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### **Associate Editors**

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Department of Forensic Medicine & Toxicology

V M Govt. Medical College, Solapur. 413003

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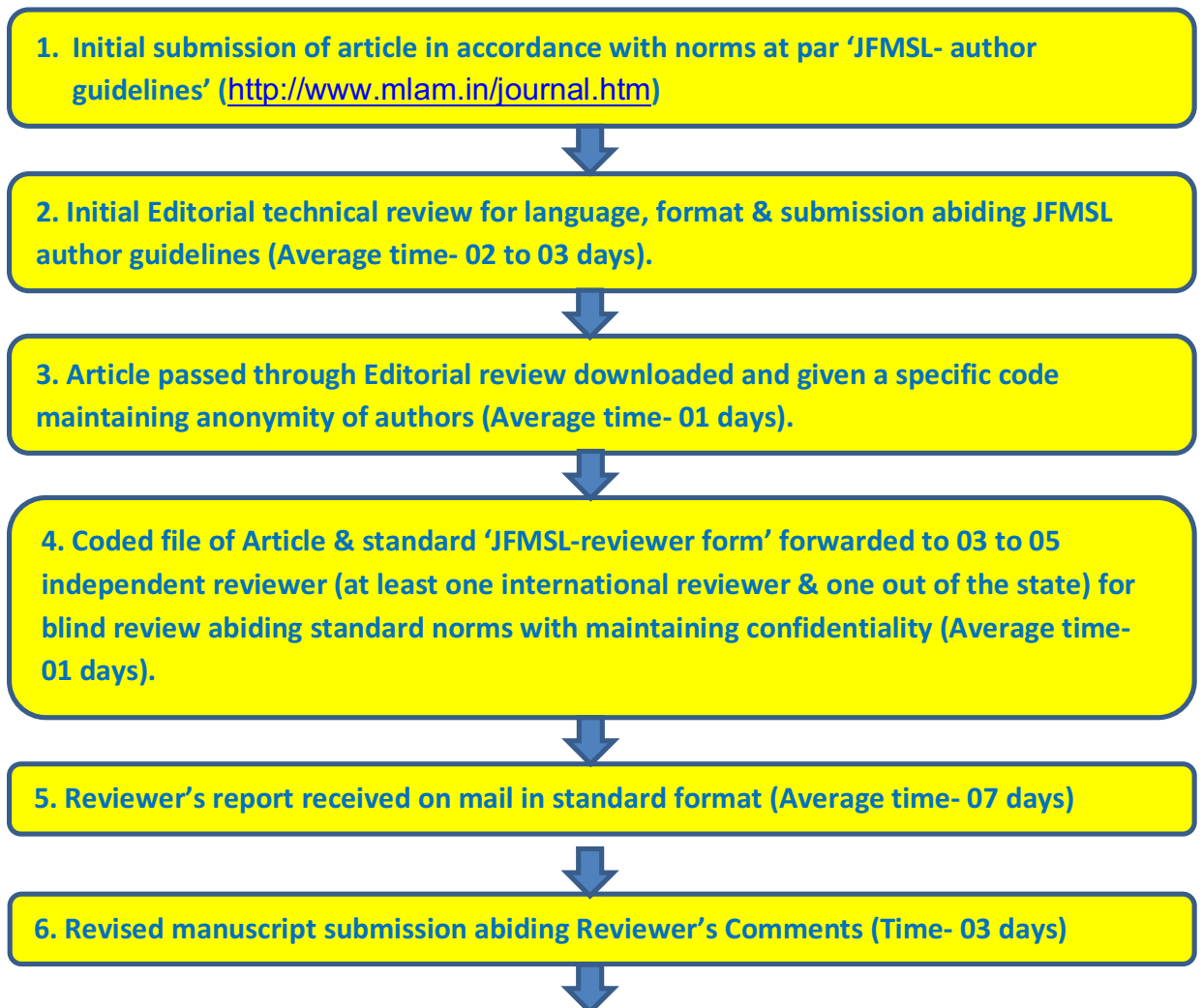
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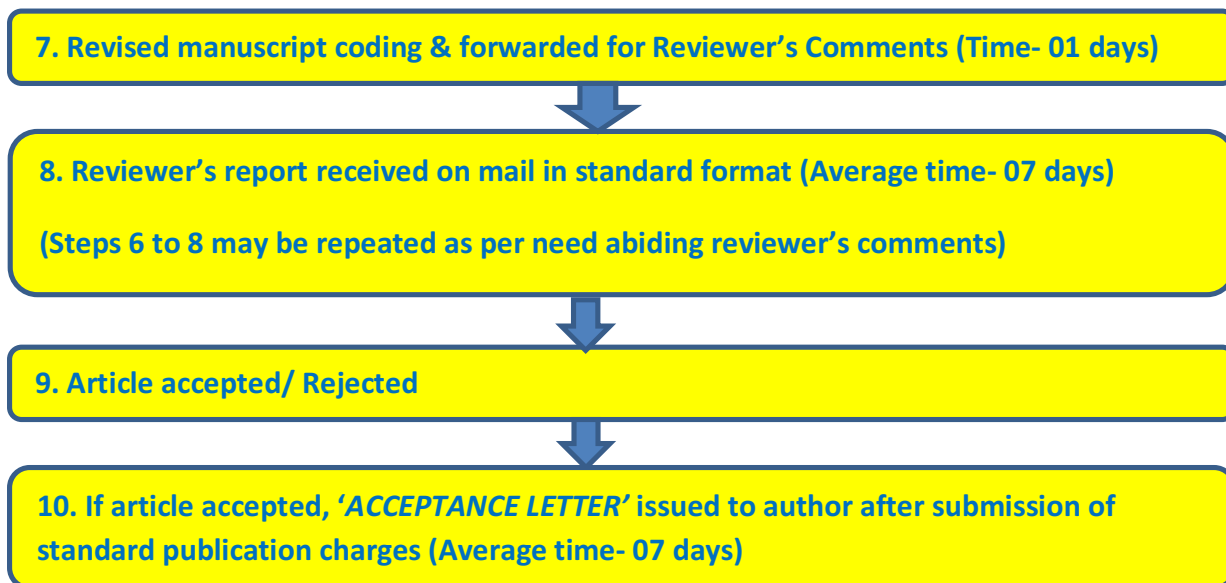
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37	Dr Mahadev Bansude	Associate Professor, Department of Forensic Medicine & Toxicology, GMC, Latur	India	bansude_mahadev@rediffmail.com
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62	Dr Anand Pal Singh	St. Johns house hospital, priory group. Diss, Co Norfolk UK.	UK	alsingh67@yahoo.ie
63	Dr. UJS Bedi	Consultant Psychiatrist, Berkshire Healthcare NHS Foundation Trust, UK	UK	usbedi@hotmail.com
64	Dr Sandeep R Biraris	Orthopaedic Centre of the West 2122 East Highland Ave Ste 100 Phoenix, AZ 85016 USA	US	sandeepb143@yahoo.com
65	Dr Niranjana Kavadi	University of Oklahoma Oklahoma City USA	US	drkniranjan@gmail.com
66	Shashank S. Shettar	University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma Country: USA.	US	ShashankShashank-Shettar@ouhsc.edu
67	Dr Abhishek Parashar	Lecturer, Department of Forensic Medicine, Maharajgunj Medical Campus, Institute of Medicine, Kathmandu, Nepal.	Nepal	drabhishekparashar@gmail.com
68	Dr Vikrant Landge	Memorial Hospital, Sitwell, Oklahoma, USA.	US	vikrant.landge@gmail.com
69	Dr Geetanjali Pai	MD AAHIVS Memorial Hospital, Sitwell, Oklahoma, USA.	US	dr.paigg@gmail.com
70	Dr Ruta Bhargava	Hospitalist, Internal Medicine, Saint Banaras Medical Centre, Livingston NJ 07039, US.	US	drrutabendre@gmail.com
71	Dr Siddharth Virani	Shoulder & Elbow Surgery, East Kent Hospitals NHS Foundation Trust Pluto House, Ashford, Kent, UK.	UK	Siddharth.virani@nhs.net
72	Dr Rahul Tambade	ICU Gold Coast University Hospital, Australia.	Australia	dr.rahultambade@gmail.com
73	Dr Anand B. Gaikwad	Consultant Radiologist, Southcoast Radiology, Australia.	Australia	anandgaik01@gmail.com

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## *Editorial*

### **COVID 19 Pandemic Vaccination Drive: Adverse Event Following Immunization Protocol.**

Ravindra B Deokar<sup>a\*</sup>, Sachin S Patil<sup>b</sup>

<sup>a</sup>Professor (Additional), Department of Forensic Medicine & Toxicology, Seth G S Medical college & KEM Hospital, Parel, Mumbai-400012.

<sup>b</sup>Associate Professor, Department of Forensic Medicine & Toxicology, Lokmanya Tilak Municipal Medical college & LTMG Hospital, Sion, Mumbai-400022.

The COVID 19 Pandemic is one of the deadliest ongoing global pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which is a single linear RNA segment (positive-sense-single-stranded RNA). Till date, more than 129 million cases were confirmed and it attributed around 2.81 million deaths due to COVID-19.<sup>1</sup> The virus mainly spreads amongst near contacts through air as it leaves from infected person's breathe, sneeze, cough or speak. Usual entry points are nose, mouth, or eyes. There are chances of spread of virus from contaminated surfaces. The important preventive measures include wearing masks over face covering nose and mouth, following social distancing norms, avoiding crowded places, frequent hand washing, sanitization of infected areas, self-monitoring and self-isolation measures.<sup>2</sup>

Vaccines are considered as one of important preventive measures against this deadly virus. Many vaccines have shown efficacy around 95% in phase III trial. The vaccination drives are launched in many countries in phased manner with prioritizing high risk groups such as health care workers, elderly people with co-morbidities, etc. In India, various laboratories are trying to develop an effective vaccine against COVID 19. The Drug Controller General of India (DCGI) given approval to two vaccines viz. **Covishield** vaccine on 1<sup>st</sup> of January 2021<sup>3</sup> and **Covaxin** on 2<sup>nd</sup> January 2021<sup>4</sup> for conditional and emergency use. In India, the national vaccination drive started at 3006

vaccination centre on 16<sup>th</sup> January 2021.<sup>5</sup> With the background of COVID-19 vaccination, there is need for identification of AEFI (adverse events following immunisation) as well as adverse events of special interest by the surveillance teams.<sup>6</sup>

#### **Adverse Event Following Immunisation (AEFI):**

Adverse event following immunization (AEFI) includes various untoward medical occurrence followed by vaccination. It may not have a direct causal relationship with use of vaccine. Such events need to be dealt effectively at the earliest to avoid the dramatic consequences due to loss of faith in vaccination drive. The prompt investigations into the incidences of such untoward medical occurrences facilitates research to identify the reasons and further appropriate needed action. WHO has established a Global Advisory Committee on Vaccine Safety to deal efficiently, promptly towards the vaccine safety issues.<sup>7</sup> In 2012, Council for International Organisations of Medical Sciences (CIOMS) given revised classification relevant to cause-specific categorisation of AEFI as follows:

#### **Cause-specific categorisation of AEFI (CIOMS/WHO 2012):**

1. Vaccine product-related reaction
2. Vaccine quality defect-related reaction
3. Immunization error-related reaction
4. Immunization anxiety-related reaction
5. Coincidental event.

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**\*Corresponding author:** Dr Ravindra B Deokar, Professor (Additional), Department of Forensic Medicine, Seth G S Medical College & KEM Hospital, Mumbai, Maharashtra, India. Email: [ravindradeokar@kem.edu](mailto:ravindradeokar@kem.edu) (M)+91-9423016325.

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**The various types of Adverse Effect Following Immunization** in accordance with the severity and frequency are as follows:

1. **Common Minor AEFIs:** Recipient's immune system react to the vaccine leading to events like fever, local reaction, etc.
2. **Severe AEFIs:** AEFIs which are not included as minor events but it also not leading to hospitalisation, disability or death.
3. **Serious AEFIs:** AEFIs leading to hospitalization, disability or death are included in Serious AEFIs.
4. **Cluster:** When two and more adverse effects following immunizations (AEFIs) occur in relation to time, place or vaccine termed as cluster. It usually associated with particular health facility, vaccine manufacturer, or vaccine vial. Such cluster occur mainly due to immunization error or anxiety-related reactions when vaccines administered on massive scale.
5. **Signal:** It is information received from multiple sources suggesting causal association between set of related events. Such information may be adverse or beneficial.

As the vaccination drive for COVID-19 is on larger scale, there is very high possibility of errors during immunization and as it involves subjects of all ages, anxiety related reactions will be on higher side. The government should be in position to tackle the clusters as compared to routine vaccination.<sup>6</sup>

**Reporting:** All serious/severe AEFI need to be reported after filling Case Report Form (CRF). The report needs to be sent to District Immunization Officer (DIO) within 24 hours who after verification of the case details in next 24 hours, forwards the information to the state and national level committee.<sup>6</sup> Co-WIN software have been used for reporting of AEFI as well as action for events subsequent to vaccination (SAFEVAC).<sup>8</sup>

#### **AEFI Investigation<sup>9</sup>:**

The District Immunization Officer (DIO) usually lead the case investigation with support of team members from District AEFI Committee. Various steps in investigation includes confirmation of information stated in report; investigate and collect data about patient, event, suspected vaccine and other people; assess immunization service; specimen collection as needed ([refer table no. 1](#)) and conclude investigation.

**Table 1: Specimen collection from Patient**

Sr No	Event	Specimen from Patient
1	Severe Local Reaction	Blood
2	CNS symptoms with no paralysis	Cerebrospinal fluid, Blood.
3	CNS symptoms with paralysis	Stool
4	Lymphadenitis	Blood
5	Anaphylaxis	Blood
6	Toxic shock syndrome	Blood
7	Abscess	Swab, blood.
8	Death	Postmortem Tissue Specimen

#### **Investigation of reported AEFI Deaths:**

Death is a serious AEFI event and hence prompt field investigation is necessary. It may cause dramatic community consequences about faith in vaccine and may affect the vaccination drive severely. An AEFI death reports are notified at all administrative level including National AEFI Secretariat of Immunization Division in Ministry of Health and Family Welfare (MoHFW).

The investigation in reported AEFI Deaths carried out by a multi-speciality team which includes clinician, laboratory and forensic experts. All necessary information on event needs to be made available to the concerned team. Various potential sources of information include verbal autopsy, medical consultation and hospital records, lab investigation reports, home visits, community visits by team, interactions with treating physician and vaccinator, etc. There is need of timely, methodical and comprehensive investigation to dealt such event promptly.<sup>9</sup>

In AEFI pertaining to COVID 19, it is needed to note the name of brand, manufacturer and batch numbers so as to relate the type of vaccine used in the country. WHO recommends Vigiflow AEFI line list to collect the particulars in the reporting form COVID-19. It is mandatory for every country to launch causality assessment processes before beginning the vaccination drive. As the age group of the persons undergoing vaccination is spread throughout, AEFI causality assessment committees must be comprising of multiple specialities.<sup>6</sup>



AEFI causality assessment committee should take into consideration the issues pertaining to COVID 19 vaccine. Few live attenuated vaccines can cause vaccine-associated enhanced disease. There is possible risk of getting affected by COVID 19 disease in severe form subsequent to COVID 19 vaccination on exposure to COVID 19 virus. Till date, deaths occurring following COVID 19 vaccination are not known to be linked with it. Even if the complications arising are mild in nature which can be controlled by the medication.<sup>6</sup>

#### AEFI Deaths- Autopsy guidelines<sup>9</sup>:

Autopsy is mandatory in all such AEFI deaths to exclude any other coincidental cause of death. It is necessary to conduct Post-mortem examination on such deceased at the earliest (within 72 hours) to avoid tissue damage, development of post-mortem artefacts due to decomposition process, and adrenal gland lysis altering diagnosis. The District Immunization Officer need to provide detailed patient's history and all relevant information on the event to the autopsy surgeon.

Autopsy need to be performed by a multi-speciality experts team comprised of Forensic specialist, pathologist, clinician, etc. The autopsy is conducted abiding the guidelines given in **annexure 17** of the AEFI Surveillance and Response Operational guidelines 2015 as soon as possible within 72 hours.<sup>7</sup> Various tissue samples need to be preserved and sent for histopathological, virological, genetic testing and toxicological examination to concerned approved and accredited Government reference laboratories. In case the autopsy is not performed, comprehensive verbal autopsy to be done and findings obtained to be sent to National AEFI committee.<sup>10</sup>

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## Original Research Article

### **Autopsy Based Study of Craniocerebral Injuries in Dependent Age Groups in Central Indian Population.**

Ramteke Bandu Waman<sup>a</sup>, Karmakar Shibanand Nepal<sup>b\*</sup>, Tumram Nilesh Keshav<sup>c</sup>

<sup>a</sup>Assistant Professor, <sup>c</sup>Professor & Head, Department of Forensic Medicine, Government Medical College & Hospital, Chandrapur, Maharashtra, India. 442401.

<sup>b</sup>Associate Professor, Department of Forensic Medicine, Terna Medical College Nerul, Maharashtra, India. 400706.

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#### Key words

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#### Abstract

**Purpose:** Brain is the most important vital organs in the body. Trauma to brain and its surrounding structures can lead to morbidity and mortality. Road traffic accidents, assaults on head and accidental falls are most common causes for craniocerebral trauma. Children, adolescents and old aged are dependent aged groups who require more attention and care as compared to adults. Current study aims to highlight the various age-wise distributions of various aspects of craniocerebral injuries in dependent aged groups. **Results:** Cases were equally distributed in both children & adolescents and old aged group. Males are commonly involved. Most of the cases died on the spot. Majority of the cases died less than 72 hours. Extreme weather conditions had majority of the cases. Pedestrians, cases of fall, cyclists, passengers of four wheeler and cases of assault were common circumstances. **Conclusion:** Craniocerebral injuries can have varied cause and effect on a growing child to a old age population in relation to its morbidity and mortality.

#### 1. Introduction

Injury to brain and its surrounding structures are one of the most commonly encountered cases in medicolegal autopsies. Brain is the most important vital organs in the body. Road traffic accidents, assaults on head and accidental falls are most common causes for craniocerebral trauma. Craniocerebral injury or head injury is defined "morbid state on account off mechanical forces leading to gross or subtle structural changes in the scalp, skull and or the contents of the skull"<sup>1</sup> Human age is classified in four categories as child (0-12 years), adolescence (13-18 years), adult (19-59 years) and senior adult (60 years and above).<sup>2</sup> Children, adolescents and old aged are dependent aged groups

who require more attention and care as compared to adults. Head injury is the leading cause of mortality in children aged less than 15 years,<sup>3,4</sup> while in elderly most frequent cause of traumatic brain injury was fall.<sup>5,6</sup> Road traffic injuries is an increasing health problem globally and in particular in South-East Asia.<sup>7</sup> Various characteristics of craniocerebral injuries in dependent aged group persons are studied in current study.

#### 2. Material and Method:

A total of 2048 cases of medicolegal autopsy were prospectively studied at our tertiary care centre for a period of two years in the department of forensic medicine.

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**\*Corresponding author:** Dr. Shibanand Nepal Karmakar, Associate Professor, Department of Forensic Medicine, Terna Medical College, Nerul, Navi Mumbai, Maharashtra, India. 400706 Email: [shivanandkarmakardr@gmail.com](mailto:shivanandkarmakardr@gmail.com) (M): +91-9766159176.

Out of the total medicolegal autopsy cases a total of 46 cases of death due to craniocerebral injuries cases of dependent age groups (children, adolescents and old aged) were studied in the current study. Necessary permission for the present study was obtained from local institutional ethical committee of our institute. Details of the cases were obtained from the respective investigating agencies. Cases with inadequate history, doubtful findings and bodies which were brought in decomposed state were excluded.

All the details of the cases were studied in relation to the various age group distribution in dependent age groups (children, adolescents and old aged). Data thus obtained were compiled and evaluated accordingly.

### 3. Results:

#### 3.1. Age group wise distribution of cases (Table No 1).

23 (50 %) cases were children and adolescence also 23 (50 %) cases were senior Citizen Cases.

#### 3.2. Age and sex wise distribution of craniocerebral injury cases (Table No 2).

36 (78.3 %) cases were males while remaining 10 (21.7 %) cases were females.

**Table no 1:** Age Group and sex wise distribution of cases.

Cases	Male	Female	Total
Children and adolescence Cases	19	4	23
Senior Citizen Cases	17	6	23
Total	36	10	46

**Table No 2:** Age and sex wise distribution of craniocerebral injury cases.

Sr No	Age group in Years	Males	Females	Total
1	< 10	7	2	9 (19.6 %)
2	11 to 20	2	2	14 (30.4 %)
7	60 to 70	14	4	18 (39.1 %)
8	>71	3	2	5 (10.9 %)
<b>Total</b>		36 (78.3 %)	10 (21.7 %)	46

#### 3.3. Distribution as per place of death (Table No 3).

29 (63.1 %) cases died on the spot while remaining 17 (36.9 %) cases died admitted in hospital.

#### 3.4. Age wise distribution of cases with respect to seasonal variation (Table No 4).

22 (47.9 %) cases were during winter season, 17 (36.9 %) cases were during summer season and 7 (15.2 %) cases were during rainy season.

**Table No 3:** Distribution of cases as per place of death.

Sr No	Age group in Years	Admitted in hospital (Observed)	Spot dead (Unobserved)	Total
1	< 10	2	7	9
2	11 to 20	4	10	14
7	61 to 70	7	11	18
8	>71	4	1	5
<b>Total</b>		17 (36.9 %)	29 (63.1 %)	46

**Table No 4:** Age wise distribution of cases with respect to seasonal variation.

Sr No	Age group in Years	Summer (March to June)	Rainy (July to October)	Winter (November to February)	Total
1	< 10	3	2	4	9
2	11 to 20	3	2	9	14
3	61 to 70	8	2	8	18
4	> 71	3	1	1	5
<b>Total</b>		17 (36.9 %)	7 (15.2 %)	22 (47.9 %)	46

**Table No 5:** Age wise distribution of cases with respect to Length of survival.

Sr No	Age group in Years	Less than 2 hours	2 hours to 72 hours	4 <sup>th</sup> day and above	Total
1	< 10	3	1	5	9
2	11 to 20	1	8	5	14
3	61 to 70	11	4	3	18
4	> 71	4	1	0	5
<b>Total</b>		19 (41.3 %)	14 (30.4 %)	13 (28.3 %)	46

#### 3.5. Age wise distribution of cases with respect to Length of survival (Table No 5).

19 (41.3 %) cases survived less than 2 hours, 14 (30.4 %) cases survived 2 hours to 72 hours while 13 (28.3 %) cases survived 4<sup>th</sup> day and more.

#### 3.6. Age wise distribution of cases with respect to Circumstances of death (Table No 6).

21 (45.7 %) cases were pedestrians, 11 (23.9 %) cases were of fall, 6 (13 %) cases were cyclists, 3 (6.5 %) cases were passengers of four-wheeler, 2 (4.3 %) cases were of assault and 3 (6.5 %) cases were of other causes.

#### 3.7. Age wise distribution of cases with respect to fracture of skull bones (Table No 7).

Fracture of frontal bone was seen in 7 (15.2 %) cases. Fracture of parietal bone was seen in 9 (19.6 %) cases.

Fracture of temporal bone was seen in 1 (2.2 %) case.  
Fracture of occiput bone was seen in 1(2.2 %) case.  
Fracture of orbital roof was seen in 1(2.2 %) case.

Extradural hematoma was seen in 5 (10.9 %) cases.  
Subdural hematoma was seen in 23 (50 %) cases.  
Subarachnoid haemorrhage was seen in 22 (47.8 %) cases.

### 3.8. Age wise distribution of cases with respect to various intracranial injuries (Table No 8).

**Table No 6:** Age wise distribution of cases with respect to Circumstances of death.

Sr No	Circumstances of death		< 10 years age group	11 to 20 years age group	61 to 70 years age group	>71 years age group	Total
1	Fall		1	4	5	1	11 (23.9 %)
2	Four wheeler	Driver	0	0	0	0	0
		Passenger	1	1	1	0	3 (6.5 %)
3	Motorcycle	Driver	0	0	0	0	0
		Passenger	0	0	0	0	0
4	Cyclist		2	2	2	0	6 (13 %)
5	Pedestrian		4	5	8	4	21 (45.7 %)
6	Assault		0	1	1	0	2 (4.3 %)
7	Others		1	1	1	0	3 (6.5 %)
			9	14	18	5	

**Table No 7:** Age wise distribution of cases with respect to fracture of skull bones.

Sr No	Circumstances of death		< 10 years age group	11 to 20 years age group	61 to 70 years age group	>71 years age group	Total
1	Fracture of skull vault	Frontal bone	2	2	3	0	7 (15.2 %)
		Parietal bone	2	3	2	2	9 (19.6 %)
		Temporal bone	0	0	0	1	1 (2.2 %)
		Occipital bone	0	0	0	0	0
2	Fracture of cranial fossa bones	Anterior	0	0	1	0	1 (2.2 %)
		Middle	2	1	5	1	9 (19.6 %)
		Posterior	0	2	2	0	4 (8.8 %)
3	Fracture of bones	Occiput	0	0	1	0	1(2.2 %)
		Orbital roof	0	0	1	0	1 (2.2 %)
		Sphenoid	0	0	0	0	0

**Table No 8:** Age wise distribution of cases with respect to various intracranial injuries.

Sr No	Various intracranial injuries	< 10 years age group	11 to 20 years age group	61 to 70 years age group	>71 years age group	Total
1	Extradural hematoma	0	1	2	2	5 (10.9 %)
2	Subdural hematoma	3	4	14	2	23 (50 %)
3	Subarachnoid hemorrhage	1	5	15	1	22 (47.8 %)
4	Cerebral Contusion	2	1	1	0	4 (8.8 %)
5	Cerebral Laceration	0	0	0	1	1 (2.2 %)
6	Both cerebral laceration and cerebral contusion	1	2	1	1	5 (10.9 %)
7	Cerebellar laceration and/ or contusion	0	0	0	0	0

## 4. Discussion

The current study was conducted in the department of forensic medicine at our tertiary care Centre for a period of two years. During the period of

study, a total of 2048 cases of medicolegal autopsy were evaluated. Out of the total medicolegal autopsy cases a total of 46 dependent age group cases of death due to craniocerebral injuries were studied.

