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# Medico-Legal Update

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# Medico Legal Update

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# Medicolegal Implications of Vascular Trauma: An Institutional Experience

Amrish Kumar<sup>1</sup>, Amit Chaudhary<sup>2</sup>

<sup>1</sup>Additional Professor & HOD, Department of Vascular Surgery, King George's Medical University, Lucknow, UP, <sup>2</sup>Assistant Professor, Vascular Surgery, King George's Medical University, Lucknow.

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## Abstract

**Background:** Vascular trauma is one of the devastating types of injuries. Despite this fact, there is an obvious deficiency in the educational sessions for vascular surgeons concerning the appropriate medicolegal dealing with such injuries.

**Aim:** To highlight the role of vascular limb trauma during present scenario with the medicolegal and clinical findings.

**Methods:** A 5-years retrospective study with a follow up period of 2 years studying the data of peripheral vascular injuries at three specialized trauma centre with special emphasize on the cause, the type, and the outcome of this trauma. Obtained data were statistically analysed using the SPSS computer program (version 23).

**Results:** This study included 1550 trauma patients (987 males and 563 females) who presented with peripheral vascular injuries. The patients' age ranged from < 3 years to >70 years. There was a significant association between the age and the circumstances of trauma. The most encountered causative mechanisms were traffic accidents (45.7%) and firearms (21.7%). There was no significant association between outcome and age ( $p = 0.114$ ) or circumstances of trauma ( $p = 0.208$ ). There was a highly significant association between the outcome and the duration of hospital stay ( $p < 0.001$ ). Lower limb injuries were higher in frequency than upper limb injuries ( $n = 286$  and  $123$ ) respectively. Upper and lower limbs arterial injuries had a significantly higher frequency rate than the venous injuries. Ulnar artery and brachial vein injuries was the most frequently encountered upper limb arterial and venous trauma, while the femoral artery and the deep femoral vein were found to be the most affected lower limb vessels. Bone injuries were the most frequently accompanying injuries (44.6% of total cases).

**Conclusion:** As any sort of injury may possess medical and lawful perspectives, medicolegal investigations have very important position when studying trauma cases, going hand in hand with the clinical aspect.

**Keywords:** vascular trauma; Medicolegal aspects; Road Traffic accidents, Bony Injury

## Introduction

Trauma is accused of 10% of all deaths worldwide, and the fifth leading cause of expressed disabilities (Puanachandra et. al. 2012) remains the

most important public health problem). The the main cause of mortality and disability through the first four decade of life<sup>18</sup>.

The implication of trauma varies from threatening

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**Corresponding Author:** Amit Chaudhary, Assistant Professor, Vascular Surgery, King George's Medical University, Lucknow.

**Email ID:** [amitchaudhary@kgmcindia.edu](mailto:amitchaudhary@kgmcindia.edu)

**Tel:** 8004424674

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life to destruction of mental and physical health as well as, the negative impacts on both frugal and social up growth<sup>16</sup>.

The influence of undue mechanical forces on the body tissues may result in compression, traction, and torsion as well as shearing (Ding et al., 2016). Factors affecting the consequent damage implicate the type of the imposed mechanical force and the nature of the targeted tissues<sup>17</sup>.

One of the important categories of any wound is its inflection's manner whether suicidal or accidental<sup>19</sup>.

They are usually classified into; abrasions (grazes or scratches), contusions (bruises), lacerations (cuts or tears) and incised wounds (slashes or stabs)<sup>21</sup>.

By 2020, injuries are anticipated to exceed communicable diseases on a secular standard as the prime reason of inability.

Developing countries still have a defect in injury prevention programs. This may be caused by many factors such as; the imperfect information for studies, lack of accuracy in detecting trauma bearding and nevertheless, in other areas such as Egypt and according to the World Health Organization (WHO) report, road-related injuries mortality accounts for 2.37% of the total death cases annually. The death rate is 14.46 per 100.000 of population<sup>1,2</sup>

These injuries are one of the grave causes for morbidity and mortality. They are believed as the fifth leading cause of death and the main occasion for hospitalization for approximately one-quarter of all in patients<sup>4,5</sup>.

Vascular trauma whether arterial, venous, and/or blood- rich organ injuries are among the life threatening conditions. They may be due to blunt trauma leading to crushing or stretching to the blood vessel or a penetrating injury resulting in puncture, tearing or severing of a blood vessel<sup>9</sup>.

Vascular trauma may cause clot formation or life-threatening haemorrhage that interrupts. The normal blood flow to the body organs and/or extremities<sup>6</sup>

On the other hand, wall defects, complete or partial transections, as well as arterio-venous fistulae (AVF) may accompany penetrating trauma<sup>10</sup>

Arterial spasm may be caused by blunt or penetrating trauma to the extremities.

A traumatic false aneurysm is formed when the surrounding tissues encapsulate The aim of this study was to retrospectively analyse the cases of limbs' vascular trauma in a period of 5 years with a follow up period of 2 years. It also aimed to describe the available medicolegal aspects beyond such injuries in those cases.

## Patients and Methods

This five years - retrospective study took place from January 2015 to December 2020 with a follow up period of 2 years. It included all patients presented with sustained extremities vascular injuries who were treated at KGMU Trauma Centre After obtaining the approval of the institute ethical committee with regard to the ethical issues of the study, demographic and clinical data, as well as laboratory and radiological findings were reported through each patient's file. Data was analysed and the following relationships were studied:

A) Circumstances of the injuries in relation to age, sex of the studied patients and the origin of trauma.

B) Age and sex in relation to the time they asked medical advice as well as the period of hospital stay after the intervention.

C) The frequencies of the injured vessels in relation to the type and site of injury.

D) Vascular injuries in relation to other accompanied lesions such as musculoskeletal injuries.

Diagnosis was based on the essence of history and both the hard and soft clinical signs of arterial injury (e.g. progressively increasing hematoma, pulsatile bleeding, impalpable distal pulses, the presence of thrill, and bruit)<sup>3</sup>.

Pearson's Chi-square test was applied to examine the association between two variables. Fisher exact or Fisher-Freeman-Halton Exact tests were employed if the expected count was less than five in any cell. Significance was adopted at  $p < 0.05$  for interpretation of results of tests.

## Results

In this study, 1550 victims with limb injuries were included; out of which 563 (36.3%) were women and 987 (63.6%) were men. They were of different ages ranging from 3 years up to 70 years with the mean of  $28.27 \pm 7.83$  years. The most encountered causative mechanisms were road traffic accidents (45.7%) and firearms (21.7%). As the highest incidence of trauma was in age group 20-35 years (males 34.5%, females 8.5%) while the lowest incidence was encountered in age group  $< 4$  with a statistically significant results.

## Discussion

Extremity vascular injuries pose a challenge to most surgeons. It is considered to be a major cause of morbidity and mortality in the developing countries. They are usually due to street offenses, imperfect roads planning, firearms, and other weapons correlated. Trauma as well as self-inflexion<sup>7</sup>.

