victimology including etiology, crime scene investigation, and prosecution.

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Issuance	The volume of Distribution
Half Yearly	1000 copies
The first volume of the journal published in 2015	Review Process
Founder Editor in chief	It is a peer-reviewed journal. The double-blind review process is followed.
Dr. R K Gorea Email: editoretv@gmail.com	Funding Bodies Support by SPIC, INPAFNUS and donations from philanthropists and advertisements in the journal.
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Published by Forensicwayout	Online Submission at Email: editoretv@gmail.com
Dr. R. K. Gorea #E-209, FF, R1, DLF Hyde Park, New Chandigarh, PO. Mullanpur Garibdas, Distt. SAS Nagar, Punjab, India 140901 Phone number: +919872020840 Email:gorea_r@yahoo.com	Address request for a reprint or further information relating to any article may please be made with the author and in the case of multi-author, please communicate with the corresponding author.
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ISSN Numbers	Subscription Information
ISSN-L: applied for P-ISSN: 2394-6822 e-ISSN: 2395-4272	Rs. 5000 (Abroad US\$ 120 or Equivalent)/issue Rs 10,000/Year (Abroad US\$ 200 or Equivalent)/year
International Journal of Ethics, Trauma & Victimology (Online)	Subscription should be addressed to:
Available online at http://ijetv.org/index.php/IJETV	Zenith Design World, 22 No. Phatak, Patiala 147001 Punjab India Phone number: +919872666799 Email: zafar.zenith@gmail.com
Indexed with Index Copernicus at	Claims for Missing Issues
https://journals.indexcopernicus.com/search/details? id=45254	A copy will be sent to subscriber provided the claim is made within 2 months of issue of the journal and a self-addressed envelope of the size of 9"x12" duly stamped is sent to the editor in chief (those of who want the journal to be dispatched by registered mail should affix appropriate Stamps)
Citefactor at	
http://www.citefactor.org/journal/index/11666#.WkskhtKWbDc	
Scilit at	
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INTERNATIONAL JOURNAL OF ETHICS, TRAUMA & VICTIMOLOGY

Vol. 7 No. 2

July-December, 2021

Print ISSN: 2394-6822

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IJETV

A Half-Yearly Publication
Volume 7(2), 2021

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Editor-in-Chief: Prof. Rakesh K Gorea

From the Editor's Desk

Dear Readers

With the blessings of the Almighty, with the publication of this issue, we are completing our 7th year of successful publication of the International Journal of Ethics, Trauma & Victimology. The credit goes to the team working hard for the publication of this journal. Now this is an open-access journal and all the issues of the journal are available at: <http://ijetv.org/index.php/IJETV>

For the success of the journal, I will like to congratulate the contributors, reviewers and members of the Editorial Board who see to it that the journal is published on time always.

I will like to thank the members of the Society for Prevention of Injuries and Corporal Punishment [SPIC] and Indo Pacific Academy of Forensic Nursing Science for their continuous support in making this journal a successful venture. This Journal is a peer-reviewed and indexed journal and there are no submission charges.

I hope that this support from the reviewers, authors and members of the editorial board will continue in the future and I assure you that we will maintain the standards and improve them further by your valuable suggestions.

Dr Rakesh K Gorea
Editor-in-Chief

INTERNATIONAL JOURNAL OF ETHICS, TRAUMA & VICTIMOLOGY

IJETV, VOL. 7 (2), JULY-DECEMBER, 2021

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Basics of Victimology for Medical Personnel

Rakesh K. Gorea

Professor and Head, Forensic Medicine, Gian Sagar Medical College, Punjab, India

ABSTRACT

Forensic physicians, gynecologists, forensic nurses, emergency medical officers and other doctors are coming across victims of violence and they need to know the basics of victimology. They need to know how to deal with them to recognize the investigative, therapeutic, judicial, social and cultural needs of the victims. They should know that victims have the right. A brief exploration of the various aspects of victimology which can be useful to the medical stakeholders is being introduced and discussed in this paper. Starting from the history of victimology to the various theories of its origin, victim's rights, victimology ethics, and the financial burden on the society are being discussed in this paper so that medical professionals can get aware of these aspects of victimology and ultimately this knowledge can guide and help them to deal with the victims rightfully.

Keywords: Ethics, Restorative justice, Rights of the victims, Victim, Victimology.

Int J Eth Trauma Victimology (2021). DOI: 10.18099/ijetv.v7i02.1

INTRODUCTION

History

The word "victim" originated in English in 1497, when the victim was sacrificed as an offer to some God during the worshiping rituals. By 1660, it referred to a person being hurt, tortured or sacrificed.¹

In the last century (1940), victimology was part of social science and the victim's role in the occurrence of crime was studied. It was thought that the victim too played a part in the victimization. Later on, the victim's treatment in the criminal justice system was studied.²

History is divided into three distinct stages: the Golden period, the Dark period, and the re-emergence of the victim period.

Golden Period: In the Golden Period, victims determined the compensation or punishment to the offenders as it is in most tribal laws. It was also known as a victim justice system.

Dark Period: In the Dark period, also known as the criminal justice system, offenders were considered to do crimes against the king or government, and the king or government decided about punishment to the offenders and the rights of the offenders were talked about. Compensations of the victims were left to the civil courts. Victims were ignored in this system and they did not have a say in punishment or compensation.

Re-emergence of the Victim Period: In the Re-emergence of the victim era, emphasis is on the rights and needs of the victims.

In the last 40 years, emphasis on dealing with victims has changed by merging positivist, radical and critical approaches leading to changes in policies of dealing with the victims.³

Definition

Victimology denotes different things to different observers: scientific, academic, social movement, advocacy or reform;

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How to cite this article: Gorea RK. Basics of Victimology for Medical Personnel. *Int J Eth Trauma Victimology*. 2021;7(2):1-5.

Source of support: Nil

Conflict of interest: None

Received: 30/07/2021;

Received in revised form: 24/12/2021;

Accepted: 27/12/2021;

Published: 20/01/2022

a humanitarian or political campaign.⁴ In modern days victimology is defined as the psychological effects of the experience of being a victim as deduced from the victims of crime study. It is also considered an attitude is constantly perpetuating being a victim.⁵

Forensic victimology is concerned with the critical evaluation of the lifestyle, circumstances, and events which lead to a person being injured.⁶ Forensic Victimology is a branch of applied victimology in which victimization is studied scientifically to find out the truth. It deals with finding out the worthiness of the statements of the victims.⁷

Ferguson and Turvey best define victimology as a "Scientific study of the victims and victimization which involve investigation, media, social movements, courts, and corrections; and the relationship between victim and offender".⁶

Theories

In victimology, the criminal justice system is usually much talked about with some emphasis on the remedies for the victims but the lesser part which is not talked about is the patterns and risk factors of victimization.⁸

In the victimology concept, the victim's relationship to criminology and social sciences is important, but society's reaction to the victimization is equally important for helping the victim and preventing the crime. It is important to treat the victim in a criminal system in a good manner, but

simultaneously, an alleged offender may become a victim if he is falsely accused. Victimization may result in homicides, suicides, victimization of children and elders and genocides. Victimization maybe by exploitation by institutions, including white-collared crime and sexual offenses.⁹

Positivistic Theory: Human behavior is affected by factors that may not be in the control of humans as per positivistic theory.⁹ This theory studies factors of victims and environment that lead to victimization.¹⁰

Defective Genes and Injuries: Crime may be due to hereditary defects resulting from defective genes. It may also be due to injury to the head and some brain illnesses.⁹

Social Structural Theory: Crime may be the result of sociological factors. Social structural theory mentions the crimes due to unequal distribution of resources and crimes is done by not haves.

Control Theory: Control theory says criminal activity is due to bonds with a crime that a person learns from.

Labelling Theory says that some people are labeled as criminals due to which crime occurs. Critical victimology says that labeling a person as a victim is like stating values. Social psychology plays an important role in why some are labeled as victims with injuries and others not labeled as victims.¹⁰

Lifestyle Exposure Theory: explains the different rates of victimization to individual lifestyles.¹¹

Asli in 2013 had explained the occurrence of crime on the active personality of the victim, passivity of victim and nature of victimhood/victimization, and this theory can help to prevent the crime and make a good judicial system by framing proper policies.¹²

Victimology is on the social theories like criminology, and there is a lack of strong theoretical orientation. There is more stress on the assistance to the victims and the victims' rights. It has less teaching content and is almost the same as in criminology. As a separate branch, it has less recognition internationally. The scope of the branch still has not expanded as it should have.¹³

Routine Activity Theory is most commonly being used for victimization.¹¹

Green Victimology is the latest in victimology and includes the non-human species and the environment and it takes the call for Eco-justice.¹⁴

Now the applied victimology is getting its due importance comparing to the theoretical approaches of victimology, improving the services in victimology.¹⁵

Criminology

"Criminology is the study of the crime as a social phenomenon."

⁹ In criminology, initially the offender was in focus and now the victim is in focus of research.¹⁵

Victimology is now a subarea of criminology which is well established and is a scientific study of the harms and the center of the study is a victim and not the offender.¹¹

Process of collecting the facts of the case, which could, later on, be put before the court as evidence to prove the case, is a criminal investigation.⁶

Now victimology is not a part of criminology but it has also not evolved completely as a social science too.² In 2009, Kirchhoff concluded that victimology has developed into a social science discussing victims, victimization, and the reactions to both these entities.¹⁶

Investigation

There can be a psychological investigation to look into the offender victim relationship. It helps in the scientific verification of the evidence of what the victim says. Victim profiling can be studied to make possible the investigation of the crime.¹⁷

Patterns

In business, there may be different patterns and businesses can be ideal victims, and research is needed on this type of victimization.¹⁸

In offenses of rapes, a person living alone or with someone may also affect the victimization. Rape victims also reported more lesbian experiences than non-raped in one of the studies.¹⁹ Incest has its patterns. The child sex industry shows the interest of the adults in children.²⁰

New types of crimes are emerging with the availability of new gadgets and studies are needed to effectively deal with such crimes e.g., carrying weapons to schools in some countries, the role of drugs in crimes, campus crime, stalking and female stalkers.²¹

Patterns may differ depending upon the type of the crime.

Risk Factors

Weak victims will stop engagement with the law enforcement agencies and this trait will make them further vulnerable to being victims again. Victims who withdraw early will help the police know that such victims will make themselves vulnerable to being victims again, especially in intimate partner violence.²²

Some clusters are seen where there is more victimization.¹⁵ Rapes in university campuses and mass shootings are situational victimizations. Cybercrimes also fall into the same category.²³

Depending upon the crime, risk factors may be different. These may be Criminal, Socioeconomic, Psychological, or Psychiatric factors. Social Feminism is a factor in domestic violence.²⁴ Research is required to know the factors that make the individuals vulnerable to becoming the victims.²⁵

Media and Social Media

Media changes the way a victim is looked upon.²⁶ Social media responds differently to the same type of crime depending upon the victim's plight, the severity of the crime, celebrity status of the victim or offender.⁹ It also depends upon the religion or minority status of the victim in India. It is also raised in



social media for the benefit of the political parties, especially near the elections.

When a victim is a celebrity, it attracts social media and even affects the policymaking as such victims are often heard more while policymaking, as had happened in one case in Australia and led to reforms on the family violence policies.²⁷

Obscene material, including pictures and videos, are transacted on social media to promote prostitution²⁸ and putting obscene materials online may lead to victimization of the persons.

Criminal Justice System

It is a system where government agencies enforce the law, deliver judgment on crime, and correct the conduct of the criminal. To make this system successful, offenders need to be punished and make such efforts that criminals do not repeat the offences, keep law and order in society and prevent the crime, compensate the victims, and rehabilitate the offenders.²⁹

In this system, multiple agencies and professionals are involved in law enforcement, investigative and supporting forensic science agencies, judiciary, and those involved with corrections. Academicians, too, play an important part in studying, teaching and researching these topics.³⁰

Punitive Justice System

The punitive system is still popular in the UK to control crime (26) and is prevalent in different countries less or more. It is more linked to the offenders and resources are used to prevent the crime.²⁶

Restorative Justice

Restorative justice is a criminal justice system in which offenders are rehabilitated by reconciliation with the community and the victims.

It is considered that restorative justice will make the environment of the schools better by diminishing the misbehavior and indiscipline in the schools.³¹

Zero tolerance may lead to suspensions and expulsions, especially in the colored students in the schools in the USA. Restorative justice removes the racial disparity in the schools and is considered better than punitive justice in schools.³² Theory and practice of restorative justice can be learnt by putting this in the academic curriculum of the schools and students learning the practice of restorative justice otherwise which is usually done by adults.³³ Though restorative justice seems acceptable in schools for misbehavior and indiscipline. There is meagre evidence and acceptability of restorative justice in the cases of sexual assaults.³⁴ Many institutions have emerged to take care of the victims and their rights in the last 4 decades.²⁶

Now the restorative justice is well accepted and well implemented in many countries.¹⁵

Relationship between the Victim and Offender

In the judicial process, the offenders' family is also victimized though there may not be any fault of theirs.³⁵ Victims and

offenders are a penal couple and an investigative outlook is required.

Compensation and Financial Impact of Victimology

Victims create a financial impact on the governments, society and families. It involves health costs, treatment costs, investigative costs, judicial system costs, punishment, and rehabilitation costs when it involves drugs and crime costs may be phenomenal. Surveys are needed to know the extent of victims and its various epidemiological factors, which themselves cost to the exchequer. These surveys tell the important aspect of crimes and the crime trends. whether these are increasing or decreasing and tell the efficacy of the prevention measures

Public Safety and Public Health

To keep the public safe from the offenders and preventing them from being the victims, and reduction in the offending behaviour.³⁰

Ethics

Ethics are the norms and values of how victimology should be practiced. How people should behave or deal with each other. It applies more to professionals while dealing with their clients so that no question of unfairness arises in the mind of anyone. Ethics are concerned with morality, usually set by society and professional bodies. Ethics may look different to the victim, and the offender as their perspectives are different. The victim thinks that ethics have not been followed, which is why the victim has suffered. After committing the crime, the offender expects ethics to be followed by the victim and society while being tried and brought to the books.

All those involved with the criminal justice system must follow ethics and all these professionals must be reliable and accountable. They should be competent and trustworthy. Ethical behaviour is the key factor in upholding the judicial system's pillars.(30) A relatively new concept of positive victimology is there so that it may be introduced for the benefit of society and will be an enhancement of victimology.³⁶

Remedies and Rights of the Victims

Though punishment to the offenders may give solace to the victims yet there is a need for proper treatment and insurance along with prevention of victimization and compensation.⁹

Why a person is targeted comes from the history and circumstances of the victim.

Victims have rights and these may differ from country to country.

Victims have rights; they should be notified of what is happening in the courts to be notified about all the court hearings. They have the right to be physically present in the courts and give their opinion.³⁷

The victim suffers financial losses too and he will have to either absorb the loss himself or depend upon the insurance companies.³⁸ They have the right to compensation.³⁷ and can



be helped by welfare schemes of the government or charity of some other agency.³⁸

They also have the right to restitution.^{37,38} The rights of the victims are increasing with time.²⁶

MATERIAL AND METHODS

A search was done on the Google scholar search engine with victimology and ethics as the keywords and some missing information was sought on the Google search engine. Articles found relevant after reading the abstracts were selected, read and the information gathered was presented in this paper.

DISCUSSION

Theories of victimology are applied practically by forensic physicians and forensic nurses while assessing and treating the victims. Forensic victimologists should be very objective, neutral and scientific.⁹

Victims have suffered physically, psychologically and financially in criminal events and care should be taken that they are not harassed further in the treatment, investigative and judicial process. Victims have rights that should be known to all and respected by all involved in dealing with the victims. Victims should be treated with respect and given proper dignity due to being human beings. They should be informed of all the court proceedings and have a right to present there if they wish. Their waiting area should be separate and not the same as that of n offender.

There is a need to further study the interaction between law enforcement agencies and the victim to improve the outcome. Research in elder and child abuse, sexual abuse, violent crimes, human trafficking, mobbing, victimization at detention and jails and cybercrime will further provide input that will help the victims and prevent victimization. There is a lot needed to be done to prevent the victimization of cybercrimes.

Same-sex violence and recurring victimizations also need to be researched.²³

In Russia, adult males are not given a space in victimology and are rather restricted to women and children. Hyper-masculinity is more related to the offenders or criminals.³⁹

Dynamics of crime, whether online or offline are seen from the viewpoint of the victims, including terrorism, hate crimes and identity thefts.⁴⁰

Victims should have a counselor if they need them and should know any monetary assistance or legal assistance if they can have for free.

In the case of sexual assaults, victims should know the Sexually transmitted diseases and HIV status of the offender if these tests are carried out of the offender.

Victims have many rights, but they are often not able to use these rights. The victim should too know their rights so that utilize their rights. Punishment is expected by society when a person does wrong to somebody else. Punishment may take different formats. But while this is being done human rights of the offenders must also be taken care of.

Victimology is often linked to every country's political, social, and economic aspects. Victimology needs to be linked to human rights and should include victims of repression along with victims of violence.⁴¹

CONCLUSIONS

Victimology is the scientific study of the causes, results and social reactions of victimization and victims. Again, the emphasis is shifting to the victims from the offenders in criminology, which is the right approach as the victim is the ultimate sufferer.

The rights of the victims should be recognized and should be followed.

Victimologists should follow the ethics completely while dealing with clients irrespective of the offender or the victim. Further research is needed to deal more effectively with the victims in different victimizations.

Once the medical and nursing professionals know about victimology and the various aspects of victimology, they will be in a better condition to deal with the different aspects of the victims and they will be able to handle the victim effectively.

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Cephalometric Analysis for Gender Determination Using Maxillary Sinus Index in Population of Gujarat, India

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ABSTRACT

Introduction: Humans are sexually dimorphic. Identification of remnants of skeletal and decomposing parts of humans is one of the most difficult skills in forensic medicine. Forensic anthropologists can receive whole or fragmented skeletal remains. But the unique thing is that the maxillary sinus is intact within the skull, so maxillary sinus radiography is being used to identify remains and determine gender.

Materials and Method: A total of 51 adult digital lateral cephalometric radiographs (20 males and 31 females) were included in the study. The maxillary sinus analysis was performed by measuring the height and width of these digital lateral cephalometric radiographs using measurement tools of Sidexis4 software. Maxillary sinus index was calculated, discriminant function analysis performed, and discriminant equation derived for determination of gender.

Results: Comparison of maxillary sinus parameters (height and width) between male and female groups showed statistically insignificant differences in this study. Regression analysis is done and an equation is derived, which will aid in the prediction of gender by substituting the values of specific measurements in the equation.

Keywords: Anthropology, Cephalometric analysis, Gender Determination, Maxillary Sinus

Int J Eth Trauma Victimology (2021). DOI: 10.18099/ijetv.v7i02.2

INTRODUCTION

Humans are sexually dimorphic. The identification process of any skeletal remains and decomposing parts of humans is one of the most difficult aspects of forensics. For gender determination in unidentified remains, the foremost choice is the innominate bones, including skull, pelvis, long bones with an epiphysis and a metaphysis, the sella turcica, foramen magnum, length and the height of the head, the distance between the basion and the nasion, the head circumference, the supraorbital edge length, the mastoid process, the mandibular ramus, the height of the mandibular symphysis, the shape and the length of the palate, the circumference of the occipital condyle, sizes of the teeth and paranasal sinuses.^{1,2} In maximum cases, like disaster victim identification, the bodies found are not in proper anatomy; often, fragments of the skeletal remains can lead to difficulty in identifying the deceased. But the unique thing is that the maxillary sinus mostly remains intact within the skull so maxillary sinus radiography is being used for identification and is a great tool for gender determination. If we go back to the development of the maxillary sinus, its anatomy shows many variations. Maxillary sinuses are two spaces, filled with air located in the maxillary bone and can be of varied sizes and shapes. The walls are thin in them. We discuss the apex extending inside the zygomatic process and settling in the zygomatic bone. The floor comprises the alveolar process, the first, the second, and the third molars, and the canines' roots may perforate the floor.³ The pneumatization of the maxillary sinus is different for everyone, and its volume depends upon age.⁴ Frontal sinuses are unique to each individual due to their morphological structures, and in forensic science, taking

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How to cite this article: Kundu A, Patel D, Silajiya D. Cephalometric Analysis for Gender Determination Using Maxillary Sinus Index in Population of Gujarat, India. *Int J Eth Trauma Victimology*. 2021;7(2):6-9.