#### 4.1. Age group wise distribution of cases (Table No 1).

23 (50 %) cases were children and adolescence also 23 (50 %) cases were senior citizen Cases. Thus, there were equal distribution of children & adolescents and senior citizen cases in death due to craniocerebral injuries. This can be attributed due to the facts that dependent populations are usually accompanied by adults and hence dependent populations are equally predisposed for craniocerebral injuries.

#### 4.2. Age and sex wise distribution of craniocerebral injury cases (Table No 2).

36 (78.3 %) cases were males while remaining 10 (21.7 %) cases were females. The high proportion of cases being males may be due to the fact that dependent age group females are shy and stay at home as compared to males. Males like to explore the outside world and hence they go out of house more frequently as compared to females. Males are commonly involved in various other studies.<sup>8,9,10,11</sup>

18 (39.1 %) cases were in the age group 61 to 70 years, 14 (30.4 %) cases were in the age group 11 to 20 years, 9 (19.6 %) cases were in the age group <10 years and 5 (10.9 %) cases were in the age group >70 years. 39.1 % cases were in the age group 61 to 70 years. As age increases attention, alertness and reflex activities decreases. Hence extreme age individuals are more likely to be involved in accidents. 30.4 % cases were in the age group 11 to 20 years. During adolescences individuals are full of energy and enthusiasm. Adolescents are also more risk taking.

These could be the reason for increased percentages of cases of craniocerebral injuries. Extreme age group individuals i.e., <10 years and >70 years were comparatively less. This could be due to the fact that such persons are always kept in close watch by other members of the family. Extreme age group individuals are mostly accompanied by other members of family.

#### 4.3. Distribution as per place of death (Table No 3).

29 (63.1 %) cases died on the spot while remaining 17 (36.9 %) cases died admitted in hospital. 63.1 % cases died on the spot. This can be attributed as craniocerebral injury cases are deadlier and causes death instantaneously. Out of the 29 cases who died on the spot; 7 cases were in the age group <10 years, 10 cases were in the age group 11 to 20 years, 11 cases were in the age group 61 to 70 years and 1 case was in the age group >71 years. Cases who died on the spot were evenly distributed in all age group

except in age group >71 showing a general predisposition in all dependent age group. Out of the 17 cases who died admitted in hospital; 2 cases were in the age group <10 years, 4 cases were in the age group 11 to 20 years, 7 cases were in the age group 61 to 70 years and 4 cases were in the age group >71 years. Cases who died admitted in hospital were evenly distributed in all age group showing a general predisposition in all age group.

#### 4.4. Age wise distribution of cases with respect to seasonal variation (Table No 4).

22 (47.9 %) cases were during winter season, 17 (36.9 %) cases were during summer season and 7 (15.2 %) cases were during rainy season. Craniocerebral cases were seen more in extreme temperature season with 47.9 % cases in winter season and 36.9 % cases in summer season. Out of the 22 cases who were during winter season; 4 cases were in the age group <10 years, 9 cases were in the age group 11 to 20 years, 8 cases were in the age group 61 to 70 years and 1 case was in the age group >71 years. Cases who were during winter season were evenly distributed in all age group except in age group >71 showing a general predisposition in all dependent age group. Out of the 17 cases who were during summer season; 3 cases were in the age group <10 years, 3 cases were in the age group 11 to 20 years, 8 cases were in the age group 61 to 70 years and 3 cases were in the age group >71 years. Cases who were during summer season were evenly distributed in all age groups showing a general predisposition in all dependent age group. Out of the 7 cases who were during rainy season; 2 cases were in the age group <10 years, 2 cases were in the age group 11 to 20 years, 2 cases were in the age group 61 to 70 years and 1 case was in the age group >71 years. Cases who were during rainy season were evenly distributed in all age groups showing a general predisposition in all dependent age group.

#### 4.5. Age wise distribution of cases with respect to Length of survival (Table No 5).

19 (41.3 %) cases survived less than 2 hours, 14 (30.4 %) cases survived 2 hours to 72 hours while 13 (28.3 %) cases survived 4<sup>th</sup> day and more. A large number of cases (71.7 %) died early duration (<72 hours). Thus, it can be inferred that craniocerebral injury cases are more likely to cause death in early periods after infliction of injury. Out of the 19 cases who survived less than 2 hours; 3 cases were in the age

group <10 years, 1 case was in the age group 11 to 20 years, 11 cases were in the age group 61 to 70 years and 4 case was in the age group >71 years. Cases who survived less than 2 hours shows more prevalence in old age group individuals. This could be due to the fact that as age increases the protective barrier skull bone becomes more susceptible due to osteoporosis. Hence old age people suffer more fatal injuries to internal structures and hence may die immediately. While children and adolescents die comparatively less immediately. Out of the 14 cases who survived 2 hours to 72 hours; 1 case was in the age group <10 years, 8 cases were in the age group 11 to 20 years, 4 cases were in the age group 61 to 70 years and 1 case was in the age group >71 years. Cases who survived 2 hours to 72 hours are distributed approximately equally in old age and in child & adolescent groups. Out of the 13 cases who survived 4<sup>th</sup> day and more; 5 cases were in the age group <10 years, 5 cases were in the age group 11 to 20 years and 3 cases were in the age group 61 to 70 years. There was no case in the age group >71 years. Cases who survived 4<sup>th</sup> day and more shows more prevalence in child & adolescent groups individuals. This could be due to the fact that child & adolescent groups protective barrier skull bone is comparatively stronger as compared to old aged persons. Hence child & adolescent groups can withstand more force, limiting the injuries to internal structures and hence may survive for long duration of time.

#### **4.6. Age wise distribution of cases with respect to Circumstances of death (Table No 6).**

21 (45.7 %) cases were pedestrians, 11 (23.9 %) cases were of fall, 6 (13 %) cases were cyclists, 3 (6.5 %) cases were passengers of four-wheeler, 2 (4.3 %) cases were of assault and 3 (6.5 %) cases were of other causes. Sevitt<sup>12</sup> in study of 175 cases head injury fatal road accidents found 79 pedestrians, 33 motorcyclists, 15 pedal cyclists, 19 vehicle drivers, 22 vehicular passengers, 5 bus passengers and 2 others. Out of the 21 cases of pedestrians; 4 cases were in the age group <10 years, 5 cases were in the age group 11 to 20 years, 8 cases were in the age group 61 to 70 years and 4 case was in the age group >71 years. Out of the 11 cases of fall; 1 case was in the age group <10 years, 4 cases were in the age group 11 to 20 years, 5 cases were in the age group 61 to 70 years and 1 case was in the age group >71 years. Out of the 6 cases of cyclists; 2 cases were in the age group <10 years, 2

cases were in the age group 11 to 20 years and 2 cases were in the age group 61 to 70 years. There was no case in the age group >71 years. Out of the 3 cases of passengers of four-wheeler; 1 case was in the age group <10 years, 1 case was in the age group 11 to 20 years and 1 case was in the age group 61 to 70 years. There was no case in the age group >71 years. Out of the 2 cases of assault; 1 case was in the age group 11 to 20 years and 1 case was in the age group 61 to 70 years. There was no case in the age group <10 years and also in >71 years. Out of the 3 cases of other causes; 1 case was in the age group <10 years, 1 case was in the age group 11 to 20 years and 1 case was in the age group 61 to 70 years. There was no case in the age group >71 years.

#### **4.7. Age wise distribution of cases with respect to fracture of skull bones (Table No 7).**

Fracture of frontal bone was seen in 7 (15.2 %) cases. Fracture of parietal bone was seen in 9 (19.6 %) cases. Fracture of temporal bone was seen in 1 (2.2 %) case. Chandra Kumar PC et al<sup>13</sup> found fracture of frontal bone in 9.4 % cases, fracture of parietal bone in 3% cases and fracture of temporal bone in 8.2 % cases. Out of the 7 (15.2 %) cases of fracture of frontal bone; 2 cases were in the age group <10 years, 2 cases were in the age group 11 to 20 years and 3 cases were in the age group 61 to 70 years. There was no case in the age group >71 years. Thus, fracture of frontal bone was seen in both children and old aged cases. Out of the 9 (19.6 %) cases of fracture of parietal bone; 2 cases were in the age group <10 years, 3 cases were in the age group 11 to 20 years, 2 cases were in the age group 61 to 70 years and 2 case was in the age group >71 years. Thus, fracture of parietal bone was seen equally distributed in all children and old aged groups. 1(2.2 %) case of fracture of temporal bone was in the age group >71 years. Thus, fracture of temporal bone was seen only in extreme old aged group. Fracture of anterior cranial fossa bones was seen in 1 (2.2 %) case. Fracture of middle cranial fossa bones was seen in 9 (19.6 %) cases. Fracture of posterior cranial fossa bones was seen in 4 (8.8 %) cases. Dinesh Kumar et al<sup>14</sup> found that middle cranial fossa was the commonest region involved (52.2%) followed by posterior cranial (25.4%) and anterior cranial fossa (22.4%). 1 (2.2 %) cases of fracture of anterior cranial fossa bones were in the age group 61 to 70 years. Thus, only case of fracture of anterior cranial fossa bones was seen only in old aged group.

Out of the 9 (19.6 %) cases of fracture of middle cranial fossa bones; 2 cases were in the age group <10 years, 1 case was in the age group 11 to 20 years, 5 cases were in the age group 61 to 70 years and 1 case was in the age group >71 years. Thus, fracture of middle cranial fossa bones was seen distributed in all children and old aged groups. Out of the 4 (8.8 %) cases of fracture of posterior cranial fossa bones; 2 cases were in the age group 11 to 20 years and 2 cases were in the age group 61 to 70 years. There were no cases in the age group <10 years and in the age group >71 years. Thus, fracture of posterior cranial fossa bones was not seen in extreme old and young aged groups. Fracture of occiput bone was seen in 1(2.2 %) case. Fracture of orbital roof was seen in 1(2.2 %) case. 1 (1.9 %) case of fracture of occiput bone was in the age group 61 to 70 years. Thus, only case of fracture of occiput bone was seen in extreme old aged group. 1 (1.9 %) case of fracture of orbital roof was in the age group 61 to 70 years. Thus, only case of fracture of orbital roof was seen in extreme old aged group.

#### **4.8. Age wise distribution of cases with respect to various intracranial injuries (Table No 8).**

Extradural hematoma was seen in 5 (10.9 %) cases. Subdural hematoma was seen in 23 (50 %) cases. Subarachnoid haemorrhage was seen in 22 (47.8 %) cases. Chandra Kumar PC et al<sup>13</sup> also found findings mostly as similar as our study. Out of the 5 (10.9 %) cases of extradural hematoma; 1 case were in the age group 11 to 20 years; 2 cases were in the age group 61 to 70 years and 2 case was in the age group >71 years. Thus, extradural hematoma was not seen in extreme young aged group. Out of the 23 (50 %) cases of subdural hematoma; 3 cases were in the age group <10 years, 4 cases were in the age group 11 to 20 years, 14 cases were in the age group 61 to 70 years and 2 case was in the age group >71 years. Thus, subdural hematoma was seen distributed in all children and old aged groups but most cases were in 61 to 70 years' age group. Out of the 22 (47.8 %) cases of subarachnoid haemorrhage; 1 case was in the age group <10 years, 5 cases were in the age group 11 to 20 years, 15 cases were in the age group 61 to 70 years and 1 case was in the age group >71 years. Most cases of subarachnoid haemorrhage were seen in 61 to 70 years' age group. Cerebral contusion was seen in 4 (8.8 %) cases. Cerebral laceration was seen in 1 (2.2 %) case. Both cerebral laceration and cerebral

contusion was seen in 5 (10.9 %) cases. Out of the 4 (8.8 %) cases of cerebral contusion; 2 cases were in the age group <10 years, 1 case were in the age group 11 to 20 years and 1 case was in the age group 61 to 70 years. There was no case in the age group >71 years. Thus, cerebral contusion was seen in all children and old aged groups except in >71 years' age group. 1 (2.2 %) cases of cerebral laceration were in the age group >71 years. Only case of cerebral laceration was seen in extreme old aged >71 years age group. Out of the 5 (10.9 %) cases of both cerebral laceration and cerebral contusion; 1 case was in the age group <10 years, 2 cases were in the age group 11 to 20 years, 1 case was in the age group 61 to 70 years and 1 case was in the age group >71 years. Thus, cases of both cerebral laceration and cerebral contusion were seen distributed in all age groups in children and old aged.

#### **5. Conclusion**

Cases were equally distributed in both children & adolescents and old aged group. Males are commonly involved. Most of the cases died on the spot. Majority of the cases died less than 72 hours. Extreme weather conditions had majority of the cases. Pedestrians, cases of fall, cyclists, passengers of four-wheeler and cases of assault were common circumstances. Injuries to various craniocerebral structures were studied in detail in relation to age group in children and old aged people. Thus, such injuries can have varied cause and effect on a growing child to an old age population in relation to its morbidity and mortality.

**Ethical Clearance:** Yes.

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**Conflict of interests:** None.

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## Original Research Article

### A Retrospective Study on Microscopic Changes of Heart in Sudden Death of Young Individuals.

K Tamilmani<sup>a</sup>, M Manivasagam<sup>b\*</sup>

<sup>a</sup>Associate Professor, Institute of Forensic Medicine, Madras Medical College, Chennai, Tamilnadu, India. 600003

<sup>b</sup>Senior Assistant Professor, Department of Forensic Medicine, Government Medical College, Karur, Tamilnadu, India. 639004

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#### Abstract

When an individual succumbs to illness within 24 hours of onset of symptoms, from causes other than unnatural causes, then deaths would be grouped under sudden death. Coronary artery disease tops the list by being the most common factor responsible for sudden death. Coronary artery diseases are by no means restricted to old age now. Many young individuals are becoming victims of this illness unknown to them. This study aims at understanding the presentation of this illness at microscopic level to aid in reducing loss of precious human lives.

#### 1. Introduction

Coronary artery diseases are the most common disease entity to cause sudden death in developing countries. Incidence of Myocardial infarction is 5/1000 deaths per year. <sup>1</sup> 50 percent of deaths due to myocardial infarction happens within 1-2 hours of onset of symptoms<sup>2</sup> which includes known illness prior to this event as well as first time patients. Over the past decade, incidence of acute myocardial infarction among the persons of age < 50 years is increasing. Increased cardio vascular risk factors such as diabetes mellitus, obesity, systemic hypertension, hyperlipidemia is contributing to this changing trend. This study concentrates on the microscopic changes in heart, grade of atherosclerosis found during autopsy. Age wise analysis in this study can be useful in screening the high risk individuals and further reduction in mortality & morbidity.

#### 2. Materials and Methods:

##### Inclusion criteria:

1. Include both sex of age groups 25 – 50 years;

2. Presenting for the first time with signs and symptoms of coronary heart disease;
3. Treatment for the present illness started and patient could not be saved or brought dead case without previous cardiac illness history, received at Hospital Casualty of Thanjavur Medical College Hospital.

4. Occlusion in at least one of the coronary arteries.

##### Exclusion Criteria:

1. Brought dead cases due to unnatural events like road traffic accidents, railway cases, insect bite and poisoning cases etc.;
2. Death due other natural causes, with prior history or found at autopsy;
3. Obscure autopsy and Negative autopsy.

**Study design:** Retrospective Cross Sectional Study.

##### Size and place of study:

100 cases of medico legal autopsies with microscopic changes in coronary arteries are studied. Cases between January - 2016 to January - 2018 were taken up for study period.

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**\*Corresponding author:** Dr. Manivasagam. M, Senior Assistant Professor, Department of Forensic Medicine, Government Medical College, Karur, Tamilnadu, India. 639004 Email: [vasagammani86@gmail.com](mailto:vasagammani86@gmail.com) (M): +91-9176741075.

Department of Forensic Medicine and Toxicology, Thanjavur Medical College, Thanjavur, Tamilnadu – a Tertiary Care Hospital was the place of study.

### Methodology:

Dead bodies were kept in individual compartment type cold storage between 0 to 4 °C, from the time of reception till the time of start of autopsy. Medico legal autopsy were conducted as per standard protocol and guidelines. During the conduct of autopsy, gross examination of heart was done, washed, and dissection was carried out by inflow-outflow method and short axis method and then weighed. Coronary vessels were incised at every 01 - 03 mm interval and examined. Sections from anterior & posterior surface of both ventricles, interventricular septum, atrium and coronary vessels were sent for histopathological examination of heart for hematoxylin and eosin staining. Specimens were preserved in 10% formalin between 03 to 06 days and there after stained and studied.

### 3. Results:

Age wise distribution of cases was maximum in 35-40 years followed by 40-45 years. Minimum no of case was seen in 20-25 years. Sex wise, 93% cases were male, 07% were female.

#### Weight:

Weight of the heart was more than 450 gm in 18 % of cases, weight was between 350 - 450 gm in 46% cases, weight was between 250 – 350 gm in 36 % of cases (Table No. 1).

#### Arterial involvement:

Atherosclerotic obstruction of Left Anterior Descending Artery was seen in 94% of cases, Left Circumflex Artery - 60% of cases and Right Circumflex Artery - 61% of cases. Coronary artery occlusion was seen in the following manner: Out of the 94 cases having occlusion in Left Anterior Descending Artery (12 cases had occlusion in Left Anterior Descending Artery alone, 23 cases had occlusion in Left Anterior Descending and also in Left Circumflex; 26 cases had occlusion in Left Anterior Descending and Right Circumflex Arteries, 33 cases had occlusion in all three Left Anterior Descending, Left Circumflex and Right Circumflex Arteries); Of the 68 cases having occlusion in Left Circumflex Artery (04 cases had occlusion in Left Circumflex Artery alone, 23 cases had occlusion in Left Anterior Descending and also in Left Circumflex; 08 cases had occlusion in Left Circumflex, 33 cases had occlusion

in all three Left Anterior Descending, Left Circumflex and Right Circumflex Arteries); Of the 69 cases having occlusion in Right Circumflex Artery (02 cases had occlusion in Right Circumflex Artery alone, 08 cases had occlusion in Right and Left Circumflex arteries, 26 cases had occlusion in Left Anterior Descending and Right Circumflex Arteries, 33 cases had occlusion in all three Left Anterior Descending, Left Circumflex and Right Circumflex Arteries).

#### Occlusion grades:

Single vessel occlusion is 18 % of cases; Double vessel involvement is 57 % of cases; Triple vessel involvement is 33 % of cases. With respect to occlusion, 09% cases were Grade II, 13% cases were Grade III and 78% cases were Grade IV blocks (Table No. 2).

#### Microscopic examination:

Most common finding was myocardial infarction with atherosclerosis. Of which, Acute Myocardial Infarction (Fig. 1) – 51% cases, healing stage of Myocardial Infarction (Fig. 2) - 21% cases, Healed Myocardial Infarction (Fig. 3) - 08% cases, Nonspecific heart findings – 18% cases (Table No. 3).

**Table 1: Weight of heart:**

Weight in grams	Frequency	Percentage
< 250 g	Nil	Nil
250 - 350 g	36	36 %
350 – 450 g	46	46 %
> 450 g	18	18 %

**Table 2: Grading of Atherosclerosis:**

Grading	Frequency
0 - 25	Nil
26 - 50	09
51 - 75	13
76 - 100	78

**Table 3: Microscopic findings:**

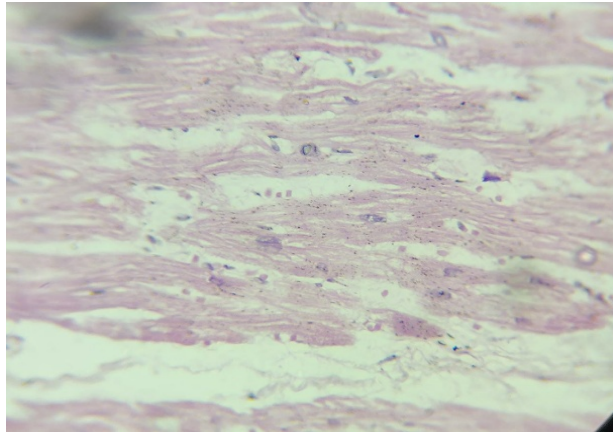
Grading	Frequency
Acute MI	51
Healing MI	21
Healed MI	08
No significant finding	10

### 4. Discussion:

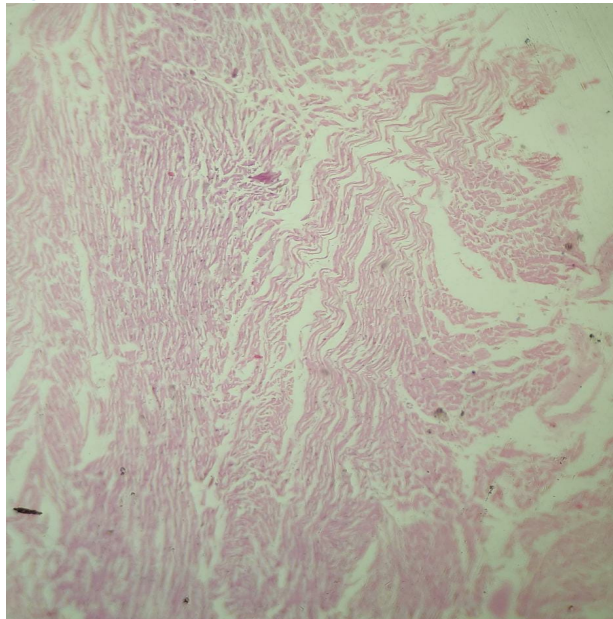
Atherosclerosis narrowing of vessels are seen most commonly in proximal portion of Left Anterior Descending Artery, followed by Left Circumflex Artery and then in Right Coronary artery. Less often narrowing is seen in major secondary epicardial branch, diagonal branch of LAD, obtuse marginal

branches of LCA or posterior branch of LCA or posterior branch descending of RCA.<sup>1</sup>

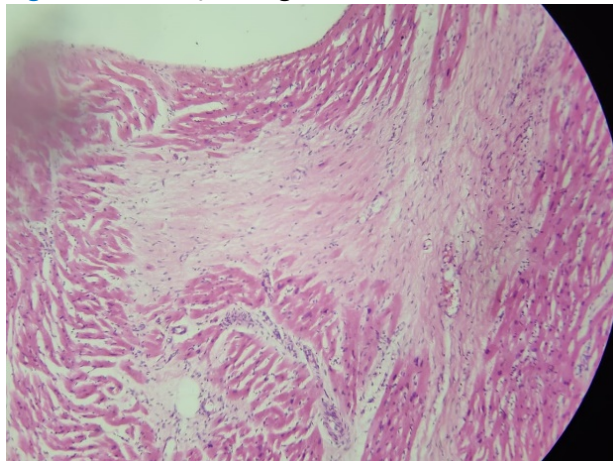
**Fig. No.1: Acute Neutrophilic infiltration – Acute MI.**



**Fig. No. 2: Wavy fibers – Acute MI.**



**Fig. No. 3: Scar / Collagenous tissue – Old MI.**



For statistical convenience, vessels are grouped under Left Anterior Descending, Left circumflex and Right Circumflex. Gross changes regarding redness, redness and pallor, yellow bordering, yellow green area and healed white scar were also noted.<sup>2,3,4</sup> Approximate lumen narrowing, atherosclerotic changes were noted and graded as follows: Grade 1: 0 - 25%; Grade 2: 25 - 50%; Grade 3: 50 - 75%; Grade 4: 75 - 100%. Incidence of sudden death due to coronary artery disease (MI) varies considerably in autopsy material, partly because of different methods of demonstrating the muscle necrosis.<sup>5</sup> Microscopic changes on heart among young individuals can be reliably used to prevent coronary artery diseases by taking appropriate screening.<sup>6,7</sup> Microscopic changes in myocardial infarction includes, within 06 hrs. – infarct muscle fibers were edematous, vascular degeneration and myocytolysis, by 12 hrs. – loss of striations, intense eosinophilic, hyaline appearance and nuclear changes, after 24 hrs. - shrunken eosinophilic cytoplasm and pyknosis of nuclei and less neutrophilic infiltration.<sup>8</sup> Within 48 - 72 hrs. the coagulative necrosis is completely seen neutrophilic infiltration; 1st week - macrophages appear with proliferation of capillaries and fibroblast; 3<sup>rd</sup> week fibro-vascular reaction is more prominent, newly formed collagen fibers, pigmented macrophages seen. End of 6<sup>th</sup> week - increased fibro-collagenous tissues, decreased vascularity, lymphocytes. Plasma cells disappears.<sup>9</sup>

Above findings can be grouped as follows: Microscopic finding of presence of coagulative necrosis with various degree of nuclear changes and prominent infiltration of neutrophils are grouped as Acute Myocardial Infarction; Heart showing above mentioned changes in various stages with presence of mononuclear leucocytes and fibroblasts without neutrophils were grouped as Healing Myocardial Infarction; Heart showing presence of collagenous scarring without cellular infiltration were labelled as Old healed Myocardial Infarction; Hearts with infiltration edema, patchy eosinophilic were considered as inconclusive for infarction and were given wider name 'death due to coronary artery disease'.<sup>9</sup>

In our study, Maximum number of cases were observed in the age group 35-40 years followed by

40-45 years. Similar finding was reported by Jochi C<sup>9</sup>, Ramazan Karanfil<sup>10</sup> and Stavroula A<sup>11</sup>, Bora Ozdemir<sup>12</sup> reports maximal incidence in 40-45 years. Sex wise distribution was seen predominantly in male sex. This is similar to Joshi C<sup>9</sup> reported 85.21% males and 14.8% females, Bora Ozdemir<sup>12</sup> reported 73% male 27% females Ramazan Karanfil<sup>10</sup> reported 74% male and 26% female. Vessel involvement in our study was LADA 94 cases, LCX 60 cases and RCA 61 cases, it is similar to study by Rao D<sup>13</sup>, Porwal V<sup>14</sup>, Garg M<sup>15</sup>, Beelwal D<sup>16</sup>.