According to the tort classical deterrence theory, the probability of litigation enforces the health care providers to be more cautious in their practice based on the well established standards of patients care, thereby, enhancing patient outcomes<sup>1,13</sup>

Most of this study population was males (82%).

This can be supported by previously published reports in which number of males is higher than females by variable percentage<sup>17,18,19</sup>

The most affected age group was 20-35 years coinciding with data in the literature<sup>12,14,20</sup>

This might be attributed to the finding that this age category may be commonly exposed to high-risk events as it is considered the most productive age.

In our existing results, traffic accidents were reported as the most common mechanism of vascular trauma (45.7%) leading to either isolated vascular injuries or accompanying limb musculoskeletal fracture. Comparable data was notified in the literature with a variable degree<sup>3,9</sup>.

On the other hand, (Ekimand Tuncer, 2009) had reported penetrating trauma as the main causative mechanism in their study on 49 patients with brachial artery injuries. The results of the current work revealed no significant association between the circumstances

of trauma and sex or the causative mechanism. This may be attributed to the new development of the Saudi society where women are offered more freedom to share in the professional work life as well as the recent permission of car driving. On the other hand, (Mostafa et al., 2002) concluded that gender-specific trauma's frequencies, circumstances, and outcome in favour of males. In this work, most injuries occurred due to assault in 275 patients (78.57%), followed by accidental in (20%), and self-inflicted in (1.43%). This data is contradicting to previously published reports that showed the prevalence of assault injuries to be 63% in Australian (Taylor and Cameron 1998), and 35% in Indian populations (Swarnkar et al., 2016) respectively.

However, self-inflicted injuries were observed in the younger age group (i.e.  $< 20$  years) with a higher incidence rate. This result coincides with that reported in an American study (Bukur et al., 2011; Minami et al., 2014) and with study from Canada (Kayssi et al., The highly significant association between the outcome and the duration of hospital stay proved in this study agreed with that reported in other work investigating the ordinarily applied measurement for quality of care inside the hospitals<sup>11</sup>.

The most encountered lesion in the current study was lower limb trauma (70%) with an injury to the superficial femoral artery coinciding with a previously published<sup>13</sup>.

Arterial injuries showed a significantly increased rate compared to those presented with the venous injury. Both upper and lower extremity arterial injuries accounted for (26.2% and 48.9%), respectively. This may be compared to those presented with venous injuries as it accounted for (3.9% and 21%) in the upper and lower limbs, respectively. Previous studies reported an increased incidence of lower extremity more than upper extremity vascular injuries that consistent with the report in this literature<sup>9</sup>.

The second most encountered pathology following vascular injury in patients with multiple injuries was the bony fracture (44.6%). This result is approximately similar to a reported percentage of 37% in the literature<sup>7</sup>.

The complications of traumatic extremity injuries were observed in most of our treated victims 50.85%

(n=178), while 46 cases (13.4%) had impaired limb function and disability. This functional disability was coinciding with that reported in others literature<sup>19</sup>. It may raise an important issue as regards the legal compensations and the quality of life.

### Conclusion

Traffic accidents are the most accused reason for vascular limb injuries followed by gunshot either assault or self-inflicted. The current work had investigated numerous points of forensic interest in relation to vascular trauma but because it was conducted in a retrospective manner, the medicolegal data obtained from the patients' files are fewer if compared with those acquired from autopsy or recently injured cases. This might reflect the defects in forensic dealing with all cases of trauma and hence throw light on the importance of the proper forensic documentation with such injuries. This appropriate documentation might be of great significance for both patients and surgeons especially in cases liable to develop legal and/medicolegal consequences.

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## Sudden Death Due to Myxomatous Degeneration of Cardiac Valves: A Case Report

Bindu Samuel<sup>1</sup>, Dipu Mohan<sup>2</sup>

<sup>1,2</sup>Assistant Professor in Forensic Medicine, Government Medical College, Kollam, Kerala.

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### Abstract

Sudden death occurs from unnatural as well as from natural causes. Forensic pathologists usually encounter cases of sudden death which occurred in apparently healthy individuals under suspicious circumstances. Most of the cases have known history of a natural diseases but unfortunately in few cases, the pathology is revealed only during autopsy. We report a case of sudden death due to mitral valve prolapse in a young boy during a scuffle after sustaining a trivial trauma.

**Key words:** Sudden death, trivial trauma, myxomatous degeneration.

### Introduction

The World Health Organization (WHO) definition of sudden death according to the International classification of diseases, version 10 (ICD-10) is death, non-violent and not otherwise explained, occurring less than 24 hours from the onset of symptoms. <sup>(1)</sup> Causes of sudden death can be divided into natural and unnatural. Forensic pathologists are necessary to give an opinion in a court of law regarding the cause of death and its medico-legal interpretation in cases where an individual dies after receiving non-fatal injuries and a natural pathology is revealed during autopsy. When a person with no previous history of any known symptoms of natural disease dies immediately after an assault, the law officials is more likely to give an association of the death with the trauma. <sup>(2)</sup> The degree of relationship of trauma to disease in such cases should be clearly interpreted. In cases where a combination of injury and disease is seen, before giving opinion, the forensic pathologist

must examine all available facts, medical documents, findings at post mortem and histopathological examination.

**Case report:** 18 year old boy was brought dead to a tertiary care hospital with an alleged history of sudden collapse following a verbal argument and scuffle with his friends at school. Police filed the case under section 174 Cr Pc and brought for medicolegal autopsy. History of the case revealed that he had history of mild abdominal discomfort for one week before death, for which no treatment was taken. There was no family history of sudden cardiac death. On external examination the deceased was moderately built and nourished. Abdomen was slightly distended. Few antemortem injuries were present on the body which occurred during the scuffle which were non-fatal. On internal examination, the intima of aorta showed numerous atherosclerotic fatty streaks. Heart weighed 400 grams, flabby and showed petechial hemorrhages on the front and

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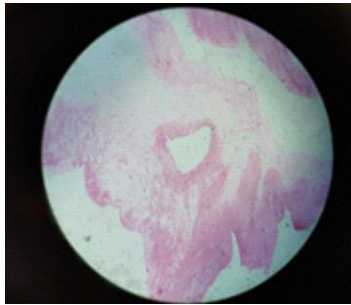
**Corresponding Author:** Dipu Mohan, Assistant Professor in Forensic Medicine, Government Medical College, Kollam, Kerala.

**Email ID:** drdipumohan@gmail.com

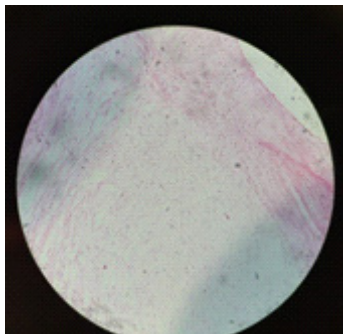
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back wall of both ventricles. Mitral valve measured 12cm Peritoneal cavity contained 400ml of straw coloured fluid. The viscera and blood were sent for toxicological analysis and reported as negative for poisons.