Source of support: Nil

Conflict of interest: None

Received: 24/12/2021;

Received in revised form: 28/12/2022;

Accepted: 29/12/2021;

Published: 20/01/2022

advantage of these features is very important for personal identification.⁵⁻⁷ The maxillary sinus is one of the paranasal sinuses' largest sinuses.⁸ Its development begins at the 3rd month of the fetal development from the infundibulum of the ethmoid bone.⁹ After continuation with birth it expands laterally during the two growth spurt periods (from birth to 3 years of age and from 7 to 12 years).¹⁰ However, the mandibular growth remains well after the further ages and outstretch its final dimensions at the age of 20 years in males and 18 years in females.¹¹ This study is designed to determine the accuracy and reliability of maxillary sinus dimensions as a method for gender identification of unknown persons.

MATERIAL AND METHODS

A total of 51 lateral cephalograms belonging to both genders (20 males and 31 females) of age group 17–47 years were selected for the study. The radiographs were then stored with

incorporated patients' details. All radiographs were interpreted, and the maxillary sinuses' height and width were measured using Sidexis4 next-generation software (version 4, Sirona, Germany). The maxillary sinus index (MSI) is calculated as $MSI = \text{maxillary sinus width}/\text{height}$ (Figure 1). The results obtained were subjected to statistical analysis using SPSS version 20 (statistical package for social sciences) software.

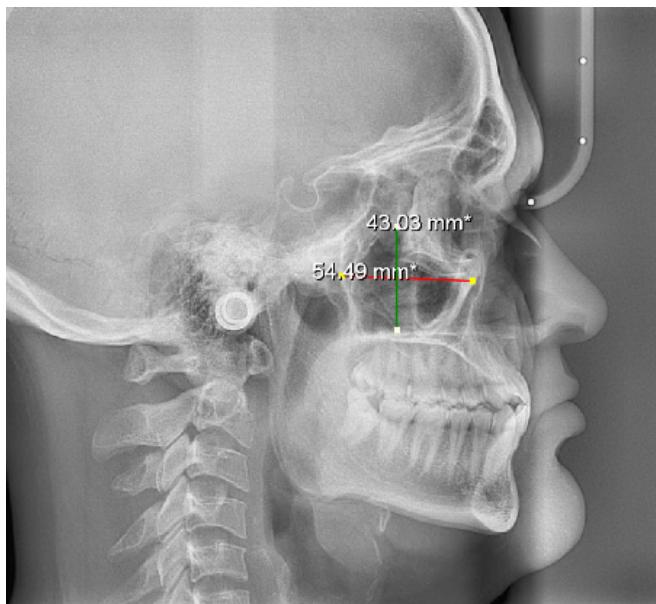


Figure 1: Measurement of the maxillary sinus height and width

The mean values and standard deviation of the maxillary sinus height, width, and MSI in males and females were obtained and tabulated using an independent t-test (Table 1). Significance level was based on p value < 0.05 .

RESULTS

Analyzing the obtained data, the result shows that the mean maxillary sinus height is 49.9 mm in males and 50.9 mm in females, and it is statistically insignificant with p value of 0.69. The mean maxillary sinus width is 44.01 mm in males and 44.12 mm in females and it is statistically insignificant with p value of 0.59. The mean MSI is higher in females (1.16) when compared with males (1.13) with an insignificant p -value of 0.244 (Table 2).

Regression analysis is done and an equation is obtained as follows (Table 3):

$$R = 1.217 + 0.338 \times MSI.$$

This equation is provided to calculate "R" which will aid in the prediction of gender by substituting the values of specific measurements (MSI) in the equation. A greater calculated "R" value near to "2" indicates female gender, while "R" value near to "1" indicates male gender.

DISCUSSION

Identification from remains of human skeletons is an important forensic procedure, and determining age and gender is an integral part of identification. The current study is designed

Table 1: Independent Sample Test.

		Levene's Test for Equality of Variances		t-test for Equality of means						95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. Error Difference			
									Lower	Upper	
Length (mm)	Equal Variances assumed	0.152	0.699	-0.696	49	0.490	-1.03306	1.48425	-4.01577	1.94964	
	Equal variance not assumed			-0.689	39.357	0.495	-1.03306	1.49891	-4.06403	1.99790	
Width	Equal Variances assumed	3.723	0.59	-0.76	49	0.940	-0.1050484	1.3874796	-2.8932930	2.6831962	
	Equal variance not assumed			-0.81	47.965	0.936	-0.1050484	1.3011363	-2.7212076	2.5111108	
MSI	Equal Variances assumed	1.390	0.244	-0.697	49	0.489	-0.02907	0.04170	-0.11286	0.05473	
	Equal variance not assumed			-0.724	45.549	0.473	-0.02907	0.04014	-0.10988	0.05174	

Table 2: Group statistics.

Sex		N	Means	Std. Deviation	Std. Error Mean
Length(mm)	Male	20	49.8950	5.31613	1.18872
	Female	31	50.9281	5.08372	0.91306
Width	Male	20	44.018500	3.9436642	0.8818301
	Female	31	44.123548	5.3268443	0.9567295
MSI	Male	20	1.1382	0.12967	0.02899
	Female	31	1.1672	0.15452	0.02775

Table 3: Coefficients

Coefficients ^a		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.217	.564		2.157	.036
	MSI	.338	.485	.099	.697	.489

a. Dependent Variable: Sex

to analyze gender-based differences in maxillary sinus dimensions. Comparison of maxillary sinus parameters (height and width) between male and female groups showed statistically insignificant differences in this study. A study conducted by Saccucci *et al.* on gender determination using maxillary sinus concluded that no statistical difference was found in maxillary sinus volumes between genders. Their study rejects the hypothesis that maxillary sinus morphology is crucial to determine gender,¹² which supports our study results. Conversely to our study results, Uthman *et al.* concluded that CT images could be used for sex determination and their study proved that the maxillary sinus exhibits anatomic variability with a significant sex difference concerning maxillary sinus width, length, and height and among these parameters, the left maxillary sinus height was the best discriminative variable.¹³ Based on the results of Sheikh *et al.*, maxillary sinus height and width exhibit anatomic variability between genders but without any significant difference. The width of the left maxillary sinus can be used as the best discriminative parameter to study sexual dimorphism with an accuracy of 59%.¹⁴ According to Urooge *et al.*, the accuracy level for the left maxillary sinus width was 60% in determining gender.¹⁵ Azhar *et al.* showed that maxillary sinus length was the best discriminant parameter with an overall accuracy of 69.81% in the determination of gender.¹⁶ A study was done by Sharma SK *et al.* to measure Maxillary Sinus volume and dimensions by CT scan for gender determination. The difference was statistically significant for sinus anterior-posterior dimension (length) and volume. The Maxillary Sinus length was the best discriminant parameter with an overall accuracy of 69.81%.¹⁷ Maxillary Sinus is the first paranasal sinus to form, and its development has been documented as early as the 17th week of the prenatal period. However, it is after birth that the majority of growth occurs.^{18,19} The Maxillary Sinuses are complex anatomical structures with significant variations between individuals.²⁰ The study of Kim *et al.* on the three-dimensional reconstruction and simulation of maxillary sinus showed that its morphology and size are variable.²¹ Morphological variability plays an important role. The differences in growth and development are genetically determined, but the morphological features are also affected by environmental modifications.²² Paranasal sinuses and pneumatic bones decrease after reaching their maximal size.²³⁻²⁵ According to Jun *et al.*, before the sinus volume declines, the maxillary sinuses of males reach their maximum volume at 21–30 years and women at 11–20 years. The decrease of the maxillary sinus volume may be caused by the loss of bone matrix in the surrounding bones due to aging.²⁶ Spaeth

et al. said that the termination of expansion of maxillary sinus is fixed at 17 years of age (same for both sexes).²⁷ Schatz *et al.* observed that maxillary sinus increases in volume for up to 15 years, afterward maintaining similar volume.²⁸

CONCLUSION

Gender determination is one of the integral aspects of personal identification of an unidentified cadaver, thus narrowing down the diagnosis to be more accurate. Most of the bones conventionally used (skull, pelvis, long bones with an epiphysis and a metaphysis, the sella turcica, foramen magnum, length and the height of the head, the distance between the basion and the nasion, and the distance between the basion and the prostion, the circumference of the head, the length of the supraorbital edge, the mastoid process, the mandibular ramus, the height of the mandibular symphysis, the shape and the length of the palate, the circumference of the occipital condyle, sizes of the teeth and paranasal sinuses.) are often recovered either in a fragmented and/or decomposed state, especially in catastrophes and mass disasters, making identification difficult. Various authors have reported that zygomatic bones and maxillary sinus remain intact although the skull and other bones may be badly disfigured in incinerated victims.^{29,30} Lateral cephalometry, a two-dimensional conventional radiographic technique, is readily available and inexpensive and provides a good assessment of the soft tissue and the hard tissue elements that define the paranasal sinuses and their surrounding structures. Therefore, the morphometric analysis of the maxillary sinus has been proved to be a valuable tool in assessing sexual dimorphism. However, further studies are desirable on large sample size.

ACKNOWLEDGEMENT

I would also like to show my gratitude to Dr. Kalgi Shah for her support in the study.

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Estimation of Time Since Death from Rigor Mortis - An Autopsy Study in Tertiary Care Hospital of Malwa Region of Punjab state of India

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ABSTRACT

Background: Postmortem interval estimation is an important tool in forensic medicine. Estimating time since death is extremely important in cases where there is doubt about the period of death. After death, many changes occur in a regular sequence and can be used to arrive at an approximate time since death. When a post-mortem is conducted, doctor conducting the post-mortem examination has to give his opinion about post-mortem interval i.e. the probable time that elapsed between death and post-mortem examination even in cases of decomposed dead bodies. While giving this opinion, we always think we should have some other dependable methods to be more accurate in answering this question. Algor mortis, Rigor mortis, and Livor mortis have been the basis for ascertaining the post-mortem interval collectively. Among them, Rigor Mortis is an important indicator of post-mortem interval. Although it is a dependable tool for estimating post-mortem interval, it is influenced by many endogenous and exogenous factors like nature of death, nature of the body, temperature, humidity etc. Time of death is almost always asked by investigating authorities to connect the crime with criminals.

Determining the death time has always been a topic of keen interest amongst forensic pathologists from its inception to date. Many workers in forensic medicine have tried to investigate to determine the time of death based on post mortem findings. To date, it is still an important and fascinating criterion to ascertain the time since death. With this study, we aimed to demonstrate the intricacies of Rigor Mortis with fluctuating temperature and humidity of the local region. We planned to estimate and compare the post-mortem interval based on Rigor Mortis in different body muscles.

Materials and Methods: This study was conducted in the Department of Forensic Medicine and Toxicology at G.G.S. Medical College, Faridkot after taking clearance from the institutional ethics committee. Thirty medico-legal autopsy cases were included in the study where the exact time of death was known and included only hospital deaths. The relatives of the deceased were explained the purpose and nature of the study and provided with the patient information sheet and informed consent was taken. The details of the cases were noted from the hospital bed head ticket, relative interview and the police inquest papers. The exact temperature and humidity were noted at the start of autopsy using a digital hygrometer.

Results: A total of 30 cases were observed out of which males outnumbered the females by approximately 3:1. Maximum cases consisted of Roadside Accidents (43.3%) followed by poisoning, assault and hanging, in that order. The average temperatures during the study months varied from a maximum of 41.3°C (June) to a minimum of 33.7°C (July). The average humidity varied from a maximum of 62.6% (July) to a minimum of 29.3% (May). The average temperatures during the study months varied from a maximum of 41.3°C (June) and a minimum of 33.7°C (July). The average humidity during the study months varied from a maximum of 62.6 % (July) and a minimum of 29.3% (May). Fully established Rigor Mortis was observed at a minimum of 10 hours and a maximum of 29 hours in May and June.

Keywords: Humidity, Postmortem Interval, Postmortem, Rigor Mortis, Temperature.

Int J Eth Trauma Victimology (2021). DOI: 10.18099/ijetv.v7i02.3

INTRODUCTION

Thanatology is the branch of science which deals with all the aspects of death. There is usually a progression from clinical death to brain death, biological death, and finally cellular death. Brain death follows clinical death immediately due to lack of oxygen. It involves the cerebral cortex, the cerebellum, and finally lower brain centres die. Ultimately the brainstem and vital centres get involved, and the process of cellular death begins.¹

After death, many physiochemical changes such as Algor mortis, rigor mortis, hypostasis and decomposition occur, leading to the dissolution of all soft tissues. Corneal clouding

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How to cite this article: Joshi R, Kumar A, Singh G, Varghese A, Singh R, Chhabra HS. Estimation of Time Since Death from Rigor Mortis- An Autopsy Study in Tertiary Care Hospital of Malwa Region of Punjab state of India. *Int J Eth Trauma Victimology*. 2021;7(2):10-15.

Source of support: Nil

Conflict of interest: None

Received: 10/11/2021;

Received in revised form: 30/09/2021;

Accepted: 06/10/2021;

Published: 20/01/2022

occurs after death with an increase in its intensity until the cornea loses its turgor whether the eyelids remain open or not.^{2,3} The importance of these changes is that they occur in a regular sequence and can be used to arrive at an approximate time of death.^{4,5} The changes that occur after death and help estimate the approximate time since death can be classified into Immediate, early and late changes. Doctors in courts are often asked to comment upon the time since death. Estimating the time of death is notoriously one of the most difficult and inaccurate techniques in forensic pathology and various pieces of evidence must be correlated to each other to arrive at some sensible time bracket within which the death could have occurred.⁶ The autopsy surgeon should do his best to arrive at the closest possible deduction as to the time elapsed since death. The courts are now depending more and more on scientific evidence for establishing the proof of a crime.⁷

Among the triad, Algor mortis is the cooling of the body after death. The body temperature at the time of death is generally 37°C which falls to the surrounding temperature by 12 to 18 hours after death. The liver mortis or post-mortem staining generally appears over-dependent parts of the body within ½ - 1 hour of death and gets fixed within 6 to 8 hours after death. Similarly, the rigor mortis, which is cadaveric rigidity, starts developing within 1 to 2 hours after death and takes around 12 hours after death for complete development and remains in the developed stage for further 12 hours and disappears in the next 12 hours generally. This can give the approximate time since death till 36 hours after death. Many other sophisticated techniques like biochemical studies of C.S.F., Vitreous Humor, Aqueous humor, etc. have been tried to reach the accuracy regarding time since death.⁸

During the stage of rigor mortis, if the position of the dead body is unusual with flexion at some major joints, it will remain rigid in the same position. If the rigor mortis is the well-established stage, the flexed limbs continue to stay flexed and will defy gravity, even when the support beneath them is missing. An unusual position in which the limbs are stiff and defy gravity could be due to putrefaction.⁹

Developed rigor mortis once damaged by any means will never recur again in the body. The disappearance of rigor mortis denoted by flaccidity of muscles is caused by the action of alkaline liquids produced by putrefaction.¹⁰ Shapiro¹¹ demonstrated Rigor's sequential progression of development from the head downward. Further, in 1960, Bendell studied the biophysics of muscular contraction, which led to a better understanding of rigor mortis. He stated that voluntary muscles consist of bundles of long fibers of the dimension of human hair. Each fibre is formed of densely packed myofibrils extending through its whole length. These myofibrils are the contractile elements, and they are made up of proteins filaments, myosin filaments and actin filaments.¹²

According to literature, Rigor Mortis appears about 1–2 hours after death, gets well-established in the entire body in about 9–12 hours. It is maintained for about 12 hours and then gradually passes off in the same order as it appeared in the next 12 hours.¹³

The primary reason for rigor mortis is the loss of adenosine triphosphate from the anoxic tissue. Rigor mortis starts to develop 2–4 hours after death and develops fully by

6 to 12 hours and gradually dissipates until approximately 72 hours after death. It has been found that post-mortem muscle proteolysis is responsible for the relaxation following rigor mortis.¹⁴

A uniform time of appearance and disappearance of Rigor Mortis cannot be made applicable throughout a vast and diverse country like India where different weather conditions exist throughout its various parts at a given time.

Nysten (in 1811) stated that "rigidity persists longer in cold, wet air than in fresh, dry air". It could be due to early and increased breakdown of ATP in the hot weather and an early setting of the putrefaction.¹⁵ Rigor supervenes and disappears rapidly in cases of violent exercise before death. The poisons that cause violent muscle contraction for some time before death e.g., strychnine, the Rigor Mortis is established rapidly and remains for a long time.

As is clear from the above, the area of consideration is vast and complex and through this study, we have tried to focus on the estimation of time since death from Rigor Mortis by studying Rigor Mortis in the body's voluntary muscles.

MATERIAL AND METHODS

This study was conducted in the Department of Forensic Medicine from 1st May 2019 to 31st August 2019 after taking clearance from the institutional ethics committee. Thirty medico-legal autopsies cases were included where the exact time of death was known, including only hospital deaths. The relatives of the deceased were explained the purpose and nature of the study and provided with the patient information sheet. Informed consent was taken. The case details were noted from the hospital bed head ticket, relative interview and the police inquest papers. The exact temperature and humidity were noted at the start of autopsy using a digital hygrometer.

The presence or absence of Rigor Mortis was observed in the voluntary muscles of the body of the corpse. In the joints, the presence or absence of Rigor Mortis was noted by observing their movements to check for any resistance offered.

The exclusion criteria included:

- Advanced putrefied bodies.
- Bodies with musculoskeletal deformities.
- The deceased had a history of chronic debility diseases
- The deceased had a severe emotional disturbance or violent exercise before death.

Observations

After getting ethical clearance from the institutional ethics committee this study was undertaken in the Department of Forensic Medicine and Toxicology. In all thirty cases, meeting the inclusion and exclusion criteria were selected and the data was recorded and analyzed. Following were the observations –

Maximum cases comprised roadside accidents (43.3%) followed by poisoning, assault and hanging. In three cases, the circumstances of the death were not clear. (Table 1)

A total of 30 cases were observed out of which males outnumbered the females by a ratio of approximately 3:1. (Table 2)



The average temperature varied from a maximum of 41.3°C (in June) to a minimum of 33.7°C (in July). The average humidity varied from a maximum of 62.6% (in July) to a minimum of 29.3% (in May) (Table 3 and Figure 3).