All cases of coronary atherosclerosis are based the extent of occlusion of coronary vessel lumen by atherosclerotic plaques. In this study 09 cases were in 25 - 50% occlusion of vessels, 13 case were in 50 - 75% occlusion of vessels, 78 cases were in 75 - 100 % occlusion of vessels. Results were similar to histological grading of atherosclerosis as per American Heart Association guidelines where maximum no of cases were seen in Grade IV followed by Grade III. Acute myocardial infarction cases were 51%, healed was MI 21%, similar to Ramazan Karanfil<sup>10</sup> - 48%, but not similar to study reported by Joshi C for acute MI 45%, old MI 55%, Rao D<sup>13</sup> reported for acute MI 24%, and old MI 27%., Jochi C<sup>9</sup> - 28%, Bora Ozademir<sup>12</sup> - 26% for acute MI. Considering all the above study results, it is evident in all deaths, the deceased persons were almost normal / did not get medical attention before. Extent of the disease in autopsy specimens suggests a disease process rather than a simple event at a point of time. Financial, psychological factors, lifestyle pattern of the deceased are to be modified along with a common belief that myocardial infarctions are reserved to old age have to be forgotten. Screening and early intervention can find disease progression and prevent losses of these precious lives.

#### Limitations:

Study did not include cardiomyopathies, arrhythmic deaths, ventricular ruptures, aneurysmal ruptures etc. Study didn't include sudden deaths with non-specific / obscure findings in heart. Since early infarcts and small infarcts could have been missed on gross examination and person would have died before microscopic changes would set in.<sup>17, 18</sup>

#### 5. Conclusion:

Coronary artery disease is the leading cause of natural deaths. Coronary atherosclerosis leads to

myocardial infarction. To prevent coronary artery disease, individuals should follow healthy diet, stress reduction, regular physical activity, life style modification. Treating doctors shall start to screen for coronary events irrespective of the age group, whereby more epidemiological data, clinical probes for better individual risk prediction in high risk groups can be achieved to save precious lives.

**Ethical Clearance:** Yes.

**Conflict of Interest:** Nil.

**External Funding:** Nil.

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## *Original Research Article*

# Analysis of Female Deaths in Custodial Set-Up: A Ten-Year Retrospective Study

Rajesh V Bardale<sup>a</sup>, Sandeep V. Haridas<sup>a</sup>, Pradeep G. Dixit<sup>b</sup>

<sup>a</sup>Associate Professor, <sup>b</sup>Professor and Head,

Department of Forensic Medicine & Toxicology, Government Medical College and Hospital, Miraj, Dist. Sangli, Maharashtra, India.410410

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### Key words

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Female.

### Abstract

**Introduction:** Fundamental rights occupy a place of pride in the Indian Constitution. Article 21 provides that no person shall be deprived of his life or personal liberty except according to the procedure established by the law. The expression "life of personal liberty" has been held to include the right to live with human dignity and indirectly it also includes a guarantee against torture and assault by State functionaries. Death of females in custodial setup is in small number and had received little or no attention. **Aim:** The aim of present study is to analyse the death of female inmates in custodial setup (police and prison) and to provide data so as to enable to formulate corrective reforms to prevent such untimely death. **Material and methods:** It was a postmortem examination based retrospective study. We examined all available files of inquest papers, autopsy reports, toxicological analysis reports, histopathology reports and case papers into the death of people in custody through 2009 to 2018. **Conclusion:** the present study had identified some traits of female deaths in custodial setup. These traits can be utilized to reduce the number of deaths.

### 1. Introduction

Fundamental rights occupy a place of pride in the Indian Constitution. Article 21 provides that no person shall be deprived of his life or personal liberty except according to the procedure established by the law. The expression "life of personal liberty" has been held to include the right to live with human dignity and indirectly it also includes a guarantee against torture and assault by State functionaries.<sup>1</sup> Deaths in custody are a well-established problem. Sometimes death is due to natural cause and at times it may be because of unnatural act. Previous studies had established that

most of the deaths were due to natural causes.<sup>2</sup> Many times, such deaths are associated with co-morbidities or due to exacerbation of illness or lack of availability of timely medical aid.

Death of females in custodial setup is in small number and had received little or no attention.<sup>3</sup> In fact, in India, no female gender specific study was reported in the literature. The aim of present study is to analyse the death of female inmates in custodial setup (police and prison) and to provide data so as to enable to formulate corrective reforms to prevent such untimely death.

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**\*Corresponding author:** Dr Rajesh V Bardale, Associate Professor, Govt. Medical College and hospital Miraj, Sangli, Maharashtra, India. Pin-410410. Email: [bardalerv@yahoo.co.in](mailto:bardalerv@yahoo.co.in) (M): +91- 9420254589

## 2. Material and methods

This is a post-mortem examination based retrospective study conducted at Department of Forensic Medicine, Government Medical College and Hospital, Miraj. We examined all available files of inquest papers, autopsy reports, toxicological analysis reports, histopathology reports and case papers into the death of people in custody through 2009 to 2018. A standard Proforma was designed to collect the information to ensure consistency for the whole sample. Only female inmate death was included in this study. Information collected included age, sex, type of custody (prison or police cell), place of death/incident, medical attention received, presence of any associated disease, history of any psychiatric illness, substance abuse and cause of death.

## 3. Results

A total 119 autopsies in custodial setup (police and prison) were performed during the 10-year period from January 2009 to December 2018 out of which 7 (8.33%) cases were of female inmate. The year-wise distribution of the male and female custodial deaths is presented in Fig 1. The study consists of 7 female inmates. Age range was from 27 years to 89 years with mean age of 52.28 years. 01 deaths (14.28%) was occurred in police lockup while 6 deaths (85.71%) were recorded in prison (Table 1).

1 female who was in police custody committed suicide within 24 hours of the arrest. Amongst prison inmates, three females (42.85%) were convicted and 3 (42.85%) were temporary prisoners (under-trial / Magisterial remand). Among 7 deaths, 2 (28.57%) were unnatural and 5 (71.42%) were natural deaths (Table 2). Amongst natural causes, deaths due to myocardial infarction were noted in 2 (28.57%) cases. Presence of co-morbidity (Table No. 3) was found in 4 (57.14%) cases. Amongst them, right hemiplegia was found in 2 (50%) cases. Medical attention was received in 5 (71.42%) cases. 1 (14.28%) death was recorded in police lockup and 1 (14.28%) was recorded in prison cell (Table No. 4). These both cases were of hanging and ligature material used was saree and scarf respectively. In police lockup horizontal bar of window was used as a suspension point where as horizontal iron bar of prison door was used as suspension point in prison cell death.

**Table No. 1: Distribution of cases as per type of custody.**

Type of custody	No. of Cases (%)
Police	1 (14.28)
Prisoner under trial	3 (42.85)
Prisoner convicted	3 (42.85)
Total	7 (100%)

**Table No. 2: Distribution of cases as per Cause of Death.**

Cause of Death	No. of Cases (%)
Bronchopneumonia	1 (14.28)
Cerebral Infarction	1 (14.28)
Intracerebral Haemorrhage	1 (14.28)
Myocardial Infarction	2 (28.56)
Hanging	2 (28.56)
Total	7 (100%)

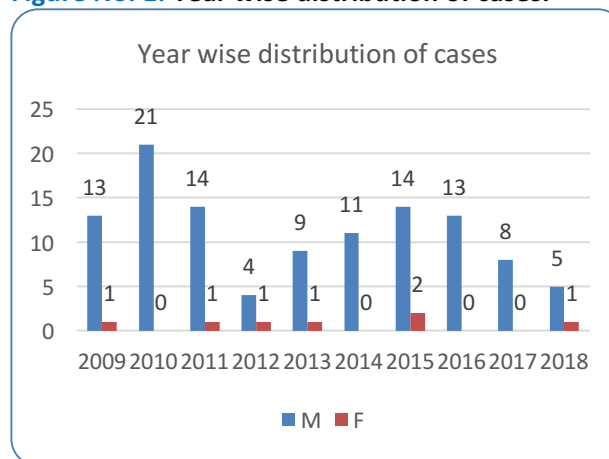
**Table No. 3: Distribution of cases as per co-morbidities.**

Co-morbidity	No. of Cases (%)
Diabetes Mellitus	1 (14.28)
Ischemic Heart Disease	1 (14.28)
Hemiplegia	2 (28.56)
No co-morbidities	3 (42.85)
Total	7 (100%)

**Table No. 4: Distribution of cases as per Place of Death.**

Place of Death	No. of Cases (%)
Lockup	1 (14.28)
Prison cell	1 (14.28)
Hospital	5 (70.44)
Total	7 (100%)

**Figure No. 1: Year wise distribution of cases.**



#### 4. Discussion

Death in a custodial setup is a tragic event and it raises suspicion in the mind of family members. When a person is taken into custody, the law enforcing agency curtails person's liberty and movement. At the same time there is the implied responsibility of the custodian to protect and preserve the inmate taken into custody.<sup>4</sup> The precious right guaranteed by Article 21 of the Constitution of India cannot be denied to convicted, under-trials, detainees and other prisoners in custody, except according to the procedure established by the law by placing such reasonable restrictions as are permitted by law.<sup>1</sup>

In the present study, majority of deaths were due to natural causes (n=5, 71.42%). The findings are consistent with other studies.<sup>2,5</sup> Amongst natural deaths, majority of deaths were due to myocardial infarction. Illness and existing comorbidities made the person more vulnerable especially if he or she is incarcerated. The concerned authorities should pay attention to the existing comorbidities before detaining an inmate. Complete history and copy of medical record should be readily available with the Doctor attached with that particular police station or prison.

In the present study, two suicide cases were noted. Studies conducted by various researchers in different countries had been found out an increase in suicide rates in custody.<sup>3</sup> These inmates use available means as ligature material.<sup>6,7</sup> In the present study self-clad sari and scarf was used as a ligature material. The suspension point was horizontal iron bar in the police-cell and prison-cell. The findings are consistent with other studies.<sup>6,7</sup>

There exists paucity of research literature regarding female inmates' death in custodial setup. It may be because of relatively small number of deaths in comparison with a greater number of male inmates' deaths.<sup>3</sup> Though the study was conducted over a period of ten years but female death appears small in number (**fig 1**). The reason for small numbers of female deaths can be attributed to less involvement of female in criminal act. 1 (14.28%) death was reported in police lock-up. It was a case of gold theft at goldsmith's shop. 3 female inmates (42.85%) were convicted and amongst them 2 cases (28.56%) were convicted under Section 302 of Indian Penal Code (IPC) and 1 case (14.28%) was convicted

under Section 465, 468, 471 and 34 of IPC with Section 146, 196 and 177 of the Motor Vehicle Act 1987. 3 female inmates (42.85%) were under-trial and amongst them 2 (28.56%) were trialled under Section 302 of IPC and 1 (14.28%) case was trialled under Section 304B, 498A and 34 of IPC.

#### 5. Conclusion

Preventing death in custodial setup is paramount important because it is the responsibility of custodian to look after the well-being of the incarcerated individuals. On a concluding note, the present study had identified some traits of female deaths in custodial setup. These traits can be utilized to reduce the number of deaths. However, further studies are required to have an adequate data to prevent such premature exit.

**Ethical Clearance:** Yes.

**Funding:** None.

**Conflict of interests:** None.

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## *Original Research Article*

### **Estimation of Stature from Foot Print Length Among Students and Staff of a Tertiary Medical Institution Between Age Group of 21 to 30 Years.**

Vinay Manjunath Raj<sup>a</sup>, Kelvekar V H<sup>b</sup>, Manjula R<sup>c</sup>

<sup>a</sup>Medical Officer; PHC Peresandra, Chikballapur, Karnataka, India. 562104

<sup>b</sup>Professor; Assistant Professor; Department of Forensic Medicine and Toxicology S.N. Medical College, Bagalkot, Karnataka, India. 587 102

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#### Abstract

Identity means the determination of the individuality of a person. Identification of a person is one of the most important issues for a forensic expert in solving many medico-legal cases. The present studies was under taken to estimate the stature from foot print length and to evolve regression equation for the same in both the gender. 100 healthy subjects (50 males and 50 females) of age group 21-30 years, who are resident of north Karnataka, were included in the study. The foot print lengths of both the feet of the participants were taken. The readings were subjected to statistical evaluation and regression formulae were established for stature estimation from foot print lengths in males and females.

#### 1. Introduction

Identification is the determination of the individuality of a person based on many characteristic features, viz name, age, sex, religion, race, anthropometry, Fingerprints, foot prints, DNA typing, congenital or acquired malformations, etc. Of these features sex, age and stature are considered as primary characteristics of identification, while others are secondary.<sup>1</sup>

Identification is more important medico-legally in both civil and criminal cases, i.e. civil cases like marriage, divorce, inheritance, paternity disputes, business contracts and criminal cases like assault, murder, sexual offences etc. It is more challenging to a forensic expert in situations of mass disasters like railway or aircraft accidents, bomb explosions, tsunami etc, where only the parts of the body

especially the peripheries like hand and foot are available.<sup>1</sup>

In the present study an attempt has been made to derive regression formulae which will be used to calculate the stature from foot print length in both the sexes among the population of north Karnataka.

#### Aims and Objectives

1. To estimate the stature from percutaneous measurement of maximum foot length in both the feet among the study population.
2. To evolve regression equation for stature estimation from above dimensions in both the gender.
3. To assess the bisexual and bilateral difference form foot print length.

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**\*Corresponding author:** Dr.Vinay Manjunath Raj, Medical officer PHC Peresandra, Chikballapur, Karnataka, India. 562104 Email- [drvinayraj84@gmail.com](mailto:drvinayraj84@gmail.com) (M): +91- 9916188996.

## 2. Materials and Methods

### **Sources of data:**

The study was carried out involving 100 subjects comprising of both students and staff of S. Nijalingappa Medical College of age group between 21–30 years. The subjects of this age group were selected as the maximum height of a person is attained after the age of puberty, to be more precise at the age 21 years.<sup>2</sup> The upper limit is taken as 30 years since growth regression starts thereafter.<sup>3</sup>

**Sampling method:** Simple random sampling.

**Sample size:** 100 healthy subjects (50 males and 50 females) involving students and staff of S. Nijalingappa Medical College and HSK hospital were included. Out of these 100-study population 10 from each age group from 21 - 30 years were considered having 5 males and 5 females in each subgroup randomly.

### **Method of collection of data:**

General physical examination of the selected subjects was done to know their general health status and to rule out the above said deformities in the subjects. The aims and objectives of the intended study were explained to the subjects in their vernacular language and an informed consent is obtained. The details of the participants are entered in the proforma and the following parameters were recorded.

### **Recording of the height:**

All the readings are taken at the same time of the day to minimize the diurnal variation. The height of each subject has been recorded by asking the subject to stand erect with barefoot on the base of the standard stadiometer in a Frankfurt plane. The subjects are asked to stand erect without support with the arms by the side of the body. The horizontal plate being attached to the vertical wooden scale of two meters' height and the reading is taken from the base of the stadiometer to the vertex of the head in centimeters to the nearest millimeter.

### **Foot print length:**

The participants are asked to wash and dry their feet to remove the dirt. A plain glass plate of about 24 X 24 inches is selected and is uniformly smeared with a thin layer of black printer's ink using a roller. The subject is then made to place their right foot on the smeared glass plate. Asked the person to stand on one leg so that adequate weight of the body is transferred on to that leg and the footprint

is transferred on A4 size white paper placed on an even hard surface. The same procedure is repeated for the left footprint. The length of the foot print is measured from pterion to acropodian of either the first or second toes whichever is longer. The reading is taken in centimeters corresponding to the nearest millimeter. The length of foot print readings is measured twice and by two different observers to minimize inter and intra observers' error.

The final readings are entered in master chart and subjected to statistical evaluation using SPSS (Statistical Programme for Social Sciences) software version 17 and the results were analyzed. The above study was approved by the ethical committee of the college and the university.

## 3. Results

In the present study focus has been made on the estimation of stature from foot length and foot print lengths by forming regression equations. A total of 100 (50 males and 50 females) healthy individuals between age group of 21-30 years were considered. The foot prints of each individual were taken separately for both right and left foot. Linear regression equations were formed separately for each age group, gender and for total population.

### **Distribution of Participants by Stature:**

It is evident that the stature in males is ranging from 156–186 cms with the mean of 169.42 cms and standard deviation of 7.215 cms. Similarly, the stature in females is ranging from 143–174 cms with the mean of 159.28 cms and standard deviation of 6.449 cms. It is observed that males have greater mean value of stature as compared to females.

### **Distribution of Participants by Foot Print Length in Males:**

In males, the right foot print length is ranges from 20.5 – 26.2 cms with the mean of 24.120 cms and standard deviation of 1.3583 cms. The left foot print length is ranged from 20.5 – 26.5 cms with the mean of 24.164 cms and standard deviation of 1.3286 cms. It is observed that the mean value of foot print length is more on left side as compared to right; however, the difference is too small and is statistically insignificant. ( $p = 0.443$ )

### **Foot Print Length in Females:**

In females, the right foot print length is ranged from 20.5 – 24.7 cms with the mean of 22.482 cms and standard deviation of 1.0022 cms. The left foot print length is ranged from 20.1 – 25.0

cms with a mean of 22.558 cms and standard deviation of 1.0258 cms. It is observed that the mean value of foot print length is more on left side when compared with right; however, the difference between two is statistically insignificant. ( $p = 0.68$ )

#### **Estimation of Stature by Using Foot Print Length in Males:**

**Table no. 01:** The linear regression equations were derived for males for stature estimation from right and left foot print length.

Side	Regression equation	SE	r	r <sup>2</sup>
Right	$S = 84.51 + 3.52X_{RFPL}$	5.45	0.66	0.43
Left	$S = 72.11 + 4.02X_{LFPL}$	4.89	0.74	0.55

SE- Standard error, r- Coefficient correlation, r<sup>2</sup>: Predictive value.

As per **table no 01**, In males, foot print length shows high positive correlation value of coefficient (r) which suggest a direct correlation between stature and foot print length. The equation derived for total males can be used within the predictive range (r<sup>2</sup>) of 0.43 for right and 0.55 for left foot print lengths. However, the independent linear regression equations of relevant age group can be used for better results if the age of the person is known.

#### **Estimation of Stature by Using Foot Print Length in Females**

**Table no 02:** Linear regression equations were derived for total females for estimation of stature from right and left foot print lengths.

Side	Regression equation	SE	r	r <sup>2</sup>
Right	$S = 64.89 + 4.19X_{RFPL}$	4.93	0.65	0.42
Left	$S = 67.08 + 4.08X_{LFPL}$	4.95	0.65	0.42

SE- Standard error, r- Coefficient correlation, r<sup>2</sup>: Predictive value.

As per **table no 02**, In females, foot print length shows high positive correlation coefficient (r) which suggests a direct relation between stature and foot print length. The equation derived for total females can be used within the predictive range (r<sup>2</sup>) of value 0.42 for both right and left foot print lengths. However, if the age of the person is known, then better result can be obtained by using the independent linear regression equations.

#### **4. Discussion**

##### **Stature:**

In our study, stature in males as shown in table 4 is ranging from 156 – 186cms with the

mean of 169.42 + 7.215cms. Similarly, stature in females is ranging from 143 – 174 cms with the mean of 159.28 + 6.449cms. It is observed that males have taller stature as compared to females. The fact that males are constitutionally taller than females as the age of puberty being 2-3 years later in them as compared to females gives the additional time for growth. This explains that formula for one sex cannot be applied for other sex. It is evident that, our study is in correlation with all the studies.

##### **Foot Print Length**

##### **Foot Print Length in Males:**

In the present study, the right foot print length is ranging from 20.5 – 26.2 cms with a mean of 24.120 + 1.3583cms and the left footprint length is ranging from 20.5 – 26.5 cms with a mean of 24.164 + 1.3286cms. It is observed that the foot print length is more on left side when compared to right in 54% cases, left smaller than right in 32% of cases and both equal in 14% of. However, the cumulative mean of foot print length of both sides did not show a statistical difference. ( $p = 0.443$ )

##### **Foot Print Length in Females**

In females, the right foot print length is ranging from 20.5 – 24.7 cms with the mean of 22.482 + 1.0022 cms. The left foot print length is ranging from 20.1 – 25.0 cms with the mean of 22.558 + 1.0258 cms. It is observed that the foot print length is more on left side when compared to right in 48% cases, left smaller than right in 34% of cases and both equal in 18% of cases as in table 12. However, the cumulative mean of foot print length of both sides did not show a statistical difference. ( $p = 0.68$ )

##### **Linear Regression Equations from Foot Print Length for Stature Estimation in Males:**

In our study to predict stature from right foot print length among males the formula derived is  $S = 84.51 + 3.52 X_{RFPL}$  with R<sup>2</sup> value of 0.43 and for left footprint length is  $S = 72.11 + 4.02 X_{LFPL}$  with R<sup>2</sup> value of 0.55 our study is in consistent with study done by other researchers Kewal K (2008)<sup>4</sup> and Raju GM et al (2009)<sup>5</sup>

##### **Linear Regression Equations from Foot Print Length for stature Estimation in Females:**

In our study to predict stature from right foot print length among males the formula derived is  $S =$

64.89 + 4.19 X RFPL and for left foot print length is  $S = 67.08 + 4.08 \times \text{LFPL}$  with R2 value of 0.42 for both. (Table 16) However, only one study was found which had done stature estimation by footprint length in females i.e., Vidya CS et al (2011) <sup>6</sup> reporting a R<sup>2</sup> value of 0.70 for both the foot print lengths and is not in correlation with our study. Many factors like race, nutrition, geographical distribution and others play an important role in human growth and development. This may have resulted in different R2 values for foot length and foot print lengths among different observers.

### 5. Conclusion

Males have greater mean value for stature as compared to females. Left side foot print lengths are more as compared to right foot print length; however, the difference is marginal and statistically insignificant. (Males,  $p = 0.443$  & females'  $p = 0.68$ ). It is found that there is direct relationship between stature and foot print lengths in both the gender. In males, regression equation for right foot print length is,  $S = 84.51 + 3.52 \times \text{RFPL}$  with R2 value of 0.44 and that for left foot print length is,  $S = 72.11 + 4.02 \times \text{LFPL}$  with R2 value of 0.55. In females, Regression equation for right foot print length is,  $S = 64.89 + 4.19 \times \text{RFPL}$  and for left foot print length is,  $S = 67.08 + 4.08 \times \text{LFPL}$  with R2 value of 0.42 for both. In case of males R2 value on left foot length is more than R2 value on right foot length, while in case of females R2 value is found to be equal for both the sides.

**Ethical Clearance:** Yes.

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## *Original Research Article*

### **Estimation of Age from Morphological Changes in the Sternal End of the Fourth Rib Using Phase Technique.**

Rohit Bharti<sup>a</sup>\*

<sup>a</sup>Department of Forensic Medicine and Toxicology, School of Medical Sciences and Research, Sharda University, Greater Noida, UP, India. Pin-201306.

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#### **Key words**

Age estimation,  
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#### Abstract

I Estimate of age is an important aspect of forensic anthropology. However, as the individual advances in age, estimation of age from bones and tissues becomes less precise. There is a need for a sensitive India-specific instrument to accurately determine age of an individual. Phase analysis method, developed by I-scan amongst White American populations, has been used in our study to estimate age by assessing the morphological changes in the sternal end of the fourth rib. A cross-sectional descriptive study was carried out in Maulana Azad Medical College, New Delhi. Hundred and fifty cases brought to the Dept. of Forensic Medicine for post-mortem were recruited. The sternal ends of the fourth rib from both sides was isolated and studied, and age of the individual was estimated based on three components. The morphological changes in the sternal ends of the ribs were found to be significantly correlated with the age of the individual. There was no difference in the findings of bilateral sides on all components. Study of phase changes in sternal ends of the fourth rib can be used for age estimation in Indian population.

#### 1. Introduction

Estimation of age is an important aspect of forensic anthropology. However, as the individual advances in age, estimation of age from bones and tissues becomes less precise, and little knowledge is available on accurately isolating the age of an individual in a narrow range.<sup>1</sup> Various researchers have studied the clavicle, sternum, scapula, the thyroid cartilage, etc., as means to accurately predict the age of an individual older than 25 years.<sup>2</sup> However, little consistency has been observed in the findings, which were largely unrepeatable in follow-up studies carried out in people with racial and geographical differences.<sup>3</sup>

I-scan et al, in 1983, introduced phase method for the estimation of adult age at death from the sternal extremity of the fourth rib. In cases bomb blasts, fragmented bodies found in mass disasters, etc., small bones like the ribs generally remain undamaged and available for age estimation of victims. His primary studies were conducted on White American males.<sup>1</sup> In 1997, he applied his rib phase technique on a Turkish population sample. According to this study rib phase method can be accurately applied to Turks.<sup>4</sup>

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**\*Corresponding author:** Dr. Rohit Bharti, Assistant Professor, Department of Forensic Medicine and Toxicology, School of Medical Sciences and Research, Sharda University, Greater Noida, UP, India. Pin-201306. Email- [rohit.bharti40@gmail.com](mailto:rohit.bharti40@gmail.com) (M) +91 8800648214.

These investigations were very vital because one cannot assume that a method developed from investigations on one group can be applied to a distant population, especially in medico-legal proceedings. Very few studies have been conducted in the Indian sub-continent where age determination has been done using sternal ends of fourth rib. Our present study was conducted to estimate the age of a case from the morphological changes at the sternal ends of fourth ribs based on phase related changes.

## 2. Materials & Methods

This study was a descriptive cross-sectional study carried out in the Department of Forensic Medicine, Maulana Azad Medical College and Associated Hospitals. A 150 cases (75 male and 75 female), of known age (as ascertained from specific documentation provided by the relative) were recruited and study materials obtained, after informed consent had been obtained from their relatives. Cases whose age was doubtful, who had fractured, diseased or deformed fourth rib or those suffering from endocrinal disorders were excluded from our study. Ethical clearance was also sought from the Institutional Ethics Committee of Maulana Azad Medical College before the study was conducted. All cases aged between 10 and 70 years were included in the study. Cases having fractured, diseased or deformed fifth rib, those having any endocrinal or growth disorder, or those cases whose age was doubtful were excluded from the study.

The study materials comprised of the fourth rib from both sides of the rib cage. The thorax was opened using routine autopsy technique. The sternal ends of fourth rib were removed after identifying and by cutting 2 inches (5cm) long portion along with the costochondral junction with the help of rib cutter. The cut portion was put in a boiling solution containing sodium bicarbonate and boiled for 20 minutes or until the soft tissue coverings have been removed. Following that, the rib was cleaned and dried at room temperature. The sternal ends of the ribs were examined with the help of magnifying lens and the mentioned morphological traits were noted.