Histopathology of the heart revealed thickening with extensive myxomatous degeneration of the cardiac valves.(figure 1 and 2)



**Figure 1**



**Figure 2.**

### **Discussion**

Forensic pathologists may encounter cases in which deaths occur following a scuffle after sustaining minor injuries and the police officials register the cases under unnatural death and bring for autopsy<sup>(2)</sup>. Even the relatives are not convinced after getting the reliable reports regarding the cause of death. The forensic pathologist has to explain the court and the police officials the degree of contribution of trauma to death in such cases.<sup>(5)</sup>

In the majority of such cases the deceased has history of symptoms suggestive of some natural illness, but in few cases the pathology is revealed only during autopsy.<sup>(4)</sup> Opinion regarding the cause of death in cases following trauma should be given after getting detailed history, police investigation reports about the circumstances of death,

toxicological and histopathological reports. Even if a natural cause of death is obtained, the contribution to death from minor trauma and emotional stress and pain cannot be excluded. The stress associated with the circumstances lead to increased secretion of catecholamine which in turn cause fatal arrhythmia especially in people with preexisting heart disease. Myxomatous degeneration of the cardiac valves is usually asymptomatic and is seen in young individuals and usually it goes undetected and is commonly associated with mitral valve prolapse.<sup>(5)</sup> Approximately 3% develop complications of Infective endocarditis, mitral insufficiency, stroke and arrhythmias leading to heart failure and sudden death is a very rare complication. In this case probably a fatal arrhythmia may be the terminal event. One would have to do a complete autopsy, including a thorough toxicological screen, to exclude other possible causes of death before making a diagnosis.<sup>(5)</sup> The emotional upset in a fight can cause death due to sudden release of adrenaline which rises blood pressure or tachycardia that may precipitate an arrhythmia. The mechanism of death in such a case may be cardiac arrhythmia related to underlying heart disease, but initiated by the emotional and physical stress. The physical and emotional stress due to an assault contributes the cause of death.

A person may die of shock without any marks of violence. Sudden death may occur in circumstances in which a victim is subjected to fear of real danger from the assailant. Co-morbid conditions like heart disease, hypertension, and diabetes mellitus can render the victim more vulnerable to stress reaction. In such circumstances, death may occur during the event or may lead to death even an hour after the threatening situation has passed.

### **Conclusion**

Sudden death may occur during an excitement, mental tension evoked by an assault by another person sustaining trivial trauma, when the question of homicidal death has to be clarified<sup>(6)</sup>. The medicolegal importance of death because of disease and injury or effort together has also to be kept in mind. After autopsy a natural death may turn out to be natural and vice versa. The medicolegal interpretation of relationship of death and the disease

or injury has to be kept in mind before giving an opinion regarding the cause of death.<sup>(7)</sup> The findings and conclusions need to be given in a sturdy way to support an opinion.

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# Study of Pedestrian Injuries and Fatalities in Road accidents at Tertiary Care Hospital in Maharashtra

Ganesh Dhondiraj Niturkar<sup>1</sup>, Arvind Rangnathrao Harbade<sup>2</sup>, K. U.Zine<sup>3</sup>

<sup>1</sup>Associate Professor, <sup>2</sup>Senior Resident, <sup>3</sup>Professor and Head, Department of Forensic Medicine and Toxicology, Government Medical College and Hospital Panchakki Road, Aurangabad Maharashtra.

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## Abstract

**Background:** The Majority of the roads are narrow in India and unrepaired with multiple pits. Heavy traffic, rash and negligent driving lead to injuries to pedestrians and also cause fatal accidents.

**Method:** 450 pedestrians were brought to the Government Medical College and Hospital, Aurangabad, and studied. Out of 450 cases, 63 (14%) had fatal fractures that were studied with an x-ray, CT scan, or MRI. Serious pedestrians were admitted to the ICU; the remaining was treated by Orthopaedics and neurosurgeons.

**Results:** 128 (23.4%) were alcoholics, 54 (12%) had a visual problem, and 15 (3.2%) had Auditory problem: 38 (8.44%) were mentally challenged (also included cases with psychiatric illness), 51 (11.3%) were on antidepressant treatment, 104 (23.1%) were busy in mobile speaking, and 60 (13.3%) were playing on the roadside. Maximum fractures observed were 107 (22.8%); cranial haemorrhage was followed by 98 (21.7%) fracture of the skull. There were 02 (0.44%) injuries to the kidney superficially or subcutaneously as four wheelers and two wheelers hit the pedestrians at the lumbar region, 3 (0.66%) in the aorta. The fatalities were 63 (14%). Among them, 40 (63.4%) had haemorrhage and shock; 16 (25.3%) had head injuries; 5 (7.93%) had septicaemia; and 2 (3.10%) had uraemia.

**Conclusion:** Well-built roads, fencing or barriers for pedestrians, awareness of traffic rules, and stringent punishment for both pedestrians and drivers of vehicles violating traffic rules can minimize pedestrian road accidents and fatalities.

**Keywords:** Intracranial, haemorrhage, Fatalities, Skull fractures, speaking on mobile, mentally challenged

## Introduction

Road Traffic accidents analysis require to conducting in-depth collision analysis identifying the collision, causation and contributing factors in different types of collisions including the role of the drivers and pedestrian, vehicle's roadways, and types of road environments<sup>(1)</sup>.

Pedestrians are common road users in India; increasing traffic on roadside has led to major injuries and fatalities of pedestrians<sup>(2)</sup>. The incidence of injuries and fatalities is significantly higher than in car occupants or motorcyclists in road accidents, which are further increasing at an alarming rate<sup>(3)</sup>. The cause of pedestrian injuries and fatalities are bilateral<sup>(4)</sup>. It includes the role of, drivers also. Hence an attempt

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**Corresponding Author:** Ganesh Dhondiraj Niturkar, Associate Professor, Department of Forensic Medicine and Toxicology, Government Medical College and Hospital Panchakki Road, Aurangabad Maharashtra.

**Email ID:** nitukarg@gmail.com

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is made to evaluate the various type of injuries of pedestrians and fatalities of various age groups.

### Material and Methods

450 (Four Hundred Fifty) injured, pedestrians aged between 10 to 70 years, brought to Government Medical College and Hospital Panchakki Road, Aurangabad were studied.

**Inclusive criteria:** pedestrian of different age groups of 10 to 70 years old were hurried to cross the roads, many of them were alcoholic, visually, auditory challenged, and mentally challenged (also included cases with psychiatric illness) were selected for the study.

**Exclusion criteria:** The pedestrian who had the intention to commit suicide, reported in the MLC report were excluded from the study.