Cases were distributed according to rigor mortis status, post-mortem interval, temperature and humidity in different months during the period of study:

• May 2019

In May 2019, the maximum recorded temperature was 41°C and the minimum recorded temperature was 28°C with a mean of 35 and a standard deviation of + 4.3. Humidity varied from a maximum of 62% and a minimum of 12% with a mean of 33.1 and a standard deviation of 14.8. Post-mortem Interval varied from a maximum of 32 hours and a minimum of 10 hours with a mean of 20.5 and a standard deviation of + 7.2. (Table 4)

• June 2019

For June, the maximum recorded temperature was 42°C and the minimum recorded temperature was 41°C with a mean of 41.3 and a standard deviation of + 0.5. Humidity varied from a maximum of 39 % and a minimum of 23 % with a mean of 30.3 and a standard deviation of 6.6. Post-mortem Interval varied

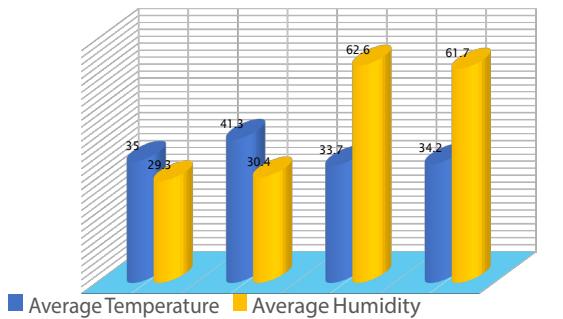


Figure 3: Average temperature and humidity, recorded during the period of study

Table 1: Distribution of cases on the alleged manner of death

Cause of death	Number of Cases		Percentage
	Total cases	Percentage	
Roadside Accidents	13	30	43.3%
Poisoning	6	30	20%
Hanging	3	30	10%
Assault	5	30	16.7%
Miscellaneous Causes	3	30	10%

Table 3: Average temperature and humidity, recorded during the study

Months	May	June	July	August
Number of cases	9	3	10	8
Average Temperature (Only the temperatures of the days on which the cases were performed have been included.)	35°C	41.3°C	33.7°C	34.2°C
Average Humidity	29.3%	30.4%	62.6%	61.7%

from a maximum of 33 hours and a minimum of 18 hours with a mean of 25.6 and a standard deviation of + 7.5. (Table 5)

• July 2019

For July, the maximum recorded temperature was 40 °C and the minimum recorded temperature was 28 °C with a mean of 33.7 and a standard deviation of + 4.1. Humidity varied from a maximum of 93 % and a minimum of 31 % with a mean of 62.6 and a standard deviation of 17.7. Post-mortem Interval varied from a maximum of 41 hours and a minimum of 14 hours with a mean of 26 and a standard deviation of + 7.7. (Table 6)

For August, the maximum recorded temperature was 36°C and the minimum recorded temperature was 25 °C with a mean of 30.8 and a standard deviation of ± 4.2. Humidity varied from a maximum of 84 % and a minimum of 50 % with a mean of 61.8 and a standard deviation of 13.2. Post-mortem Interval varied from a maximum of 43 hours and a minimum of 13 hours with a mean of 26.1 and a standard deviation of ± 12.5. (Table 7)

Table 8 shows the Cases in which Rigor Mortis was present.

Table 9 shows the Cases in which Rigor Mortis was absent:-

From the observations (as mentioned earlier), we can observe that temperature and humidity play an integral role in affecting the onset and duration of Rigor Mortis in the human body. The onset of Rigor Mortis is slow and duration longer in cold and humid weather, whereas the onset is rapid and duration is short in hot and dry weather. (Table 10)

Table 2: Distribution of cases according to gender

Gender	Number of cases	Total cases	Percentage
Males	23	30	76.7 %
Females	7	30	23.3 %

Table 4: Post-mortem interval and status of Rigor Mortis for May 2019

	Postmortem Interval	Temperature	Humidity (%)
Case 1	32 hours	40°C	18
Case 2	18 hours	41°C	12
Case 3	22 hours	33°C	40
Case 4	13 hours	35°C	33
Case 5	25 hours	35°C	33
Case 6	16 hours	33°C	37
Case 7	20 hours	28°C	62
Case 8	29 hours	39°C	22
Case 9	10 hours	31°C	41
Mean	20.5 + 7.2	35 + 4.3	33.1 + 14.8

Table 5: Post-mortem interval and status of Rigor Mortis for June 2019

	Postmortem Interval	Temperature	Humidity (%)
Case 1	33 hours	41°C	39
Case 2	18 hours	41°C	29
Case 3	26 hours	42°C	23
Mean	25.6 + 7.5	41.3 + 0.5	30.3 + 6.6



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Table 6: Post-mortem interval and status of Rigor Mortis for July 2019

	Postmortem Interval	Temperature	Humidity (%)
Case 1	28 hours	40°C	31
Case 2	22 hours	32°C	52
Case 3	18 hours	38°C	51
Case 4	18 hours	36°C	60
Case 5	29 hours	28°C	93
Case 6	32 hours	34°C	55
Case 7	26 hours	37°C	53
Case 8	14 hours	29°C	83
Case 9	32 hours	28°C	82
Case 10	41 hours	35°C	66
Mean	26 + 7.7	33.7 + 4.1	62.6 + 17.7

Table 7: Post-mortem interval and status of Rigor Mortis for August 2019

	Postmortem Interval	Temperature	Humidity (%)
Case 1	31 hours	28°C	53
Case 2	18 hours	36°C	55
Case 3	20 hours	36°C	61
Case 4	43 hours	29°C	84
Case 5	17 hours	29°C	84
Case 6	46 hours	36°C	50
Case 7	21 hours	27°C	51
Case 8	13 hours	25°C	56
Mean	26.1 + 12.5	30.8 + 4.2	61.8 + 13.2

Table 8: Cases in which Rigor Mortis was present

Case Number with Month	Post-mortem Interval	Rigor Mortis	Temperature	Humidity
Case 2 May	18 hours	Present	41°C	12%
Case 3 May	22 hours	Present	33°C	40%
Case 4 May	13 hours	Present	35°C	33%
Case 5 May	25 hours	Present	35°C	33%
Case 6 May	16 hours	Present	33°C	37%
Case 7 May	20 hours	Present	28°C	62%
Case 8 May	29 hours	Present	39°C	22%
Case 9 May	10 hours	Present	31°C	41%
Case 2 June	18 hours	Present	41°C	29%
Case 3 June	26 hours	Present	42°C	33%
Case 1 July	28 hours	Present	40°C	31%
Case 2 July	22 hours	Present	32°C	52%
Case 3 July	18 hours	Present	38°C	51%
Case 4 July	18 hours	Present	36°C	60%
Case 5 July	29 hours	Present	28°C	93%
Case 6 July	32 hours	Present	34°C	55%
Case 7 July	26 hours	Present	37°C	53%
Case 8 July	14 hours	Present	29°C	83%
Case 9 July	32 hours	Present	28°C	82%
Case 1 August	31 hours	Present	28°C	53%
Case 2 August	18 hours	Present	36°C	55%
Case 3 August	20 hours	Present	36°C	61%
Case 5 August	17 hours	Present	29°C	84%
Case 7 August	21 hours	Present	27°C	51%
Mean	21.7 + 6.1	Present	34 + 4.7	50.3 + 20.2

DISCUSSION

Rigor Mortis is best known of all signs of death and is the most deceiving sign of the triad. Rigor seems to be a common occurrence in the bodies of the extremely obese, although it occasionally occurs in the senile, bony and emaciated.

A total of 30 cases were studied of which males outnumbered the females by approximately 3:1. Maximum cases consisted of Roadside Accidents (43.3%) followed by poisoning, assault and hanging, in that order. In three cases, the circumstances of the death were not clear.



Table 9: Cases in which Rigor Mortis was absent

Case no with month	Post-mortem Interval	Rigor Mortis	Temperature	Humidity
Case 1 May	32 hours	Absent	40°C	18%
Case 1 June	33 hours	Absent	41°C	39%
Case 10 July	41 hours	Absent	35°C	66%
Case 4 August	43 hours	Absent	29°C	84%
Case 6 August	46 hours	Absent	36°C	50%
Case 8 August	13 hours	Absent	25°C	56%
Mean	34.6 + 11	Absent	35.3 + 5.7	52.2 + 20.7

Table 10: Inferences

Period of Study	Remarks
May –June	Temperatures remained high and humidity was low. Rigor Mortis appeared early in cases and duration was short. Fully established Rigor Mortis was observed at a minimum of 10 hours and a maximum of 29 hours in May and June.
July–August	Temperatures remained low and humidity was high. The onset of Rigor Mortis was delayed, and duration increased. Complete Rigor Mortis lasted from 17 hours to 32 hours.

The average temperatures during the study months varied from a maximum of 41.3°C (June) and a minimum of 33.7°C (July). The average humidity during the study months varied from a maximum of 62.6% (July) and a minimum of 29.3 % (May).

In May, the maximum recorded temperature was 41°C and the minimum recorded temperature was 28°C with a mean of 35 and a standard deviation of + 4.3. Humidity varied from a maximum of 62% and a minimum of 12% with a mean of 33.1 and a standard deviation of 14.8. Post-mortem Interval varied from a maximum of 32 hours and a minimum of 10 hours with a mean of 20.5 and a standard deviation of + 7.2.

In June, the maximum recorded temperature was 42°C and the minimum recorded temperature was 41°C with a mean of 41.3 and a standard deviation of + 0.5. Humidity varied from a maximum of 39% and a minimum of 23% with a mean of 30.3 and a standard deviation of 6.6. Post-mortem Interval varied from a maximum of 33 hours and a minimum of 18 hours with a mean of 25.6 and a standard deviation of + 7.5.

In July, the maximum recorded temperature was 40°C and the minimum recorded temperature was 28°C with a mean of 33.7 and a standard deviation of ± 4.1. Humidity varied from a maximum of 93% and a minimum of 31% with a mean of 62.6 and a standard deviation of 17.7. Post-mortem Interval varied from a maximum of 41 hours and a minimum of 14 hours with a mean of 26 and a standard deviation of ± 7.7.

In August, the maximum recorded temperature was 36°C and the minimum recorded temperature was 25°C with a mean of 30.8 and a standard deviation of ± 4.2. Humidity varied from a maximum of 84% and a minimum of 50% with a mean of 61.8 and a standard deviation of 13.2. Post-mortem Interval varied from a maximum of 43 hours and a minimum of 13 hours with a mean of 26.1 and a standard deviation of ± 12.5.

The sequence of the establishment was as per the literature. It was first observed in eyelids, followed by lower jaw, neck, shoulder joint, elbow joint, wrist, fingers, hip joint, knee, ankle and finally, it was observed in the toes.

The disappearance of Rigor followed the same fashion as its appearance. Hence, according to findings it could be postulated that Rigor Mortis while being well-established in the upper limbs may not be seen in the lower limbs and conversely,

Rigor Mortis may be observed in the lower limbs while it has already disappeared from the upper limbs depending upon the death time. It has been observed that the lower limbs are the last to be affected by Rigor and last to exhibit disappearance too whereas eyelids and parts of the face are the first to be affected and the first ones to exhibit disappearance. In our study, the temperatures remained high and low humidity in May and June. Rigor Mortis appeared early in cases and duration was low. Fully established Rigor Mortis was observed at a minimum of 10 hours and a maximum of 29 hours in the months of May and June. Temperatures remained low and humidity was high months of July and August. The onset of Rigor Mortis was delayed and duration increased. Complete Rigor Mortis lasted from 17 hours to 32 hours. Other studies recorded similar findings. In the study conducted by Gorea,¹⁶ the longest duration in which rigor mortis had not completely appeared in the body was 14 hours.

The average duration for fully developed rigor mortis was 17 hours 34 minutes and the shortest duration was 3 hours. This average duration was minimum at a temperature range of 31°C–35°C (10 hours 15 minutes). The average duration of disappearing rigor mortis was 19 hours 52 minutes with the longest duration as long as 39 hours. This duration increases with the decrease of temperature. The shortest duration in which the rigor mortis had completely disappeared was 15 hours. While Dalal *et al.*¹⁷ found in their study that in April to June, fully developed rigor mortis lasted from 11 hours 25 minutes to 28 hours 25 minutes while in the quarter of July to September, complete rigor mortis lasted from 17 hours 15 minutes to 34 hours 20 minutes. The maximum temperature during these months ranged from 46.5°C to 26.6°C while minimum temperature ranged between 27.6°C to 12°C.



Relative humidity levels in these months varied between 9 to 31%. From October to December, fully developed rigor mortis lasted from 16 hours 25 minutes to 61 hours 5 minutes, while from January to March it lasted from 19 hours 5 minutes to 50 hours 15 minutes. The maximum temperature during these months ranged from 35.4°C to 13.6°C, while the minimum temperature ranged from 20°C to -2.6°C and the relative humidity varied between 97% to 65%. Sugatha *et al.*¹⁸ in their study, observed that the average duration for the onset of rigor mortis was 8 hours and 39 minutes. The minimum duration in which rigor mortis had begun to appear in the body was 1 hour and 35 minutes while the longest maximum by which rigor mortis had not completely appeared in the body was 24 hours. The average duration for fully developed rigor mortis was 18 hours and 19 minutes, the shortest duration being 3 hours and 15 minutes and the longest 33 hours and 40 minutes. The average duration for disappearing rigor mortis was 34 hours and 36 minutes. The shortest duration by which rigor mortis had disappeared had 15 hours and 30 minutes, while one case was observed in which rigor mortis presented some parts of the body at 70 hours and 35 minutes. In 94.6% of cases, rigor mortis appeared first in the eyelids followed by lower jaw, neck, upper limbs, trunk, lower limbs and lastly fingers and toes. It disappeared in the same fashion. However, in 5.4% of cases, sequence was found to be erratic. In a study done by Deepak *et al.*¹⁹, the author stated that the onset and duration of rigor mortis are governed by various factors. In Indian conditions, it is different, compared to the temperate countries, when the time since death needs to be estimated. Rigor mortis starts within 2–3 hours and takes about 12 hours to develop, persists for another 12 hours, and takes about 12 hours to pass off.

CONCLUSION

Rigor Mortis is a physiochemical process and dependent upon several factors including temperature, humidity, cause of death, age, physical build of the body etc. So, Nysten's Rule of 12, which states that "Rigor Mortis appears in 12 hours, remains apparent for 12 hours and disappears in the next 12 hours", does not hold in every case as has been observed in this study. In a diverse country like India, where wide variations in weather conditions can be observed, the post-mortem interval of state may be very different from others. Therefore, every state should have its table of Rigor Mortis status so that it proves to be an effective tool for measuring the post-mortem interval. Rigor Mortis is and will remain an important benchmark to calculate the time since injury. Its dependence on multiple factors may confound the results but a learned physician is less likely to be misled. The sample size of our study was small due to which several other factors affecting the process of Rigor Mortis could not be studied and may have confounded our results. More regional studies with a larger sample are needed to reach a definite conclusion.

Ethical Clearance

Clearance was taken from Institutional Ethics Committee.

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A Pre-experimental Study to Assess the Effectiveness of Structured Teaching Programme on Knowledge Regarding Substances Abuse among Boys at Selected Senior Secondary Schools in Jalandhar, Punjab state of India

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ABSTRACT

Background: Substances abuse is dangerous not only for health but also in the view of economic and social values. The habit of substance abuse becomes the cause of purposeless waste of money and affects health. This study was conducted to assess the effectiveness of a structured teaching program on knowledge regarding substances abuse among boys at selected senior secondary schools.

Methodology: A pre-experimental pretest-posttest is used. The setting is at senior secondary schools Jalandhar. The sample includes 60 boys selected by a convenient sampling technique. The tool consisted: Part 1 demographic variables and part 2 structured knowledge questionnaire. The reliability of the tool was established by using the split-half method.

Results: The study's findings show that the mean score, median score and SD in the pre-test were 12.78, 12.5 and 2.92, respectively, whereas the mean score, median score, and SD in post-test were 22.58, 23 and 2.02, respectively. The calculated 't' value was found to be 19.2 while the tabulated value of the 't' at 0.05 level of significance is 1.645, which is lesser than the calculated 't' value. It was safely assumed that STP had a definite impact on raising students' knowledge of substances abuse.

Keywords: Effectiveness, Substances abuse, Boys, Senior secondary schools.

Int J Eth Trauma Victimology (2021). DOI: 10.18099/ijetv.v7i02.4

INTRODUCTION

Adolescence is signaled by puberty rights, usually in tests of strength and courage. The completion entitles the individual to be recognized as a young adult.²

Man's internal thirst for new and more enriching experiences has driven him beyond the routine and mundane pleasure of every day to search for and reliance on substances. Those are even momentarily affording him relief from monotony and uniqueness of perception. These experiences are satiating not only in themselves but also because then. They make the individual stand apart from his fellow beings. Immutable research has been conducted and a great deal more has been written about the nature and consequences of these mind-changing drugs/substances, yet they remain an enigma. They have been hailed as of enormous social, medical, and religious value and the most destructive, pathogenic, and misleading discovery of all times.³

In India, the last two decades have been a period of rapid increase in the percentage of drug and alcohol abusers. Alcohol is getting a social sensation over a wider stratum of society. There has been a marked increase in the use of heroin (popularly known as smack and brown sugar) in our country in the last few years. The affected group has also changed. Earlier, it was usually seen among the elites, upper-middle-class, and student communities. But today, the class, age, and education are no

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How to cite this article: Singh, R., Gupta, R., Andrade, R.J. A Pre-experimental Study to Assess the Effectiveness of Structured Teaching Programme on Knowledge Regarding Substances Abuse among Boys at Selected Senior Secondary Schools in Jalandhar, Punjab state of India. *Int J Eth Trauma Victimology*. 2021;7(2):16-22.

Source of support: Nil

Conflict of interest: None

Received: 25/11/2021;

Received in revised form: 03/12/2021;

Accepted: 06/12/2021;

Published: 20/01/2022

bar for drug and alcohol abuse. A new risk group has emerged: youth educated and illiterate, employed and unemployed, rural and urban industrial workers, labor class and people on tour.⁵

Some teens face personal challenges that compound their risk of substance use and addiction. These include: a genetic predisposition toward developing an addiction or a family history of substance use disorders, adverse childhood events, such as abuse, neglect or other trauma, co-occurring mental health problems, peer victimization or bullying.⁵

A range of effective treatments for adolescent substance use disorders has been developed, including cognitive-behavioral techniques and motivational enhancement therapies. Programs

more likely to be effective are built on strong evidence, are family-oriented, developmentally appropriate, and delivered by qualified health care professionals. Yet programs to treat teens with substance use disorders are few and far between and, of the programs that do exist, few are tailored to the unique needs of teens. Access to treatment is constrained further by cost, limited insurance coverage and an inadequate referral stream from health care providers who are not well informed of appropriate and effective treatment options⁸

MATERIALS AND METHODS

Study Design & Sample Size

A pre-experimental research approach is used in the present study. One group pretest-posttest design (no control group or randomization) is used to find the effectiveness of structured teaching programs on knowledge regarding substance abuse among boys at selected senior secondary schools Jalandhar, Punjab. The data collection period extended in February 2014 as per the convenience of the adolescents. the study consists of 60 samples, between the age of 15–18 years were participated. A pre-test was conducted and, STP was given to students on the same day, and a post-test was taken from same samples on the 7th day.

Ethical Consideration

Institutional Ethical Permission was obtained(letter no.: BINT/PO/IEC/029 DT 10/05/2013). Data was collected after getting formal permission from the concerned authorities.

Data Collection Measures

Convenient sampling technique (Non-Probability Sampling Technique) was used to collect the sample validated by experts and found reliable. Data collection tools are the procedures or instruments used by the researcher to observe or measure key variables in the research problem. It is prepared in **Section A-** It consists of demographic data with 13 items (Age, Religion, Education grade, Education of father, Occupation of father, education of mother, Occupation of mother, Types of family, Monthly income of a family, Family history of substances abuse, Source of information. **Section B-** consists of a self-structured multiple-choice questionnaire to assess the knowledge of adolescence regarding substances abuse. It contains 30 multiple-choice questions. Data was collected by self-administration of knowledge assessment questionnaire by study subjects. Each correct answer was given a score of “one” and the wrong answer was “zero”. The total score given was 30. The score was interpreted as, Poor = 0–8, Satisfactory = 9 – 15, Good = 16–24, Excellent = 25–30.