- Component I ( Pit depth)
- Component II (Pit Shape)
- Component III (Rim Shape and edges of rim wall)

The readings were recorded in a tabular form and were then assigned to one of six stages for each of the components. (See [Table 1-3](#)).

**Table 1: Component I – Pit depth (i.e., the maximum depth of the pit was measured with the depth calliper calibrated to 0.1mm). It was divided into six stages<sup>2</sup>.**

Stage	Component findings
0	Flat to slight billowing with no indentation (pit) less than 1.1 mm.
A	Definite pit formation with a depth ranging from 1.1 to 2.5mm.
B	Pit depth ranging from 2.6 to 4.5mm.
C	Pit depth ranging from 4.6 to 7mm.
D	Pit depth ranging from 7.1 to 10mm.
E	Pit depth of 10.1mm or more.

**Table 2: Component II – Pit shape. It was divided into six stages.**

Stage	Component findings
0	Flat and billowy articular surface.
A	A shallow indentation.
B	Formation of V-shaped pit with thick walls.
C	The pit assumes a narrow U shape with fairly thick walls.
D	Wide U shape pit with thin walls.
E	Pit is still wide U shaped, yet deeper, more brittle and poorer in texture with some disintegration of bone.

**Table 3: Component III – Shape of rim and edges of rim wall. It was divided into six stages.**

Stage	Component findings
0	Smooth regular rim, with no wall formation.
A	Beginning walls with a thick, smooth regular rim.
B	Definite visible walls that is thick and smooth with a scalloped or slightly wavy rim.
C	The scalloped edges are disappearing wall are thinning yet the wall are fairly without fairly study without significant deterioration in the texture.
D	The rim is becoming sharper and increasingly irregular with more Frequent bony Projection, often more pronounced at the cranial and caudal margins. The walls Shows further thinning cranial and are less sturdy with noticeable deterioration in texture.
E	Texture shows extreme friability and porosity, rim is very sharp, brittle and highly irregular with long bony projection. Occasionally windows are formed in areas where the walls are incomplete.

**Table 4: Analysis of Fourth Right & Left Rib according to Pit Depth (Stage A to E)**

Pit Depth	RIGHT			LEFT		
	N	Mean $\pm$ Std. Dev	Range	N	Mean $\pm$ Std. Dev	Range
A	8	18.88 $\pm$ 2.03	16-23	15	20.60 $\pm$ 3.18	16-27
B	31	24.65 $\pm$ 5.63	19-42	38	26.03 $\pm$ 5.06	21-41
C	37	31.59 $\pm$ 8.14	22-54	36	38.03 $\pm$ 10.67	24-64
D	32	47.13 $\pm$ 6.31	26-58	38	53.55 $\pm$ 7.53	42-73
E	42	60.24 $\pm$ 9.25	45-79	23	61.74 $\pm$ 9.99	46-79
Total	150	40.81 $\pm$ 16.45	16-79	150	40.81 $\pm$ 16.45	16-79

**Table 5: Analysis of Fourth Right & Left Rib according to Pit Shape (Stage A to E)**

Pit Depth	RIGHT			LEFT		
	N	Mean $\pm$ Std. Dev	Range	N	Mean $\pm$ Std. Dev	Range
A	8	18.88 $\pm$ 2.03	16-23	15	21.33 $\pm$ 3.68	16-27
B	29	24.90 $\pm$ 5.74	19-42	37	25.78 $\pm$ 4.83	20-41
C	40	32.00 $\pm$ 9.66	22-54	42	39.98 $\pm$ 12.21	21-65
D	32	46.87 $\pm$ 6.49	26-58	38	52.39 $\pm$ 7.14	42-73
E	41	60.22 $\pm$ 9.36	45-79	18	65.44 $\pm$ 8.42	52-79
Total	150	40.81 $\pm$ 16.45	16-79	150	40.81 $\pm$ 16.45	16-79

**Table 6: Analysis of Fourth Right & Left Rib according to Rim Shape (Stage A to E)**

Pit Depth	RIGHT			LEFT		
	N	Mean $\pm$ Std. Dev	Range	N	Mean $\pm$ Std. Dev	Range
A	7	18.43 $\pm$ 1.27	16-20	11	19.91 $\pm$ 3.05	16-26
B	28	23.64 $\pm$ 3.72	18-39	31	24.00 $\pm$ 3.59	20-36
C	40	31.85 $\pm$ 9.49	21-56	32	32.22 $\pm$ 8.86	23-56
D	35	46.74 $\pm$ 6.24	26-61	42	50.83 $\pm$ 8.21	36-72
E	40	60.52 $\pm$ 9.27	45-79	34	58.62 $\pm$ 10.62	37-79
Total	150	40.81 $\pm$ 16.45	16-79	150	40.81 $\pm$ 16.45	16-79

The bones were replaced in the body after the findings were recorded. The data thus collected, was entered in MS-Excel and analysed using MS-Excel and SPSS version 20. The data was summarised as means and proportions. One-way ANOVA was used to test for significance between the age of the study participant and the stages of the morphological traits assessed by the observer.

### 3. Results

The study was conducted on 150 cases (75 male cases and 75 female) with age ranging from 16 to 79 years. The fourth rib from each side was analysed based on following parameters – Pit Depth, Pit Shape, Rim Shape and Edges of Rim Wall. All parameters had five stages (A – E). Descriptive results indicated that the mean age progressively increased from Stages A to E in Pit Depth, Pit Shape and Rim Shape for the fourth Rib on both sides (Fig. 1 to 3).

For the fourth Right Rib, the mean age of the eight cases having Phase A changes in Pit Depth was 18.88( $\pm$ 2.03) years. Mean age of the 31 cases showing Phase B changes was 24.65( $\pm$ 5.63) years. For the 37 cases showing Phase C changes, mean age was 31.59( $\pm$ 8.14) years. Thirty-two cases showing Phase D changes in Pit Depth had mean age of 47.13( $\pm$ 6.31) years, and Phase E changes showed by 42 cases had a mean age of 60.24( $\pm$ 9.25) years.

Similarly, for the fourth Left Rib, the mean age of 15 cases showing Phase A changes in Pit Depth was 20.60( $\pm$ 3.18) years. Phase B changes were seen in 38 cases with mean age of 26.03( $\pm$ 5.06) years. Phase C consisted of 36 cases with mean age of 38.03( $\pm$ 10.67) years. Phase D consisted of 38 cases with mean age of 53.55( $\pm$ 7.53) years. Phase E changes were seen in 23 cases with mean age of 61.74( $\pm$ 9.98) years. Similar findings were seen in Pit Shape and Rim Shape for both sides

of the fourth rib (Refer [table no. 4 to 6](#)). The magnitude of correlation between the Age of the study participant and the Stages of the three morphological traits were analysed using one-way ANOVA. Age was found to be significantly correlated with the progressive stages of the morphological traits in the study. Paired t-test failed to show any difference between right and left fourth rib for any variables analysed, indicating that there was comparison in the findings of both sides.

**Figure 1: Pit floor**



**Figure 2: Irregular pit margins**



**Figure 3: U-shaped pit**



#### 4. Discussion

This study was done on 150 cases brought for medico-legal autopsy at Mortuary of Lok Nayak Hospital. In this study, the fourth rib from both sides

were studied. The sternal extremity of each rib was analysed in relation to pit depth (component I), pit shape (component II) and rim shape and wall configuration (component III). Mean age in all components for all the ribs was gradually increasing for score A through E in present study.

The study results inferred that the age at death may be estimated from the rib in between third & fourth decade within about 3 years. It inferred that the age at death may be estimated from the rib in the sixth and seventh decade of life within about 6 years. In one-way analysis of variance for fourth right ribs, it was found that 79.9% of studied ribs showed changes in pit depth in accordance with age of the individual. For the other two components, 76.7% of studied ribs showed changes in pit shape and 78.7% of studied ribs showed changes in rim shape and wall configurations were found to be in accordance with the age. One-way analysis of variance of fourth left ribs indicated that, 76.8% of studied ribs showed changes in Pit depth were in accordance with age. 74.6% of studied ribs showed changes in Pit shape and 76.7% of studied ribs showed changes in Rim shape and edges of rim, were in accordance with the age. The analysis of variance statistic was found in total component score to be 73% in Iscan et.al (1984)<sup>2</sup>, 79% in Meena et.al study (2012)<sup>5</sup> and 83% was found in Meena et al (2014)<sup>6</sup>.

In the present study, statistical analysis showed that there are very little morphological variations in the fourth ribs of both sides. Paired t-test failed to show any difference between right and left sided ribs. Gupta et al in 2007<sup>7</sup>, Meena et al in 2012<sup>5</sup>, Meena et al in 2014<sup>6</sup> and Doshi et al<sup>8</sup> made the same findings in 2014. Tyagi et al, conducted a study on 77 males to find out the bilateral metamorphological variation in the sternal end of fourth ribs. The observed that score for Component II & III (Pit Shape and Rim Edge) is more age dependant than Component I (Pit Depth) for right and left sided fourth ribs.<sup>9</sup> This is in contrast to our present study that showed that Component I (Pit Depth) is more age dependent than Component II & III (Pit Shape and Rim Edge) for all the ribs of both sides.

In our study, it was found that component method is applicable for estimation of age in Indian males and females. The rate of change of morphological pattern in the sternal end of the ribs are statistically associated with age.



## 5. Conclusion & Recommendation

Multifactorial parametric and comprehensive approach should be the hallmark for arriving at a conclusion regarding the age of the subject. It is essential, especially in medico-legal cases, to have demographic methods known to be accurate in adult Indians, since few standards have been developed from Indian specimens. This study revealed that morphological changes in the sternal ends of the fourth ribs may help to estimate age using component method. Component method can accurately estimate age in Indian population throughout the adult life span. More studies need to be conducted to generate population-specific data on the validity of estimation of age of an individual from the morphological traits studied above.

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## *Original Research Article*

### **Survivor-Perpetrator Relationship and Consensual Sexual Act in Children.**

Pawan Sabale<sup>a</sup>, Bhavish Prakash<sup>b</sup>, Shailesh Mohite<sup>c</sup>

<sup>a</sup>Professor (Additional), <sup>c</sup>Professor and Head; Department of Forensic Medicine and Toxicology, Topiwala National Medical College, Mumbai, Maharashtra, India. Pin-400008.

<sup>b</sup>Senior Resident, Post Graduate Institute of Medical Education & Research, Chandigarh, India. Pin-160012

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#### Abstract

Protection of Children from Sexual Offences Act in India seeks to protect both girls and boys below the age of eighteen years from crimes of sexual assault and pornography. This study was conducted to evaluate the survivor- perpetrator relationship with emphasis on consensual sexual act of children and the reasons for delay in reporting and medical examination. A total of 65 child survivors of sexual assault under POCSO Act 2012 were included in this study. Female survivors were 93.8 % and male were 6.2%. Maximum survivors i.e. 49 (75.3%) belonged to the age group of 12-18 years. Fear of social stigma (26.8%) was the most common cause of delay for police complaint. In 54 % of cases, interval between last incidence of sexual assault and medical examination was more than 96 hours. Survivor knew the perpetrator in 89.3 % cases. In most of the consensual penetrative sexual assault cases, the perpetrator was her boyfriend. It is observed that there is a rise in the number of teenagers and young adults booked under POCSO Act for being involved in consensual sexual acts. The POCSO act should be amended and more liberal provisions should be added for the cases of teenager's consensual sexual relationship.

#### 1. Introduction

Child Sexual abuse (CSA) is a brutal reality violating the rights children irrespective of socio-economic levels, and cultural backgrounds. It has resulted in detrimental health development and economic aftermath for both the victims and society.<sup>1,2</sup> A National Study in India on Child Abuse reported that extreme forms of sexual abuse were experienced by about 21% of the participants, of which 57% were boys and 43% were girls.<sup>3</sup>

As per the available statistics of the National Crime Records Bureau, 17780 cases of sexual offences on

children were registered in India in the year 2017.<sup>4</sup> CSA is a major concern affecting more than one in five females and one in ten males globally.<sup>5</sup> A meta-analysis showed that 19.7% of females and 7.9% of males had experienced some form of sexual abuse during their childhood.<sup>6</sup>

The Protection of Children from Sexual Offences Act 2012 is a landmark law passed in India which intends to protect both girls and boys below the age of eighteen years from crimes of sexual assault and pornography.

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**\*Corresponding author:** Dr Pawan Sabale, Professor (Additional), Department of Forensic Medicine and Toxicology, Topiwala National Medical College, Mumbai, India. 400008. Email - [drsabalepawan@yahoo.co.in](mailto:drsabalepawan@yahoo.co.in) (M): +91-7738646504.

POCSO Act takes account of a various forms of sexual offences. It includes penetrative sexual assault (complete and partial); non-penetrative sexual assault; using the child for pornography; showing pornography; stalking or exhibitionism. The law aims to protect children from both physical and non-physical forms of abuse.<sup>7</sup>

Many countries use various models to provide co-ordinated services to the victims of sexual assault. These include psychological, health, forensic and legal services at a single location. In India there are efforts being made to establish one stop centre (OSC) on similar lines of Sexual Assault Referral Centres (SARC) as in England.<sup>8,9</sup> In USA and Australia services in remote area are provided through the use of Forensic Nurse Examiners.<sup>10</sup> In countries namely Norway, Iceland, Sweden and Denmark the multidisciplinary and victim-focused centres started as early as 1986 and referred to as a centre of excellence.<sup>11</sup> In 2004 European Commission endorsed the Daphne II program to prevent and combat violence against children and women. It also provides assistance to victims of rape and abuse in Italy.<sup>12</sup>

In India the protocol and guidelines recognize the role of health sector in strengthening legal frameworks, developing comprehensive and multi-sectorial national strategies. This is a positive way of providing empathetic support and rehabilitating lives of the survivors after sexual assault. These guidelines and protocols put into effect the standard operating procedures for the care, evidence collection, treatment, psychological support and rehabilitation of victims of sexual violence.<sup>13</sup>

We hereby discuss the survivor- perpetrator relationship with emphasis on consensual sexual act of children and the reasons for delay in reporting and medical examination.

## 2. Material and Methods

This longitudinal observational study was undertaken at tertiary care center in Mumbai after the approval from institute's ethics committee during the period of January 2018 to October 2018 with approval number ECARP/2017/84. All the child survivors of sexual assault under POCSO Act 2012 brought to the department of forensic medicine were included in this study. Whenever any incidence

of child sexual assault was identified in the hospital or brought to the casualty, forensic medicine department was intimated and a quick response team carried out the medical examination. The Quick Response Team consisted of doctors from departments of Forensic Medicine, Psychiatry and Gynecology or Surgery or Pediatric Surgery according to the sex and age of the survivor.<sup>14</sup> The examination was done as per the guidelines and protocols for medico-legal care of survivors of sexual violence by the Government of India.<sup>13</sup> The data obtained from all the survivors was tabulated on MS Excel program. Number and percentages were calculated for each of the variable. The final data was presented in the form of tables and graphs.

## 3. Results

During the study period, a total of 65 cases were reported to the department with an alleged history of sexual assault under the POCSO Act 2012. Most of the cases i.e., 58 were referred by the police for examination to the hospital. Seven survivors were brought by the parents directly to the hospital.

**Table 1: Age & sex distribution of child survivors. (n=65).**

Age (Years)	Male		Female		Total	
	No.	%	No.	%	No.	%
1-6	2	3.1	3	4.6	5	7.7
7-12	2	3.1	9	13.9	11	17
13-18	0	0	49	75.3	49	75.3
Total	4	6.2	61	93.8	65	100

Female survivors were 93.8 % and male were 6.2%. Maximum survivors i.e., 49 (75.3%) belonged to the age group of 13-18 years (**Table 1**). Youngest female & male survivor was 2 years & 4 years old respectively.

**Table 2: Reasons for delay of more than 24 hours in informing police. (n=52).**

Reasons	No. of Survivors	(%)
Fear from social stigma	14	26.8
Emotional disturbance	11	21.2
Fear of questioning or of not being believed by police	8	15.4
Fear of perpetrator	6	11.5
Punishment to the perpetrator being her boyfriend	5	9.6
Feeling of guilt	4	7.8
Trust on the perpetrator due to false promise of marriage	4	7.8
<b>Total</b>	<b>52</b>	<b>100</b>

The police complaint was lodged by 13 survivors within 24 hours of incidence. In the remaining 52 cases there was a delay of 24 hours to 2 years in lodging the police complaint. Fear from social stigma was the most common cause of delay for police complaint followed by emotional disturbance (Table 2). In 54 % of cases, interval between last incidence of sexual assault and medical examination was more than 96 hours. Majority of the incidences of sexual assault occurred in the offender's house (37%) and in an isolated place (35.4%). The other places were survivor's home, hotel, vehicle, and relative's home. Only one episode of sexual assault occurred with the survivor in 50.8 % of cases. In 49.2 % cases, the survivors were sexually abused multiple times.

All the perpetrators were male. In 53 incidences one perpetrator was involved. In 5 cases each; two perpetrators and in 3 cases each; three

perpetrators were involved. Most of the perpetrators were in the age group of 15-24 years (Figure 1).

Figure 1: Distribution according to the age of perpetrators.

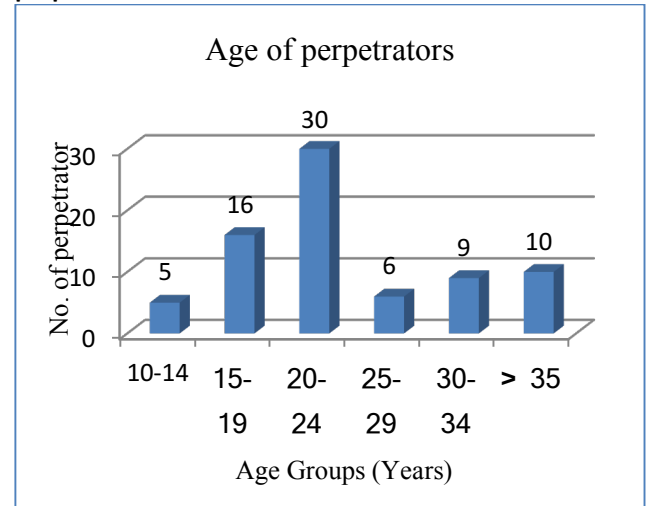
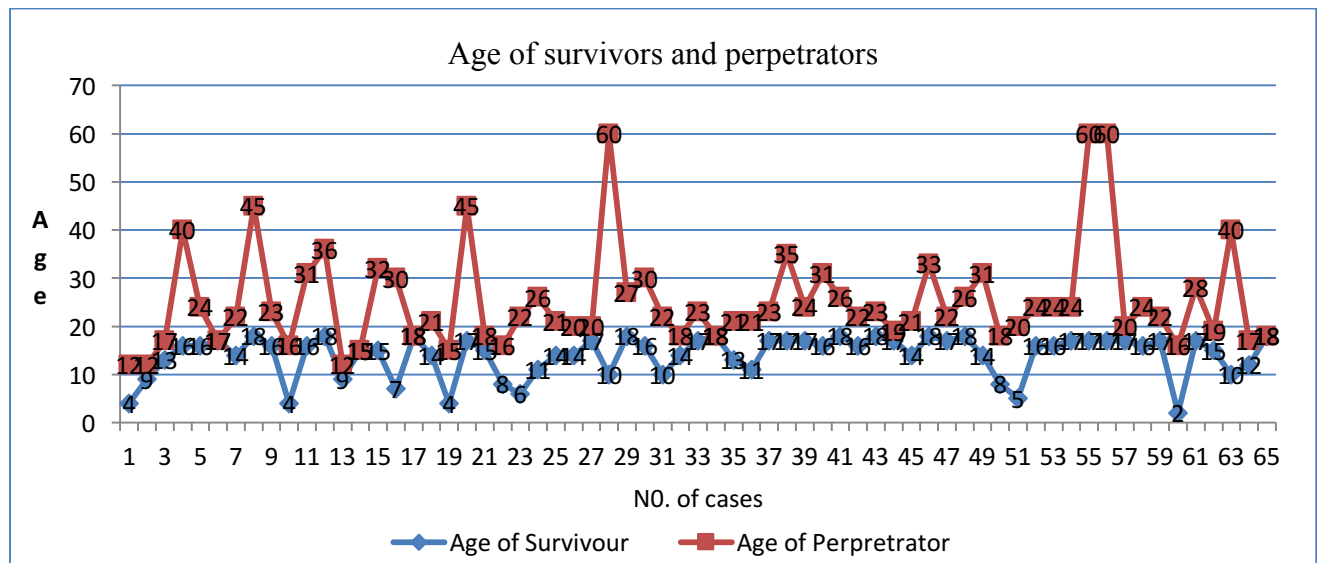


Figure 2: Age of survivors versus age of perpetrators (n=65).



Age of perpetrator was either same or more than that of the survivor in all cases (Figure 2). It was observed that 35 survivors (53.8%) were in the age group of 16 -18 years. Out of these 35, 13 cases (37%) were consensual; where the age difference between the survivor and perpetrator was not more than 5 years. Survivor knew the perpetrator in 89.3 % cases. In 78.5 % of cases perpetrator was her boyfriend, a neighbor or a work colleague. In 10.8 % instances they were family members and near relatives. Strangers were involved in

10.7% of cases. There was a history of penetrative sexual assault in 76.9 % of cases and remaining were non-penetrative forms of sexual assault. Out of 50 cases of penetrative sexual assault, 26 were consensual and 24 were non-consensual (Table 3).

It was observed in the study that all the non-penetrative sexual assaults were non-consensual. The age of consensual survivors was between 12-18 years. However, non-consensual sexual assault was observed among in all the age groups.

**Table 3: Survivor- perpetrator relationship. (n=65).**

Relationship	Perpetrators involved			Total	%
	Consensual penetrative act	Non consensual penetrative act	Non-penetrative act		
Boyfriend	20	5	3	28	43.1
Neighbor	0	9	8	17	26.3
Work colleague	4	0	2	6	9.2
Relatives	2	5	0	7	10.7
Stranger	0	5	2	7	10.7
Total	26	24	15	65	100

The perpetrator was the boyfriend of the survivor in 20 of the 26 penetrative sexual assault cases which were consensual. However, in non-consensual penetrative sexual assault cases, the most common perpetrator was the neighbor followed by a stranger (Table 3). On learning about the love affair of their minor daughter, the parents of said survivor would register a complaint with the police, making it the most common reason for a police complaint. The other reasons were elopement, false promise of marriage and pregnancy.

**4. Discussion & Conclusion**

Females are more vulnerable to sexual abuse<sup>15-17</sup> and the most commonly affected age group is 13-18 years.<sup>18-21</sup> However some researchers observed that females less than 15 years are more vulnerable.<sup>22,23</sup> There was a delay in reporting to the police due to fear from social stigma and emotional disturbance. Delayed reporting is common. Many children do not reveal the incidence of abuse to anyone at the time, or during their childhood or adolescence; an unknown number never tell anyone.<sup>24,25</sup> The emotional trauma endured may prevent victims from reporting the crime to police, and when they do, it may take time for victims to process the event and make the decision to inform law enforcement.<sup>26</sup> The reluctance of victims to report to police immediately following a sexual assault can be explained by a number of psychological and emotional factors, including- but not limited to - denial, self-blame, shame, humiliation, fear, feeling threatened by the perpetrator, and a sense of helplessness.<sup>26,27</sup> The reasons for wide variation in the time of incidence and the disclosure to family members or to the police is perhaps due to threats or fear of stigmatization, violence or even death.<sup>28</sup> The other causes of delay were fear of parent’s reaction, fear of use of corporal punishment by mother and perpetrator’s use of persuasion.<sup>29,30</sup> Missing

of the survivor, elopement, transfer of the case from one police station to another, non-availability of facilities for medical examination could be the reasons of delay for medical examination. Delay in disclosure of the incidence and medical examination lowers the quantity as well as quality of forensic evidences, consequently affecting the outcome of the case in the court of law.<sup>31</sup>

The swabs from oral cavity, breast, vagina, anus, perianal region or from any other site must be collected on the basis of the nature of assault. If a woman reports within 96 hours of the assault, the likelihood of getting positive forensic evidence after 72 hours (3 days) is greatly reduced.<sup>32</sup> It is suggested to collect evidence up to 96 hours when the survivor is unaware about the exact duration since the assault.<sup>13</sup> A study conducted in Mumbai showed that 74.34% survivors reported for examination almost after a week of incidence.<sup>19</sup> In another study 58% survivors presented within 96 hours.<sup>33</sup> The time of presentation of the survivor in the hospital affects the outcome of evidence collection. In sexual assault cases, collection of forensic samples is of more value if the patient presents within three to four days of the reported assault.

Majority of the incidences of sexual assault would occur in the perpetrator’s house or the survivor’s house.<sup>15,19,34,35</sup> Large number of victims reported being assaulted by more than one assailant.<sup>19,33,36</sup> Most of the perpetrators were in the age group of 15 - 24 years, on the contrary other studies observed it to be in age group of 20-59 years.<sup>22,37</sup> In most of the cases survivor knew the alleged accused and stranger being a perpetrator is observed less frequently.<sup>20,22,38</sup> The most common offenders are close friend, neighbor, co-workers and family members.<sup>3,19,36-40</sup>

The POCSO Act defines a child as, any person below eighteen years of age.<sup>7</sup> The age of consent has been increased to 18 years which was 16 years before the enactment of POCSO Act.<sup>41</sup> The High Court of judicature at Madras, India also observed that the majority of cases found were those of consensual relationship between adolescent boys and girls.<sup>42</sup> Therefore counseling for adolescents shall be made compulsory in all the schools and colleges. POCSO awareness programs should be carried out for the people of the State in order to achieve the ultimate aim of the society to be free from such crimes in future.

The High Court also suggested that “the definition of child under the POCSO Act can be redefined as 16 instead of 18 and teenage relationship after 16

years can be to distinguish from the cases of sexual assault on children below 16 years where the age of the offender ought not to be more than five years or so than the consensual victim girl of 16 years or more.<sup>42</sup> In view of the profound assertions made by many organizations that the act should be amended and more liberal provisions should be added for the cases of teenager's consensual sexual relationship. However, it becomes imperative to consider the age of perpetrator in such cases.