**Method:** Out of 450 Pedestrians injuries, 63 (14%) had fatalities, injuries to the different parts of the body, fractures of the skull, intracranial haemorrhage fractures of long bones, and multiple trauma recorded from x-ray, USG, CT scan/MRI (if necessary) in injured pedestrian, medico-legal case reports, additional information was collected from relatives and police department. Serious or unconscious were admitted to ICU units, remaining were referred to orthopaedic and Neuro Physician, Neurosurgeon.

The duration of the study was January - 2022 to January - 2023.

**Statistical analysis:** Causes of pedestrian injury to viscera, and head injuries history of pedestrians were classified with percentage. The statistical analysis was carried out in SPSS software. The ratio of male and female's were 2:1

**Table 1: History of the Pedestrian injuries and fatalities**

(No. of patients: 450)

Sl. No	Details	No. of Cases	Percentage (%)
1	Alcoholic	128	28.4
2	Visual problem	54	12
3	Auditory problems	15	3.33
4	<b>Mentally challenged</b>		
	a) Mentally retarded	38	8.44
	b) Patients on antidepressant	51	11.3
5	Busy in mobile speaking	104	23.1
6	Playing roadside	60	13.3

**Table 2: Study of injuries to the pedestrian**

(No. of patients: 450)

Sl. No	Parts or organs involved	No. of Patients	Percentage (%)
1	Fractures of sternum	41	9.11
2	Heart	9	2.0
3	Lungs (external or superficial)	28	6.22
4	Aorta	03	0.66
5	Stomach	11	2.44
6	Liver	38	8.44
7	Spleen	14	3.11
8	Kidney	02	0.44
9	Fracture of skull	98	21.7
10	Intra Cranial haemorrhage	102	22.6
11	Fractures of long bones	38	8.44
12	Multiple fractures	43	9.55

**Table 3: Cause of fatalities in pedestrians**

(No. of patients: 63)

Sl. No	Cause of Death	No. of Patients	Percentage (%)
1	Head Injuries and intra cranial Haemorrhage	16	25.3
2	Haemorrhage and Shock	40	63.4
3	Septicaemia	5	7.93
4	Uraemia	2	3.17

### Observation and Results

**Table-1:** History of the pedestrian injuries and fatalities – 128 (28.4%) were alcoholic, 54 (12%) had a visual problems, 15 (3.3%) had an auditory problems, 38(8.44%) were Mentally challenged (also included cases with psychiatric illness), 51 (11.3%) were on antidepressant treatment, 104 (23.1%) were busy in mobile speaking, 60 (13.3%) were playing on the roadside.

**Table-2:** Study of injuries to pedestrians 4 (9.11%) had a fractures of the sternum 9 (2%) were injured to the heart, 28(6.2%) to the lungs (external or superficial), 3(0.66%) to the Aorta, 11(2.44%) to the stomach, 38(8.44%) to the liver, 14(3.11%) spleen, 2(0.44%) kidney, 98(21.7%) fractures of the skull, 102 (22.6%) had intracranial haemorrhage, 38 (8.44%) had a fractures to long bones, and 43(9.22%) had multiples fracture.

**Table-3:** Causes of fatalities – 16 (25.3%) had head injuries and intra cranial, hemorrhage, 5(7.93%) had hemorrhagic shock, 2(3.17%) had Uremia.

### Discussion

The Present study of pedestrian injuries and fatalities, in accidents in Maharashtra population. 128(28.4%) alcoholic, 54(12.1%) visual problem pedestrians, 15(3.33%) had Auditory problems, 38(8.44%) were mentally challenged (also included cases with psychiatric illness), 51 (11.3%) were on antidepressant treatment, 104(23.1%) were busy in Mobile speaking, and 60(13.3%) were playing on the roadside (Table-1). 4(9.11%) had Fractures of the sternum, 9(2%) injury to the heart, 28(6.22%) to the lungs (external or superficial), 3(0.66%) to Aorta, 11(2.44%) to the stomach, 38(8.44%) to the liver, 14(3.11%) spleen, 2(0.44%) to the kidney, 98

(21.7%) had a fractures of the skull, 102 (22.6%) had intracranial haemorrhage, 38 (8.44%) fractures of the long bone, and 43 (9.55%) had multiple fractures (Table-2). The cause of fatalities were 16 (25.3%) head injuries and intracranial haemorrhage, 40(63.4%) haemorrhage And shock, 5 (7.93%) had septicaemia, 2 (3.17%) had Uraemia (Table-4) These findings were more or less in agreement with previous studies<sup>(4)(5)(6)</sup>.

A Pedestrian can be defined as a person on foot, walking running jogging, hiking, sitting, or lying down. Walking transport modes, where relatively unprotected road users interact with traffic of high speed and mass. This make pedestrian vulnerable. They suffer the most severe consequences in collisions with other road users interacting with traffic of high speed and mass. of the vehicle against him/her<sup>(7)</sup>. Collisions between pedestrians and bicyclists or motor vehicles are the major problems in the countries that are becoming motorized and high rates of walking and bicycling<sup>(8)</sup>. Pedestrians are commonly referred to as vulnerable road users because in collisions with motor vehicles the lack of protective structure and differences in mass height make their injury susceptibility, protecting the mischallenge be cause road infra structure typically have built for motor vehicles with little attention to those that moving on foot who may wish to travel on or alongside roads or cross them or change direction at intersections<sup>(9)</sup>.

The injuries and fatalities of the pedestrian can be divided into three phase s (stages):- pre-crash, crash and post-crash. Pre-crash is the phase of prevention. The crash phase is the traumatic event that involves the exchange of energy or kinematics (mechanics of energy). Lastly ,the post-crash phase of patientcares.<sup>10</sup>

The pedestrian's road crossing behaviour has been explained in the terms of minimum gap

acceptance value by using a rolling gap. The driver's yielding of this minimum gap acceptance plays a vital role in a pedestrian to escape from collision which may cause injury or fatalities<sup>11</sup>. Pedestrian crossing or passing the unidentified or prohibited area may cause injuries and fatalities. Most of the pedestrians were impatient and could not wait for the passage of trains, vehicles, Lorries, etc, and were more vulnerable to getting injured and fatalities.

### Summary and Conclusion

The present study of pedestrian injuries and fatalities highlights the Causes and types of injuries and deaths. Moreover, it is advocated that wide, safe roads; deployment of more traffic police force, the stringent punishment can mitigate such accidents. In addition to this awareness programs of traffic rules for both pedestrians and drivers will be more effective to control road accidents.

Limitation of the study: Owing to the tertiary location of a research center, a small number of patients and lack of the latest technologies, we have limited findings and results.