Statistical Analysis

Descriptive and Inferential statistics were used to analyze data as per the objectives and hypothesis. In the descriptive analysis, calculations were done by using frequency and percentage. mean, median and SD & for inferential statistics chi-square test was used to find out the association between pre and post-test knowledge score regarding substances abuse and selected demographic variables

Table 1 : Frequency and Percentage Distribution of Demographic variables of boys (n = 60)

S. No.	Demographic Data	F	%
1	Age a) 15–16 b) 16–17 c) 17–18 d) 18 and above	21 16 12 11	35% 26.67% 20% 18.33%
2	Religion Sikh Hindu Muslim Christian	15 40 4 1	25% 66.67% 6.67% 1.66%
3	Education grade 11 th 12 th	29 31	48.33% 51.67%
4	Education of father Illiterate Upto primary level Upto secondary level Graduation Post graduation and above	7 23 23 5 2	11.67% 38.33% 38.33% 8.33% 3.33%
5.	Occupation of father Farmer Businessman Dailywages Government employee Unemployed Private employee	3 8 19 8 2 20	5% 13.33% 31.67% 13.33% 3.33% 33.33
6.	Education of mother. Illiterate Up to primary level Up to secondary level Graduation Post graduation and above	13 19 24 2 2	21.67% 31.67% 40% 3.33% 3.33%
7.	Occupation of mother Housewife Dailywages Government employee Private worker Unemployed	48 3 5 4 0	80% 5% 8.33% 6.67% 0%
8.	Types of family Nuclear Joint Extended	31 14 15	51.67% 23.33% 25%
9.	Monthly income of the family in rupees. a) 5,000–10,000 b) 10,000–15,000 c) 15,000–20,000 d) 20,000 and above	40 13 4 3	66.67% 21.67% 6.67% 5%
10.	Family history of substances abuse At regular interval Occasionally Daily Never	15 13 12 20	25% 21.67% 20% 33.33%
11.	Common substances abused. Alcohol Tobacco	20 5	33.33% 8.33%

	Cigarette	10	16.67%
	Opium	4	6.67%
	Cannabis	1	1.67%
	None	20	33.33%
12.	Family member abusing substances.		
	Mother	1	1.67%
	Father	30	50%
	Sister	0	0%
	Brother	5	8.33%
	Self	4	6.67%
	No one	20	33.33%
13.	Source of information regarding substances abuse		
	Healthpersonnel	16	26.67%
	Massmedia	11	18.33%
	Relatives/Friends/Familymembers	24	40%
	Books,literature	9	15%

RESULTS

Table 1 reveals about Demographic characteristics, that according to age majority 35% of boys were in the age of 15-16 years. religion, most of the boys (66.67%) were Hindus and 25% were Sikhs and 8.33% related to other religions. According to education, (51.67%) of boys was studying in the 12th class. education of fathers mostly is educated at the primary level (38.33%) and up to the secondary level(38.33%). The father's occupation, 33.33% were private employees and 31.67% were working for daily wages. education of mother, the majority of student's mothers were educated up to secondary level (40%) and up to primary level (31.67%). Whereas occupation of mother, most women (80%) were housewives. participants type of family, the majority (51.67%) of boys belonged to nuclear family. Their monthly family income, the majority (66.67%) of boys had their monthly income below Rs.10000. The family history of substances abuse, 66.67% of boys said someone abused substances in the family mostly by father (50%) or brother (8.33%). According to common substances abused, the majority (33.33%) of boys said alcohol is mostly abused in their family. The majority of the participant's sources of information regarding substances abuse, (40%) of boys acquired information from relatives/friends, while 26.67% of adolescence acquired information from health personnel.

Table 2 explains students' frequency and percentage distribution according to pre-test knowledge scores regarding substance abuse. Maximum students (68.33%) had a satisfactory level of knowledge and minimum (6.67%) had poor knowledge while (21%) had a good level of knowledge whereas none of the students had an excellent level of knowledge score.

Table 3 depicts students' frequency and percentage distribution according to post-test knowledge scores regarding substances abuse. Maximum students (80%) had a good level of knowledge and (20%) had an excellent level of knowledge. None of the students had satisfactory and poor knowledge scores.

Table 2 : Frequency and percentage distribution of pre-test knowledge score regarding substances abuse (n = 60)

Level of knowledge	Score	f	%
Poor (≤ 25) Satisfactory (26–50%)	0–8	4	6.67%
Good (51–75%)	9–15	41	68.33%
Excellent (>75%)	16–24	15	25%
	25–30	0	0%

Maximum Score = 30, Minimum Score = 0

Table 3: Frequency and percentage distribution of post-test knowledge score regarding substances abuse (n = 60)

Level of knowledge	Score	N	%
Poor (≤ 25) Satisfactory (26–50%)	0–8	0	0%
Good (51–75%)	9–15	0	0%
Excellent (>75%)	16–24	48	80%
	25–30	12	20%

Maximum Score = 30, Minimum Score = 0

Table 4: Comparison of pre and post-test mean knowledge score regarding structured teaching questionnaires on substances abuse (n = 60)

	Pre-test	Post-test
Mean	12.78	22.58
Median	12.5	23
SD	2.92	2.02
"t" test		19.2*

Maximum Score = 30, Minimum Score = 0

Table 4 reveals that the mean score, median score and SD in the pre-test was 12.78, 12.5, and 2.92, respectively, whereas the mean score, median score, and SD in post-test were 22.58, 23, and 2.02, respectively. The calculated "t" value was found to be 19.2, while the tabulated value of the "t" at 0.05 level of significance is 1.645, which is lesser than the calculated "t" value.

Hence null hypothesis is rejected, and the research hypothesis is accepted that is the post-test knowledge score regarding substances abuse was significantly higher than the pre-test knowledge score. It can be safely assumed that STP had a definite impact on raising students' knowledge.

Table 5 shows the association between pre-test knowledge scores regarding substances abuse with selected demographic variables.

The chi-square test is used to find the association between the pre-test knowledge score with the selected demographic variables. The tabulated chi-square value at 0.05 level of significance for 1df (degree of freedom) is 3.84. If the calculated chi-square value is greater than the tabulated value, then the null hypothesis will be rejected and will be concluded that there is a significant association between the pre-test knowledge score and the particular demographic variable.

It is seen that there is a significant association between the pre-test knowledge score and the religion of the students the calculated value is 11.87. the null hypothesis is rejected in this case, while there is no significant association between the pre-test knowledge score and any other demographic variables. Thus



Table 5 : Findings related to association between demographic variable and pre-test knowledge score (n = 60)

S. No.	Demographic variable	\geq Median	<Median	Chi-square value	Inference
1.	Age (in years)				
	a. 15 – 17	22	17		
	b. >17	8	13	1.83	N
2.	Religion				
	a. Hindu	20	20		
	b. Minorities	19	1	11.87	S
3.	Education grade				
	a. 11 th	12	17		
	b. 12 th	17	14	1.09	NS
4.	Education of father				
	a. Up to primary level	13	18		
	b. Secondary level to post graduate	18	11	2.43	NS
5.	Occupation of father				
	a. Self employed.	8	16		
	b. Regular employment	20	16	2.86	NS
6.	Education of mother				
	a. Up to primary level	13	19		
	b. Secondary to post graduation level	17	11	1.61	NS
7.	Occupation of mother				
	a. Unemployed.	21	26		
	b. Employed	9	3	3.38	NS
8.	Types of Family				
	a. Nuclear	16	15		
	b. Joint	14	15	0.06	NS
9.	Monthly income of family (in rupees)				
	a. 5000–15000	24	29		
	b. 15000 and above	5	2	1.7	NS
10.	Family history of substances abuse.				
	a. No	13	7		
	b. Yes	17	23	0.13	NS
11.	Source of information regarding substances abuse.				
	a. Health personal, relative and friends	23	17	2.7	NS
	b. Mass media, books, literature	7	13		

S = Significant, NS = Not significant

it is concluded that the null hypothesis is accepted in the other cases.

In Table 6, it is seen that the calculated chi-square value for an educational grade is 13.03. This value is significantly higher than the tabulated chi-square value at 0.05 level of significance which is 3.84.

Thus, the null hypothesis is rejected and the research hypothesis is accepted and concluded that there is a significant association between the post-test knowledge score with educational grade. No association was found between any other variables and post-test knowledge score. Thus null hypothesis is accepted in all other cases.

DISCUSSION

The findings of the study showed that maximum students (68.33%) had an average level of knowledge and minimum (6.67%) had below-average knowledge and 25% had a good level of knowledge and the excellent level of knowledge (0%). Thus, it was evident that the majority of students had an average level of knowledge regarding substances abuse. The mean score, median score and SD in the pre-test was 12.78, 12.5 and 2.92 respectively.

This study was supported by Syed Masud Ahmed and AKM Masuel Rana's descriptive study on general knowledge



Table 6: Findings related to association between Demographic Variable and Post-test Knowledge Score (N = 60)					
S. No.	Demographic variable			Chi-square value	Inference
		≥Median	<Median		
1.	Age (in years)				
	a. 15 – 17	21	16	1.01	NS
	b. >17	10	13		
2.	Religion				
	a. Hindu	20	20	0.53	NS
	b. Minorities	12	8		
3.	Education Grade				
	a. 11 th	8	21	13.03	S
	b. 12 th	23	8		
4.	Education of father				
	a. Up to primary level	14	16		
	b. Secondary to Post graduation level	16	14	0.27	NS
5.	Occupation of father				
	a. Self employment	12	12	0.04	NS
	b. Regular employment	19	17		
6.	Education of mother				
	a. Up to primary level	16	16		
	b. Secondary to Post graduation level.	16	12	0.31	NS
7.	Occupation of mother				
	a. Unemployed	23	25	1.35	NS
	b. Employed	8	4		
8.	Types of Family				
	a. Nuclear	13	18	2.43	NS
	b. Joint	18	11		
9.	Monthly income of family (in rupees)				
	a. 5000 – 15000	26	27		
	b. 15000 and above	5	2	1.24	NS
9.	Monthly income of family (in rupees)				
	a. 5000 – 15000	26	27		
	b. 15000 and above	5	2	1.24	NS
10.	Family history of substances abuse.				
	a. No	11	9	2.7	NS
	b. Yes	20	20		
10.	Family history of substances abuse.				
	a. No	11	9	2.7	NS
	b. Yes	20	20		

S. No.	Demographic variable	≥Median	<Median	Chi-square value	Inference
11.	Source of information regarding substances abuse.				
	a. Health personal, Relative and friends	23	17	1.63	NS
	b. Mass media, books, literature	8	12		

S = Significant, NS = Not Significant

on substances abuse among adolescent boys and girls in New Delhi, Mean knowledge score in the area related to narcotics was 42% and 39.9% for boys and girls and related to alcohol was 32.6% for both groups. Based on the study conclude the majority of respondents has inadequate knowledge regarding substance abuse.¹⁵

The study findings showed that a maximum (80%) of the students had a good level of knowledge and (20%) had an excellent level of knowledge regarding substances abuse. Thus, it was evident that the majority of students had gained a good and excellent level of knowledge regarding substances abuse. The mean score, median score and SD in the post-test was 22.58, 23 and 2.02, respectively.

This study was supported by Karnool and Raju's quasi-experimental study on drug addiction among engineering students at Bangalore which showed that in post-test the overall mean knowledge score of the students is 76.63%. In the pre-test, majority of students, had a mean knowledge score of 48.37%. Thus it showed that structured teaching programs had a definite impact on raising the knowledge of students regarding drug addiction.²⁹

The study revealed that Pre-test and post-test mean knowledge score was 12.78, 22.58 Respectively. The calculated „t“ value was 19.2 which was significant at the p>0.05 level while the tabled value on this level of significance was found at 1.645. Hence null hypothesis was rejected and the research hypothesis was accepted i.e. the post-test knowledge score regarding substances abuse was significantly higher than the pre-test knowledge score. It can be safely assumed that STP had a definite impact on raising the knowledge of students on substance abuse.

This study was supported by Prathima Moorthy, N, Manjunatha's a pre-experimental study on knowledge about opioids and cocaine abuse among college students in Bangalore. Which show that the calculated t- value was t = 37.74 and was greater than the tabulated value at a 0.05% level of significance. The overall findings of the study showed that this structured teaching program is very effective in improving the knowledge of college students on opioids and cocaine.³¹

The current study findings showed that there is a significant association between the religion of students and pre-test. The chi-square value of religion was found to be 11.87. while the table value at the 0.05 level of significance was 3.84. no other demographic variable had a significant association with the pre-test knowledge score.



The post-test there was found a significant association between the educational grade and post-test knowledge score. The chi-square value of educational grade was found to be 13.03 in post-test. Where the tabulated value at the 0.05 level of significance was 3.84 the study did not show any other significant association between demographic variable and post-test knowledge score.

This study was supported by Sreevani R's a quasi-experimental study on adverse effects of tobacco smoking among adolescent students in Tamaka dist. Kolar that there was no relationship between variables and knowledge of adolescence but there was the relationship between education and knowledge of adolescence regarding the adverse effect of tobacco and smoking. Based on findings the investigator concluded that PTP has improved the knowledge of adolescence regarding the adverse effect of tobacco and smoking³².

CONCLUSION

The following conclusions were drawn based on the findings of the study. The majority of students had inadequate knowledge regarding substances abuse in the pre-test. Age of the boys, Education and Occupation of the parents, type of family and income of a family, Source of information regarding substances abuse had no impact on knowledge regarding substance abuse. A structured teaching program had a definite impact on students' knowledge regarding substances abuse. In the post-test majority of students had adequate knowledge regarding substances abuse.

RECOMMENDATIONS

A formal education program must be conducted in all senior secondary schools regarding substances abuse. The study can be replicated on a large sample; thereby findings can be generalized to a large population. A concentrated effort should be made to increase the awareness among the boys of senior secondary school students of their responsibilities in today's society. Substances abuse assessment (SAA) for adolescence and young adults could be held on a regular basis.

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Developing an Image Processing-Based Method to Objectively Decide the Conspicuousness of Permanent Facial Scar

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ABSTRACT

Permanent facial scars cause serious trauma because the person has to live with a scar which s/he cannot easily hide. Conspicuous scar tissue will have a negative impact on psychology depending on how much importance they give to their appearance. Because of this reason, it is evaluated as an aggravated form of punishment in Turkish Criminal Law.

In this study, image processing software was used for the quantitative analysis of facial scars. The scar photographs were taken, and the relative colour difference of the scar region was measured concerning the nearby healthy area. The scar's physical properties, such as the length and the surface area, were measured by processing the photographs in software.

An evaluation of 100 cases showed that the relative color difference rate of 15% is critical for deciding the conspicuousness of permanent facial scar. Above this rate, the facial scar is visible by the naked eye without affecting any factors such as the physicians' visual acuity, attention, and experience. Otherwise, the scar's length and the surface area must also be evaluated for a correct decision about the conspicuousness of a permanent facial scar.

Keywords: Facial scar, Forensic Medicine, Image Processing, Forensic Science, Legal Medicine

Int J Eth Trauma Victimology (2021). DOI: 10.18099/ijetv.v7i02.5

INTRODUCTION

Physical injury or a wound has been defined as damage to any part of the body due to a deliberate or an accidental application of mechanical force or other traumatic agent causing serious bodily harm.^{1,2} Facial scars are considered aesthetic damage that causes unpleasant modifications in both the static or dynamic facial expression recognized by everyone and affect the image of the person.³

It is reported that people who have symmetrical faces are more attractive to the opposite sex than those with asymmetrical faces and the social interactions with both sexes are easier.⁴ It is also known that anxiety and depression caused by the trauma of the face, increase with the healing process delay.⁵ It has also been reported that the disfigurement based on facial trauma makes the person unhappy, socially isolated and stigmatized.^{4–6} The aesthetic concerns of these patients lead to multidisciplinary surgical intervention more than once in many cases.⁷ It has been reported that facial trauma victims have more somatoform symptoms, an increased tendency to substance abuse, and decreased joy of life.⁸

Each trauma, depending on the level, affects individuals painfully and destructs them psychologically. Therefore, Turkish law is seeking a criterion to assess the perpetrator's penalty according to the severity of the trauma. In addition, the law has been concerned with the significance of the trauma result without being directly related to its level. A trauma that leads to a permanent and conspicuous facial scar is also evaluated in this context, and the penalty given to the perpetrator is more aggravated than the bare form of crime.⁹

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How to cite this article: Gelir A, Yilmaz AS, Asicioglu F, Kadi OF, Yildirim KB, Okudan M, Gulpinar K. Developing an Image Processing-Based Method to Objectively Decide the Conspicuousness of Permanent Facial Scar. *Int J Eth Trauma Victimology*. 2021;7(2):23-29.

Source of support: The author(s) disclosed receipt of the following financial support for the research: This work was supported by the Scientific and Technological Research Council of Turkey (TUBITAK) [Grant No. 216S896]

Conflict of interest: None

Received: 11/09/2021;

Received in revised form: 15/11/2021;

Accepted: 23/11/2021;

Published: 20/01/2022

In a criminal assault case, if the act of the perpetrator causes a permanent and conspicuous scar on the face of the victim, according to the criminal law of several countries like Bangladesh, Italy, Turkey, the punishment will be heavier than a simple form of offence, and it may also cause indemnity claims. The decision of the conspicuousness and permanence of the facial scar is determined by medical doctors at least six months after the incident via the observation of the victim's face from one or two meters away by the naked eye under adequate light (preferably daylight). However, the decision can be affected by many factors such as the visual acuity, attention, mood, sense of aesthetics, and experience of the physicians.

In this study, the relative color changes of the scar region concerning the nearby healthy region were calculated.

Furthermore, the surface area and the length of the scar were measured to facilitate the physician's final decision on the significance and permanence of the facial scar with objective parameters.

MATERIALS AND METHODS

The victims of all cases were selected randomly whom criminal courts sent to the 2nd Specified Committee of Turkey's National Council of Forensic Medicine. This Council is the main organization in the country which works under the jurisdiction of the Ministry of Justice. The Council has subunits in all cities of the country. The Council consists of laboratories that provide analysis and different specialized committees that give expert opinions by evaluating the case as a whole with the participation of experts from different disciplines. There are eight specialized committees of the Council, which are named with numbers. The aforementioned 2nd Specified Committee gives an expert opinion about all kinds of trauma that contain permanent and significant facial scar evaluation. It consists of board members from 12 different medical and forensic disciplines such as forensic medicine specialists, plastic and reconstructive surgery, general surgery, ear, nose, and throat surgery, ophthalmology, psychiatry, orthopedics, radiology, etc.

The photographs of the victims were taken by using Canon 1300D cameras on a tripod. During photograph taking, different lighting conditions were used. A ring led illuminator with different colors mounted on the lens and a polarizing filter (B and B Digital CPL 58mm filter) in front of the lens were used for lighting.

Image Processing Procedure

Processing the images was performed by using the ImageJ software, a Java-based image processing program developed by the National Institute of Health of the USA.¹⁰

The photographs were directly used for processing, i.e., no filtering or further modifications were applied to the photographs for analysis. The procedure for the quantitative analysis of the photographs can be explained as follows:

- Determining the relative color change between the scar region and the nearby intact area on the face. To obtain this color difference in the greyscale, the plot profile tool of the ImageJ software was used. For this purpose, first, the image

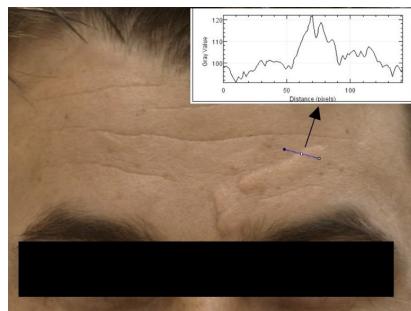


Figure 1: Sample photograph on which the colour profile was shown. A line was drawn through the healthy and the scar regions on the face, and a plot of the color values for this profile was given as a subfigure.

is converted to an 8-bit grayscale image, and then a line that passes over the healthy part and the scar region was drawn to draw the colour profile plot through this line as seen in Figure 1. The relative colour change was calculated by taking the ratio of the averages of the healthy colour values and the scar regions on the face. The average colour values were calculated in the intervals in which the sharp changes, especially while passing from healthy to scar regions, were excluded. For example, in Figure 1, the interval 25 to 50 pixels and 65 to 85 pixels were used to calculate the average color values of the health and the scar regions, respectively.