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## *Original Review Article*

### Legal Aspects of Tele-health in India

Nishigandha Rajendra Bangal<sup>a</sup>, Rajendra Shivaji Bangal<sup>b</sup>, Ananad Pal Singh<sup>c</sup>

<sup>a</sup>Intern, SKN Medical College, Pune, Maharashtra, India.

<sup>b</sup>Professor and Head, Department of Forensic Medicine & Toxicology, SKN Medical College Pune, Maharashtra, India. Pin- 411041.

<sup>c</sup>St. Johns house Hospital, Priory group. Diss, Co Norfolk, UK.

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#### Key words

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#### Abstract

**Introduction:** This article reviews various legal provisions in India affecting the practice of telehealth either directly or indirectly, on the background of 'Telemedicine Practice Guidelines' (enabling RMPs to provide healthcare using telemedicine), published by the erstwhile Board of Governors in supersession of Medical Council of India (now dissolved), in partnership with NITI Aayog. Attempt has been made to compile and review various legal provisions affecting the practice of tele-health either directly or indirectly. **Material and Methods:** This is a review article. List of articles reviewed is provided at the end of the article. **Results and Conclusion:** A welcome step is taken by the erstwhile Board of Governors by publishing the 'Telemedicine Practice Guidelines'. However the guidelines are limited to 'telemedicine' and further efforts are needed for guidance of 'telehealth' practices in India.

#### 1. Introduction

Before National Medical Commission came into force wef 25/09/2020, the erstwhile Board of Governors in supersession of Medical Council of India (now dissolved), in partnership with NITI Aayog have prepared 'Telemedicine Practice Guidelines' enabling RMPs to provide healthcare using telemedicine. These were published on 25/03/2020 and constitute Appendix 5 of the IMC (Professional Conduct, Etiquette and Ethics) Regulation, 2002.<sup>1</sup> It is the first such document in the field of telemedicine made available by a statutory body to Indian allopathic doctors. These guidelines were intended to be used in conjunction with other national clinical standards, protocols, policies, and procedures. These guidelines were intended only for practitioners of modern medicine, as it has defined 'A Registered Medical

Practitioner [RMP], as a person who is enrolled in the State Medical Register or the Indian Medical Register under the Indian Medical Council Act 1956.' [IMC Act, 1956].<sup>2</sup> Its scope is limited to tele-consultations within Indian jurisdiction.

Though these guidelines define both Telemedicine as well as Telehealth, however the entire document deals only with telemedicine. Telehealth, being a broader term has been specifically excluded from the scope of these guidelines. As a result, it does not address the issues of specifications of hardware or software, infrastructure building and maintenance, data management systems involved, standards and interoperability, use of digital technology to conduct surgical or invasive procedures remotely, use of telehealth in research, CMEs etc.

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**\*Corresponding author:** Dr Rajendra Bangal, Professor and Head, Department of Forensic Medicine & Toxicology, SKN Medical College Pune, Maharashtra, India. Pin-411041. E-Mail: [rbangal@gmail.com](mailto:rbangal@gmail.com) (M): 9987052211.



This article addresses some legal aspects of telehealth (which includes telemedicine), which the doctors should be aware of.

Following are some of the examples of Telehealth.

- Telemedicine
- Robot- Assisted Surgery
- Self-monitoring Health-care devices
- Electronic Health Records
- Health Service Aggregation
- M-Health
- Big data in health care
- Targeted Advertisement
- e-Pharmacies
- E-Learning in health sector

In India telemedicine programs are actively supported by Dept. of Information Technology, Indian Space Research Organization (GRAMSAT), State governments, NEC Telemedicine program for North-Eastern states, some other private organizations and hospitals.

Currently, there are four primary methods of telehealth, which include live video, store-and-forward, remote-patient monitoring and mobile health.

## 2. Laws Governing Tele-health services

The laws that broadly cover Tele-Health services include:

- The Information Technology Act, 2000 (“IT Act”),<sup>3</sup>
- The Information Technology (Reasonable security practices and procedures and sensitive personal data or information) Rules, 2011 (“Data Protection Rules”) and<sup>4</sup>
- The Information Technology (Intermediaries Guidelines) Rules, 2011<sup>5</sup>
- Indian Medical Council Act, 1956,<sup>2</sup>
- The Indian Medical Council (Professional Conduct, Etiquette and Ethics Regulation 2002)<sup>1</sup>
- Drugs & Cosmetics Act, 1940 and Rules 1945,<sup>6</sup>
- Clinical Establishment (Registration and Regulation) Act, 2010,<sup>7</sup>
- Unsolicited Commercial Communications Regulations, 2007 (“UCC Regulations”) and Telecom Commercial Communication Customer Preference Regulations, 2010 (“TCCP Regulations”)<sup>8</sup>
- The Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954 and Drugs and Magic

Remedies (Objectionable Advertisements) Rules, 1955 (“DMRA”)<sup>9</sup>

- Pharmacy Practice Regulations, 2015<sup>10</sup>

**Information Technology Rules 2011;**<sup>4</sup> categorize ‘medical records and history’, as “**Sensitive Personal Data or Information (SPDI)**”. Thus

- Before a doctor or an institution does anything with patients’ data, they are required by law to obtain the recipient’s consent in writing. The patient must be informed about the fact that the data is being collected, what it will be used for and whether it would be transferred to any third parties, along with the contact details of the agency collecting the information.
- Body corporate (means any company and includes a firm, sole proprietorship or other association of individuals engaged in commercial or professional activities) should have privacy policy in place and published on its website.
- This consent is usually obtained by having the patient accept the terms of the body corporate’s privacy policy, which is also required to have such information, in addition to the security practices the body corporate has adopted to keep the information safe.
- In cases where the SPDI is being transferred, the body corporate transferring the SPDI must ensure that the receiver of the SPDI has adequate security practices in place.
- The Data Protection Rules also mandate the implementation of reasonable security practices and procedures in order to keep the SPDI secure.
- This requirement is fulfilled if the body corporate conforms to the international standard IS/ISO/IEC 27001 on “Information Technology – Security Techniques – Information Security Management System – Requirements” or similar standards that are approved and notified by the Central Government.
- Other provisions include Appointment of ‘Grievance Officer’ and allowing users to opt-out or modify their SDPI if required.

**In 2013, Ministry of Communication & Information Technology (MOCIT)** clarified that Body corporate that were collecting, storing, processing or transferring information out of a contractual obligation were not required to observe some of the

requirements of the Data Protection Rules such as obtaining consent from the owner of the SPDI for collecting or disclosing the SPDI. The other requirements, however, must still be observed.

**Sec 2(w) of the Information Technology act 2000**<sup>3</sup> defines an “intermediary,” with respect to any particular electronic records. It means any person who on behalf of another person receives, stores or transmits that record or provides any service with respect to that record and includes telecom service providers, network service providers, internet service providers, web-hosting service providers, search engines, online payment sites, online-auction sites, online-market places and cyber cafes. MOCIT has framed guidelines for these intermediaries, which include guidelines for due diligence to be observed while discharging its duties. Intermediaries have set ups that merely facilitate the interaction between the patient and the service provider and are not directly involved in the provision of the services.

As per the guidelines issued by **Department of Telecommunications (DoT)** the “**Other Service Providers (OSP)**” has been defined. On 21 October 2019, the Telecom Regulatory Authority of India (TRAI) has provided its recommendations reviewing the terms and conditions for registration of ‘OSPs’. It defines OSP as a Company or Limited Liability Partnership (LLP) providing services like Business Process Outsourcing (BPO), Billing Service Centre, e-Publishing Centre, Financial Service, Knowledge Process Outsourcing (KPO), Medical Transcript Service, Network Operating Centre, Tele-Medicine, Tele Education, Tele-Trading, Vehicle Tracking Centre or Other similar services on outsourced basis i.e. on behalf of another entity using Telecom Resources provided by authorized Telecom Service Providers. These OSPs are required to be registered as an ‘Other Service Provider’ (“**OSP**”) with the Department of Telecommunications.

**The Drugs and Cosmetics Act, 1940 (“D&C Act”) and Drugs and Cosmetics Rules, 1945 (“D&C Rules”)**<sup>6</sup>

- The D&C Act states that no person can sell any drug without a license issued by the licensing authority.
- The D&C Rules also state that prescription drugs (Schedule H, H1 and X) can only be dispensed on the production of a prescription which is in accordance with the provisions of the rules.

On 28<sup>th</sup> August 2018, Ministry of Health & Family Welfare published a Notification in the Gazette of India containing **draft of Drugs and Cosmetics Rules (to be amended) for e-pharmacy** and invited objections and suggestions from the public.

One issue that is peculiar to India is, in India there is no separate category of medicines as ‘Non-Prescription drugs’ or ‘Over the Counter (OTC)’ drugs. As a result, even the Schedule K drugs (tincture iodine, eucalyptus oil, paracetamol, cough and cold medicines) are also not specifically categorized as ‘OTC’ drugs. Thus, medicines are sold as OTC, by exclusion; i.e., those drugs which are not ‘prescription drugs’ are understood to be OTCs. With advent of e-pharmacy and Telehealth, separately identifying and categorizing OTCs, is the need of hour in India.

As per rules, irrespective of the schedule in which a medicine may fall, prescription of a medicine can be made only by a registered medical professional. A “**prescription**” has been defined under Section 65(10) of the Drugs & Cosmetic Rules, 1945, so as to have the following components-

- be in writing and be signed by the person giving it with his usual signature and be dated by him;
- specify the name and address of the person for whose treatment it is given, or the name and address of the owner of the animal if the drug is meant for veterinary use;
- Indicate the total amount of the medicine to be supplied and the dose to be taken.

**Pharmacy Practice Regulations, 2015**,<sup>10</sup> defines: “**Prescription**” means a written or electronic direction from a Registered Medical Practitioner or other properly licensed practitioners such as Dentist, Veterinarian, etc. to a Pharmacist to compound and dispense a specific type and quantity of preparation or prefabricated drug to a patient.

For all medical treatments through telemedicine or web-interface format, it is important to ensure that the prescriptions must satisfy the above requirements of being in writing and signed by a registered medical practitioner, without which the prescription will be invalid in the eyes of the law.

- Digital signatures are legally recognized under Section 5 of the IT Act, 2000, which states: "where any law provides that information or any other matter shall be authenticated by affixing the signature or any document shall be signed or

bear the signature of any person then; notwithstanding anything contained in such law, such requirement shall be deemed to have been satisfied, if such information or matter is authenticated by means of digital signature affixed in such manner as may be prescribed by the Central Government."

- Digital Signatures are a type of Electronic Signature that uses a certificate-based Digital ID, obtained either from a cloud-based trust service provider, or from the signer's local system.

**The Indian Medical Council Act, 1956 ("MCI Act")<sup>2</sup>, The National eMedical Commission Act, 2019<sup>11</sup> ("NMC Act") and The Indian Medical Council (Professional conduct, Etiquette and Ethics) Regulations, 2002 ("MCI Code")<sup>1</sup>:** These provide for following:

- Only those persons who have a recognized degree in medicine and are registered with one of state medical councils have the right to practice medicine in India.
- Professional and ethical standards of interaction of doctors with patients.
- Efforts are to be made to computerize medical records so that they can be retrieved quickly.
- Doctors are bound by the MCI Code and are required to submit a declaration to that effect.

These principles will have to be reviewed on the background of practice of tele-health. Also, the machinery and mechanism for disciplining the defaulters will have to be upgraded, to keep pace with the advancing technology.

**The Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954 and Drugs and Magic Remedies (Objectionable Advertisements) Rules, 1955 ("DMRA"):**<sup>9</sup> With rising percolation of tele-health services in India, there are chances of non-compliance to the provisions of these acts.

**Unsolicited Commercial Communications Regulations, 2007 ("UCC Regulations") and Telecom Commercial Communication Customer Preference Regulations, 2010 ("TCCP Regulations"):**<sup>8</sup> Sending unsolicited commercial communications over voice or SMS are prohibited under the TCCP Regulations and UCC Regulations. In order to increase their clientele, companies providing tele-health platform to doctors might be seen flouting these provisions.

**The Clinical Establishments (Registration and Regulation) Act, 2010 ("Clinical Establishments Act")<sup>7</sup>**

Though not yet implemented in the state of Maharashtra, however, it will be pertinent to strictly follow the provisions of this act in concerned states. Also, important amendments are expected in this act in view of the practice of tele-health.

**Department of Information Technology (DIT), Ministry of Communications and Information Technology (MCIT),** in the year 2003 has prepared a **Report of the Technical Working Group on Telemedicine standardization.**<sup>12</sup> It has recommended guidelines and standards for practice of Telemedicine in India. It was submitted to a committee for standardization of digital information to facilitate implementation of telemedicine systems using information technology enabled services. This document delineates:

- Necessary information on standards required for hardware, software and clinical devices including the security aspects and finally the Telemedicine Process guidelines.
- A framework for defining the scope of standards addressing the requirement of Infrastructure for Hardware, Software, Minimum Data Sets (MDS) and Unique Identifiers.
- Details of specifications for Infrastructure required in terms of Telemedicine Hardware like the Computer systems, the clinical devices like ECG, X-Ray digitizer, Glucometer, etc and the specifications for video conferencing units.
- The communication hardware details like, LAN/PSTN/ISDN/VSAT including GSM & CDMA mobile have been indicated.
- System requirement for different classes & levels of Telemedicine centers like Primary, Secondary and Tertiary.
- Software standards in terms of requirement of operating system, telemedicine software, user interface, Patient Information Records, storage & transmission formats.
- Digital Imaging & Communication in Medicine (DICOM), the Minimum Data Sets (MDS) & Identifiers.
- The Security aspects for Telemedicine, which is one of the important factors for Telemedicine Practice with respect to the security mechanisms including signature schemes.

- Patient's critical confidentiality records, Telemedicine Centre guidelines and the protocols for each of these methodologies including the consent form to be used for ensuring quality consultation & treatment.

Thus, this document, in fact, truly complements the 'Telemedicine Practice Guidelines' by erstwhile BOG. It covers the technical aspect of telemedicine, which the 'Telemedicine Practice Guidelines' has specifically excluded. It serves as a ready reckoner for judicious adaptation of the Information & Communication Technology for the practice of Telemedicine at any level of Health care delivery in India. However, this document, which was prepared 17 years ago, needs a serious updating, in view of the tremendous progress in the telecommunication as well as health sectors over these years. [We are not aware of whether it has been updated or not. We failed in our attempts to search for an updated edition].

#### IAMAI

- According to Internet and Mobile Association of India (IAMAI), in the absence of any legal provision that prohibits online medical consultations or prescribes the manner of communication between medical practitioners and patients, **there is no illegality in providing medical consultations online in India subject however, to compliance with all other laws that may be applicable, including the MCI Act, The Code of Ethics and other laws that may be applicable to activities involved in the process, such as the Drugs and Cosmetics Act, 1940 that deals with the issuance of prescriptions.**

**In the High Court of Judicature at Bombay, Criminal Appellate Jurisdiction, Criminal Anticipatory Bail Application No. 513 of 2018** [Deepa Sanjeev Pawaskar and Sanjeev Pawaskar versus the State of Maharashtra]<sup>13</sup>

- Registered ANC case. Elective LSCS. Discharged in absence of doctors. Post-op care not explained. Next day of discharge, patient started vomiting. Relatives called the doctor on phone. Doctor told them to call from medical shop. Doctor gave instructions chemist on phone. Chemist gave tablets to patient. Patient consumed tablets. Vomiting continued, fever started. Patient went to hospital at 8:30 pm. Doctors were not available. They were out of

station on a pre-scheduled visit. However, on phone they advised to admit the patient. Accordingly, patient was admitted. Patient was being treated by nurses as per telephonic instructions from doctor. Patient's condition deteriorated. Some other doctors visited the patient (other than Dr. Pawaskars). Condition further deteriorated. Patient shifted to other hospital, however expired on admission. Autopsy revealed Pulmonary Embolism.

- The main issue before the court was whether the act of doctor Pawaskars would fall under IPC section 304A (Causing death by Rash and Negligent Act) or under IPC Section 304 (Culpable Homicide not amounting to Murder)?
- In its order, the Court does not say medicines ought not to have been prescribed at all over the telephone. The issue under consideration by the Court was "Prescription without diagnosis and hence resulting in death of the patient amounts to criminal negligence on the part of the doctors."
- This can be comprehended to mean that prescription without diagnosis, resulting in fatal consequences, would amount to culpable negligence, which the Bombay High Court affirmatively decided. The court also mentioned "The medicines were administered on telephonic instructions without even inquiring about the symptoms or nature of the pain suffered by the patient." Anticipatory bail was denied.
- However, the Hon'ble Supreme court was of different view, that, in an established patient-doctor relationship, telephonic and telemedicine consultation do not amount to negligence. It granted the doctors relief from arrest under Sec 304 IPC.

**The Indian Medical Council (Professional Conduct, Etiquette & Ethics) Regulations, 2002** (the "Code of Ethics")<sup>1</sup> laid down by the MCI, prescribes standards of professional conduct, etiquette and ethics for registered medical practitioners. There is nothing in this Code of Ethics that prohibits the online practice of medicine, provided due diligence is exhibited by the doctor and there is no other law in India that prohibits online medical consultations or prescribes the manner of communication between a medical practitioner and a patient.

**Inter-state e-health services**

- In terms of the MCI Act, once a doctor/medical practitioner is qualified and registered in any one of the state medical registers maintained by the respective states, a copy of his/her registration certificate is forwarded to the Medical Council of India for enrollment of his/her name in the Indian medical register (national database). In terms of Section 27 of the MCI Act, any person whose name is enrolled in the Indian medical register can practice as a medical practitioner in any state of India according to his qualifications. Hence, inter-state practice of Telemedicine by medical practitioners is permissible.

**Online health service companies/ Apps etc**

- Advertisement in media by these companies inviting doctors to join their panel of online consultants
- MCI Code of Ethics Regulations: Soliciting of patients directly or indirectly, by a physician, by a group of physicians or by institutions or organizations is unethical
- KMC (June 2018): Threatens to initiate action against doctors who take up online consultations

**IMA**

- In situations where physical examination is not required — like adjusting insulin according to blood sugar levels in a regular patient, analgesics for acute exacerbation of chronic pain under regular treatment, etc. — telephonic consultation will not amount to negligence.
- Also, in situations of managing emergencies till the doctor arrives, telephonic consultation can be undertaken in a judicious manner.
- In this type of consultation, there is an element of contributory negligence on the part of the patient or relatives if they by themselves opt for telephonic consultation,

**Curbside consultation**

In a curbside consultation, the treating physician seeks informal information or advice about patient care from another doctor colleague to assist in the management of a particular, real patient. It can happen in a hallway, elevator, sidewalk, and canteen or by telephone. Often the colleague has a particular expertise which can come handy and prove to be useful for the patient.

To obtain curbside consults the seeker presents the case or asks direct questions. The colleague consultant does not see the patient or review the chart, but instead obtain details by asking further questions. The colleague is not paid for the consultation.

Here, doctor-patient relationship is not established between the colleague doctor and the patient. The physician giving the opinion provides an informal service to the physician seeking consultation rather than to the patient. In fact, a patient may not even know if or when her or his physician obtained a curbside consult. The physician seeking the curbside consult remains free to exercise her or his own professional judgment; in accepting, rejecting, or otherwise relying on the consultant colleague's advice.

**Telephonic Consultations**

- To be avoided as a routine
- May be given if:
  - In acute emergency
  - If there is an established Doctor-Patient relationship
  - Doctor is aware of the diagnosis
  - May be given to another doctor who is with the patient
- It should be limited to conveying of results of tests/ to manage the acute phase till the patient can reach a nearby doctor
- Telephonic consultations should be documented
- Doctors should also be careful about any recordings being made by the patient
- Doctors should mind the tone and contents of the conversation
- Confidentiality and privacy of the consultation should be maintained.
- No data/ information should be shared without prior consent of the patient
- Doctors should be fully cognizant of the attendant risks, both medical and medicolegal.

**3. Legal Liabilities****Suits before civil court**

- For breach of contractual obligations between e-health service provider and the patient/ user
  - Payment of liquidated damages (decided at the time of contract)

- Un-liquidated damages (on court decision)
- For commission of a tort such as negligence on the part of the service provider or its employees
- Amount claimed as consequential damages

#### **Vicarious Liability**

- E-Health Employer- Employee relation
- Employer vicariously liable for acts and omissions of the employee arising in course of his/her employment
- No vicarious liability in employer-independent contractor relationship, where the service provider does not have much control or supervision over the acts of the independent contractor.

#### **Liability under Consumer Protection Act**

- Deficiency in Service
- Unfair trade practice
- Defective products

#### **Disciplinary Action by MCI**

- SMC
- NMC: Ethical Committee (EMRB)

#### **Criminal Liability**

- "GROSS" Negligence
- Expert Medical Committee
- IPC 304A, 336, 337, 338
- No vicarious liability of employer

#### **Further regulations required**

- Online procedure of obtaining specific consent for telemedicine services
- Archival and retrieval of patient records
- Implementation of Quality oversight mechanism
- Cross-state licensing
- Insurance coverage for tele-medicine services
- Patient privacy and confidentiality
- More clarity on online prescriptions
- m-Health: USFDA divided mobile applications into three categories:
  - mobile applications that are considered medical devices and subject to USFDA regulations,
  - mobile applications that may be considered medical devices, but which the FDA does not currently intend to regulate, and
  - mobile applications that could be used in a health care environment, but are not considered medical devices

- Standardizing the content to be included in health records,
- Placing legal obligations on doctors to update health records,
- Safeguards for accessing health data and the interoperability of health records.
- Ensuring quality and efficiency as well as supervision and oversight in the performance of such services
- Disclaimers must be put in place that informs the user of the accuracy of the information provided and the possibility of errors, mechanical or otherwise.

#### **5. National Health Stack: NITI Aayog (National institution for Transforming India)**

- While the National Health Analytics Framework will initially focus on Health Insurance, it will provide for "horizontal expansibility"—enabling the potential to cover, at a later point in time, important areas including (and not limited to) disease surveillance, predicting epidemics, classifying and clustering population segments for proactive care, nutrition, health schemes, and national health infrastructure such as telemedicine, teleradiology, and the enhancement of process controls.
- The National Health Stack is designed to provide the foundational components that will be required across Ayushman Bharat and other health programs in India. The Health Stack is a nationally shared digital infrastructure usable by both Centre and State across public and private sectors. The Stack is designed to bring a holistic view across multiple health verticals and enable rapid creation of diverse solutions in health. National Health Stack will provide necessary regulations for the telemedicine sector too,"

Attempt has been made to compile and review various legal provisions affecting the practice of tele-health either directly or indirectly. The erstwhile BOG has provided us with the 'Telemedicine Practice Guidelines'. We look forward to NMC to develop a comprehensive and practical 'National Tele-Health Policy' considering its extended scope across various sections and sectors. It will enable the stakeholders to effectively provide and obtain the extended benefits of tele-health in India.

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## *Original Review Article*

### **Date Rape Drugs- A Review**

Arpan Mazumder<sup>a</sup>, A J Patowary<sup>b\*</sup>

<sup>a</sup>Assistant Professor, Department of Forensic Medicine, Silchar Medical College & Hospital, Silchar, Cachar, Assam, India. Pin-788014.

<sup>b</sup>Professor and Head, Department of Forensic Medicine & Toxicology, North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences (NEIGRIHMS), Shilong, Meghalaya, India. Pin-793018.

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#### Abstract

**Date Rape Drug** refers to a drug that can be used to assist in the commission of a sexual assault, such as rape. With the modernization the number of late-night parties and club parties are also increasing resulting in increasing incidence of sexual abuse cases. In this present review article, some of the date rape drugs and a few measures to decrease the incidence of female sexual abuse cases are discussed.

#### **1. Introduction**

The relationship between man and woman is from the beginning of the civilization, however, whenever there is force or fraudulent means are used, the problems started.

**Rape** is one of such heinous crime.

In India, the section 375 IPC describes Rape and if we analyze the clauses it may be described as follows:

A man is said to commit rape who has sexual intercourse with a women under the circumstances falling under any of the following descriptions:

**Firstly**, against her will.

**Secondly**, without her consent.

**Thirdly**, with her consent, when her consent has been obtained by putting her or any person in whom she is interested in fear of death, or of hurt.

**Fourthly**, with her consent, when the man knows that he is not her husband and that her consent is given because she believes that he is another man to whom she is or believes herself to be lawfully married.

**Fifthly**, with her consent, when, at the time of giving such consent, by reason of unsoundness of mind or

intoxication or the administration by him personally or through another of any stupefying or unwholesome substance, she is unable to understand the nature and consequences of that to which she gives consent.

**Sixthly**, with or without her consent, when she is under 18 years of age.<sup>1,2,3,4</sup>

So, it is evident that the consent given by an adult woman for the sexual act must be a conscious one, free of any obligation, without fear or threat and any deviation from the above can be treated as an act of rape on the woman. There are situations when man used to use some means where the woman may be compelled to take part in the sexual act, though she may not be willing or have given consent of her own.

#### **2. Date Rape Drug:**

These are the drugs that are used to assist in committing a sexual assault on a woman which may amount to rape. Many agents may be used to facilitate rape which have sedative, hypnotic, dissociative and/or amnesic effects and can be added

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**\*Corresponding author:** Dr A J Patowary, Professor & Head, Department of Forensic Medicine, North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences (NEGRHIMS), Shilong, Meghalaya, India. Pin-793018. Email: [drajpatowary@gmail.com](mailto:drajpatowary@gmail.com) (M): +91- 9435018221



to a food or drink without the knowledge of the victim. The act of adding such substances to drinks is known as DRINK SPIKING. Many a time these spiking agents are used for personal amusement or theft or sexual assault.<sup>5,6</sup>

#### **TYPES OF DRUGS:**

The three most commonly used drugs for date rape are alcohol, GHB (gamma hydroxybutyric acid), and benzodiazepines such as Flunitrazepam, also known as Rohypnol or Roofies.<sup>5,6,7,8,9</sup> However an American study (1997) showed that alcohol is the most common drug used in cases of assisted sexual assault.<sup>5,6</sup>

**ALCOHOL:** Alcohol is the most commonly used date rape drug. The reason may be because of the fact that it is readily available legally in all over the globe. Many assailants use alcohol because many a time their victims willingly take it and can be encouraged to drink enough to lose inhibitions or consciousness. Even if the victim agrees to sexual act, the act may be considered rape in some jurisdictions if the victims judgment was impaired or incapacitated by alcohol.<sup>5</sup>

**GAMMA HYDROXY BUTYRIC ACID (also known as liquid E):** Its effects are very similar to alcohol. GHB and its analogues mix well in water and are odorless. They are salty in taste but are indiscernible when dissolved in beverages such as soft drinks, liquor etc. In human body the analogues are rapidly converted to GHB. In presence of alcohol or any other sedatives, its effect is amplified and many people have died after consuming GHB or its analogues, in combination with alcohol or other sedatives.