This research paper was approved by the Ethical Committee of Government Medical College and Hospital Panchakki Road, Aurangabad Maharashtra-431001

Conflict of Interest: No

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# The Development of Health Massage Establishments Participation Model under COVID-19 Situation in Phetchabun, Thailand

Kiattisak Saeio<sup>1</sup>, Boadsaporn Anusornpanichakul<sup>2</sup>

<sup>1</sup>Sirindhorn College of Public Health Phitsanulok, Faculty of Public Health College and Allied Health Sciences, Praboromarajchanok institute, Wangthong Phitsanulok, Thailand, <sup>2</sup>Department of Consumer Protection and Public Health Pharmacy, Phetchabun Provincial Public Health, Mueang Phetchabun, Thailand

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## Abstract

The purpose of research was to study participation towards Phetchabun health massage establishments under COVID-19 situation. Informal interview, in-depth interview, and participation observation were carried out respectively. Purposive sampling was used with 15 health consumer protection officers in charge; 11 district level, 2 provincial level, 2 regional level as well as each representative of 11 districts. Then group discussion was performed with each service provider representative of 3 zones, each resident representatives of 3 zones which were village health volunteers, and 4 officials in charge; 3 district level, 1 provincial level. After implemented, participation processes were classified into four phases. First of all, input were recent COVID-19 situation as well as involved regulations and laws. Secondly, participation steps were decision-making and planning, implementation, benefits, and evaluation. Thirdly, output were activities done as planned, the establishments standardized as prescribed, and cooperation network built. Lastly, outcomes were clients were assured of hygienic and safe service, circulating fund was increased in economic system, and tourist attractions were become. In summary, as the networks of health massage establishments were built, they served as significant channels to exchange experiences, to share knowledge, to send messages, and to encourage. Clients were provided standardizes services that they firmly believed safety and clean services. Government officers deeply understood the providers and the practitioners of authentic practices in communities while they achieved their performance objectives. Since the standardized services attracted more clients, their incomes were risen.

**Keywords:** Health Massage Establishments, Government Officers, Participation Model, COVID-19, Personal Health Practice

## Introduction

Due to COVID-19 spread, health massage establishments were considered that a risk business for contracting; therefore, they were forced to shut down. Department of Health Service Support, was authorized to regulate health establishments, realized

impacts towards practitioners and service providers; as a results, "Preparation Guidelines for Health Spa, Health Massage, and Beauty Massage to Promote Health Tourism During COVID-19 Pandemic" was issued and granted which they were required to strictly accomplish before reopen business<sup>1</sup>. They also adapted services following regulations and

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**Corresponding Author:** Kiattisak Saeio, Sirindhorn College of Public Health Phitsanulok, Faculty of Public Health College and Allied Health Sciences, Praboromarajchanok institute, Wangthong Phitsanulok, Thailand.

**Email ID:** [kiattisak@scphpl.ac.th](mailto:kiattisak@scphpl.ac.th)

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measures provided that became challenges for them. The Preparation Guidelines were implemented throughout the country that Phetchabun with 11 districts divided into three zones, was included.

Participation plays a vital role in people’s management of their own affairs<sup>2</sup>. The participation is a systematic process involving a group of individuals in decision-making affecting their lives. It also includes implementing programs of participants, their benefits sharing, and their efforts to evaluate such projects<sup>3</sup>. Sherry Arnstein (1969) stated that participation can enhance local’s empowerment, can promote effectiveness of projects, and can foster development inwardly<sup>4</sup>. In addition, it can create ownership of development process and place rural people in position to identify, determine and control their priorities for actions<sup>5</sup>. Community participation is considered as a main point for good governance. The United Nation (2005) proposed that community participation is a means to enable society members actively participate in development processes, to influence it, and to live up to outcomes of development which can increase accountability and transparency<sup>6</sup>. Most important agencies believed that sustainable development cannot achieve goals without participation and involvement of community in particular programs<sup>7</sup>. Community development, as a method for purposive change, associated with people in community area to plan, to do things together, and to find suitable solutions to their problems for better living materially and socially. For achievable and long term development, it is essential to ensure the participation and active contribution of all members in society as a whole in design of the community development programs<sup>8</sup>.

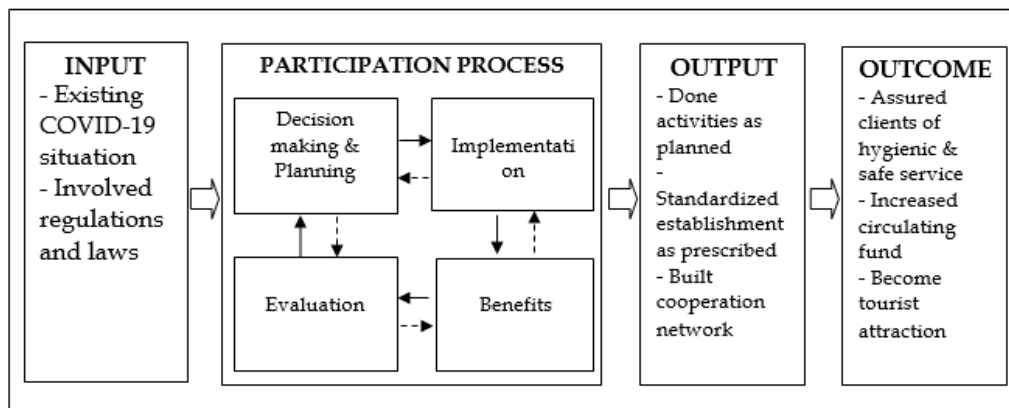
However, researcher purposed to investigate the participation of Phetchabun health massage establishments under COVID-19 situation.

**Methods**

This research adopted informal interview, in-depth interview, and participant observation, respectively. Purposive sampling was used and data collection was carried out with 15 health consumer protection officers in charge; 11 district level, 2 provincial level, 2 regional level as well as each representative of 11 districts. After that, group discussion was managed with each service provider representative of 3 zones, each resident representatives of 3 zones which were village health volunteers, and 4 officials in charge; 3 district level, 1 provincial level. Validity and reliability of instruments were also assessed. Later, content analysis was conducted and triangulation method was used for data validation.

**Results**

After investigated, participation processes for the health massage establishment development in the study were divided into 4 phases. Firstly, input were recent COVID-19 situation as well as involved regulations and laws. Secondly, participation steps were decision making and planning, implementing, benefiting, and evaluating. Thirdly, output were activities done as planned, the establishments standardized as prescribed, and cooperation network built. Lastly, outcomes were clients were assured of hygienic and safe service, circulating fund was increased in economic system, and tourist attractions were become as shown in Figure 1.



**Figure 1: Participation processes towards heath massage establishments**

As displayed above, there were explanations of 4 participation steps.

1) Decision-making and planning: respondents had a meeting to collect data of existing COVID-19 situation, problems, and needs. Officers introduced involved regulations and laws and provided knowledge about participation. Their facility requirements were identified then mutual agreement was explored. Next, functions, activity schedule, and performance process were specified. While having discussion, officials introduced useful and practical participation activities to establishment providers (EPs). Later, they presented perceived information to other providers in communities and they were allowed to select an appropriate activity. After that, they were allowed to design their own development plan with academic framework for their context under regulations and laws. There were found that village community method was used in some rural areas while voting method via LINE Application was carried out in some urban areas. On the other hand, the provincial officials conducted using appreciative inquiry. Although there were different methods used, various "good models" were discovered.