- The second step of the analysis is selecting the scar region and then calculating the surface area of this region. The selection of the scar region is performed by using the Versatile Wand Tool¹¹ plugin of the ImageJ software. This is a powerful tool for selecting the regions automatically. Some parameters must be adjusted before or during the selection process in this tool, as seen in Figure 2. The most important parameter in this tool is the Value Tolerance which is used to expand the selection to all image points as long as the difference between the pixel value of the point clicked and the image point is less than the Value Tolerance. This parameter is adjusted to be able to select the scar completely in this study. In addition, the connectedness was set to "8-connected" and "include holes" was checked. Other parameters were used as default.

The photograph must be calibrated to obtain a result in SI units in the measurements and calculations. For calibration, the scale's photograph is taken together with the victim's photograph and by using the line tool, the value of a selected length of the pixels can be obtained in SI unit by using this scale. This value is then entered into the Set Scale tool of the ImageJ for calibration.

To simplify the analysis process, a menu that includes only the required tools was designed using JAVA language as seen in Figure 3.

RESULTS AND DISCUSSIONS

Some example photographs of the facial scars are represented in Figure 4. These photographs were taken a minimum of 6 months after the trauma when the healing is completed. It is easily seen that these scars are visible by the naked eye, and

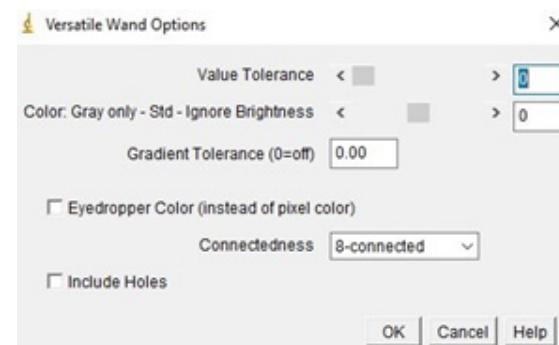


Figure 2: The parameters of the Versatile Wand Tool plugin used in ImageJ.



they can be assumed as permanent and conspicuous facial scars.

The photographs were taken under different lighting conditions to obtain clearer photographs, and some examples are shown in Figure 5. It is seen that when the polarized filter and white light illumination are used, the visibility of the scar

is better, as shown in Figure 5(a). When other colors are used for lighting, information in the image is lost partly.

The quantitative analysis of these scars is crucial for preparing an objective forensic medical report. The first step of the analysis is determining the relative color change between the scar region and the nearby intact area on the face. The ImageJ plot profile tool was used to determine the relative color change as mentioned in the Materials and Methods section. Here, the most essential point is selecting the point where the line will be drawn to obtain the relative color change. The criterion of the selection of this point is maximizing the relative color change. This can be performed by moving the line which passes through the scar-healthy region in the “live” mode of the plot profile tool and deciding a line for which the contrast between the intact and the scar regions is maximum. Some example pictures of this procedure are shown in Figure 6 and it is seen that the upper left profile has the maximum contrast between the scar and nearby healthy regions where the color values for the scar are higher than the color values of the healthy part.

After the line decides for plotting the color profile, the relative color change can easily be calculated by taking the ratio of the average color values of the scar and the nearby healthy regions.

The second step of the analysis is the selection and the calculation of the surface area of the scar region as seen in



Figure 3: The menu is written in JAVA language, which includes only the required tools for the analysis

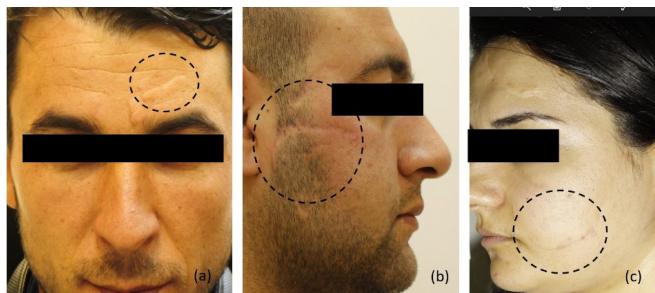


Figure 4: Some examples photographs which show facial scars.

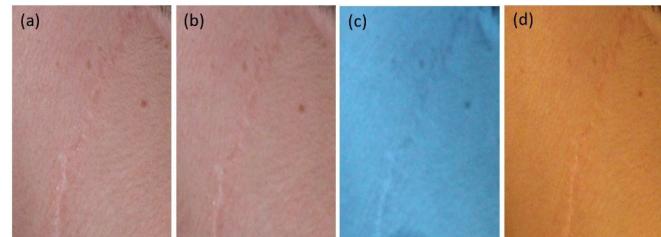


Figure 5: The photographs were taken under different conditions; white light with polarized filter (a), white light (b), blue light (c), and yellow light (d)

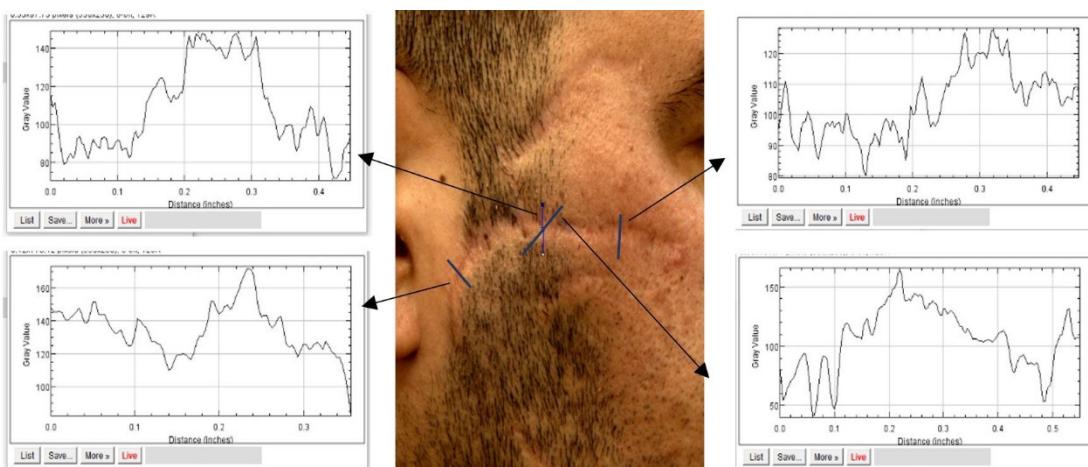


Figure 6: Different colour profiles through the lines drawn at different points of the scar-nearby healthy region. Here, it is seen that the upper left profile has the maximum contrast between the scar region and the intact area

Figure 7. After selecting the scar region, it must be marked and added as a region of interest. This can be done by using the region of interest (ROI) tool of the ImageJ software. The selected regions can be added to the ROI list by clicking the “Add” button in the ROI manager. Sometimes, the scar region cannot be selected as a single part. Some small regions are selected to cover the scar completely in these cases, and each region is added to the ROI manager list. After adding these selections to the list, they can be combined to obtain one selection covering the whole scar region. The surface area of this combined region can automatically be measured by using the “Measure” tool in the ROI manager.

In quantitative analysis of the photographs, it is expected that most of the deviation will result from the selection of the scar region. Here, the tolerance in the Versatile Wand tool depends on the person who makes this analysis, and the value of the tolerance will change the value of the surface area of the scar region. In Figure 8, the variation of the surface area of the same scar region selected by different people at different times was shown. From this variation, it was concluded that the amount of the deviation in the selection of the scar is about 12% and it can be assumed that it does not have a considerable effect on the results of the analysis.

Many photographs were analyzed successfully by following the procedures mentioned above. Some example photographs and analyses were given in the following figures.

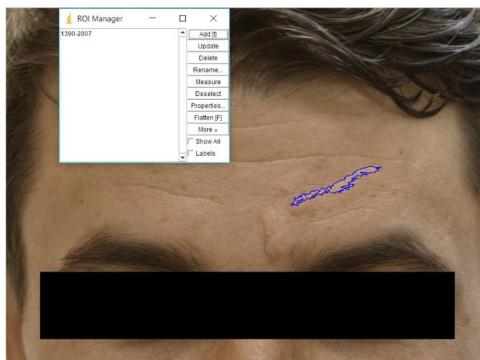


Figure 7: A photograph with a selected scar region and the region of interest (ROI) tool of ImageJ

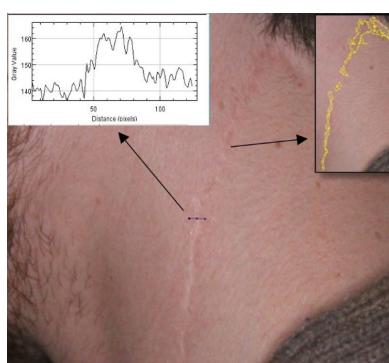


Figure 9: The scar is seen on the neck of the victim. The plot of the colour change through the line and the selection of the scar was given in the inset figures

In Figure 9 the scar region on the neck of the victim was shown. The relative colour change for this scar is about 16 % and the surface area of the selected scar region is 266.9 mm². In addition to the surface area, the length of the scar was also measured by using polynomial approximation to 116.7 mm. The visibility of the scar region by the naked eye is clear and the decision of the conspicuousness of permanent scar can easily be given for this victim.

In Figure 10, the scar region is seen on the chin of the victim. The relative colour change for this scar was found as 20%, which is higher than the relative change obtained for the victim given in Figure 9 even if the scar region is bigger. This is probably due to the location of the scar. In Figure 10, the skin's surface is covered by the residue beard after shaving, which darkens the color of the intact region. Thus, the relative color change is more pronounced for this victim. The surface area and the length of the selected scar region were measured as 30.1 mm² and 15.5 mm, respectively.

Another example of the scar which is visible with the naked eye is shown in Figure 11. Here, the visibility of the scar region differs for different parts of the scar. The bottom part of the scar is more pronounced than the upper part. The relative color change analysis of the scar must be performed as the previous analysis and the maximum change must be chosen at the end. In addition, a relatively long beard decreases the visibility of the scar and for correct analysis,

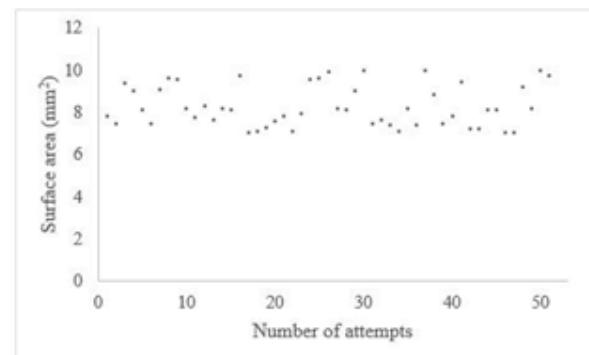


Figure 8: Variation of the surface area of the same scar region depending on the selection of the scar region at different times by different people

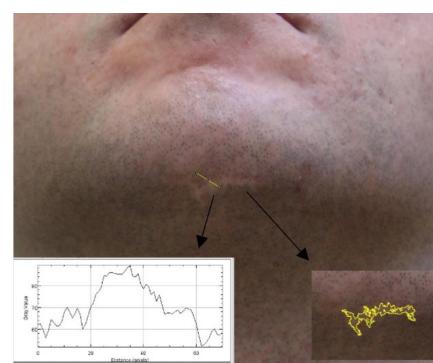


Figure 10: The scar region on the chin of the victim. The plot of the colour change through the line and the selection of the scar was given in the inset figures

it must be shaved before the analysis. The length of the scar again was calculated by using a polynomial approximation and found to be 104.7 mm. The surface area of the selected scar region was calculated as 272.9 mm².

The conspicuousness of permanent facial scar can easily be given for the victims given in Figures. 9, 10 and 11 by using just the relative color changes and with the observation by the naked eye. However, the scars are given in the following Figures. 12, 13 and 14 are not visible to the naked eye and the decision of conspicuousness of permanent facial scar is not easy to make. In addition to the relative colour change, other physical properties such as the length and the surface area of the scar region must also be taken into account before the final decision for these types of scars.

In Figure 12, the scar on the upper lip was shown. In the upper inset figure, the plot profile was given and the relative colour change between the scar region and the intact area was measured as 8%. In the bottom inset figure, the selection of the scar region was given and from this selection, the surface area of the scar region was calculated as 17.8 mm². The visibility of the scar region with the naked eye concerning nearby healthy region is not clear enough so the decision of conspicuousness of permanent facial scar cannot be made easily for this victim.

In Figure 13, a scar on the temple is shown. As seen in this figure, the scar is not clear enough to observe by the naked eye. For this scar, the relative color change was found to be 6%.

The surface area and the length of the scar were measured as 38.1 mm and 160.7 mm².

Another example of these types of scars is given in Figure 14. Here, the scar region is fairly visible by the naked eye again, and the relative color change for this scar was calculated as 9%. The surface area and the length of the scar were measured as 12.1 mm and 21.2 mm².

After examining 100 cases in the 2nd Specified Committee of Council of Forensic Medicine, it was concluded that the final decision of conspicuousness of permanent facial scar could easily be given under the observation by physicians' naked eye when the relative color change is bigger than 15%. Whereas, for the victims with a relative color change smaller than 15%, the observation by the naked eye is not enough to give the decision of the conspicuousness of permanent facial scar objectively. For these cases, the results of the quantitative measurements given in this study must be used together with the observation made by the naked eye.

In the photographs given in Figure 15, this situation is seen clearly. Here, the relative color change of the scars for the left and right photographs was calculated as 6% and 12%, respectively. Although the relative color change is more extensive for the victim in Figure 15(b), the conspicuousness of permanent facial scar decision was made for the victim in Figure 15(a), not for the victim in Figure 15(b) as a result of the observation by the physicians' naked eye. Here only

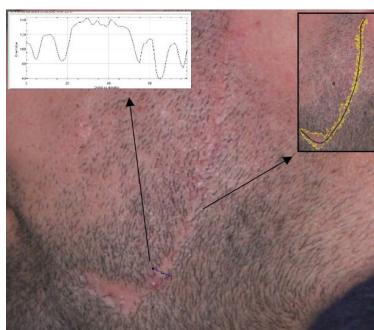


Figure 11: The scar on the cheek of the victim. The plot of the colour change through the line and the selection of the scar was given in the inset figures

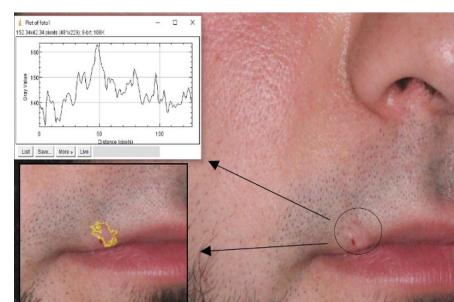


Figure 12: The scar on the upper lip. The plot of the colour change through the line and the selection of the scar was given in the inset figures

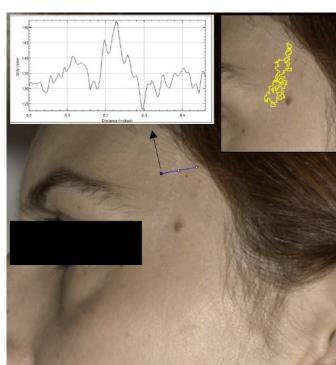


Figure 13: A scar on the temple. The plot of the color change through the line, and the selection of the scar was given in the inset figures



Figure 14: The scar at the borderline of the moustache. The plot of the colour change through the line and the selection of the scar was given in the inset figures



Figure 15: Comparison of two critical facial scars. The relative color change of the scars was calculated as 6% (left) and 12% (right)

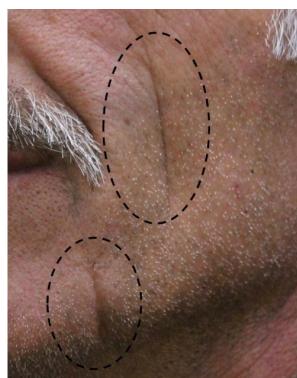


Figure 17: The scar regions on the cheek and chin. These scars are examples of deep scars

one example is given, but it was observed that these kinds of evaluations that appear contradictory mainly were met for the victims who have relative color change below 15%. Therefore, it is recommended that quantitative measurements for these critical cases must be taken into account before the final decision, as in this example.

In Figure 16, the scar on the left ear of the victim was given, and the relative color change, length and the surface area of the scar region were found as 20%, 7.2 mm, and 7.3 mm², respectively. This photograph clearly shows that the image processing-based analysis given in this study can easily be applied to the photographs taken from any body part. It means that the technique proposed in this study can easily be generalized to many forensic applications related to image processing.

In Figure 17, an example of a deep facial scar was given. For these types of scars, 3D imaging of the scar region must be used, and it is more meaningful than the 2D images. Because, by using the 2D images, only the cross-sectional area can be calculated, which deviates from the real value of these cases. Using the 3D images will be possible to obtain the correct surface area and the volume information of the complete scar.

CONCLUSION

It was shown that the image processing-based analysis could be used for quantitative measurement of the physical



Figure 16: The scar on the ear. The technique proposed in this study can be generalized to any part of the body

properties of the facial scars. The analysis gives very precise results, and these results can be used for the objective decision of the conspicuousness of the permanent facial scar.

Although parameters such as the location of the scar tissue, its dimensions, accompanying age lines, etc. are important, it is considered that the 15% and/or above relative color difference for a significant part of the cases will be effective alone in deciding for the conspicuousness of permanent facial scar. However, for some exceptional cases, if the physician gives the opposite opinion despite these relatively high color changes, this decision should be explained and supported by some other evidence. One example of this can be the location of facial scars such as surrounded by beard or moustache. It should be highlighted that if the surrounding area of the scar is suntanned; the decision should be postponed until the tanned skin goes back to its normal color.

As contrarily, a decision for conspicuousness of permanent facial scar can be given by physician although the relative colour change of scar is lower than 15%, but this decision should also be based on the quantitative results such as volume, square, length and location of scar or explained by physician's external observation.

Most errors might occur from the selection of the scar region because, during the selection, the operator adjusts the tolerance of the selection, and some fluctuations might probably arise depending on the operator. Therefore, care should be given for some border cases with a little less than 15% relative color change because, during the selection process, the operator's adjustment to select the value tolerance may affect the results. However, as it was calculated that the deviation result from this part is about 12%, and it does not have a considerable effect on the analysis.

ACKNOWLEDGEMENT

We would like to thank the director of the Turkish Council of Forensic Medicine for his contribution.

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A Brief Account on Socio-demographic Profile of the Victims of Violent Asphyxial Deaths in Dhaka City

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ABSTRACT

Background: Violent asphyxial deaths are often dealt with during autopsy, and its magnitude is mentionable nowadays.

Objective: To determine the frequency of cases of violent asphyxial death along with the determination of the socio-demographic variety of the victims.

Study Design: It is a cross-sectional type of descriptive study.

Place of Study: Department of Forensic Medicine of Sir Salimullah Medical College, Mitford, Dhaka, Bangladesh.

Duration: The study was conducted from January 01, 2017, to December 31, 2019.

Materials and Methods: A proforma was prepared where various data were tabulated, compiled and analyzed.

Results: 1060 cases of violent asphyxial death were encountered out of 9410 medico-legal autopsies. Male (68.67%) predominance was evident. The age group of 20-29 years (44.15%) was principally affected. Maximum victims were from urban areas (61.03%). Victims were mainly married (56.6%) and unemployed (26.6%). The Muslim (81.32%) victims were mostly seen and lower class people (58.2%) were the prime victims. Hanging (65.84%) and drowning (27.64%) were chiefly encountered.

Conclusion: The study reflects the magnitude of violent asphyxial death and a brief picture of the socio-demographic profile of the victims.

Keywords: Violent asphyxial death, Hanging, Strangulation, Drowning, Autopsy.