**BENZODIAZEPINE (BZP):** BZPs are used to treat anxiety, panic attack, insomnias and several other conditions. Some BZPs used to treat insomnia possess strong sedative, motor impairing and amnesic effects. The most commonly encountered name in this group is Rohipnol. Though Rohypnol is often cited as a date rape drug because of its high potency, strong effects and the ability to cause strong amnesia during its duration of action, investigations into its actual use as date rape drug have contraindicated popular belief.<sup>7</sup>

Rohypnol is the brand name of flunitrazepam, and is one of the benzodiazepine class of drugs. It is used in the short-term treatment of sleep disorders. It is 10 times more potent than diazepam. It is one of the common drugs used as the

date rape drug because of the fact that it is colorless, odorless and tasteless – so considered an ideal drug for spiking drinks undetected – to achieve sedation or euphoria in approximately 20 to 30 minutes. Several cases were report about Rohypnol being given to women without their consent in order to remove their inhibitions.<sup>8</sup> It has been implicated in several date rape cases in the US, although there is no confirmed case of it being used in sexual assault cases in the UK.

This use of this drug made the Hoffman-Roche, the company manufacturing Rohipnol, to add a blue dye to its formula in January 1998 so that when it is added to any drink it turns blue, and it is slower to dissolve.

The street names for Rohypnol include rophies, ropies, ruffies, roofies, roche, R-2, mexican valium, rib, and rope. Users report mixing it with beer to enhance the feeling of drunkenness, and it has been reported to be used in combination with marijuana and cocaine, as well as heroin.

Flumazenil is an agent that reverses the effects of Rohypnol. It is a benzodiazepine antagonist. and is used for reversing the severe effects of overdose. However, it needs to be administered by a doctor as it is an injection.<sup>4,5</sup>

#### **3. Legal Issues**

In most parts of the world, whether or not a drug was used is irrelevant to the issue of whether a particular incident is rape or not. The legal definition of rape in countries such as U.S. also covers an aspect of lack of consent. When the victim is unable to say 'NO' to intercourse as a consequence of drugging or simply alcohol consumption.

There are many incidences of illegal activities related to the contraband drugs; in one such incident in U.S., Government had to recall about 4.2 million Chinese made aqua dot bad toys. The fact is that toys were coated with some chemicals that once metabolized, converts into the toxic 'date rape drug GHB. The U.S. Government had to recall the toys after some children started to vomit and become comatose after swallowing them.<sup>9</sup>

#### **4. Other Drugs**

**KETAMIN (Special K, K etc.)** – It is an anesthetic agent; high doses can lead to unconsciousness and can leave the user open to assault.

There is also record of use of Dhatura to facilitate sexual assault.<sup>1</sup>

**CLUB DRUGS:** These are drugs that are generally used in partying situations such as clubs, big house parties etc. which usually refers to Ecstasy (E or MDMA), GHB, Cocaine, Crystal Meth, Ketamine etc.<sup>6</sup> These are the agents which are used by the individuals to enhance so called enjoyment of the parties and may a time they are being abused for procuring the undue advantages on women, may a time may amount to rape on the woman.

#### 5. Protection:

The simple steps should be followed: Simple steps to keep yourself and your friends safe at places of bar, restaurant or in any public setting are as follows:

- Never leave your drink unattended.
- Do not accept open-container drinks from anyone but a bartender or server. When you are accepting a drink, you must make sure that it is from an unopened container or you open the container yourself.
- Be wary about accepting drinks from anyone you do not know well or long enough to trust.
- Attend parties or visit bars with a group of friends, arranging beforehand to watch each other's drinks.
- If you arrive as a group, leave as a group.
- Watch out for your friends. If you noticed that a friend is showing symptoms of date-rape drug ingestion, you need to seek medical attention immediately.
- Notify other females you know about the effects of these dangerous drugs.
- If you think that you have been a victim, notify the authorities immediately<sup>3,8</sup>

#### In case of any suspected sexual assault on a woman, the following are to be maintained:

If the woman is ill or injured, call for help or go to a hospital emergency department for treatment.

In case the woman wants to report the incident, which is always advisable in such situations, call the police. In such an event, it becomes utmost essential to preserve the evidence, and to do so, – do not shower, change clothes, or brush your teeth – until a proper medico-legal examination is done to collect all the evidences. Urine examination will be helpful in detection of such drug/ intoxicant hence, avoid urination until medical/legal evidence is being collected at the hospital. It is always to be remember

that sooner you get to the hospital, the more likely the drug will be found in your system.

#### 6. Conclusion

In today's world though we think that women are safer than earlier, the actual scenario remains the same, infect it is getting worse day by day. While human civilization is advancing, people are becoming more and more civilized, the number of cases of female abuse is also in rise.

The government should put more limitations on selling these drugs. The chemists should give the drugs on prescription of a registered medical practitioner only.

The survivor should be examined at the earliest so that no evidence is lost; treatment if require should be started immediately which includes treatment for the mental as well as the physical trauma due to the assault. The society should always play a supportive role, so that the woman never fills like a deserter.

The hotels and restaurants must follow safety rules strictly, particularly so in the parties.

Lastly though our cultural and social bonding teach us to respect women in all spheres but in reality, for many so called civilized and educated members of the society, women are always to be suppressed and to be dominated by men in the society and that is root cause of such assault and criminal activates against women in society. So, to conclude respect the women, as they deserve it, only the change in the perception of men supremacy can lead to a safe environment woman in the society.

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## *Original Review Article*

### **Vitiligo and The Indian Constitution- A Medicolegal Perspective**

Kattamreddy Ananth Rupesh<sup>a</sup>, Kattamreddy Divya Chaitanya Reddy<sup>b\*</sup>, A Yeshwanth Kumar<sup>c</sup>

<sup>a</sup> Assistant Professor of Forensic Medicine and Toxicology, ACSR Govt. Medical College Nellore, Andhra Pradesh, India. Pin-524003.

<sup>b</sup> Advocate, SAMVAD Partners, 11/6, 2nd Floor, Railway Colony, 3rd Street, Nelson Manickam Road, Aminjikarai, Chennai, Tamil Nadu, India. 600029.

<sup>c</sup> Dermatologist, Derma Circles Clinic, South Extension, Delhi, India. Pin- 110049. (M)+91 98994 23708.

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#### Abstract

Right to equality is one of the sacrosanct fundamental rights of a democratic polity. Indian judiciary has time and again upheld the importance of Article 14 and 16 of the constitution in ensuring good governance. Vitiligo/Leucoderma is a skin condition which causes white colour patches over body surface. Persons with vitiligo face a lot of stigma in society because of 'cosmetic unpalatability' among the masses of our country. Not so surprisingly, vitiligo/Leucoderma is often confused with leprosy leading to a tremendous social ostracization of this class of citizens. The Sanskrit word 'Swethakusth' is perhaps the reason for this urban legend, which is a misnomer with respect to the pathophysiology of disease. Though persons with vitiligo generally face a lot of issues in interpersonal and matrimonial relationships, we are limiting to discuss in detail about state laws which are discriminatory to vitiliginans in public employment matters. Such impugned statutes are nonetheless ultra-vires of the Indian constitution per se and in the light of catena of judgements of the Supreme Court as well. Our effort is to bring into limelight about the inhuman nature of these discriminatory provisions and prepare ground for fighting prejudice towards vitiliginans.

#### 1. Introduction

The American Academy of Dermatology defines Vitiligo (vit-uh-lie-go) as a medical condition causing the skin to lose its natural colour. It can be restricted to few areas of skin as patches or it can be global, spreading to the whole-body skin.<sup>1</sup> Vitiligo can affect any area of the skin or hair, but generally occurs on skin exposed to the sun, such as face, neck, and hands.<sup>2</sup>

Leucoderma is the genus and Vitiligo is the species in de-pigmentation diseases. However, they are used synonymously world over. Vitiligo is often

confused with leprosy and people with vitiligo are discriminated against everywhere. Matrimonial relationships, recruitment, international travel, sanction of work visa, retrenchment upon developing vitiligo are some situations where persons suffering with vitiligo are stigmatised a lot. As it is often quoted everywhere, Indians are so fond of white skin, but they do not like white patches on skin. People in the west do not treat vitiligo because they consider it as a variation in skin tone and not as a disease. It would be astonishing for any good-spirited constitutionalist

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**\*Corresponding author: Dr. Kattamreddy Ananth Rupesh**, Assistant Professor of Forensic Medicine and Toxicology, ACSR Govt. Medical College Nellore, Andhra Pradesh, India. Pin- 524003 Mobile- +91 82977 16897, E-mail: [ananth.kattam@gmail.com](mailto:ananth.kattam@gmail.com)

to find statutory sanction for this discrimination. Perhaps they are vestiges of the colonial racial practices. It is our bounden responsibility to amend the statutes and do away with such provisions to uphold the ideals of justice and equality.

In previous days, when diagnostic medicine was not well sophisticated to diagnose every disease, vitiligo was considered as a cutaneous marker for several other internal diseases. White patches on skin can occur in several medical ailments. However, if that is the rationale for raising a blanket ban against persons with vitiligo, the recruiting state agencies can very well perform all tests in today's advanced technology scenario to rule out any associated disease with vitiligo. Presuming that several other diseases are co-existent with vitiligo without investigating the same when the wherewithal to do is available is nothing but false labelling, stigmatizing and a wilful discrimination on the part of recruiting agencies. Vitiligo is purely a clinical diagnosis for a trained eye, but a skin biopsy can be further confirmatory. The risk of a false diagnosis of vitiligo is a possibility when the recruitment medical officer in the medical board is not a dermatologist.

There are almost no Indian studies that establish the statistical probability of other disease associations with vitiligo. A person with vitiligo has a mere probability of having any co-existent disease. Vitiligo may be just indicative of an underlying disease condition but not probative. The same must be thoroughly investigated and confirmed.

## 2. Conditions Associated with Vitiligo<sup>i</sup>

### Skin Diseases-

Premature greying of the hair, leukotrichia, halo nevus, lichen planus and alopecia areata are frequently reported. Occasionally, other skin disorders like dermatitis herpetiformis, giant congenital melanocytic nevus with neurotization, chronic urticaria, nevus depigmentosus, polymorphic light eruption and malignant melanoma have also been recorded in association with vitiligo. Hashimoto's thyroiditis and morphea are other autoimmune associations.

### Ocular associations:

Vogt-Koyanagi-Harada syndrome refers to the full constellation of vitiligo, poliosis and alopecia with pan-uveitis and auditory and neurological manifestations. Sometimes, few vitiligo patients show iris and retinal pigmentary abnormalities as

isolated findings. Although visual acuity is unaffected in such patients, choroidal abnormalities may be detected in up to 30% and iritis in 5% of vitiligo patients.

### Systemic associations:

Systemic disorders like hypo / hyperthyroidism, diabetes mellitus, Addison's disease, pernicious anaemia, lymphoma, leukaemia and human immunodeficiency virus (HIV) infection, autoimmune polyendocrinopathy candidiasis-ectodermal dystrophy (APECED) are associated with vitiligo. Like many autoimmune diseases, pathogenesis of vitiligo is influenced by genetic, stochastic, and environmental factors. So, any of us can acquire this disease for no fault of us. However, a small subset of individuals develops contact/occupational vitiligo following exposure to chemicals. The phenolic/catecholic derivatives are the largest class of chemicals known to trigger contact/occupational vitiligo. Detailed classification and nature of disease can be accessed from this medical publication.<sup>ii</sup>

### 3. Indian Statutes Discriminating Vitiligans

Recruitment medical manuals of various government agencies describe vitiligo as a general ground for rejection in state employment. The recruitment rules of Ministry of Defence and Ministry of Home affairs preventing persons with vitiligo/leukoderma entering service in combat positions are some patent examples to cite. This is sheer bigotry towards people with vitiligo.

There is no scientific rationale behind such bar against persons with vitiligo to be a part of any combat force. Such practice is not only bad in law but is also against the medical ethics. The fundamental argument of Vitiligans is that vitiligo does not cause any handicap to a person in discharging any form of duties. It is just a skin-deep condition. However, if someone can establish that persons suffering with vitiligo are less human; they will make a strong case for declaring vitiligo as a 'disability' or even a 'benchmark disability' that needs to be recognised under the disabilities legislation to provide them additional benefits for protecting their rights and to look after their welfare.

Since the inception of our constitution there were a lot of legal cases against such discrimination towards persons with vitiligo. Nonetheless, very few of them questioned the constitutionality of the provisions in recruitment medical manuals of various

governmental agencies. In *K. Gangadhar v. A.P State Road Transport Corporation, Hyderabad and Another*<sup>iii</sup> it was held:

“Clause 4(c)(ii) of the Medical Manual undoubtedly discriminates, between those who suffer from Vitiligo and are seeking appointment in the A.P.S.R.T.C. vis-a-vis those who have contracted this skin disorder after appointment in the Corporation and falls foul of the equality clauses enshrined in Articles 14 and 16 of the Constitution of India.

If all persons suffering from "Vitiligo" are to constitute one homogenous class, there cannot be a further classification between those already employed and those who seek employment. Persons afflicted with Vitiligo are vulnerable to discrimination on the basis of prejudice and unfounded assumptions.

This is manifestly unfair. The constitutional right of the petitioner not to be unfairly discriminated against cannot be determined by ill-informed public perception regarding this skin disorder. Prejudice can never justify unfair discrimination.

Having regard to all these considerations, denial of employment to the petitioner, only because he suffers from "Vitiligo" impairs his dignity and constitutes unfair discrimination. (Mr. X, Indian Inhabitant's case (supra). Since Clause 4(c) (ii) of the Medical Manual is patently arbitrary, irrational, and discriminatory it is ultra vires Articles 14 and 16 of the Constitution of India.

As a result, no person can be denied employment, in the respondent-Corporation, solely on the ground that he suffers from "Vitiligo".

In *Satish Chander v. Delhi Transport Corporation*<sup>iv</sup>, the honourable court held,

“9. The various diseases mentioned in para-VII of the Medical standard would show that same have to be read with the initial paragraphs dealing with patient's performance of duty. Thus, sub clause (j) has to be read in that context and it has to be an inveterate disease which is likely to interfere in the person's performance of duty.”

“10. In my considered view the disease of vitiligo commonly known as leucoderma cannot be stated to be a disease which would fall within this sub-clause (j) of para VII. I am thus of the considered view that the petitioner has been wrongly denied his appointment on medical grounds.”

Let us consider few discriminatory rules in recruitment process for combat positions and non-combat positions in armed forces of the union like the

Army, the Navy, the Air Force, and other Central Armed Police Forces. The below stated illustrations bring-forth the policy of these organisations in connection with vitiligo-

I. The Recruitment Medical Manual of Indo Tibetan Border Police (Central Armed Police Forces) states that- (These rules are similar for other Central Armed Police Forces including Assam Rifles).<sup>v</sup>

**10.4 General grounds for rejection:** The man presenting with any of the following conditions will be rejected.

Chronic Skin diseases like Leucoderma, Leprosy, SLE, Eczema, Chronic fungal dermatitis.

II. National Defence Academy notification for recruitment of cadets prescribes the following medical standards.<sup>vi</sup>

### **18. Dermatological System**

Candidates suffering from minor degree if Leucoderma affecting the covered parts may be accepted. Vitiligo limited only to the glans and prepuce may be considered fit. Those having extensive degree of skin involvement especially, when the exposed parts are affected even to a minor degree, will not be accepted.

The above mentioned I, II and similar provisions with respect to persons with vitiligo during recruitment process has led to discrimination towards them for hundreds of years so far. Among the multitude of those who lost an opportunity to serve the armed forces of the union, very few had the economic strength to fight a legal case. Nevertheless, they were lost in technicalities and the constitutionality of discriminatory provisions was rarely brought forward into question. Some cases like *Aakash Tyagi (Petitioner) Vs Union of India & Others*<sup>vii</sup>, *Durga Singh (Petitioner) Vs Union of India & Others*<sup>viii</sup> are some good examples to refer to.

**4. Whether these provisions discriminating persons with vitiligo stand the test of Article 14, Article 16 and subsequent court decisions in connection with the same?**

The Supreme Court of India in *State of West Bengal v. Anwar Ali Sarkar*<sup>ix</sup> brought forward test of reasonable classification and rational nexus for any statute to pass the test of non-arbitrariness-

- The classification must be founded on an intelligible differentia which distinguishes those that are grouped from others are left out of the group

- The differentia must have a rational relation to the object sought to be achieved by the Act.

The entire imbroglio can be sorted out by answering the following questions. These questions are framed in view of several contentions by raised government recruiting agencies so far.

**1. Will a person with vitiligo withstand harsh environmental conditions and work in higher altitude, deep sea, and combat environment?**

- A. Yes, a person with vitiligo can withstand vicissitudes of weather and environmental conditions like everyone else. The risk of acquiring any new disease by working in harsh locations is like persons without vitiligo.

**2. What is the chance that vitiligo can progress and effect the entire skin in the event of an injury on warfront? Will any disability subsequent thereto be of an aggravated nature to render him/her unfit for service?**

- A. The Koebner phenomenon is the development of similar white patches in the injured uninvolved skin of patients who have cutaneous diseases like Vitiligo.<sup>x</sup> The prevalence of Koebner Phenomenon in Vitiligo differs widely, and it is reported to occur in 21% to 62% of patients.<sup>xi</sup> So, vitiligo may progress and spread further in the event of any injury to the person. On the other hand, it shall not bring-forth any new disease or disability on the person to render him unfit for service.

**3. What is the common percentage of coexistent diseases among persons with vitiligo in Indian population?**

- A. Practically very less. Reliable Indian studies are required in this area to prove any considerable associations. In a western study, the data confirmed earlier results of association with autoimmune thyroid disease, whereas purported association with many other diseases was found to be a random event. 6.2% of the patients had congenital nevi compared with 2.8% in a normal healthy population.<sup>xii</sup> The randomness of being associated with some other disease is like the general population.<sup>xiii</sup>

**4. Is there any predictive tool to declare the likelihood of developing more diseases because that a person is having certain percentage of body surface area involved in vitiligo?**

- A. Risk factors for some diseases are generally formulated after conducting thorough scientific studies. It is highly unlikely to devise such a tool because in that case if you work up at the genetic

level, you may come up with some finding in every individual having predilection for one or the other disease. Every applicant will become unfit on medical grounds for employment. Trying to view and predict biological matters purely on genetic basis is ill-founded, unethical and is discriminatory as multitude of environmental factors influence disease incidence.

**5. How does vitiligo affect the mental health of a person?**

No person with vitiligo has any mental illness associated with it. They may develop depression or anxiety only if people around them ridicule, discriminate or vilify them. Vitiligo is considered a serious illness by affected persons in view of possible adverse effects on marriage, securing a job, undesirable appearance, stigma, medication side effects, treatment failures etc. However few people felt it was not serious and stated that the disease was asymptomatic, not contagious, was at an early stage, was curable and was not leprosy and that nobody had responded adversely to the patches.<sup>xiv</sup>

**6. Should only the 'cosmetic un-acceptableness' for colleagues and other stakeholders at workplace be considered a criterion for rejecting/retraining a person with vitiligo from any job?**

No. such a practice would amount to creation of a statutory vitiligo apartheid which is inhuman.

The contention of the Ministry of Defence that vitiligo in non-exposed parts is accepted and even of a minor degree in exposed parts is a ground for rejection is arbitrary, flawed, illegal and unconstitutional prima facie. The concerned organisation has given too much emphasis for cosmetic reasons and appearance of an individual to serve in the combat positions than the ability, attitude, and aptitude of the person.

In the light of all the facts discussed above, the classification of persons with vitiligo being made ineligible for recruitment is not founded on any 'intelligible differentia'. Vitiligo is just a skin-deep condition and has nothing to do with ability of individual to perform any sort of duties including combat, high altitude, and any other hardship duties like every other human. In connection with the 'reasonableness test', let us assume the object of these organisations is to recruit healthy subjects. When a person with vitiligo is no less human than any other healthy person and the disease is non-contagious and a non-infective condition the classification of denying them, equal opportunity fails

to stand the test of 'intelligible differentia and rational nexuses.

Several dermatologists informed that they have come across many patients who were rejected work visas merely for the presence of white patches/hypopigmentation. If that is the case, this matter needs an international consensus for vitiligo friendly visa regimes.

Several sports persons like Rasheed Abdul Wallace, Karl Dunbar, Scott Jorgensen, Hedvig Lindahl etc excelled despite their vitiligo.<sup>xv</sup> There are many famous vitiligans like Michael Jackson and Amitabh Bachan to name a few who are role models for all.

Persons with vitiligo are eligible for all sorts of combat and non-combat service in the United States of America and the United Kingdom.<sup>xvi</sup> It is very unfortunate that we failed to amend the recruitment medical manuals of organisations including the armed forces for so long even though the sources of such laws were amended in the west.<sup>xvii</sup>

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#### 5. Conclusion

It is indeed very prudent on the parts of state governments of Tamil Nadu and Maharashtra to officially delegitimize the use of words like 'Swethakusth', 'Ven Kushtum' and 'Ven kuttum' from public usage in all forms within their territories.

The first step in promoting equality and equal opportunities for vitiligans should start by striking down all biased public employment laws. On a personal level, people with vitiligo have a lot of inhibitions, majority of them concerning the other's perception of disease. Hence it is our responsibility to welcome them into mainstream. The legal environment should usher a utopia where every white patch on skin is celebrated as something new rather than make them sulk secretly away from us. Hope this white patch apartheid is a history soon.

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## *Short Communication*

### **Dignified Management of the Dead in Disasters**

Rijen Shrestha<sup>a</sup>, Amit Patil<sup>b</sup>

<sup>a</sup>Lecturer, Department of Forensic Medicine, Maharajgunj Medical Campus, Institute of Medicine, Kathmandu, Nepal.

<sup>b</sup>Additional Professor & Head, Department of Forensic Medicine & Toxicology, AIIMS, Patna, Bihar. India. Pin-450001.

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#### Abstract

Disasters are a common occurrence throughout the world that results in significant loss of human lives. Sir William E. Gladstone once said “Show me the manner in which a nation cares for its dead and I will measure with mathematical exactness, the tender mercy of its people, their respect for the law of the land and their loyalty to high ideals.” This is still relevant today and demonstrates the need for planning and preparedness of our medico-legal systems for disasters.

The dignified management of the dead in disasters is therefore important for the families to cope with the loss of their loved ones. Additionally, it is important for the medico-legal system for correct identification of the deceased. The INTERPOL DVI guide is an essential tool for all medico-legal practitioners. Dignified management of the dead in disasters including the DVI process should therefore be included in the curriculum of MBBS and MD courses.

#### **1. Introduction**

The US Bangla air crash in 2018 was the 39th air crash in Nepal, resulting in a total of nearly 800 casualties. Other instances of mass fatalities include bus accidents and accidents involving multiple vehicles. Additionally, mass casualties may result from natural disasters including earthquakes, floods, etc.<sup>1</sup>

The need for proper and methodical documentation for identification of the deceased is self-evident. It is necessary for all members of the Disaster Victim Identification (DVI) teams to prevent bias, while guarding against missed and mis-identification.<sup>1</sup> The experience of forensic practitioners at the Department of Forensic Medicine, Institute of Medicine, Kathmandu shows that systematic examination of clothing, personal

belongings, and physical structures can often be extremely useful in identification of the deceased, in addition to the accepted primary methods of identification.<sup>1</sup>

Disasters are defined as events, natural or otherwise, that overwhelm the capacity of a society to deal with the economic, socio-cultural and health effects.<sup>2</sup>

With regards to the forensic and medico-legal effects, disasters may lead to mass casualties and massively overburden the capacity of medical institutions to deal with the increased deaths. In these instances, forensic medical personnel are required to perform medico-legal examinations and help in establishing the identity of the deceased.

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**\*Corresponding author:** Dr Rijen Shrestha, Lecturer (Assistant Professor), Department of Forensic Medicine, Maharajgunj Medical Campus, Institute of Medicine, Tribhuvan University, Kathmandu, Nepal. Email: [dr.rijen.shrestha@gmail.com](mailto:dr.rijen.shrestha@gmail.com) (M) +91 9667915168

Furthermore, tools have been developed to assist the forensic specialists in confirming the identity of the deceased. Technological developments over the last few decades have led to the automation of fingerprint matching. Similarly, the identification process has been greatly assisted by the development of DNA profiling. All these techniques require considerable skills and trainings. Standardisation of Forensic Odontology has also been a significant development in the identification process. Lastly, matching of ante-mortem and post-mortem medical and surgical findings, including marks of identification can help greatly in identification. These four techniques constitute the primary methods of identification.<sup>3</sup>

## 2. Disaster Victim Identification

The Disaster Victim Identification operations instituted by INTERPOL is an ideal tool for use in the identification of unidentified bodies. It was developed to standardise and streamline the DVI process globally. The operations require an interdisciplinary team, to work together to establish identity while ensuring standards in the scientific procedures. At the same time, it is also important to maintain the dignity, compassion and respect of the deceased and their families. Following INTERPOL standards also helps in co-ordination and sharing of information between national teams.<sup>3</sup> The process is divided into five phases<sup>3</sup>:

1. Scene
2. Post-mortem
3. Ante-mortem
4. Reconciliation
5. Debriefing

The scene in any disaster as well as all human remains and artefacts should be processed as in a scene of crime. The process may vary depending on the nature of the disaster and the requirements of the investigation. The scene investigation following a bomb blast will be different from the scene recovery operations following an earthquake. Ideally, the scene should be meticulously examined as in any scene of crime. However, the scale and nature of disaster as well as other constraints may require prioritisation of certain aspects of the scene investigation. It is therefore important to provide adequate training to develop the knowledge and skills of first responders. In addition, forensic doctors may be required to visit the scene and help

in the recovery process. The inclusion of forensic anthropologists and forensic odontologists in scene investigation can help in ensuring that all human remains are recovered.<sup>4</sup>

The forensic doctor is primarily responsible for the second (post-mortem) phase in the DVI operations. The human remains and associated personal effects are systematically examined to collect as much information as possible that can help in identification of the individual. Additionally, numerous techniques are used to assist in the identification process, including photography, radiography, fingerprinting, odontology and DNA profiling and require their own experts.<sup>3</sup>

While developed countries have trained DVI units, usually within their police forces, for collecting information about the missing person (Ante-mortem data),<sup>[3]</sup> in our experience, this responsibility also falls primarily on the forensic doctors. The family of the deceased are interviewed to collect all the relevant information. The interview should include open ended questions as is the practice in any forensic interview or history-taking. It is important to elicit as much information as possible as this will later be analysed and tallied with the findings of the post-mortem examination. Contact details of all relevant associates of the deceased, including his doctor and dentist should be obtained.<sup>4</sup>

In addition to the second and third phases, the forensic doctors are also involved in the reconciliation phase. The information collected during the second (post-mortem) and third (ante-mortem) phases are examined and matched to confirm the identity of the deceased during the reconciliation phase.<sup>4</sup> In our experience, this is also the primary responsibility of the medical personnel, while they will need to be assisted by a multi-disciplinary team.