2) Implementation: both the EPs and the officials were asked for collaboration with informal ways to perform activities as scheduled. While resources and facilities were supported, the officials provided useful suggestions as a member in the community as well. After the EPs performing, positive encouragements which were certifications and compliments were provided to whom achieved the Preparation Guidelines. After implementing, the EPs felt anxious about performances which were irregularly managed while any operations and activities were not recorded systematically. Hence, it was proposed that the officials should observe and take note while practicing so that the plan was progressed. They also asked for assistance of other organizations such as Department of Skill Development and institutes with certified health massage course to participate in community activities.

3) Benefits: after implementation their health massage establishments were standardized whereas practitioners and providers gained more knowledge and developed essential skills so that they safely serviced with self-confidence. They felt pride of

their profession then network of the establishments was created. Besides, the official performances were fulfilled as prescribed ministry indicators. It was expected that number of unstandardized establishments were decreased resulted in official inspections were reduced. They increasingly also understood various circumstance of the providers. While the network was built, channels to ask for collaboration were easier and more convenient. Moreover, they were found different examples for further developments. In addition, community network was risen that caused additional activities were arranged. People were advertised their improved standards, then number of clients was increased with their risen incomes. The establishments were also became tourist attractions with higher circulating funds in the community. In addition, they were not embarrassed to be open-minded and to express opinions to the officers. They had accessible ways to ask for assistance or cooperation and had confidence with upgraded service. However, these participants took part for lesson learned after performance (After Action Review).

4) Evaluation: the provincial officials mainly functioned to follow and inspect the performances while the representatives observed overall of the operations. The district officials were major examiners each district and the representatives monitored the performances. The evaluation was carried out every quarter and at the end of the fiscal year which it was divided into 2 parts. Firstly, activities and programs were examined they were whether accomplished as planned or not. Then, problems and barriers were explored as well as solutions. Secondly, their learning knowledge exchange was enhanced while feedbacks were provided. Empowerment visit with having compliments and encouragements was arranged which these were to collect data for further operations.

## Discussion

Division of Consumer Protection and Pharmaceutical is a major agency to promote, enhance and regulate the health establishments in Phetchabun which authorized district and provincial officers to provide knowledge, to improve service provider potential, to develop connection and participation,

and to receive and deal with complaints. Along with the Preparation Guidelines, officials of the Division of Consumer Protection and Pharmaceutical performed based on Provincial Orders and Notifications of the Communicable Disease Committee so that it was suitable in their circumstances.

After the participation investigated, there were some discussions of the processes.

1) Decision making and planning: The participants both public and private sectors gathered to brainstorm with common goal of health massage establishment development. The officials certainly provided opportunities to heartily hear opinions' people because members in communities were crucial stakeholders<sup>9</sup>. Also, they actuated members to share and exchange knowledge about concept and importance of participation throughout the processes; as a result, people were not embarrassed to express their demands. After that, establishment providers and practitioners became independent to define their needs and problems in specific environment. While they were influenced to design and plan activities, district officials facilitated and consulted. Yuvadee Phongrod et al. (2021) stated that giving chances for members in villages and communities significantly plays a role<sup>10</sup>. They explicitly understood their strengths and weaknesses responding to local desires and changing circumstances which they directly involved ownership of the programs: they will be empowered and will manage over decision affecting on their lives<sup>7</sup>. Moreover, the development activities were under principles with assistance of district officials. While participation of communities produced various good practices for either their establishments or tourism features, provincial officials investigated the good practices using appreciative inquiry.

Furthermore, all stakeholders in different conditions selected accessible and suitable operations for development projects. For example, participants in rural society employed village community to share visions and ideas how to plan, do, check, and act the activities (PDCA). Piyanush Ngernklay et al. (2020) proposed that community forum was arranged for development participation with exact issues and timing<sup>11</sup>. Then, written and spoken notifications were done for locals. Usman Bappi et al. (2018) mentioned

that people generally were informed about community topic and were interested in resolving it, felt they can be more effective in working in groups<sup>8</sup>. They also managed their time to collect involved information for showing opinions. In the meantime, villagers in urban areas participated in by voting via LINE Application.

2) Implementation: the officials informed formally and informally concerned information to community members to encourage positive attitude towards activities. The participants willingly engaged in the planned activities in order to achieve. While implementing the district officials gave consults about academic approaches, regulations, laws and facilitated. On the other hand, the provincial officials played a major role to perform appreciative inquiry because informants had satisfied experiences to participate in the activities using AI in previous study of health massage establishments. So, they realized its benefits and presented to communities. However, the locals were provided chances to independently select appropriate methods enhancing their participation. Kitima Chumart and Kamolporn Kanlyanamitra (2017) proposed that publicity was a vital factor to promote collaboration both public and private sectors that people informed its advantages voluntarily participated in<sup>12</sup>. Nevertheless, the sectors specified certain functions in the projects and were aware of their roles so that performances were managed successfully and effectively.

3) Benefits: the programs achieved its objectives then the participants recognized benefits of their involvement. Later, they received a share of project benefits. Siriluk Khumphiranont and Anchana NaRanong (2020) proposed that expectation of mutual benefit was the most influential factor contributed to successful collaboration among government, private sector and civil society<sup>13</sup>. Piyanush Ngernklay et al. (2020) stated that the government officers should be truly open-minded to friendly hear people's opinion, complaints, challenges, and limitations through accessible and different channels such as opinion boxes, hotlines, and websites<sup>11</sup>. Besides, After Action Review: AAR was proposed to carry out to improve effective knowledge for further projects. Similarly, benefits of development promoted pride and self-reliance especially villagers in the community.

Nevertheless, providing opportunity to participate in other aspects significantly effected to receive mental and physical benefits such as valuable community pride and clean environment<sup>14</sup>.

4) Evaluation: the participants engaged in the appraisal of work done focused on program operations and how outcomes were achieved. After implementing they exchanged their experiences to discover advantages and disadvantages then they recognized improvements that can be made. Suraphop Nakonchom and Napatsawan Thanaphonganan (2022) mentioned that evaluation carried out before, during, post performances greatly enhanced participation of teachers and educational personnel so that they took part in sharing and exchanging to provide practical suggestions for development<sup>15</sup>. While district officials played a crucial role to control the operation, representatives of stakeholders engaged 3-month monitoring and at the end of the fiscal year. On the other hand, the provincial officials were leaders of evaluation whereas the representatives examined overall of the practices. Nongnuch Yaboonna et al. (2017) and Thitilina Chaipiarn (2015) also proposed that both villages and leaders should continually spread the news and their performances through various channels such as bulletin board, website, social media, and local radio that it can enhance community participation for further development<sup>16, 17</sup>.