Int J Eth Trauma Victimology (2021). DOI: 10.18099/ijetv.v7i02.6

INTRODUCTION

The term “Asphyxia” has been accepted in the true medico-legal sense for many a year around the globe.¹ It is a Greek term that means pulselessness.² But in Forensic Parlance, it is meant by “Interference with oxygenation”.³ Mechanical asphyxia is a broad term in which enough external pressure is applied to the neck, chest, or other areas of the body, or the body is positioned in such a way that respiration becomes difficult or impossible.⁴ Commonly encountered violent asphyxial deaths include hanging, ligature strangulation, manual strangulation or throttling, smothering, drowning, traumatic asphyxia, and choking. Among these, hanging is one of the prime methods to commit suicide.⁵⁻¹¹ Hanging is invariably thought to be suicidal except accidental hanging in autoerotic deaths, homicidal hanging in case of lynching, and judicial hanging. In England and Wales, hanging constitutes about 2000 deaths each year and is considered the most common method of suicide.¹² Hanging is the second most common technique to commit suicide as per the report published in Canada.¹³ Death due to strangulation is considered homicidal all the time, but it may be accidental.¹⁴⁻¹⁸ Since Bangladesh is a land of rivers and there are plenty of lakes, ponds, and wells, a large seacoast,

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How to cite this article: Akber EB, Mahmud S, Ahmad M, Barua AK, Jahan I. A Brief Account on Socio-demographic Profile of the victims of Violent Asphyxial Deaths in Dhaka City. *Int J Eth Trauma Victimology*. 2021;7(2):30-34.

Source of support: Nil

Conflict of interest: None

Received: 07/07/2021;

Received in revised form: 12/11/2021;

Accepted: 24/11/2021;

Published: 20/01/2022

drowning cases are often encountered at autopsy. Based on a global burden of disease (GBD) study conducted by WHO in 2010, global mortality due to drowning is estimated to be 7% of all asphyxial deaths. They also estimated the annual global incidence of death in drowning to be 4,00,000.¹⁹⁻²³ The cases of smothering are very rarely dealt with in Bangladesh. Postmortem findings are often missed during autopsy if a soft pillow or a soft cloth is used for this purpose. Careful history taking, crime scene investigation, and careful examination

can solve this problem and may preserve justice.²⁴ Cases of traumatic asphyxia are not often found in Bangladesh.

In most cases, traumatic asphyxia is accidental.²⁵ Literature in this respect is of unmentionable number here in Bangladesh. Henceforth, this study aimed to ascertain the frequency of cases of violent asphyxial death in Sir Salimullah Medical College Morgue House, Dhaka from socio-demographic viewpoints.

AIMS AND OBJECTIVES

- The study was done to assess the impact of violent asphyxia to bring about death along with other unnatural causes
- To determine the socio-demographic variety of the victims.

MATERIALS AND METHODS

This study was done from Jan 2017 to Dec 2019 at Sir Salimullah Medical College Mortuary Dhaka in which the study revealed 1060 cases of violent asphyxial death out of the total 9410 medico-legal autopsies. A proforma was prepared and findings were written down in various tables. Epidemiological data, including age, sex, religion, dwelling place, marital status, occupation, and family history, were collected from the police inquest reports and information gathered from interviews with the relatives of the deceased. After that, these variables were tabulated, assembled, and scrutinized.

OBSERVATIONS AND RESULTS

Table 1 shows a gradual yearly increase in the total number of cases of violent asphyxial death which denotes 303 cases (10.84%) of the total 2794 autopsies in 2017 followed by 336 cases (10.72%) of the total 3133 autopsies in 2018 and 421 cases (12.08%) of the total 3483 autopsies in the year 2019. Thus, this study revealed a total of 1060 cases of violent asphyxial death, comprising 11.26% of the total 9410 autopsies.

Table 2 shows a total of 728 (68.67%) male victims, which outnumbered the females (332 victims/31.32%) out of the total 1060 cases of violent asphyxia.

Table 1: Year-wise distribution of cases of violent asphyxial death

Year	Total no. of the autopsy performed	Frequency of cases of violent asphyxial death	Percentage (%)
2017	2794	303	10.84
2018	3133	336	10.72
2019	3483	421	12.08
Total	9410	1060	11.26

Table 2: Sex-wise distribution of cases of violent asphyxial death (n=1060)

Sex	Frequency	Percentage (%)
Male	728	68.67
Female	332	31.32
Transgender	0	0
Total	1060	100

Table 3 indicates the most affected age group was 20–29 years in 468 cases (44.15%) followed by 30–39 years in 244 cases (23.01%), 40–49 years in 124 cases (11.69%), 50–59 years in 113 cases (10.66%), 10–19 years in 107 cases (10.09%), 0–9 years in 3 cases (0.28%) and >60 years only in 1 case accounting for 0.09% of the total.

Table 4 shows that the majority of the victims were from urban areas i.e., in 647 cases (61.03%) followed by rural in 228 cases (21.50%), sub-urban in 178 cases (16.79%), and 7 victims were unknown, comprising 0.66% of the total.

Table 5 Manifests that among 728 male victims 387 (53.15%) were married, 336 (46.15%) were unmarried, and 5 victims (0.68%) were unknown. On the other hand, among 332 female victims, 213 (64.15%) were married, followed by unmarried 117 (35.24%) and unknown 2(0.6%). Wherefore, this study revealed a total of 600 (56.60%) married victims followed by 453 (42.73%) unmarried and only 7 (0.66%) unknown victims out of the total 1060 cases of violent asphyxial death.

Table 6 reveals that Muslims were on top of the list concerning religion which means in 862 cases (81.32%) followed by Hindus in 132 cases (12.45%) and Christians in 5 cases (0.47%). There were 7 (0.66%), unknown victims, as well.

Table 7 shows the dominance of lower-class people as far as socio-economic class is concerned that means in 617 cases (58.20%) followed by the middle class in 239 cases (22.54%) and upper class in 197 cases (18.58%).

Table 8: indicates that maximum victims were unemployed which means in 282 cases (26.60%) followed by housewives in 276 cases (26.03%), students in 192 cases (18.11%), day laborers in 188 cases (17.73%), service holders in 64 cases (6.03%), businessmen in 33 cases (3.11%), farmers in 16 cases (1.50%) and only 2 victims (0.18%) who were retired from their job.

Table 3: Age-wise distribution of cases of violent asphyxial death (n=1060)

Age in years	No. of cases of violent asphyxial death	Percentage(%)
0–9	3	0.28
10–19	107	10.09
20–29	468	44.15
30–39	244	23.01
40–49	124	11.69
50–59	113	10.66
>60	1	0.09
Total	1060	100

Table 4: Distribution of cases of violent asphyxial death in relation to dwelling place (n=1060)

Dwelling place	Frequency	Percentage (%)
Urban	647	61.03
Rural	228	21.50
Sub-urban	178	16.79
Unknown	7	0.66
Total	1060	100



Table 5: Distribution of cases of violent asphyxial death based on marital status (n=1060)

Marital Status	Male		Female		Total	
	No.	%	No.	%	No.	%
Married	347	53.15	213	64.15	600	56.60
Unmarried	336	46.15	117	35.24	453	42.73
Unknown	5	0.68	2	0.6	7	0.66
Total	728	100	332	100	1060	100

Table 6: Distribution of cases of violent asphyxial death according to religion (n=1060)

Religion	Frequency	Percentage (%)
Muslim	862	81.32
Hindu	132	12.45
Christian	5	0.47
Buddhist	0	0
Unknown	7	0.66
Total	1060	100

Table 8: Distribution of cases of violent asphyxial death according to occupation (n=1060)

Occupation	Frequency	Percentage (%)
Unemployed	282	26.60
Housewives	276	26.03
Students	192	18.11
Day Laborers	188	17.73
Employed (service)	64	6.03
Businessmen	33	3.11
Farmers	16	1.50
Unknown	7	0.66
Retired persons	2	0.18
Total	1060	100

Table 9 shows that hanging was mostly encountered among other cases of violent asphyxial death which means hanging was in 698 cases (65.84%) followed by drowning in 293 cases (27.64%), traumatic asphyxia in 34 cases (3.20%), strangulation in 19 cases (1.79%), throttling in 14 cases (1.32%) and smothering only in 2 cases accounting for 0.18% of the total.

DISCUSSION

Table 1: This study revealed 1060 cases (11.26%) of violent asphyxial death. Almost indistinguishable observations were drawn by Kumar *et al.*²⁶ (10.5%), Murty *et al.*²⁷ (10%), Tirmizi *et al.*²⁸ (7.08%), Arif *et al.*²⁹ (5.9%), Patel *et al.*³⁰ (5.63%), Amandeep *et al.*³¹ (5.26%) and Sharma *et al.*³² (5%). On the other hand, in studies conducted by Azmac D *et al.*³³ and Reddy SP *et al.*,³⁴ the occurrences were 15.7% and 19.7%, respectively.

Table 2: Male predominance was observed in this study. Similar impressions were obtained from the study done by Patel *et al.*³⁰ Males were the most common victims in other studies done by Chaurasia *et al.*³⁵ (Males-60.89% & females- 39.11%), Vadgama *et al.*³⁶ (Males-64% & females-36%), Ahmad *et al.*³⁷

Table 7: Distribution of cases of violent asphyxial death concerning socio-economic status (n=1060)

Social Class	Frequency	Percentage (%)
Lower class	617	58.20
Middle class	239	22.54
Upper class	197	18.58
Unknown	7	0.66
Total	1060	100

Table 9: Distribution of cases of violent asphyxial death on the basis of type of death (n=1060)

Type of Death	Frequency	Percentage (%)
Hanging	698	65.84
Drowning	293	27.64
Traumatic Asphyxia	34	3.20
Strangulation	19	1.79
Throttling	14	1.32
Smothering	2	0.18
Total	1060	100

(Males-61.9% & females-38.1%) and Akber *et al.*³⁸ (Males-54.07% & females-45.92%).

Table 3: The age group of 20-29 years was most affected. Similar findings were found from other studies done such as Ghadge *et al.*³⁹ and Arora. *et al.*⁴⁰

Table 4: Maximum victims were from urban areas. Studies showing similar pictures include Chauhan *et al.*⁴¹ (Urban 70.2%, sub-urban-19.85% and rural-9.89%), Rawat *et al.*⁴² (Urban-72.28% and rural-27.72%). Some other studies reflected dissimilar pictures where the victims were more in rural areas than urban areas which include Singh *et al.*⁴³ (Rural-51.6% & urban-48.4%), Santosh CS *et al.*⁴⁴ (Rural-51.14% & urban-44.86%) and Gupta *et al.*⁴⁵ (Rural-43.75% & urban-41.56%)

Table 5: Both male and female victims were from the married group in this study. In contrast, these findings were almost similar to the study done by Kumar *et al.*²⁶ in which there were 63.9% married victims as compared to 36.1% victims who were unmarried. Waghmare *et al.*⁴⁶ revealed 68.33% victims who were married as compared to 25% unmarried victims, and Ahmad *et al.*³⁷ revealed 51 (57.3%) married and 38 (42.7%) unmarried victims.

Table 6: In this study, Muslims were the predominant victims. A similar study revealed a completely different picture as reported by Sharma *et al.*³² in which predominant victims



were Hindus (98.6%) and Mohanty *et al.*⁴⁷ also revealed the dominance of Hindu victims (93.5%).

Table 7: People of lower socioeconomic status were the prime victims in this study. A similar study conducted by Singh *et al.*⁴⁸ revealed 215 (98.17%) victims were also from the lower class followed by the middle class (3 cases/1.36%) and upper class (1 case/0.45%).

Table 8: Maximum victims were from the group of unemployed and housewives as per observation from this study. A similar study was done by Majumder *et al.*⁴⁹ in which there were 25.8% students, 21.3% farmers and 11.3% service holders.

Table 9: In this study, cases of hanging and drowning were mostly encountered. A study conducted by Singh *et al.*⁴⁸ revealed hanging in 60.27% followed by drowning (19.63%) and strangulation (14.61%). Similar pictures were observed in a study conducted by Gurudut *et al.*⁵⁰ Cases of smothering are rarely dealt with in Bangladesh. A study, conducted in Ghana revealed that cases of smothering accounted for 0.158% of the total 635 cases of unnatural death in the central region of Ghana.^{51,52} Another study was conducted in Varanasi, India in which there were 33 cases of traumatic asphyxia among the other cases of violent asphyxial death.⁵³

ACKNOWLEDGMENT

I am grateful to all the faculty, staff and mortuary assistants of the Department of Forensic Medicine of Sir Salimullah Medical College, Mitford, Dhaka. I would like to thank Dr Sohel Mahmud, Head of the Department of Forensic Medicine of Sir Salimullah Medical College for his continuous and tremendous support in conducting this study. All the authors contributed equally during data collection, data analysis, and editing of the manuscript.

CONCLUSION

In the light of the above, this study concluded that hanging and drowning were mostly encountered among all other violent asphyxia. Hanging was observed to be the most chosen means to commit suicide. Furthermore, people with emotional instability and suicidal tendencies need counseling and psychiatric consultations to prevent suicide. Drowning contributed mainly to accidental deaths. Carelessness, hurriedness and heavy rushes in launches, steamers and boats on the part of the passengers during the festival time are identified causes of accidental drowning in Bangladesh. Electronic and print media can play a vital role in initiating awareness among mass people. Law enforcing authority and Bangladesh Inland Water Transport Authority (BIWTA) have to monitor the movement of the water transports vigorously, particularly during major festivals, to cut down and prevent further incidences of accidental drowning from the country.

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Internship in Forensic Medicine & Toxicology-A Proposed Curriculum

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ABSTRACT

The controlling authority for medical education in India has finally taken the much-needed decision to increase the course duration of the subject Forensic Medicine & Toxicology (FMT). The subject has been now included in the 3rd Professional MBBS (Part 1), thus increasing the course duration by nearly one year. There is now also a provision for 15 days of elective internship posting in the subject. However, these 15 days of training are often not optimally utilised as there is a lack of clear-cut guidelines. The MCI/NMC curriculum is vague and too much open for interpretation in this regard.¹ So a standard curriculum that can easily be followed in all Medical Colleges of India is much necessary to ensure a uniform standard of training.

Keywords: Ethics, Forensic Internship, MBBS, Medico-Legal, Medicine & Toxicology.

Int J Eth Trauma Victimology (2021). DOI: 10.18099/ijetv.v7i02.7

INTRODUCTION

In the new MBBS curriculum enacted since the 2019 academic year, the subject of FMT has been given its due importance. The elective internship posting of 15 days is another step in the right direction. This posting is quite popular among the interns and almost no slots go vacant.

However, there is no uniform protocol on how to conduct the training of an Intern. Most of the faculties have never done an internship in this subject as it was not available in their time. This has led to a rather confusing situation resulting in two extreme scenarios. On one hand, the over-zealous department is trying to teach each & every aspect of FMT to the intern, treating them like “PROXY JRs”. It caused nothing but frustration to both parties.

On the other hand, the apathetic department is only concerned with the physical presence of the intern often assigning menial & clerical jobs to him/her, thus completely devaluing the purpose of the internship.

So it is evident that a clear cut guideline and protocol is needed to address this unfortunate situation. Medico-legal litigations against doctors are on the rise and due to the COPRA ACT², doctors have essentially become “service providers”. The internship period can be utilised effectively to warn and train the budding doctors to avoid such pitfalls. It is also a golden opportunity to incite interest in the subject to choose it as a future specialization.

For this, a balanced and relevant curriculum is essential as it is useless to introduce the intern to a myriad of complex autopsies and vexing medico-legal problems. It is proven that less than 1% of a standard MBBS batch (150 students) will choose FMT as their specialization.

It is clear then that the aim of the training should be focused on the medico-legal aspects and scenarios faced by all practising doctors irrespective of speciality.

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How to cite this article: Bhattacharyya PS. Internship in Forensic Medicine & Toxicology - A proposed. *Int J Eth Trauma Victimology*. 2021;7(2):35-36.

Source of support: Nil

Conflict of interest: None

Received: 27/07/2021;

Received in revised form: 14/09/2021;

Accepted: 29/9/2021;

Published: 20/01/2022

The aim and objectives of the said training are multifaceted and can be broadly summarized as below:

AIMS AND OBJECTIVES

- **Introduction:** This should be done at the beginning of the training period, preferably by senior faculty members. The focus should be on the scope of the subject, the various medico-legal situation faced by practicing doctors, subtleties of Medical Ethics and Etiquette.
- **Clinical Forensic Medicine:** Focus should be on preparing medico-legal reports and medical certificates commonly encountered in day to day practice. Priority should be given to preparing Injury reports, sickness/fitness certificates, Death certificates and Police Intimation. How to identify and mark medico-legal cases and subsequent procedures are also covered in this section. Female interns must be sensitised to POCSO³ cases as examination by a lady doctor is mandatory in such cases.
- **Autopsy:** Undue emphasis must not be given on autopsy as it is unlikely that the intern will face it in future unless he/she specializes in FMT. Common cases like hanging, burn, RTA, poisoning, Myocardial infarction should

A model curriculum is provided below for ready reference			
Day	Aims & Objective	Focus Area	Coordinator
1	Introduction	Meet& greet, joining formalities, the scope of FMT, Basics of medical ethics & etiquette, medical negligence	HOD/senior faculty
2	Introduction (cont)	Medical negligence, defence against medical negligence, consent taking, duties of a doctor etc	Associate/assistant professor
3	Clinical forensic medicine	Injury report, the victim of sexual assault examination, sickness/ fitness certificate	Assistant professor/SR
4	Self study	NA	NA
5	Autopsy	Routine cases as mentioned	Surgeon of the day
6	Clinical forensic medicine	DC writing, police intimation, breaking of the bad news	SR/JR3
7	Self Study	NA	NA
8	Court visit	Summon receiving, court procedures	Faculty of the day
9	Autopsy	Routine cases as mentioned	Surgeon of the day
10	Self Study	NA	NA
11	Teaching	The pre-assigned topic for practical/demonstration class	SR/JR3
12	Miscellaneous	Various non-academic departments work	NA

#3 days have been deducted to account for Sundays/Holidays/Leaves

*Can be adjusted according to the departmental need viz ongoing exams etc

The intern will keep a record of the training in the logbook which has to be signed by the HOD before completion.

suffice. When to send a dead body for autopsy is of equal importance. Proper collection, preservation and dispatch of viscera to FSL should be covered in detail.

- **Self Study:** It is a bitter truth that the whole purpose of the MBBS course has been reduced to a mere passport for appearing in PG entrance exams. To deny this hard truth is similar to burying one's head in the sand. The interns should be allowed to do self-study within the department premises for at least 3/4 days. He/she should be encouraged to solve the MCQs of FMT and ask for help from the faculty if needed. This will be beneficial for the intern's future and also will create an atmosphere of goodwill.
- **Court visit:** This is a unique part of training which is very difficult in any other department. The interns will learn how to receive a summon and accompany a faculty member for one day in court to observe the proceedings first-hand. This exposure will help him/her for any future court appearance whether as an expert witness or accused.
- **Teaching:** As the term "Doctor" itself means teacher, it is the role for every doctor academically inclined or not. Unfortunately during the hectic internship schedule, teaching opportunities are hard to come by. So to awaken the dormant teaching skills, the intern may be allowed to take one practical/demonstration class on a pre-assigned topic under the supervision of a junior faculty member. This will surely boost the morale and confidence of the budding doctor and may turn him/her into a skilled teacher.
- **Toxicology:** As the intern will gain plenty of hands-on-training during medicine/casualty postings regarding poisoning cases, separate toxicological training other than what

is mentioned under the "Autopsy" section is not recommended.

Drawbacks

- Difficult to follow in the departments where no medico-legal work is done. (A theoretical outlook can be given instead)
- Centres with low faculty strength will not allow proper implementation.
- Apathy from the concerned intern and lack of interest from the concerned faculties.

CONCLUSION

As medico-legal litigations are on the rise and the weakening of the doctor-patient relationship, a young and budding doctor must be always on guard against both legal penalties as well as physical assault. If utilized properly, the internship period in Forensic Medicine can impart crucial knowledge and skill to the would-be doctor, which will help him/her meet the ever-changing and unique challenges associated with the medical profession.