One very important part of the disaster response that is usually forgotten is debriefing. During this phase, team leaders will debrief their teams to examine the deficiencies in the response and also evaluate the improvements that can be made for the future.<sup>4</sup> In addition, members of all the teams need to be counselled, especially if involved in the management of the dead. Psycho-social counselling should also be made available to family members that desire the service. The practice in

Nepal shows that resource management is an important skill required for forensic practitioners involved in DVI operations.

It is important to stockpile kits and equipment in preparation for the next disaster and while it may not require considerable resources, it requires significant planning. Training is an important tool for knowledge and skill development. Simulation-based training is best suited to disaster management. <sup>[5]</sup> The logistics for such trainings requires significant resources and planning. The only way to develop the management of the dead in disasters is to systematise the process. We therefore suggest the inclusion of this important topic in MBBS and MD curriculum as well as in associated specialities. This can help provide significant resources to support the existing systems.

### **Conclusion**

Management of the dead and disaster victim identification operations are critically interlinked and require systemic intervention for further development. This can be achieved through the combined efforts of all related specialists and needs advocacy and lobbying to be brought to fruition.

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## Case Report

### Male Infanticide by Stab Wound- A Case Report

Ankur Patel<sup>a</sup>, Tikendra Dewangan<sup>b</sup>, Prabhakaran S<sup>c</sup>, Deki Bodh<sup>c</sup>

<sup>a</sup>Associate Professor, <sup>c</sup>Junior Resident; Department of Forensic Medicine & Toxicology, B.J. Medical College Ahmedabad, Gujarat, India. Pin-380016.

<sup>b</sup>Assistant Professor, Department of Forensic Medicine and Toxicology, Raipur Institute of Medical sciences, Raipur, Chhattisgarh, India. Pin- 492101.

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#### Abstract

**Infanticide** is killing of an infant at any time from birth up to the age of 12 months. Historically, child killing has by no means always been a crime, and has been practiced as child sacrifice, a method of population control or as a social and economic necessity since the dawn of humanity. In India, female Infanticide is common but male infanticide is also practiced in certain cases. Here is a case report of a decomposed male infant with stab injury brought for postmortem examination at Department of Forensic Medicine and Toxicology, B.J. Medical College, Ahmedabad. Since most often infants are killed by suffocation or poisoning and sometimes by abandonment. Aim of the case report is to high light the importance of careful and meticulous autopsy in decomposed body to give justice to innocent.

#### 1. Introduction

Historically, child killing has by no means always been a crime, and has been practiced as child sacrifice, a method of population control or as a social and economic necessity since the dawn of humanity. The cultural and socioeconomic setting is still relevant today and reverberates through phenomena such as son-preference and sex-selective abortions, particularly in South Asian countries.<sup>1</sup>

**Infanticide** is killing of an infant at any time from birth up to the age of 12 months. Neonaticidal mothers are often young, unmarried women with unwanted pregnancies who receive no prenatal care.<sup>2</sup> In a trial for infanticide, the prosecution is required to prove that the child was born alive, and that it died from criminal violence inflicted after birth.<sup>3</sup> Due to certain social customs practiced in different societies of India female infanticide is very

common but male Infanticide is also practiced in case of illegitimate children born of widows or unmarried persons. With the wide spread of education and restrictive action by the government, it is relatively less prevalent but the low sex ratio of women in some states in India, particularly in the states of Haryana, west UP and Rajasthan are dangerous pointers conclusively establishing human interventions of killing of girl child at birth or equally worrisome practices of female foeticide. Sacrifice of a live child amongst the uneducated to protect one from evil are also reported. Certain studies also show that psychiatric illness as being responsible for a mother to kill her own children.<sup>4</sup>

#### 2. Case History

An unknown dead body of a male infant was brought for post mortem examination at Forensic Medicine Department, B.J. Medical College, Ahmedabad.

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**\*Corresponding author:** Dr Tikendra Dewangan, Assistant Professor, Department of Forensic Medicine and Toxicology, Raipur Institute of Medical sciences, Raipur, Chhattisgarh, India. Pin- 492101. E mail- [d.tikendra@gmail.com](mailto:d.tikendra@gmail.com) (M): +91-9098715256.

As per the police papers and history, dead body was found in canal in a stage of decomposition and no cloth was present over dead body in wearing condition. On examination dead body was found in stage of decomposition emitting foul smell (Refer Fig. 1). Greenish discoloration was seen more over abdominal. Peeling of epidermis was present all over the body at places. Maggots of size 0.2cm-0.3cm were present all over the body at places. Facial features were not identifiable and skins over the face were missing exposing underlying bone. Scalp hair was easily pluckable. Scar of fallen umbilical cord was identifiable which indicate that it was a live born case. Skin around the neck, dorsum of both feet and around anal region were missing and its margins were pale and irregular appears to be produced by animal bite and insect. Skull sutures were separated and greyish liquefied brain matter was coming out from skull cavity.

#### Measurements of the dead body.

- (i) Total length – 55cm
- (ii) Weight – 1340 grams
- (iii) Chest circumference - 30 cm

**Fig 1: Photograph showing decomposed male Infant.**



On careful examination of dead body, one vertical stab wound of size 4cm x 1.5cm up to peritoneal cavity deep was present in front aspect of abdomen (Refer Fig. 2). Its upper end was 11 cm below tip of right shoulder and its lower end was 4

cm above right anterior superior iliac spine and 3.5 cm right to midline.

On dissection, it cuts skin, soft tissue, muscle, liver, loops of intestine and stomach. Blood mixed clot was present in peritoneal cavity. Margins of the wound were irregular probably due to gnawing effect caused by animal and insect bite. Red colour extravasation of blood is seen in the floor of margin and along the track of the wound (Refer Fig. 3 & 4).

**Fig 2: Photograph showing stab wound over abdomen.**



**Fig 3: Photograph showing extravasation of blood along the track of wound.**



No other antemortem injuries were present. The ossification centre appeared on lower end of femur, upper end of tibia but not in capitata bone.

Scar of fallen umbilical cord was identified and age of infant was given between 10 days to 2 month. Cause of death in this case was given as shock and hemorrhage as a result of stab injury over abdomen caused by sharp and penetrating object, antemortem in nature. Time since death was opined between 3-5 days before starting postmortem examination.

### 3. Discussion

In India, there is no distinction in law between infanticide and murder, such as exists in many Western countries. **The English Infanticide Act, 1938, Section 1, provides:** Where a woman by any willful act or omission causes the death of her child, the child being under the age of 12 months, but at the time of act or omission the balance of her mind was disturbed by reason of her not having fully recovered from the effect of giving birth to the child or by reason of effect of lactation consequent upon the birth of the child, then, notwithstanding that the circumstances were such that but for this act, the offence would have amounted to murder, she shall be guilty of felony of infanticide and may for such offence be dealt with and punished as if she had been guilty of the offence of manslaughter of the child. This Act tells us about the balance of mind which was disturbed at the time of committing the act.<sup>5</sup>

Law presumes that every newborn child found dead was born dead until the contrary is proved.<sup>6</sup> Whether the crime is to be treated on the lines of manslaughter (as in England) or on the lines of murder (as in India), certain facts have to be established by a doctor such as whether the child was capable of survival after birth or the child was born alive and had a separate existence outside mother's body or whether the death was caused by willful act or omission.

Infanticide must be differentiated from sudden infant death syndrome (SIDS) which is the sudden death of any infant or young child which is unexpected by history and in whom a thorough necropsy fails to demonstrate an adequate cause of death.<sup>7</sup> Infanticide may be misdiagnosed as SIDS due to lack of evidence. Meadow's dictum states that "One sudden infant death is a tragedy, two is suspicious and three is murder, until proved otherwise".<sup>8</sup>

### 4. Conclusion

Most often infants are killed by suffocation or poisoning sometime by abandonment but infanticide by means of stab injury is very rare. This case report highlights the vigilance of Forensic Medicine expert and importances of meticulous autopsy which help us in identifying the cause and manner of death in such decomposed body, where injury present in the dead body should be differentiate with postmortem artefact. It also emphasizes the crime of infanticide as a window into the social dynamics of the private and domestic space, where love, lust, incest, ignorance, poverty, and rape, sometimes resulted in many unwanted and illegitimate pregnancies. Micro-histories or even no history are there such as in our case, careful and thorough autopsy should be conducted so that proper justice is given to innocent.

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## Case Report

### White Death: Avalanche Fatality in Nanda Devi Mountain

Pooja Hatwal<sup>a</sup>, Chandra Prakash Bhaisora<sup>b</sup>, Shinto Devassy<sup>c</sup>

<sup>a</sup>Junior Resident, <sup>b</sup>Professor, <sup>c</sup>Assistant Professor

Dept of Forensic Medicine & Toxicology, Government Medical College, Haldwani, Nainital, Uttarakhand, India. Pin- 263145.

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#### Abstract

**Background:** Nanda Devi is the second highest mountain in India and since it is one of the toughest peaks to summit, it attracts only a few climbers. It was an attempt to summit by a group of international climbers with the help of an Indian guide on an unclimbed peak at 6477 meter. During the course of the summit, one of the most dangerous risks they face is the Avalanche, as the climbers will be having all other necessary protection kits like oxygen, light and staple food. While giving permission for such adventure activities, government should have in mind the risk of Avalanche and should also give advices continuously regarding the weather condition and provide provisions for airlifting, to deal with the event of a medical emergency.

**Case presentation:** We report a case of Avalanche fatality which happened on Nanda Devi Mountain. Owing to the bad weather and adverse climatic condition; bodies of the climbers were recovered only after a period of 28 days by ITBP through Operation Devil.

**Conclusion:** In all the cases, trauma was the major cause of death. Proper safety measures and medical attention at the right time could have saved most of these precious lives.

#### 1. Introduction

Nanda Devi is the second highest mountain in India with an elevation of 7,816 meter.<sup>1</sup> It is the 2<sup>nd</sup> highest mountain in India and 23<sup>rd</sup> highest peak in the world. It is a part of Garhwal Himalayas and is located in chamoli district of Uttarakhand, between Rishiganga valley on west and Goriganga valley on east.<sup>2</sup> Due to its religious significance the peak as well the circle of high mountains surrounding it, was closed to both the locals and climbers in 1983. In 1988, Nanda Devi National Park was declared a UNESCO World Heritage Site. The mountain has two summits, the main summit at 7816 meter and Nanda Devi east at 7434 meter. The western summit is higher and the eastern

summit is lower one. Nanda Devi is also notable for its large, steep rise above local terrain.<sup>3</sup>

To climb any peaks in Nanda Devi, permission must be granted from Indian Mountaineering Foundation which is an apex organisation. While climbing any peak mountaineers face may difficulties and problems, avalanche is one of them, which is serious and life threatening problem. Precautions must be taken during mountaineering to prevent such life threatening accidents. Safety measures for prevention of such accidents includes bad weather presumption, follow the instructions given by authorities.

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**\*Corresponding author:** Dr. Shinto Devassy, Assistant Professor, Dept of Forensic Medicine & Toxicology, Government Medical College, Haldwani, Nainital, Uttarakhand, India. Email: [shinto.devassy@gmail.com](mailto:shinto.devassy@gmail.com) (M): 0091 9742383741.

## 2. Case report

### Case history

A team of climbers with 12 members including one Indian guide after obtaining permission for climbing Nanda Devi east peak started their journey on 13 May 2019 and after conquering the Nanda Devi east peak, 8 members from group led by Martin Moran (who owns a Scotland based adventure company and having numerous expedition adventures in Himalayas, to his credit) without informing the authorities started their journey to climb an 'unclimbed peak' at height of 6477 meters. They were heard for the last time on 26 May 2019, a day before avalanche hit the Nanda Devi peak.

On 3 June 2019 after search IAF helicopter spotted five bodies but due to inclement weather immediate recovery was not possible. On June 23, 2019 seven bodies were recovered by ITBP team after 20 days search 'operation daredevil'. On 3 July 2019 all the bodies were taken to Haldwani for Medico-legal autopsy and identification. The post mortem was conducted by panel of three doctors on requisition from police and videography was done.

**Figure1:** Pale area surrounded by hyperaemic areas and black discoloration of bridge of nose.



### Autopsy Findings

On external examination, pink coloured hypostasis noted over victims, washerwoman hands and feet with peeling of skin. Ischemic signs over Nose and finger tips noted. On internal examination, multiple traumatic injuries noted.

The cause of death in all mountaineers was polytrauma due to blunt impact force resulting in shock and haemorrhage. However, the bodies were recovered from cold climatic condition (beneath Snow Mountain as per inquest papers) which favours natural preservation of dead bodies. Therefore, exact time of death could not be ascertained. In these cases, the circumstantial evidences may be taken into consideration to finalise time of death. After conducting medico-legal autopsy and identification of dead bodies, dead bodies were handed over to the respective authority.

**Figure2:** 3<sup>rd</sup> degree frost bite (involving all layers of skin and causes permanent tissue damage along with wrinkling of skin).



## 3. Discussion

India has 73 percent of the Himalayan range. It is a huge potential for mountaineering expeditions. Indian Mountaineering Foundation has laid down the guidelines and basic minimum



standards specifically to commercial expeditions. It was a higher risk time due to lots of winter snow and being the beginning of the warming period. In all the cases, blunt trauma was the leading cause of death. Mathieu Pasquier, Olivier Hugli et al in their study concluded that Trauma was the presumed cause of death in 94% in summer avalanche accidents.<sup>4</sup> Alison Sheets, Dale Wang, et al conducted their study on 110 cases of avalanche fatalities and concluded that Asphyxia was the cause of death in 65% of fatalities. Trauma was the cause of death in 29% of the fatalities, out of which the primary cause was multiple system trauma.<sup>5</sup>

An avalanche victim may suffer any degree of trauma. Even due to minor musculoskeletal trauma, victims may cease to struggle and rest entrapped in the debris leading to death from a combination of trauma, asphyxia and hypothermia. Most of the time it is clouded by the non specific and inconclusive post-mortem findings in asphyxia and hypothermia. Elevated avalanche hazard and heightened avalanche activity can be forecasted to some extent. In IMF's criteria the team should carry a radio for having all India radio services. It doesn't specifically cover the weather condition of that particular area and in addition to it at the heights weather changes in a sudden. Slope-cutting techniques are commonly used by Avalanche professionals. In this technique the backcountry users rapidly traverse through the potentially unstable slope from one safe zone to another for testing stability. This technique helps an avalanche in a controlled fashion to eliminate some or all of the avalanche hazard on a slope with providing information on the slope stability. The inexperience of a single person can cause death of the entire team.<sup>6</sup>

Avalanche airbags contains 1 or 2 inflatable balloons as backpacks or vests. It is the avalanche safety devices aimed for preventing burial. A user manually pulls activation handle to deploy the device when caught in an avalanche.<sup>6</sup> It is not there in the IMFs devices to be carried on and should be included in those with avalanche risk. Helmets helps to prevent minor and major trauma in resort skiers and snowboarders. The protective capabilities of helmets designed for recreational skiing and climbing not sufficient to bear impact of the velocities created by medium and large avalanches.

But, most of the recreational victims are killed in small to medium sized avalanches of lesser velocities. In such cases, helmets could prevent mild to moderate traumatic brain injuries and helpful to save life. In this case report, Indian guide was the only person who was not wearing helmet and suffered from head injury. Artificial air pocket devices enable a completely buried avalanche victim to divert exhaled CO<sub>2</sub> away from airway. Integrating these 2 devices (airbag and artificial air pocket devices) is advantageous as it helps to minimize the separate pieces of equipment and decrease total cost.<sup>6</sup>

Currently, in India, there is no rescue system which is specialized as fire-fighting or emergency medical response in the city for mountaineering. They were not allowed to carry satellite phones due to security issues which all cut them totally out of the world. There were no private helicopters available in the area to reach immediately and airlift the survivors. Helicopters can decrease response time to remote locations, and can be used to search from air with transceiver and RECCO technology.<sup>6</sup> Conditions such as time of day, weather and pilot proficiency in mountain environments can significantly affect the performance of helicopter. Nanda Devi is the second highest mountain in India and since it is one of the toughest peaks to summit, it attracts only a few climbers. During climbing any mountain, climbers face many difficulties like shortage of food, lack of oxygen, avalanches, falling ice, falling rocks, crevasse etc. avalanche is one of the life-threatening problems faced by mountaineers during mountaineering. Avalanche fatalities are common in winters but early season snowfalls are also dangerous and therefore, an avalanche can occur in any month of year.

Avalanche control begins with a risk assessment conducted by surveying for potential avalanche terrain by identifying geographic features, seasonal snow distribution that is indicative of avalanches. Before summiting any peak mountaineers must go through about the peak which is planned to summit, weather forecasting, following instructions provided by authorities. Although prevention should always be the best mitigator of avalanche risk, avalanches can occur even in presumably safe condition. If an avalanche occurs,

rapid rescue and possibly air pocket devices offer extra survival potential for those buried.<sup>7</sup>

### Conclusion

Most of the times instead of taking sufficient prevention ends up in blaming game like they were given only permission for Nanda Devi East whereas relatives alleges as they have got open permission and the liaison officer who is with them can decide on accepting any deviation of route. In most of the cases the life could have been saved on timely availability of medical emergency services. The trouble with the Indian rescue apparatus for extreme sports is society has little empathy for these pursuits and often gets labelled as irresponsible and can be seen in every link of the chain from policy interpretation to reporting by media.

Ministry of home affairs has opened up 137 peaks to foreigners desirous of mountaineering in August 2019 and planning to open more mountain peaks. Along with the expanding of such extreme sports government should come forward with solid plans of rescue systems or the availability of medical emergency medical services within short time period on the expense of the climbers who are happy and ready to spend for it.

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## Case Report

### Sudden Unexpected Death Due to Acute Hemorrhagic Pancreatitis

Daideepya C Bhargava<sup>a</sup>, Atul S Keche<sup>b</sup>, Brinda Patel<sup>c</sup>, Ashwini Tandon<sup>d</sup>, Vivek K Chouksey<sup>c</sup>

<sup>a</sup>Junior Resident, <sup>b</sup>Associate Professor, <sup>c</sup>Senior Resident, <sup>d</sup>Additional Professor

Department of Forensic Medicine and Toxicology, AIIMS, Bhopal, Madhya Pradesh, India. Pin- 462020.

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Coagulative necrosis,  
Fatty liver.

#### Abstract

Sudden and unexpected death is an important indication for medico-legal autopsy. It is done for establishing the cause of death in such suspicious cases. It is a challenge for a forensic expert to determine a cause of death in sudden and unexpected death cases. Sudden death involving the pancreatic abnormalities remains a rare and unusual condition. The rapid progressing disease condition is one of the reason behind the sudden unexpected death due to pancreatitis. While a large number of studies have dealt with the clinical picture, course, and outcome of acute pancreatitis in the clinical setting, postmortem studies of fatal acute pancreatitis, and particularly those dealing with medicolegal autopsy cases, are sparse. We report a case of a 45-year-old man without a significant past history who suddenly died at his home. Gross autopsy findings and histopathological examination findings lead to the specific diagnosis. Gross examination during autopsy revealed severe pathology in and around pancreas which was pointing to a particular cause of death. Histopathology of the pancreas revealed acute inflammation and coagulative fatty necrosis. This paper highlights a case of acute hemorrhagic pancreatitis which is not so common in current forensic practice, thus it is being reported.

#### 1. Introduction

Sudden deaths are mostly natural deaths, which occur immediately or within 24 hours of the onset of terminal symptoms.<sup>1,2</sup> Most of the sudden deaths are mainly attributed to the cardiovascular system to the extent of 45%, 25% are related to the respiratory system, 20% to the nervous system and 10% are due to other causes.<sup>3</sup> Sudden pancreatic death remains a rare and unusual condition although acute pancreatitis is a common surgical emergency. Incidence of acute pancreatitis cases in urban population is increasing nowadays, probably due to increase in alcohol abuse. Alcoholism ranks the first

among the etiological factors of acute pancreatitis.<sup>4</sup> The autolyzed tissue in pancreas is often hemorrhagic and may be mistaken for acute pancreatitis, though Histopathological examination rapidly resolves the problem.<sup>5</sup> Autopsy findings when supported by histopathology immensely help in determining cause of death especially in cases of sudden deaths including those related with pancreatic pathology. Sometimes severe acute pancreatitis can be complicated by multiorgan failure which can be fatal in more than 50% of cases. But sudden pancreatic death remains an unusual condition.<sup>6</sup>

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\*Corresponding author: Dr Atul Keche, Associate Professor, Department of Forensic Medicine and Toxicology, AIIMS, Bhopal, Madhya Pradesh, India. Pin- 462020. E mail- [atul.fmt@aiimsbhopal.edu.in](mailto:atul.fmt@aiimsbhopal.edu.in) (M): +91-8208072886.

Acute pancreatitis represents a spectrum of disease, characterized by 'inflammation of the pancreas ranging from a mild, transitory illness to a severe, rapidly progressive hemorrhagic form, with massive necrosis and mortality rates of up to 24%. Its causal relationship with sudden death should always be kept in mind.<sup>7</sup> Patients with pre-existing diabetes mellitus have a 94% increased risk of suffering from acute pancreatitis. It is still unknown if acute pancreatitis is the cause of uncontrolled diabetes or diabetic ketoacidosis leads to acute pancreatitis.<sup>8</sup>

## 2. Case Report:

In the month of March, a 45-year-old businessman, apparently healthy, who was living with his mother in a duplex, was found dead in his bed room upstairs at around 11:00 a.m. by his mother when he didn't show up for his regular morning tea. Immediately he was brought to AIIMS emergency where he was declared brought dead. Then body was sent to mortuary for Postmortem examination. Past history was not significant.

**On external examination-** It was an average built and moderately nourished body. Eyes were closed, cornea clear and pupils were dilated. Mouth was closed and dried blood was seen trickling down from angle of mouth towards the ear lobule on both the sides. Tongue was inside the mouth cavity and teeth were intact. Rigor mortis was well developed all over the body. Postmortem lividity was present on back and was fixed. There were no signs of decomposition.

**On internal examination:** Mild retroperitoneal hemorrhage was evident (**Figure-1**) and after evisceration of pancreatic tissue block the gross appearance was suggestive of acute hemorrhagic pancreatitis (**Figure-2**) and histological findings revealed the severe pancreatic pathology (**Figure-3, 4 & 5**). Histological examination of the pancreas showed neutrophilic infiltration and many optically empty areas, compatible with necrosis of fat and adipose tissue due to acute hemorrhagic pancreatitis. Liver was enlarged (Weight-2025 gm) (**Figure-6**). Histopathology of liver showed marked fatty changes (**Figure-7,8**) Intrahepatic cholestasis and portal triaditis was evident with mild periportal inflammation (**Figure-9**). Severe congestion was observed in the brain, lungs, kidneys and liver. In heart, left coronary artery showed about 80% block in its lumen. We concluded that the cause of death is due to combined effect of pathology in pancreas and Left coronary artery occlusion (80%). In the present case, there was no significant past history.

Meticulous autopsy evaluation and histopathological examination, was useful in determining the cause of death.

**Figure 1:** In situ view of acute hemorrhagic pancreatitis with retroperitoneal hemorrhage.



**Figure 2:** Gross appearance of acute hemorrhagic pancreatitis after evisceration of tissue block.

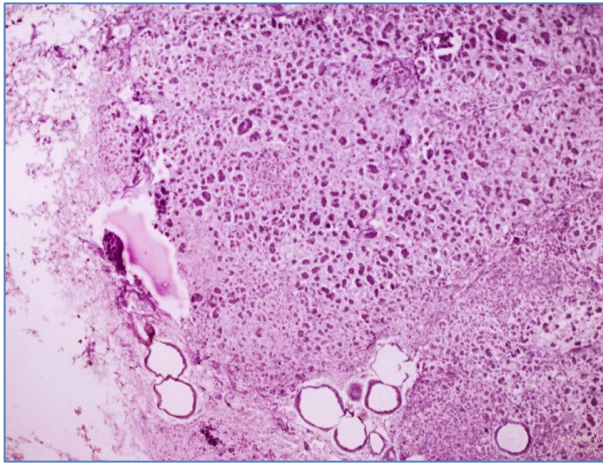


## 3. Discussion:

Acute pancreatitis was found in about 4.9% of patients who visited the hospital with a complaint of acute abdominal pain.<sup>3</sup> Acute pancreatitis is quite difficult to diagnose and it is often missed clinically.<sup>9</sup> Severe acute pancreatitis or hemorrhagic pancreatitis is associated with mortality rates ranging from 10-30%. Some authors report that acute pancreatitis without hemorrhage may also

cause death, but hemorrhagic pancreatitis is more commonly reported in autopsies related to sudden deaths.<sup>10</sup>

**Figure 3:** (H & E, 20x): Pancreas showing marked coagulative necrosis with ghost outline of cells and fat necrosis at periphery.