### Recommendations

1. Policy recommendation: the health massage establishments were supported to strengthen networks for self-development and solve problems under participation.

2. Research recommendations: studies of factors towards participation to develop establishments were studied. Strategies development of health establishments were also investigated for authentic practices in context.

### Conclusion

As the networks of health massage establishments were built, they served as significant channels to exchange experiences, to share knowledge, to send messages, and to encourage. Clients were provided standardizes services that they firmly believed safety

and clean services. Government officers deeply understood the providers and the practitioners of authentic practices in communities while they achieved their performance objectives. Since the standardized services attracted more clients, their incomes were risen. Moreover, all contributors with unities were assumed as a considerable part to reach mutual goals and benefits. Leaders of involved sectors also encouraged members to realize importance of participation. Clarified communication that could reach exact targets were a drive to strengthen participation; meanwhile, frequent activities were included. Public sectors were required to support useful academic source.

### ETHIC

The study was approved by the Ethics Committee for Human Research, Phetchabun Provincial Public Health Office 2/2564 Project number: Sor Sor CHor.2/64-14-25/06/64. All participants provided written informed consent.

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**Conflict of Interest:** Nil

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## Pattern of Medicolegal Cases Reported at a Tertiary Care Centre, Udaipur, Rajasthan: A Retrospective Study

Pranav Kumar<sup>1</sup>, Pooja Singh<sup>2</sup>, Shantilal Pargi<sup>3</sup>, Khusboo Kumari<sup>4</sup>, Anis Ahmed<sup>5</sup>

<sup>1</sup>Associate Professor, Department of Forensic Medicine, <sup>2</sup>Assistant Professor, Department of Pharmacology, <sup>4</sup>Postgraduate Student, Department of Biochemistry, <sup>5</sup>Professor and Head, Department of Forensic Medicine, Pacific Institute of Medical Sciences, Udaipur, <sup>3</sup>Associate Professor, Department of Forensic Medicine, Ananta Institute of Medical Science & Research Center, Rajsamand

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### Abstract

A medicolegal case is a case of injury or illness where the attending doctor, after taking history and clinical examination of the patient, thinks that some investigation by law enforcement agencies is essential to establish and fix responsibility for the case in accordance with the law of the land. It is a responsibility of a registered medical practitioner to judge each case properly and in doubtful cases, it is better to inform the police. This saves the doctor from unnecessary and needless allegations later. This study was carried out retrospectively on Pattern of Medicolegal Cases reported to casualty department of Pacific Institute of Medical Sciences, Udaipur, a tertiary care teaching hospital from 1st January 2022 to 31st December 2022. The main objectives of the study were to highlight the pattern of medicolegal cases. Data was collected and analyzed. Out of 297 cases studied, RTA constitutes a majority of cases (61.95%), followed by poisoning (15.83%), trauma by animal (8.08%) and fall from height (4.04%). 241 (81.15%) were males and 56 (18.85%) were females. The majority of the victims belonged to 21-30 years of age 91 (30.64%). The rural victims constituted 245 (82.50%) compared to the urban counterparts, 52 (17.50%). Maximum number of medicolegal cases reported to casualty between 12 pm - 6 pm, 108 (36.36%). Most of the cases were reported during rainy season 117 (39.39%). The study concludes that the burden of medicolegal cases demands exact fixation of MLC, proper documentation, report submission, prevention and its rational management.

**Key Words:** Medicolegal cases (MLC), Road Traffic Accident (RTA), Pattern, Casualty department.

### Introduction

A medicolegal case is a case of injury or illness where the attending doctor, after taking history and clinical examination of the patient, thinks that some investigation by law enforcement agencies is essential to establish and fix responsibility for the case in accordance with the law of the land. It is the

responsibility of a registered medical practitioner to judge each case properly and in doubtful cases, it is better to inform the police. This saves the doctor from unnecessary and needless allegations later.<sup>1</sup>

The casualty department is the backbone of every hospital. It deals not only with medical and surgical emergencies round the clock but also deals with a

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**Corresponding Author:** Pranav Kumar, Associate Professor, Department of Forensic Medicine, Pacific Institute of Medical Sciences, Udaipur, Rajasthan.

**Email ID:** docpranav3@gmail.com

**Mobile:** 9045840598

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huge number of medicolegal cases which comprises accidents, assaults, burns, poisoning, sudden deaths, operative deaths, suicide, homicide, any suspicious deaths and cases referred from police or court.<sup>2</sup>

The pattern of medicolegal cases is of importance for those, who are directly or indirectly concerned with law and order, who treat them and also who are bothered with etiology, manner of causation and their documentation.

The present study attempts to highlight the pattern of medicolegal cases reported at a tertiary care centre, PIMS, Udaipur, Rajasthan. The result of this study could be useful in interpreting the pattern of medicolegal cases and then strategic planning can be made accordingly for the benefit of the community and people at large in this region.

### Material and Method

The present study was conducted in the casualty department of Pacific Institute of Medical Sciences, Udaipur, a tertiary care teaching hospital from 1st January 2022 to 31st December 2022. During this period a total of 297 medicolegal cases recorded in the medicolegal register of the hospital were included in the study. This study is a retrospective study, and the main objective of the study was to highlight the pattern of medicolegal cases. Information regarding various parameters of the study were obtained in standardized proforma from medicolegal register and hospital record of individual patient. The relevant data thus obtained was analyzed and observations were presented in tables and compared with other studies.

**Inclusion Criteria:** All cases which were registered as medicolegal case and entered in medicolegal register in casualty department of Pacific Institute of Medical Sciences, Udaipur.

**Exclusion Criteria:** Any medicolegal case who admitted before and after the start of this study.

### Observations and Results

In this one-year retrospective study from 1 January 2022 to 31 December 2022, a total number of 297 medicolegal cases were reported and studied. Out of all cases, maximum number of cases were RTA (61.95%) followed by poisoning (15.83%), trauma by animal (8.08%) and fall from height (4.04%). (Table 1)

Present study showed that out of total cases reported in casualty, male cases (81.15%) predominant over female cases (18.85%). (Table 2) It is also observed that maximum cases were between 21-30 years of age (30.64%) followed by between 11-20 years (21.55%), 31-40 years (21.55%). Number of medicolegal cases reported between the age, 11-20 year and 31-40 year were same (21.55%). Minimum cases (4.04%) were reported at age 61 & above years. (Table 3)

In our study, also observed that more numbers of victims belong to rural habitat (82.50%) as compared to urban habitat (17.50%). (Table 4) Maximum number of cases were reported between 12 p.m. to 6 p.m. (36.36%) followed by 6 p.m. to 12 a.m. (36.03%), 6 a.m. to 12 p.m. (16.84%). Time of arrival of cases was the time mentioned in medicolegal register. It was observed that minimum cases were reported between 12 a.m. to 6 am (10.77%). (Table 5)