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Impacts of Forensic Outcomes on Cadaveric Organ Donations in Malaysia

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ABSTRACT

In forensic medicine, there can be times when the dilemma of having to choose between harvesting organs from cadaveric donors versus the need to complete the forensic analysis to savor the equally important forensic outcomes becomes tricky as well *cul de sac* of one on another. The deliberation of the seemingly practical junction is of academic value and ethical considerations that need to be dissected upon. As such, the impacts of forensic outcomes on cadaveric organ donations in Malaysia through the lenses of (i) academic benefits of forensic outcomes, (ii) ethically justified considerations of the dilemma, and (iii) available data helpful in navigating through the two competing needs.

Keywords: Autopsy, Ethical justification, Malaysia, Organ donation.

Int J Eth Trauma Victimology (2021). DOI: 10.18099/ijetv.v7i02.8

INTRODUCTION

Organ transplant is an excellent medical advancement, particularly in the era of modern medicine. It brings hope, potentials, and a new lease of life to patients who are otherwise likely to succumb to death or subject to poor quality of life for as long as they are still alive. In today's medical technologies and developments, almost all our organs are transplantable, from major organs such as kidneys, heart, lungs, pancreas, uterus, and intestines, to corneas, skin, bones, ligaments, tendons, and even our face. Technically, all of those are transplantable from either cadaveric or living sources, except for the heart exclusive to cadaveric donations in the sense of brain death patients. As such, health authorities worldwide work on increasing the rate of organ donations to match the unbalanced demands, especially when it comes to the needs of kidneys, lungs, liver, and heart, which are life-changing and even lifesaving to patients on the waiting lists.¹

Zooming in to the subject of cadaveric organ donations, it is uniquely different compared to living organ donations in the sense that it is not readily limited to recipients who are genetically or emotionally related, most obvious in countries where living organ donations are heavily regulated to curb the issue of organs selling. In countries such as Iran, which legalize the selling of organs, the difference between cadaveric and living organ donations is more subtle.² Therefore, as most countries do not allow for the sale of organs, the beauty of cadaveric organ donations (compared to living organ donations) is epitomized by the vast choices of potential recipients able to benefit from the systems that are no more limited to genetically or emotionally related donor-recipient relationship. Even living donors can still donate altruistically to non-biologically or non-emotionally related recipients. Most systems employ rigorous and thorough reviews or rather complicated organs allocation systems, which in the cadaveric organ donations are hassle-free in that sense.

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How to cite this article: Jalil IJA, Ahmad MAH, Mohd Isa NA, NizamaniSM, IslamMN. Impacts of Forensic Outcomes on Cadaveric Organ Donations in Malaysia. *Int J Eth Trauma Victimology*. 2021; 7(2):37-43.

Source of support: Nil

Conflict of interest: None

Received: 30/07/2021;

Received in revised form: 30/09/2021;

Accepted: 06/10/2021;

Published: 20/01/2022

In 2018, around 25,000 patients in Malaysia were on the waiting list for kidney transplants alone, but only 30 to 40 kidneys are available each year for transplant. It was also projected that the number of patients requiring kidney transplants increases as much as 1,000 every year, but as of August 2018, only 424,143 people have pledged to become organ donors.³

In Malaysia, the Malaysian Medical Council has its Guideline on Organ Transplantation (MMC Guideline 006/2006), whereby item 8 of the document's annexure (on the guideline for organ transplantation from living donors) specifically discusses that organ donation by living unrelated donors is "primarily not accepted unless in special circumstances". It goes on to explain that such special circumstances "may prevail when there is no suitable living donor or cadaveric donor for liver transplant" that still need to go through approval from the Unrelated Transplant Approval Committee (UTAC). However, apart from the liver, no other organs were mentioned further to explain the prohibition of genetically or emotionally unrelated donors. Item 3 of the main document also highlights that "even in organ transplantation where the live donor is possible and available, such as kidney transplantation, the main or preferred source of organs is still the cadaver".⁴

Despite the already depressive figures, an additional hindrance of the effort to further improve the rate of organ donations, particularly the cadaveric organ donations, may come in the form of forensic evaluations, which necessitate turning down golden opportunities to harvest valuable organs.⁵ Nevertheless, it is important to understand that forensic evaluation is not of lesser importance than organ donations, albeit the wonders of cadaveric organ donations to patients on the waiting lists in particular. As cadaveric donors can come from various case backgrounds, including homicides, suicides, road traffic accidents, or even medically puzzling scenarios; forensic outcomes are pivotal in constructing a complete conclusion that is central in delivering justice, answers, and closures to any case relevant parties.⁶ Having a cadaveric donor who had pledged to donate organs is not simply an excuse to refute forensic evaluations and outcomes.

Given the dilemma of choosing between harvesting organs from cadaveric donors, versus the need to complete the forensic analysis to savour the equally important forensic outcomes; it is of academic value and ethical considerations that need to be dissected upon. As such, this writes up will further explore the impacts of forensic outcomes on cadaveric organ donations in Malaysia through the lenses of (i) academic benefits of forensic outcomes, (ii) ethically justified considerations of the dilemma and (iii) available data useful in navigating through the two competing needs.

MATERIALS AND METHODS

This study adopts electronic library-based research by going through scientific databases such as PubMed, Google Scholar, and Web of Sciences to provide insight on impacts of forensic outcomes on cadaveric organ donations in Malaysia by looking into other sources such as academic journals' articles, credible reports, and relevant authoritative websites. The keyword "forensic outcomes" was used in combination with "cadaveric organ donation", "autopsy", "post-mortem", "forensic investigation", "organ donation", "Malaysia", "ethical justification", "bioethics" and "organ donation". All original articles, discussions, and scientific documents were included from 2016 onwards.

DISCUSSIONS

Academic Benefits of Forensic Outcomes

Forensic outcomes offer excellent academic benefits which are helpful in many circumstances, including ascertaining the actual cause of death in criminal or suspected criminal cases, allowing proper claims of insurance pay-outs following one's death as well as providing clinical conclusions in medical mortalities of complicated conditions.⁷

These benefits often become a conflicting predicament whenever the not-so-common chance of cadaveric organ donation presents itself. Nevertheless, it is wise to detail these benefits of forensic outcomes that are potentially but adversely denying the golden opportunities of harvesting organs from cadaveric organ donations.

Criminal or Suspected Criminal Cases

Once the police bring a dead person's body for an autopsy, there is no denying that such authority to order a thorough and complete post-mortem examination is legally valid and forensically sound. However, one should also be attentive to the reasons behind the order for autopsies, particularly if the dead person has pledged to be an organ donor. In Malaysia, where organ donation is an opt-in system rather than opt-out, as in Singapore, the United Kingdom, or Spain; receiving and honoring the deceased's pledge to donate organs is always tempting and responsibly perceived. But, simply arguing against conducting forensic examinations can be shallow, and denying the valuable forensic outcomes in certain cases is utterly irresponsible. It gets even more precarious in cases of apparent suicides where suicide notes are left indicating their wishes to donate organs.⁸

Forensic outcomes help investigators get a better picture of what might have transpired through the alleged criminal events. Forensic investigations such as DNA or fingerprints pieces of evidence are not necessarily capable of impacting the cadaveric organ donations. However, autopsies, in general, will involve a prolonged period of non-perfusion to vital organs, exposing them to biochemical processes of decaying and dying itself, cutting open organs for a complete forensic examination—all at the expense of patients on numerous waiting lists that could have benefited from the cadaveric organ donations as opposed from the autopsies. However, the value of forensic outcomes in such criminal cases is central to the investigation and the eventual judicial processes and outcomes.

In cases where the deceased had pledged as an organ donor is found to be in situations suspected of crime such as murder or vehicular accidents resulting from drunk driving cases; forensic outcomes are also vital in ascertaining the cause of death and to delivering justice to the perpetrators.⁹ On the other hand, forensic outcomes can also help to free the accused who are innocent. In this regard, dissecting and examining organs to the point that they are no more transplantable to organ recipients is as important and noble as harvesting those organs for the benefit of organ recipients.

Insurance Claims Purpose

In this modern-day, more and more people subscribe to health and life insurances to better protect their and their loved ones' economic safety. In submitting the insurance claims following one's death, the insurance companies, more often than not would understandably request for the cause of death.¹⁰ In straightforward cases where the cause of death can be clinically confirmed, the need for autopsy may not arise, hence not impacting on the cadaveric organ donations processes. However, in cases where there were suspicions of suicides or foul play; it is justifiably acceptable as it would be unfair for the insurance companies to be paying out to the families of the insured person who committed suicide to trigger the pay-out to be received by their loved ones.

Such circumstances would be more significantly disturbing in cases where a young person is found dead or died in the



emergency department of a hospital following motor vehicle accidents, and the person was subscribing to hefty life insurances premiums. In such a young person, their organs are more likely to be in healthy conditions and suitable for cadaveric organ donations. As such, the dilemma between allowing for smooth life insurance claims by forensically ruling out suicides versus harvesting his or her organs for cadaveric organ donations is significantly a crossroad needed to be wisely negotiated or navigated.

Whenever such cases involve a pledged organ donor, the much-needed forensic outcomes would be needed if the cause of death cannot be clinically determined. Again, for a complete forensic outcome such as determining or ruling out medical conditions as the culprit behind the death such as extensive coronary blockages, the dissected heart is no more transplantable. Even the time taken to complete the forensic examinations would mean that his or her organs are no more transplantable.¹¹ However, in forensically confirming the cause of death, both parties, the insurance companies and the benefactors of the insurance policies, are given adequate evidence in the form of forensic outcomes that is fair to everyone.

Having discussed the sort of cases that are clinically tricky and puzzling to determine the exact cause of death, it is paramount to note that straightforward cases not requiring forensic examinations in determining the cause of deaths should be subjected to autopsies, even more, if the deceased has pledged as an organ donor. Insurance companies do accept the clinical cause of death in straightforward cases without irresponsibly mandating for unnecessary forensic examinations.

Medically Uncertain Mortalities

Medicine is an art that keeps developing and evolving. Many medical conditions are still not thoroughly known in discussing causes of diseases; they are often referred to as “unknown aetiology”. Medicine also do from time to time, present with inpatient mortalities that are rather puzzling in nature.¹² Defensive medicine practicable nowadays also leads to mortality review which can sometimes be accusative to a specific person or department, even it should be done to improve the quality of healthcare services rather than fault-finding.¹³

At this point, even the deceased's next of kin will be facing challenges in making up their mind on the clinicians' request of whether to go for forensic investigations in the form of a complete post-mortem autopsy or to allow for the cadaveric organ donations. The next of kin would already be grieving, busy making funeral arrangements as well as having to choose between forensic outcomes, or cadaveric organ donations, or neither of both.

Forensic outcomes can shed light on an actual scenario of what might have transpired clinically in such clinical cases that are potentially beneficial in terms of medical development and better clinical care or even controversial in terms of fault-finding behaviours. In this regard, forensic examinations can

produce forensic outcomes that also educate clinicians to better judge and decide for future patients.¹⁴ However, when such a patient in issue is a pledged organ donor, a difficult decision will need to be made to either harvest his or her organs as he or she had pledged or subject the patient to forensic examinations at the expense of other patients in the organ transplants waiting lists.

Ethically Justified Considerations

Clinical practices are full of ethical issues. From the righteousness of obtaining informed consents to patients' confidentialities and the likes of considering the forensic outcomes on cadaveric organ donations. Ethical dilemmas can be discussed and argued through many ethical theories, among them is the Principlism Theory covers four main elements of respect for autonomy, justice, beneficence and non-maleficence.¹⁵ In considering the impacts of forensic outcomes, all of the four elements are worth deliberating.

Respect for Autonomy

In the Malaysian context, where a deceased had pledged to be an organ donor, even the decision post-mortally is at the hand of a person who is lawfully in possession of his or her body (under Section 2 of the Human Tissues Act 1974 [*Act 130*]). It ultimately comes back to the deceased's autonomous decision to donate his or her organs to be considered respecting or otherwise. In clinical settings, the need for forensic outcomes should be carefully weighed against the deceased's autonomy in wanting to donate his or her organs.¹⁶

Respect for autonomy also needs to be comprehensively assessed in criminal situations. Not only the authorities are with the police officers or the Magistrate of a particular case, but clinicians need to consider that the deceased's decision to donate his or her organs may not be made while considering the chance of him or her ending up dead in a criminal nature. Thus, the element of respect for autonomy in this sense must be deliberately explored in assessing the impacts of forensic outcomes on cadaveric organ donations.¹⁷

The autonomy of those who are legally in possession of the body needs to be respected as well. In this regard, for them to be fully autonomous, clinicians play a central role in giving them the whole picture of what is going on and what are the implications of any of the decisions are going to be in their specific cases. They should not be misled or withheld from any of the relevant information; chances to seek the second opinion or consult any other person should also be adequately presented to those who need to make such an important decision.

Justice

Justice can be served distributive, procedurally, retributively and restoratively. Distributive and restorative justice is particularly relevant to the subject of forensic outcomes impacting cadaveric organ donations. In distributive justice, the decision to subject one to forensic examinations instead of favouring cadaveric organ donations must apply to the next case with similar parameters. It will be a distributive injustice



to apply one set of rules or decisions to a particular group and another set for another group.¹⁸

In restorative justice, forensic outcomes are prioritized over cadaveric organ donations, more so in the cases of crime or foul play. The impact of forensic outcomes in this scenario is particularly instrumental in delivering justice to the victims and the accused. Restorative justice is delivered in the context of reprimanding the perpetrators and in the form of acquitting the innocently accused person. As such, forensic outcomes do limit the cadaveric organ donations on a bigger picture, but in case-specific issues; it serves as an important tool for the judicial system.¹⁹

The element of justice needs to be discussed from the deceased's point of view as well. In cases of a deceased had pledged to be an organ donor, or having a living will on that matter, to either respect their autonomy to proceed with organ donations or to instead subject their body for forensic examinations at the former's expense, the eventual decision need to be just. Should the scenario of his or her death warrant forensic outcomes rather than their wish to be a cadaveric organ donor, then it would be just to do so. If it would not do the deceased any justice in not respecting his or her autonomy to decide what happens to his or her body and organs posthumously, then the ethically correct decision justice-wise is to honor the deceased's wish to go for the cadaveric organ donations.

Beneficence

The element of beneficence is the hallmark of medical services. Be it forensic medicine or another patient-based discipline such as internal medicine, surgery, pediatric or obstetrics and gynecology services, the benefits of instituting any form of investigations or therapeutic options are of utmost importance. Going after forensic outcomes that reduce the rate of cadaveric organ donations due to a long period of organ non-perfusion and cutting open organs for forensic examinations, the beneficence of the whole process should be judged on a case-to-case basis.²⁰

As discussed earlier, cadaveric organ donations are richly benefitting to several patients on the organ transplants waiting lists, particularly in Malaysia where the number of people who have pledged to donate organs still needs to improve further. In balancing the benefits of forensic outcomes such as described in item 2.1 above, each case is unique and has a solution that fits all might be tricky. The bottom line in this argument is that the benefits of forensic outcomes should be greater than the already advantageous cadaveric organ donations should one opt to forego harvesting organ donations from the relatively rare golden opportunity of an organ donor ended up dead on his or her doorstep.²¹

In cases with absence or limited degree of beneficence in subjecting the deceased to forensic examinations rather than cadaveric organ donations, one should be clear enough to opt for the cadaveric organ donations rather than having less-benefiting forensic outcomes. Even in criminal cases, if the circumstances and scientific evidence are pointing to be

non-beneficial forensic outcomes likely, the ethically correct decision should always move away from forensic examinations. Should it be statutorily wrong to do so, judicial review or court orders can be looked for to help decision making in unique and relevant cases?

Non-maleficence

First, do no harm. The very basis of the non-maleficence element in principlism ethics was formed way before these days of modern medicine. Practicing the art of treatment should not be inflicting further harm to the already suffering patients, or in our case; the deceased.²² In the case of cadaveric organ donations, limiting the source of organ donors can be harmful to the other patients in need of such organs. Performing full and thorough forensic examination also in a way harms the organs in such a way that they are no more transplantable.

However, in any particular case whether of criminal, insurance claim issues or medically problematic mortalities; not having the luxury of forensic outcomes will also cause potentially worse harms. Again, balancing the possible harms as well as other elements of principlism ethics is the hallmark of good ethical practice. It is case-specific as every single case has its unique characters and parameters. Great harm in one situation, maybe lesser harm in another situation.²³ So long the principle of non-maleficence is held onto and wisely applied in clinical scenarios, harms can be negated or at least reduced.

In assessing the impacts of forensic outcomes on cadaveric organ donations in Malaysia, the element of non-maleficence should also be weighed in on the subject of racial and religious sensitivities. Malaysia is a multi-racial and multi-religious country. Each has its stake in forensic examinations as well as on the subject of cadaveric organ donations itself. Clinicians should approach this subject sensibly and wisely as not to cause unnecessary misunderstandings or insults. Being emphatic can help in such situations, but more importantly, is to be non-provocative towards the next of kin or whoever is legally or socially in possession of the deceased's body.

Available Data Helpful in Navigating through the Competing Needs of Forensic Outcomes Versus the Benefits of Cadaveric Organ Donations

In situations where adequate data are available, the relationship between forensic outcomes and cadaveric organ donations can be quantitatively and qualitatively studied in detail. The first issue that can be forked out from such a relationship is whether the rate of cadaveric organ donations has been significantly impacted by the need to obtain forensic outcomes. It can be assessed by obtaining the number of deceased who pledged for organ donations or agreed by the next of kin for the organs to be donated, but organ harvesting was not done due to the need for forensic outcomes in such cases. As discussed earlier, such needs for forensic outcomes may arise in criminal cases, insurance claims issues, or even medical mortalities, which call for forensic explanations.

Another issue is the other way around; which is whether any significant issues arise as a result of the absence of desired forensic outcomes due to cadaveric organ donations.



This can be achieved by studying judicial cases, complicated insurance claims or pay-out issues, and medical mortalities that are affected by the lack of forensic outcomes due to the need for cadaveric organ donations. The relationship between the quality of forensic outcomes obtained from cadaveric sources, which also proceeded with organ donations, can be assessed should such data are accessible. Similarly, it can be studied by observing judicial issues, insurance claims, or medical mortalities directly related to the quality of forensic outcomes that are compromised to give way to cadaveric organ donations.

These studies can help policymakers formulate a proper, effective and efficient mechanism to deal with conflicting needs between forensic outcomes and cadaveric organ donations. That way, the needs for forensic outcomes were not inconsiderably shoved away to give way to cadaveric organ donations. In parallel, it can also contribute to the cadaveric organ donations' rate not unnecessarily affected by the need to obtain forensic outcomes.

A recent study in Queensland, Australia found that out of 177 reportable deaths (which were referred for organ donations over four years), 10 cases were recommended restrictions from proceeding with organ harvesting. Of the 177 cases, none that proceeded with organ donations caused significant impacts on the cause of death findings and the ensuing criminal proceedings. It was also concluded that organ donations had a limited impact on autopsy findings and court proceedings, and coronial findings or judicial outcomes were not significantly affected in those cases where organ harvesting was not carried out to preserve the forensic outcomes.²⁴ Another study by the same lead author also dived into literature reviews of 27 studies on the subject of the impact of organ donation on coronial processes and forensic investigation found that in favoring for forensic outcomes, organs are lost and not transplantable well as no study suggest that organ retrieval can significantly impact on the cause of death determination or judicial outcome for that matter. It was concluded that better forensic decision making and strategies would increase the availability of organs for transplantation.²⁵

A study in France indicates that approximately 30 cases per year, which make up 4% of deaths involving legal proceedings, need forensic outcomes more than cadaveric organ donations. To reduce the conflict between forensic outcomes and cadaveric organ donations, local authorities have formed guidelines to increase the effectiveness of communication between agencies and standardising practices so that the rate of cadaveric organ donations does not unnecessarily affect by the needs for forensic outcomes.²⁵ Another published report by the same lead author and a few others described the organ procurement issues at the crime scene. It explains in detail the differences of risks for crime scene contamination in an already dead and non-heart-beating person versus emergency treatment rendered by emergency medical personnel. Again, the conflict of procuring organs for cadaveric organ donations collides with criminal investigations, which needed efforts both from scientific and procedural rigour as well as the judicial policy of zero refusals to harmonize the two conflicting needs).²⁷

An interesting report emerged from Spain where excellent coordination between a forensic institute, local judicial system, and local tissue bank has demonstrated that seamless interaction between related agencies can provide a win-win situation in the battle of requiring forensic outcomes versus making full use of cadaveric organ donations. Albeit the donated organ, in this case, is mainly the cornea, it still offers hope and directional policy to cater to both needs. It highlights that ironically, the number of autopsies performed in the forensic institute has positively contributed to increasing the number of tissues available for cadaveric organ donations. This sort of relationship is not only exemplary but more importantly, proves that the need for forensic outcomes should not limit cadaveric organ donations. On the contrary, it should drive the rate of cadaveric organ donations to the next level it can achieve.²⁸

CONCLUSION

In conclusion, the impacts of forensic outcomes on cadaveric organ donations in Malaysia can be methodologically phrased as inversely repressive on each other. The need for forensic outcomes can be seen as denying the opportunity to savour cadaveric organ donations. In an opt-in organ donation system applicable to the Malaysian setting, such needs to purposely neglect an incredible opportunity to harvest organs for the benefit of patients on the organ transplant waiting lists are sadly uncomfortable, to begin with. Given the advantages and rates of cadaveric organ donations as opposed to living organ donations, it appears at a glance that it should never be turned down by any means.