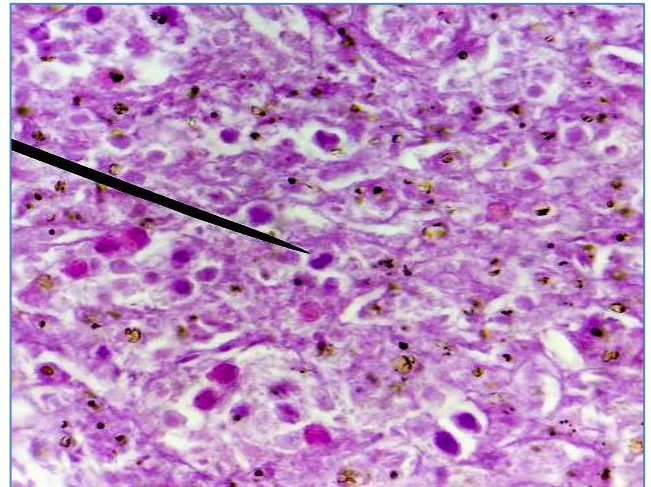
**Figure 4:** (H & E, 4x). Section of pancreas showing Necrotic foci.



M Tsokos et al. reported that the overall mortality rate of acute edematous pancreatitis is below 1%, but when considering the severe hemorrhagic form of the disease, mortality rates range from 13.5%–24%.<sup>9</sup> In sudden deaths, determining the cause of death is a tough job for forensic experts. Acute hemorrhagic pancreatitis is one of the conditions where careful postmortem examination is required to opine the cause of death. Here we are reporting a case of sudden death due to pancreatic etiology which was revealed only after autopsy. Among the additional associated autopsy findings, fatty liver was present in 41%, liver cirrhosis

in 26%, heart pathology in 33% and in 26% cases chronic bronchitis was found.

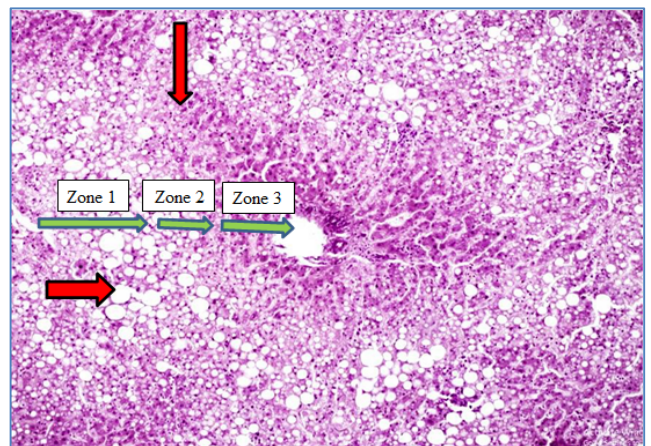
**Figure 5:** (H & E, 100x). Neutrophilic infiltration in pancreatic tissue suggestive of Acute inflammation.



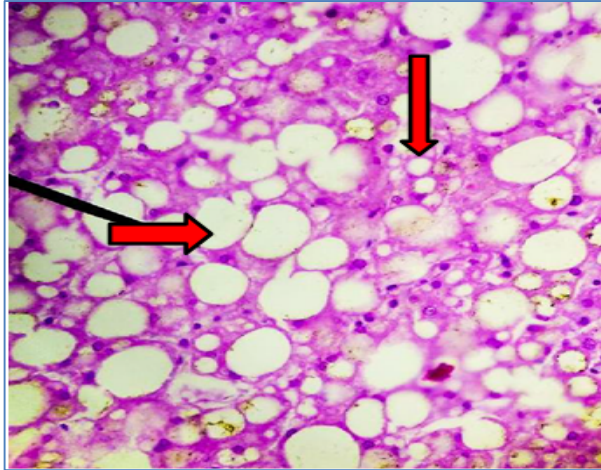
**Figure 6:** Gross appearance of enlarged liver.



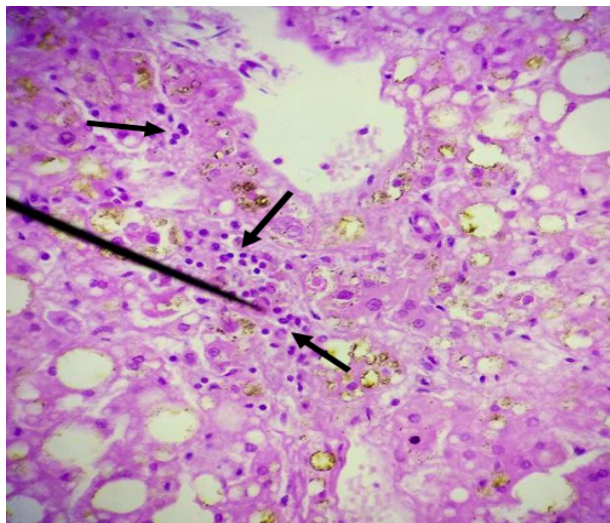
**Figure 7:** (H & E, 20x). Fatty liver with steatosis (micro vesicular and macro vesicular) in zone 1 of liver.



**Figure 8:** (H & E, 40x). Histopathological examination of the Liver tissue block reveals macro as well as micro vesicular steatosis.



**Figure 9:** (H & E, 40x). Neutrophilic infiltration in liver tissue suggestive of steatohepatitis.



The mean age of male subjects was 47 years and that of female was 60 years and the mean age for all subjects together was 52 years. Shetty et al in their case series concluded that the mean age of their series was 35 years. Although no seasonal variations, 63% fatalities occurred during October-April. History of chronic alcohol consumption could be established in 70% of cases. It has been reported that, about 74% people who are socially isolated and not having any contact to family or neighbors, or homeless people commonly suffer from this disease.<sup>3,9</sup> In type 2 diabetes there is 84% increased risk of suffering from acute pancreatitis.<sup>8</sup>

Interstitial edema and an inflammatory infiltrate were found in mild cases of acute pancreatitis, usually with no organ dysfunction.

Pancreatic parenchyma showed extensive inflammation and necrosis, often associated with severe gland dysfunction and multiorgan failure in severe cases. This study by Shetty et al also showed hemorrhage in the peritoneal cavity in all the cases.<sup>3</sup> Hemorrhagic pancreatitis is more commonly associated with frank intra-peritoneal hemorrhage. Microscopic evidence of acute inflammation is confirmatory finding for the diagnosis of acute pancreatitis as the gross finding of it may be mistaken for those of postmortem autolysis.<sup>10</sup> In the routine autopsy, the frequent diagnostic difficulty faced by the autopsy surgeon is this autolysis of the pancreatic specimens due to its enormous enzymatic activity. Loss of architecture due to post mortem autolysis leads to the loss of significant findings. Hence the better time interval for studying pancreas histologically is till 8 hours after death.<sup>3</sup>

This case highlights the role forensic expert in determining the cause of sudden death. In such a situation, history, circumstances of death, meticulous autopsy and histopathology are needed to find out the exact cause of death.

#### 4. Conclusion:

Missed clinical diagnosis of acute pancreatitis is a well-known problem. Forensic experts are likely to encounter pancreatitis at autopsy examination and thus must be familiar with the gross and histopathological findings. Serum amylase levels, ultrasonography and computed tomography are recommended for early diagnosis of this condition.

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**Competing interests:** None.

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## Case Report

### Incidental finding of Corrosive Acid Poisoning in a case of Hanging

Aditya Anand<sup>a</sup>, Sahil Khurana<sup>a</sup>, Dibya Sharma<sup>b</sup>

<sup>a</sup>Senior Resident, <sup>b</sup>Junior Resident

Department of Forensic Medicine, Vardhman Mahavir Medical College (VMMC) and Safdarjung Hospital, New Delhi, India.110029.

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Asphyxia.

#### Abstract

Suicidal deaths due to hanging are documented worldwide as a popular means of suicide and makes the majority of asphyxial deaths. Keeping this in mind, majority of times we proceed every case of hanging like a normal suicidal asphyxial death but very rarely we can find an incidental finding of additional suicidal mode like poisoning as seen in our case. A case of middle aged man with alleged history of suicidal hanging was found with internal visceral findings of poisoning consistent with that of Hydrochloric acid ingestion (confirmed on visceral report). An important message to all forensic experts to carry out an autopsy in meticulous way and don't hesitate to carry or inform about the need of psychological autopsy to the concerned Investigating authorities.

#### 1. Introduction

Death due to corrosive injuries occurs worldwide and do not pose any significant problem for autopsy surgeon to rule out the cause of death. Most of the corrosive injuries are accidental in nature, but there are reports of using acids as weapon (Vitriolage) or as means of suicide.<sup>1</sup>

But sometimes even these rare suicidal cause of deaths may be supervene by a common suicidal cause of death and in these situations it may pose a problem for young forensic experts to miss these findings which are supposed to be rare but autopsy carried out in a meticulous way and with a broad mind can help to bestow the actual cause of death which may be significant to Investigating authorities and for statistical purpose for understanding better epidemiology of a particular mode of suicides in a given population or area. Here we present a case of a 28 years old Man with alleged history of hanging and with signs of asphyxia came with a incidental finding of corrosive injuries in viscera specially stomach which

later confirmed to be Hydrochloric acid by the FSL report.

#### 2. Case Report

A 28 years old man working in a chemical factory, was found dead hanging to a ceiling fan in his rented room. The deceased was identified by the police personnel based on his identity card. Body was taken to a tertiary health care centre for autopsy. At autopsy, deceased was of moderate built and well nourished with eyes and mouth partially open, face was congested, both the ear lobules, lips and finger nails of both the hands were showing bluish discoloration (cyanosed), blackish colour froth oozing from both the nostrils and an incomplete oblique ligature mark was present around the neck ([refer figure no.1](#)). There was no evidence of any other external injury over the body. Internally, left pleural cavity contained about 150 ml of reddish blood tinged fluid with some turbid oil like droplets associated with corrosion of medial surface of left lung.

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\*Corresponding author: Dr. Sahil Khurana, Senior Resident, Department of Forensic Medicine, VMMC and Safdarjung Hospital, New Delhi, India- 110029. Email: [sahilkhurana4444@gmail.com](mailto:sahilkhurana4444@gmail.com) (M): +91-8149164990.



The left side of diaphragm was perforated corresponding to opening of stomach. Interlobar surfaces of the lungs showed multiple petechial hemorrhages, heart and aorta contained dark fluid blood.

**Fig. 1:** Picture depicting dissection of neck with infiltration of blood mixed with blackish turbid fluid (mixed with Hydrochloric acid).



**Fig. 2:** Picture depicting dark blackish discoloration of stomach wall with deeply congested mucosa.



On opening of stomach, 100 ml of blackish fluid present with an abnormal burning odor and was warm to touch, walls showed blackish discoloration and mucosa was deeply congested (as shown in the figure no.2) predominantly over the lesser curvature and the blood vessels around stomach shows prominent venous markings and blackish discoloration, corresponding greater omentum showed blackish discoloration. The viscera were preserved for chemical analysis which revealed the presence of Hydrochloric acid. Histopathology of the lungs showed areas of hemorrhage and congestion,

kidneys showed acute tubular necrosis, oesophagus showed loss of mucosal lining with ulceration and trachea showed congestion with epithelial erosion and liver showed fatty changes and congested capillaries. Cause of death was given as Asphyxia due to hanging associated with Hydrochloric acid poisoning. An empty plastic bottle with no label was found at crime scene. The bottle was preserved and sent for chemical analysis which revealed the presence of Hydrochloric acid.

### 3. Discussion

Chemical injuries of the oesophagus are caused by ingestion of corrosives like acids, alkalis and neutral substances<sup>2</sup>. Chemical burns of upper gastrointestinal tract are common in India due to its easy availability<sup>3</sup>. Acid are highly irritative substances and can lead to choking and gagging after ingestion<sup>4</sup>. Deaths as a result of corrosive acid consumption are commonly reported in the forensic medicine literature<sup>5</sup>. Suicides by consumption of Hydrochloric acid are commonly reported in psychotics and adults with suicidal tendencies<sup>6,7</sup>. The ease of availability of corrosives to factory workers contributes to selection of this mode of attempting suicide in India as in our case. Exposure to strong acids such as hydrochloric acid either to the skin or gastrointestinal tract or respiratory mucosa will result respectively in significant or occasionally fatal cutaneous chemical burns as well as devastating corrosive damage to the respiratory and gastrointestinal tract. Most of the injuries are accidental but there are reports of using acids as weapon of offence or as means of suicide<sup>1</sup>.

In our case there was obvious findings and ligature mark over neck which is consistent with hanging came suddenly came with the internal findings consistent with incidental finding of poisoning. After this incidental finding, concerned Investigating authorities were informed and on carrying the psychological autopsy it was revealed that deceased had stolen a acid bottle from the factory without informing the manager, which was informally told by one of his factory mate. Before hanging he had severe gastric discomfort as he was trying to ingest ice cubes from fridge and ice cream after ingesting acid but when pain became unbearable he decided to hang himself with a nylon rope with a ceiling fan. By looking at the severe congestion and discoloration of the stomach wall it can be concluded that acid ingestion itself was

sufficient in ordinary course of nature to cause of death but unbearable pain provoked him to hang himself.

Deaths due to consumption of corrosives do not always cause problem in diagnosis but when these findings are supervene by some other suicidal manner, expertise of a forensic expert is called for. This case can serve as a lesson for public health authorities and appropriate factory management units to be aware of risks for consumption of hydrochloric acid as a possible means of suicide specially by workers who has a easy access in these set up, they should consider for a proper check up and documentation of amount of corrosives used or utilized during each day and should make abetments in factory laws, if any of these bottles are missing before closing time of the factories and if suspicion arises then psychiatric help can be seek to prevent such suicides at early stages.

#### 4. Conclusions:

There should be proper provisions regarding strict supervision of the individuals working in places in proximity of these hazardous chemicals like factories and proper routine psychiatric counseling and work up for individuals showing or having suicidal tendencies. Employee`s State Insurance Corporation of India should arrange for it. The autopsy surgeon should always take care not to miss these rare incidental findings so as to conclude the actual cause of death and conduct every autopsy meticulously.

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## Letter to Editor

### **A Strong Need for Digitalization in Medico-Legal Practice in India**

Kattamreddy Ananth Rupesh<sup>a</sup>, Ganja Chandra Deepak<sup>b</sup>, M. Taquiuddin Khan<sup>c</sup>.

<sup>a</sup>Assistant Professor, Department of Forensic Medicine and Toxicology, ACSR GMC, Nellore.

<sup>b</sup>Senior Resident, Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences, New Delhi

<sup>c</sup>Professor and HoD, Department of Forensic Medicine and Toxicology, Osmania Medical College, Hyderabad.

#### **1. Introduction**

Modern Medicine has been continuously changing for the better, both from the service provider and client perspective. Patient's expectations are on an all-time high amid the circumstances of COVID 19 pandemic which even forced the regulators of medical practice to legitimize telemedicine services, a long-cherished goal. The recent pandemic is certainly a game-changer in various roles of our lives, be it personal or professional front. We accepted and adopted many new practices in our lives under a very short notice. Every Medical practitioner donned the role of an infectious disease specialist, PCR technology has come to every medical school; every medical teacher started going live online to deliver lectures, tele-consultations picked up, lot of investments in to health industry! Perhaps, after the Second World War this is the time when there's a humongous impetus in our health and allied industry.

#### **2. Information & Communication technologies in Medico Legal Practices:**

Undoubtedly, technology and artificial intelligence are revolutionizing health care world-over but the real challenge is to introduce technology based digital solutions in health care delivery systems. In India, the NIMHANS digital academy has performed extremely well in this arena by successfully utilizing digital platforms for training of trainers and delivery of Tele-psychiatry services to cite an example.

Gloomily, nothing has changed much in medico-legal practice of autopsy surgeons in our country. COVID 19 dead body management was really a herculean task to manage for all of us with the minimal infrastructure facilities at various medico

legal centres in different states. However, most centres executed well in dealing with COVID dead bodies.

One of the long pending demands of autopsy surgeons is to digitalize their day-to-day work, enable them to submit reports online and also electronically depose evidence in courts.<sup>1</sup> Receiving **e-requisitions** from the Police/Magistrates, generating software-based medico-legal reports and updating them in the server on real time basis in stipulated timelines will ensure smooth functioning of Forensic Medicine departments and ensure transparency at our end.

Provision must be made for saving photographs and video graphic record of the autopsy/Clinical examination if required in the central server/portal maintained for medico legal services. A digital based platform for medico legal services will solve the major problem of archiving important data at our end (**Fig. 1**). Linking such server with Emergency Medicine and Hospital Administration Departments will also streamline the Clinical Forensic Medical services. Collaboration of the police, agencies conducting ancillary investigations and judiciary is highly required to successfully implement paperless e-medico legal practice (**Fig. 2**). Requests made to the Forensic Science Laboratories and other agencies should be generated online and reports are to be tracked thereafter.<sup>2</sup> Labelling of different containers with specimens for analysis with barcoded stickers generated from the software will also ensure chain of custody of case property and any mismanagement in handling specimens for ancillary investigations.

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**\*Corresponding author:** Dr Ganja Chandra Deepak, Senior Resident, Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences, New Delhi, India. Pin-110049. Email: [deepakggdoc@gmail.com](mailto:deepakggdoc@gmail.com) (M): +91- 9885927887.

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Figure 1: Integrated ICT based Solution for Digital Medico Legal Practice.

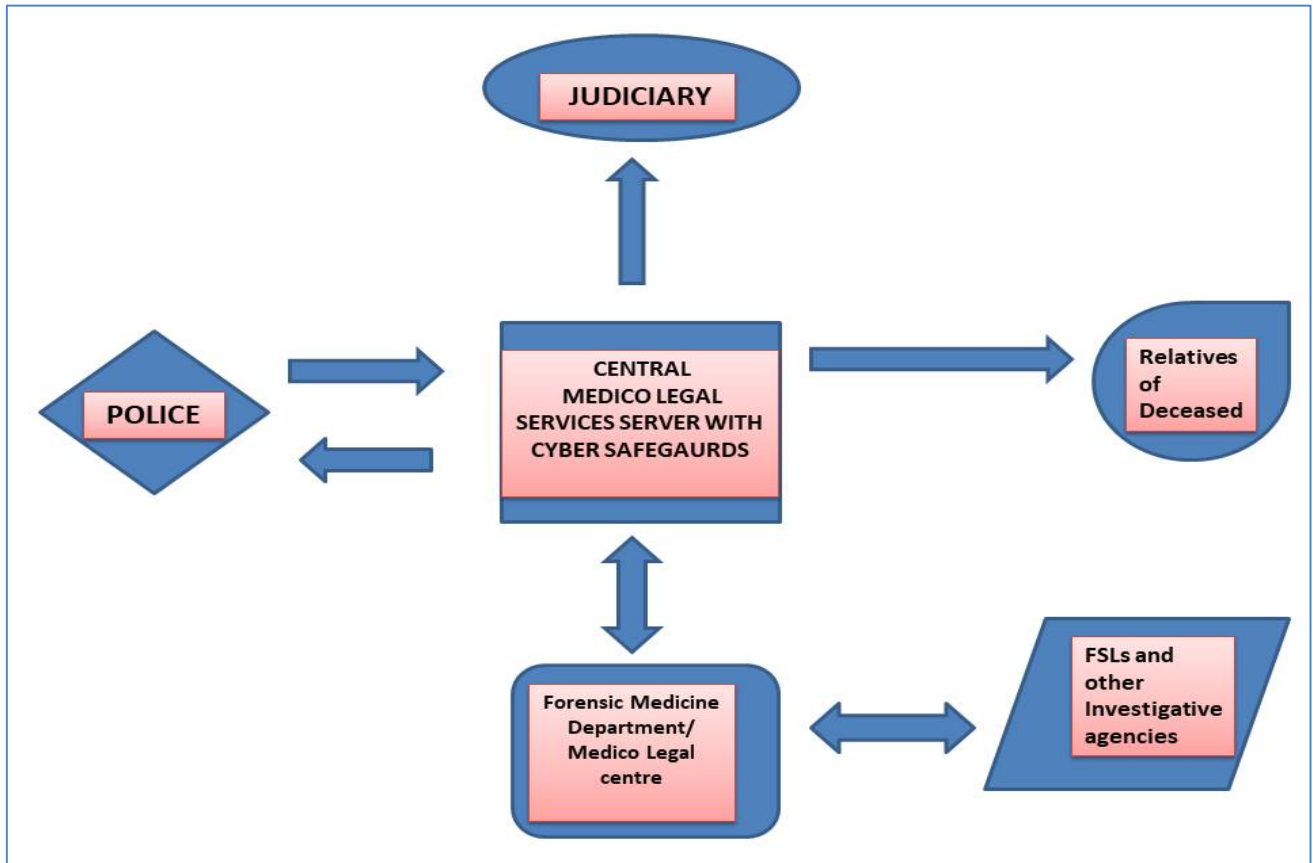
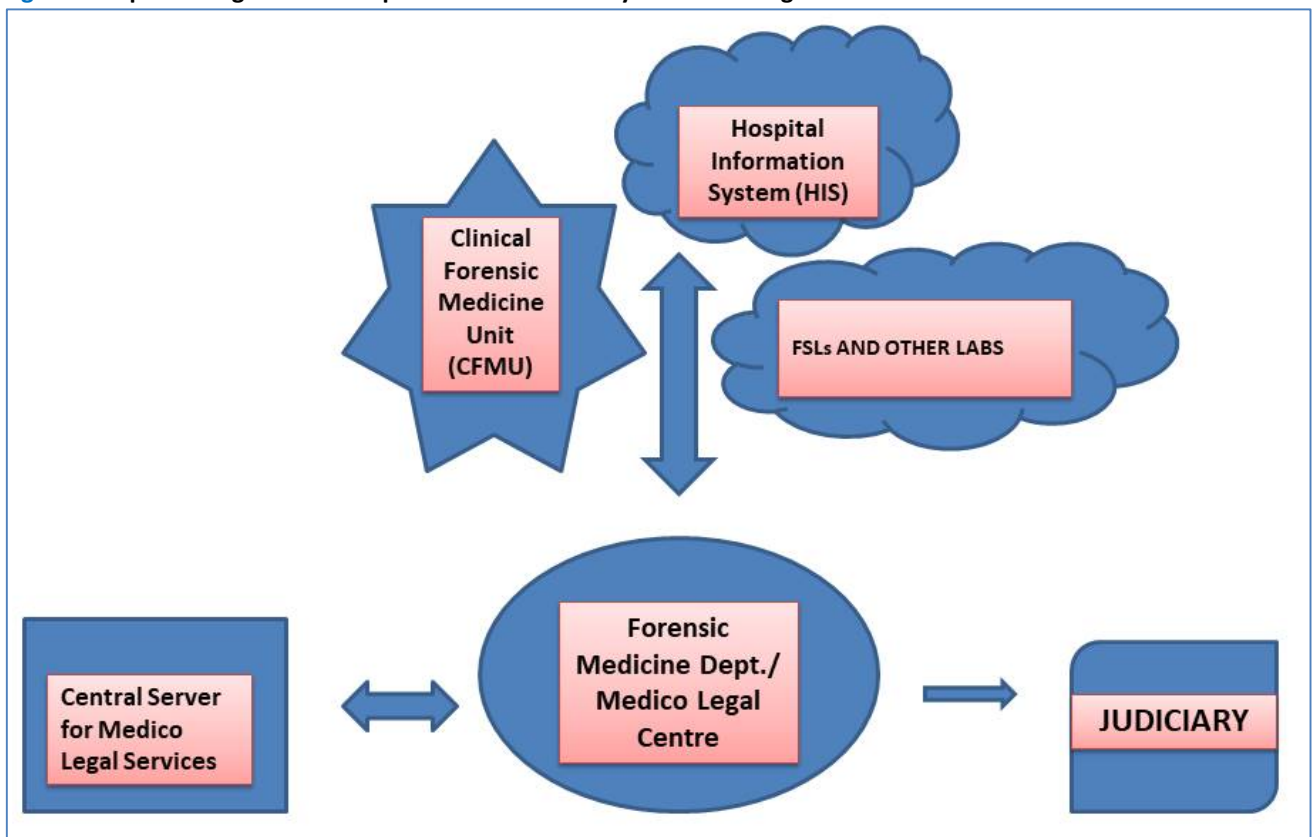


Figure 2: Expected digital intra-loop for Effective delivery of Medico Legal Services.



These changes will usher a new era in policing by improving efficiency, reducing graft and transforming policing in to a more citizen friendly affair. All digital solutions will finally benefit the next of kin of deceased in knowing the cause of death early and also receive reports for claiming insurance and other benefits.

The concerned investigation officer, jurisdictional judicial magistrate and the autopsy surgeon should have access to the all-necessary documents of the case from the same server.

### 3. Existing Digital practices in Medico-Legal Departments

Such digital solutions for Post-mortem Reports and all other medico legal documents were adopted long back by using MedLeapR software<sup>1</sup> in few states like Punjab and Haryana. However, there were connectivity issues that hampered the complete success of the project in the initial days. Some states like Madhya Pradesh also adopted an online platform for common medico legal record generating and archiving. The Madras high court has dealt the matter of impropriety in Forensic Medicine Departments across Tamil Nadu and mandated use of a software throughout the state for medico legal reporting.<sup>2</sup>

Digitalization can help us monitor the practices across centres in dealing with different type of cases, bring in standard operative procedures and ensure they are adhered with and make sure that the functioning of department is transparent and corruption free.

The other major reprieve continuously demanded by Forensic Medicine fraternity is to make electronic court evidence deposing a rule and physical presentation of medical evidence an exception. Fortuitously, many lower courts in the country allowed e-evidence facility for doctors during these pandemic times. This should be continued further hereafter.

In many instances the criminal justice system of our country is very kind towards the accused and allows them for videoconference presence during trial for various law and order reasons or other peculiar causes. Let us hope that they will value the time and efforts of a medico legal practitioner. Moreover, very few cases require cross examination and it shall be not so difficult to accept the proposal of e-court facility for expert witnesses. One can see that the entire higher judiciary is functioning in electronic mode without any hassle ever since COVID fear struck all of us.

### 4. Conclusion:

As the health sector is developing rapidly with respect to use of technology in the day-to-day practices, we reiterate the demand for digitalization in medico legal practice in all states of our country in both reporting and court evidence deposing as well.

### 5. Recommendations

A pilot project interlinking all the stake holders in the medicolegal system should be started at least in one district of each state to know the feasibility, hurdles and efficiency of such digital solutions in day-to-day forensic practices.

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