However, understanding and valuing the importance of forensic outcomes, makes the tensionless provocative. The values of forensic outcomes in criminal cases, complicated insurance claims, and medically puzzling mortalities are not less important than the already noble and much sought after cadaveric organ donations. In forensic outcomes, the impacts of prolonged organs non-perfusion periods, structural and physiological damages to organs which are cut open for forensic examinations, and the chemical process of dying itself are scientifically produced, leading to harvesting organs from such cadaveric donors, not a practical option anymore.

It is also important to approach the dilemma with sound ethical justifications. Adopting the principlism ethical theory; the elements of respect for autonomy, justice (particularly distributive and restorative justice), beneficence, and non-maleficence should be well-balanced in any case that arises. The concept of one size fits all is not an option in such ethical and clinical dilemmas, as each situation warrants its unique interpretation of scenarios and parameters. In each scenario, every element of the principlism ethical theory has differing weightage assigned to, depending on the uniqueness of the case.

Access to valuable data directly related to the relationship between forensic outcomes and cadaveric organ donations is interestingly educative. Most kinds of the literature suggest a possible win-win situation where forensic outcomes were not impacted in any significant ways by cadaveric organ

donations and vice versa. Although it is obvious that the need for forensic outcomes does limit the rate of cadaveric organ donations, it has also been shown that judicial outcomes were not significantly affected by forensic examinations done in cases where cadaveric organ donations still proceeded. On another end, no significant judicial improvements were seen in cases where forensic outcomes were prioritized over cadaveric organ donations. Literature has also shown that effective and efficient coordination between related agencies can make a win-win situation for forensic outcomes and cadaveric organ donations a beautiful reality, co-existing harmoniously and has been shown to support each other's needs as opposed to canceling out each other's rate of success.

Overall, the impacts of forensic outcomes on cadaveric organ donations in Malaysia can be quantitatively and qualitatively analyzed with the correct data set, but more importantly, is first to understand the complicated nature of the seemingly opposing relationship. Understanding and unwinding the principal reasons and justifications of both options will help us to harmonize the conflicting duo of modern medicine better. It is fundamental to appreciate the qualities of both sides to make significant grounds both in terms of applications of the forensic outcomes and the success rate of lifesaving, life-changing of cadaveric organ donations.

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When Compassion Hurts: An Autoethnographic Experience of Vicarious Trauma by a Forensic Nurse

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ABSTRACT

Caring for victims of violence includes obtaining history, examining and collecting evidentiary matter, and providing expert testimony in the court of law. In this paper, the researcher shared her own experiences as a forensic nurse on how being compassionate and listening to the stories of victims of violence and witnessing the sustained injuries led to some emotional stress which is referred to in the literature as vicarious trauma. Working every day with victims led to an altered worldview that impacted the researcher's psychological, physiological, and social being. A qualitative autoethnographic approach was explored to describe the researcher's experiences working with victims of sexual assault in a designated center within a public hospital. Personal narratives were used as a data collection method and thematic approach to analyze and describe the experiences. Although the researcher acknowledges that not every forensic nurse may suffer symptoms resulting from vicarious trauma, the shared experiences may add value to individuals who have an interest in enrolling for a clinical forensic nursing course in becoming conversant with the concept, to think of ways to handle vicarious trauma and seek interventions on time. Moreover, organizational managers may know the ordeal, forensic nurses' experience and provide the necessary support.

Keywords: Autoethnography, Compassion, Forensic nurse, Vicarious trauma.

Int J Eth Trauma Victimization (2021). DOI: 10.18099/ijetv.v7i03.9

INTRODUCTION

One of the major roles of the researcher as a forensic nurse included interviewing, gathering evidence of sexual abuse and treating any injury sustained during the assault.¹ The researcher also had to provide expert testimony as deemed necessary by the court of law. During interaction and care of victims of violence, the researcher got exposed to some of the cruellest and most horrific things human beings could do. According to Newman *et al.* (2021), exposure to traumatic events in the workplace is known to have a psychological impact on the healthcare professionals such as anxiety, insomnia or even traumatic symptomatology, referred to as vicarious trauma, a concept that the researcher was not familiar with at the time.² It took the researcher several months of working at the trauma centre, which was specifically designated for caring for victims of violence, specifically sexual assault and rape cases, to experience life changes that included chronic changes in the researcher's perception of the world³ and how the researcher started viewing people around the community.

Despite the professional attributes and ethical behaviors of dealing with victims of violence acquired during training, the researcher realized later in life that she was suffering from vicarious trauma. Vicarious trauma has been described in the literature as the profound and unique psychological effect on psychotherapists of working with sexual violence survivors.⁴ According to Wies and Coy (2013), vicarious trauma symptoms are similar to those of post-traumatic stress disorder (PTSD); however, it differs in that the person with vicarious trauma has not experienced the traumatic event first-hand.³ As opposed to compassion fatigue that may be experienced as a result of a

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How to cite this article: Sebaeng JM. When Compassion Hurts: An Autoethnographic Experience of Vicarious Trauma by a Forensic Nurse. *Int J Eth Trauma Victimization*. 2021;7(2):44-46.

Source of support: Nil

Conflict of interest: None

Received: 22/11/2021;

Received in revised form: 09/12/2022;

Accepted: 11/12/2021;

Published: 20/01/2022

deep desire to alleviate the pain or suffering of another person,⁵ vicarious trauma entails negative and accumulative changes that occur when one engages in an empathetic relationship with clients and develops through clients' disclosures of trauma.⁶

Like the researcher, most nurses may develop an interest in entering the forensic nursing field specialization without knowing the impact that the services they will be provided to victims of violence may have on their health. The objectives of this paper are therefore to:

- To share the psychological and physiological symptoms experienced by the researcher from interacting with victims of violence, specifically sexual assault and rape cases that may be mistaken for pathology.
- To share knowledge that will enable forensic nurses to understand the concept of vicarious trauma to identify the early signs and symptoms and seek interventions timely.
- To make recommendations to countries developing forensic nursing curriculum to include vicarious traumatization in the programme.

MATERIAL AND METHODS

This paper employed a qualitative autoethnographic approach. Autoethnography is of interest to the researcher because its epistemological focus enables the researcher to explore, explain, and analyse own experiences scientifically.⁷ Moreover, autoethnography created a platform for the researcher to place the self (auto) in a sociocultural context (ethno) and explain (graphy) it. As averred by MacMillan and Ramirez (2016), this means the researcher used their autobiographic material as the primary data.⁸ Although autoethnography can be written collaboratively (collaborative autoethnography), this paper presents a single author autoethnography.

Data Collection

Data collection in this paper was drawn through personal narratives and self-reflections resulting from the researcher's experience of interacting and providing care to victims of sexual assault and rape. The researcher is a forensic nurse who worked in one of the designated centres within a public hospital of South Africa referred to as Thuthuzela Care Centres. There are 54 TCCs distributed across the country and they provide comprehensive management of sexual assault victims.⁹ The shared experience resulted from 29 months of working with victims of gender-based violence.

Ethical Considerations

Ethics is very critical in every research and the related ethical principles must be observed at all times. Some of the ethical challenges identified in autoethnography include researcher vulnerability.¹⁰ The researcher is cognizant of what Lapadat refers to as relational ethics i.e. despite having to provide an account on own personal narratives, the researcher is not an island and that the stories shared are not wholly my own implicate relational others with whom the researcher have interacted. In this paper, no names were mentioned to anonymize those who may be implicated. Moreover, full descriptions of the cases dealt with were not provided to avoid linkages of the stories to the clients thus keeping their information confidential.

RESULTS

Experiences of Working with Trauma Victims

Working with trauma cases directly subjected the researcher to almost the same symptoms experienced by victims of violence and was mainly psychological and physiological. On the other hand, constant exposure to trauma stories and injuries from victims changed how the researcher behaved and interacted with people in public areas. Lack of support from the organizational managers as well as failure to understand what forensic nursing work entails and its potential effects on the general health of the carer also exacerbated the situation.

It all started hardly two years after having joined this particular hospital when the management co-opted the researcher to serve in a task team to develop a strategic plan leading to opening a specialized centre for victims of violence.

The researcher accepted the delegation as a team member but was unsure of the role expectation and the contribution value with limited knowledge on the scope of the field. A formal enrolment for forensic nursing science with a university became an option for the researcher to learn more about managing violence survivors. The journey began in 2006 and the program included theoretical and practical components. The first trimester of the training was conducted within the university and mostly comprised the theoretical component. The end of the first trimester led to hospital placement for the practical component. The clinical staff and lecturers introduced us to the actual role of a forensic nurse. As part of the training, we got assigned a task whereby we identified a case, obtained history, and examined the victim alongside an experienced doctor or forensic nurse. The researcher's first case involved a gang rape of a woman who also got robbed of her valuables and stabbed in the chest with a knife. The woman got admitted from sustaining a pneumothorax. The researcher followed up on the case and could not believe the lady's ordeal was going through.

During the case presentation to the lecturer six weeks later, it felt like the information was heard for the first time. The researchers disrupted the presentations, sobbing into tears from the beginning until the end. The training continued for 12 months and there were always supervisors and lecturers in the clinical setting, guiding and providing support on how to deal with different victims of violence.

Going Solo as an Independent Practitioner

The challenge began when the researcher had to practice independently. There were no trained forensic nurses, particularly in the North West Province of South Africa. The researcher worked during weekdays shifts of 07:00 am to 4:00 pm. Care was rendered to victims of all ages, and second opinion was solicited from medical practitioners, gynecologists, and other medical specialists within the hospital as necessary. The researcher's work entailed listening to survivors' stories, examining and collecting evidentiary matter almost every day. Six months after working at this center, the researcher started experiencing persistent left-sided chest pain. A medical examination was done at different intervals during consultations by three medical practitioners at different intervals in the emergency department, whereby two performed an ECG with no sign of any pathology to the heart. The researcher was eventually diagnosed with work-related stress and referred to a staff wellness clinic for further management. As time went by, the researcher started becoming obsessed with my safety and security and my significant others. All the security measures within the researcher's means around the house were put into place. Failure of the kids to arrive home at an expected time after school will make the researcher feel not at ease, leading to a mad driving around the township searching for them. The researcher became obsessed with the safety of young girls and boys in the community and as a result, became socially irrational.



Gender-based violence in South Africa is very high and thus demands forensic nursing service to communities. The researcher could not endure the stress associated with the service and eventually left the center. This was exacerbated by lack of support and constant exposure to trauma stories, witnessing injuries, and engaging with all stakeholders involved. However, the researcher's thoughts were constantly with the women and children who needed to be cared for. As a result, the researcher vowed to support colleagues who are currently practicing as forensic nurses. Together with forensic nurses in the country, the researcher established the South African Forensic Nursing Association (SAFNA), which aims to provide the necessary support and empowerment to practicing nurses.

DISCUSSION

Constant exposure to trauma narratives and injuries can change the perception of an individual about self, others, and the environment. In other instances, a person may suffer from both physiological and psychological symptoms, which may temporarily or permanently affect their functioning and work productivity. Therefore, forensic nurses must learn to develop coping strategies to provide much-needed care to victims of violence.

CONCLUSION

The researcher entered the field of forensic nursing specialization without any idea of its envisaged impact on her health and was illiterate as far as vicarious trauma is concerned. Although the researcher is aware that individuals react differently to similar situations and that not everyone exposed to trauma stories and injuries develops symptoms, the researcher feels that forensic nurses must be conversant with the concept of vicarious trauma, which is to be accomplished through training for nurses already in practice. Vicarious trauma topics may also be included in the forensic nursing curriculum, enabling

nurses to identify the symptoms at an early stage and seek assistance on time. It is also significant for practicing nurses to create platforms such as communities of practices of forensic nurses to debrief and support each other.

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Respected Sir,

Even though the world is not recovering completely from this devastating Covid 19 pandemic, another fear of newly identified SARS-CoV-2 lineage B.1.1.529 named “Omicron” emerges. The term “Omicron” was designated on 26th November, 2021 by the World Health Organization, which is more dreadful with a whopping 32 mutations in the spike protein alone, the first case being reported to the World Health Organization from South Africa on 25th November this year.¹ Dr. Tedros Adhanom Ghebreyesus, the Director-General of WHO, has reported that about 77 countries are affected by Omicron cases, though the reality is that Omicron is probably in most countries, even if it has not been detected yet.² The first confirmed Omicron death was reported from the UK. India reported its first cases of the Omicron variant in Karnataka’s Bengaluru city, where two people, including a South African national of Indian origin and a doctor, tested positive for it, and the total tally stands at 49.³

Researchers worldwide, especially in South Africa, are conducting various studies to know more about this new variant regarding its transmissibility, severity of disease, prior infection, the effectiveness of vaccines, etc. The World Health Organization is also coordinating various countries about the researches on its signs & symptoms, the effectiveness of testing and treatment. Though it is still not clear whether it is more transmissible and more serious than other variants, we can extrapolate from what is known about the mutations of omicron to provide preliminary indications on transmissibility, severity, and immune escape to a certain extent.⁴

In most cases, symptoms are mild, mostly expressed as fever, cough, tiredness, loss of taste or smell, etc. Less common symptoms include sore throat, headache, aches, pains, diarrhea, a rash on the skin, discoloration of fingers or toes, etc. Very serious clinical features may be in the form of breathlessness, confusion, loss of speech, chest pain, etc. In any situation, prevention is the best option, and one must strictly follow the covid-19 norms & COVID-19 appropriate behavior. However, one must not be panic. If suspected, one must do the COVID Test and follow the SOPs available on its official website @who.int.

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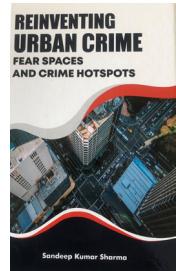
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Review of Reinventing Crimes Fear Spaces and Crime Hotspots

Reinventing Crimes Fear Spaces and Crime Hotspots is a beautifully written book about the research on the geographical and social factors of crime in Ludhiana, one of Punjab's biggest metropolitan cities. This book has focussed on two types of crimes i.e. crimes against the person and crimes related to property.

Crime has been very aptly defined in the very beginning in the different dimensions. Characteristics of different theories of the occurrence of the crime have been very well described. Pattern and vulnerability as the promoter of the crime have been emphasized nicely.



Painstaking research has been carried out thoroughly, considering various parameters to determine the different dimensions of factors responsible for the crimes. Spatial and temporal factors related to the crime are established in this book. Results of the temporal characteristics of the crime seem very interesting, and it seems that these results may be applicable in other cities too. Effects of spatial factors studied will be applied locally as this has been explained on the type of the population and workforce in that particular area which may differ in different cities. More crime with more escape routes has been emphasized repeatedly, which gives escape to the responsibilities of the police officials. Colored maps provide an instant understanding of what the author wishes to highlight.

The concentration of the one type of population (Poor, less educated people, and laborers) has been responsible for the majority of the crimes. It may seem astonishing, but the acquainted person's crime is indeed more than unknown persons.

This work has fulfilled most of the aims and objectives of the research planned. A reader will enjoy the mindset rooted verbiages on the crime as those are the first-hand feelings near the truth. Similarly, case studies make the book interesting and give the readers the first-hand experience of victims, the community in which the victims lie, and the investigators. Perceptions of the victims and their associates are beautifully described giving insight that can be very useful for reducing and preventing the crimes.

Though this research work is published as a book, the total format remains that of thesis and it seems to be the thesis publication rather than a book. Conversion of the thesis into a book would have made it a better reading material for the common people. Short statements rather than big tables in the Introduction would have conveyed better information for readers reading a book and not a thesis. The reference style used is of a thesis, and all names coming in between are interruptions in the reading. Reading would have been smoother if superscript numbers would have been used while referencing in the text. The list of tables, figures, and maps does not serve any useful purpose in this book initially and could have been omitted. An ordinary reader expects generalization of the research, which may be applicable to the general population but is critically lacking and is focused on one city.

The role of unemployment, illiteracy, and poverty have been very well highlighted, but there is much repetition of these factors when analyzing the various crimes.

Conclusions drawn are not very specific but just information that may not be easy to apply even if planners need to apply. At best, this research is good for Ludhiana city only.

This research work has been soft while commenting on the shortcomings in the police, and some factors have been ignored, which may be the topmost in the public's minds for crime reduction. All is said well about the police except some planning of police stations and their placements in the community. This could be well understood as the researcher is one of the stakeholders himself on which research is being carried out. Candid comments would have made this research more near the truth.

This book is a good attempt based upon research to find out the root cause of the crimes against persons and crimes related to the property. This research is a good initiation for the future agenda of the research on the crimes is rightly recommended which should be followed by more researchers in the other cities so that results from other studies can be compared with this research to formulate the recommendations for the reduction of crime. I will recommend this book to the students and researchers of the Geography who wish to understand the technicalities of the crimes against the person and crimes related to the property. This book will also be helpful to the police officials to have an insight into the crimes related to property and against the persons.

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3	O.P. Jasuja	43	Kalpana Gill
4	SS Sandhu	44	Manjot Singh
5	Dildar Singh	45	Simran Jit Kaur
6	Anil Garg	46	Kamaljeet K Mangat
7	Sandeep Goyal	47	Ramanpreet Kaur
8	J.P. Singh	48	Harleen Kaur
9	Akash D Aggarwal	49	Preet Bawa
10	KK Aggarwal	50	Prabh Sharan Singh
11	Pritam Kaur	51	Harjesus S Sandhu
12	Kiranjot Kaur	52	Tapas K Bose
13	Gurneet Kaur	53	DS Bhullar
14	Dawinder Kaur	54	Harjinder Singh
15	Navjot Kaur	55	Rifat Fazili
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17	Rupakshi	57	Harinder Jit S Sekhon
18	Manpreet Kaur	58	Anju Gupta
19	Rajwinder Kaur	59	Jagjiv Sharma
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28	Charu	68	Munish Wadhawan
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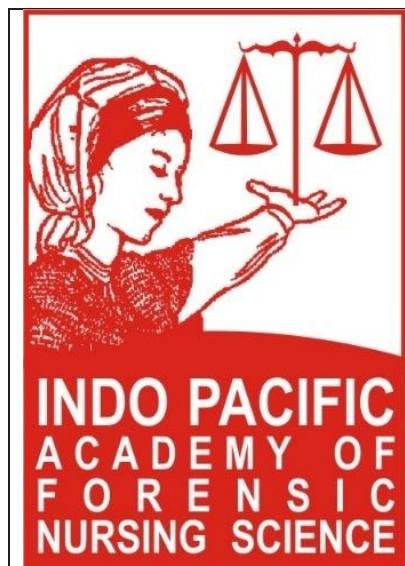


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2nd Issue of Volume 7, 2021

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