In our study maximum number of cases registered in casualty were in rainy season (39.39%) followed by winter season (36.03%). Minimum number of cases reported in summer season (24.58%). (Table 6)

**Table 1: Patterns of Medicolegal Cases**

Types of Medicolegal Cases	Cases (N)	Percentage (%)
Injury by self	3	1.01
Firearm injuries	2	0.67
RTA	184	61.95
Thermal injuries	6	2.02
Violent asphyxia	4	1.35
Sexual offences	0	0.0
Assault	7	2.35
Fall from height	12	4.04
Trauma by animal	24	8.08
Poisoning	47	15.83
Brought dead	8	2.69
Total	297	100

**Table 2: Sex wise Distribution**

Sex	Medico legal cases (N)	Parentage (%)
Male	241	81.15
Female	56	18.85
Total	297	100

**Table 3: Age Wise Distribution**

Age(years)	Causes (N)	Percentage (%)
0-10	20	6.74
11-20	64	21.55
21-30	91	30.64
31-40	64	21.55
41-50	30	10.10
51-60	16	5.38
61 & above	12	4.04
Total	297	100

**Table 4: Rural/Urban Wise Distribution**

Habitation	Number of cases	Percentage (%)
Rural	245	82.50
Urban	52	17.50
Total	297	100

**Table 5: Time of Arrival at Casualty**

Time	Cases (N)	Percentage (%)
6 am-12 pm	50	16.84
12 pm-6 pm	108	36.36
6 pm-12 am	107	36.03
12 am-6 am	32	10.77
Total	297	100

**Table 6: Season Wise Distribution**

Season	Cases (N)	Percentage (%)
Summer (March-June)	73	24.58
Rainy (July-October)	117	39.39
Winter (November-February)	107	36.03
Total	297	100

## Discussion

In the present study, a total of 297 medicolegal cases were reported to casualty department of a tertiary care hospital, PIMS, Udaipur. Out of which, maximum number of cases reported to casualty were Road Traffic Accidents, 184 (61.95%) followed by Poisoning 47 (15.83%) which is consistent with other studies<sup>3,4,7-10</sup> reason being hilly area, poor road

condition, not-following the traffic rules, rash driving and increasing population day by day.

Malik Y. et. al.<sup>5</sup> & Yadav A. et. al.<sup>6</sup> studies showed that maximum cases reported to casualty were of poisoning, which differs from present study, reason may be these two studies conducted in rural area, where most of the people are farmer, uses pesticides in their agricultural activities and easy availability of pesticides among them makes them prone.

In our study, it was observed that most of the victims were male 241 (81.15%) than female 56 (18.85%) which is consistent with other Studies<sup>3-6,9,10</sup> reason being males are more exposed to outdoor activities, their dominance in the society and they have to work outside to earn daily bread, while females usually stay at home.

In our study most victims 91 (30.64%) were from age group 21-30 year followed by 31-40 year 64 (21.55%) and 11-20 Year 64 (21.55%) which is similar to other studies. (3-6,9,10) the reason being that they are active, economically productive and involved in outdoor activities.

In this study, the majority of the medicolegal cases comprised of rural population 245 (82.50%) as compared to the urban 52 (17.50%) which is consistent with other studies.<sup>6,11</sup> reason being our medical college is situated in rural area, hence patients from rural area are more than the patients residing in urban area. As majority lives in rural areas having low level of education, poor condition of basic amenities and land disputes that run into generations makes them prone.

In this study, maximum number of medicolegal cases reported to casualty between 12 pm - 6 pm, 108 (36.36%) reason behind most of the people involved in outdoor activities during this period of time and minimum reported between 12 am - 6 am, 32 (10.77%) during this time people usually remain asleep. which is consistent with other studies.<sup>3,4,7,9</sup>

Season wise distribution of medicolegal cases revealed that majority i.e. 117 (39.39%) presented during rainy season, followed by winter 107 (36.03%) and summer 73 (24.58%) which is consistent with other studies<sup>3,4</sup> reason being hilly area with narrow gaze road, become slippery with altered visibility



during rainy season.

### Conclusion

In our study, Rural, Young age (21-30 yrs) males are commonly involved, and Road traffic accidents are one of the leading pattern among medicolegal cases followed by poisoning and trauma etc. comprising a considerable public health problem. The magnitude of problem needs to be addressed and comprehensive approach for preventive strategies ought to be developed by public health authorities.

The emergency department of any medical college not only treats the patients but also carry out legal duties like examination, documentation and reporting of medicolegal cases. which puts a lot of burden on the emergency department and the duty doctor, mostly they are MBBS only, not an expert in forensic medicine, need to be trained in handling medicolegal cases.

The duty doctor should be well acquainted with the guidelines when dealing with medicolegal cases. Reorientation courses and Continuing Medical Education programs of casualty duty doctor are recommended for getting acquainted with the management & handling of medicolegal cases.

A uniform Medicolegal Manual must be formulated by National Medical Commission (NMC) i.e "How to Handle Medicolegal Cases."

RTA cases can be reduced by implementing strict road traffic rules, improving the road condition by concerned authorities, at the same time users of the road and vehicles also realize their responsibility in following traffic rules.

**Conflict of Interest:** Nil

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# A Manner Wise Distribution of Fire-Arm Cases According to Major Body Part Involved among Fatal and Non-Fatal Fire-Arm Injuries at Sms Hospital Jaipur: A Prospective Study

Shantilal Pargi<sup>1</sup>, Lovekumar Bhagora<sup>2</sup>, Rohit Kumar Meena<sup>3</sup>,  
Manoj Sharma<sup>4</sup>, Brijesh Tatwal<sup>5</sup>

<sup>1</sup>Associate Professor, Dept. of Forensic Medicine, Ananta Institute of Medical Science & Research center, Rajsamand, Rajasthan. <sup>2</sup>Associate Professor, Dept. of Forensic Medicine, Nootan Medical College & Research Centre, Visnagar, Gujarat. <sup>3,4&5</sup>Medical Officer, Dept. of Medical & Health, Rajasthan.

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## Abstract

**Background :** Invention of fire was the greatest invention for the human from primitive matchlock system to the present automatic weapons. It has become the most dreaded killing tool used by human being. Proper examination of the victims of firearm injuries needs to ascertain the characteristics of wound and body part involved to correlate with fatalities.

**Methods:** A total of 115 cases of gunshot injury were included in this study carried out at the Department of Forensic Medicine, SMS Medical College and Hospital, Jaipur over a period of 17 months from mid of May 2014 to beginning of August 2015, after seeking permission and ethical clearance.

**Results:** During Study period total 115 cases were included in study. We observe finding after dividing human body in five body region for better understanding. The commonest targeted body parts were the peripheries including the upper and lower limbs (33.04%). The next to follow was the chest in 36 cases (31.30%). Abdomen including pelvis was targeted in 18.26% cases and head was the soft target in only 14.78% cases. Least affected body part was neck with only 3 cases.

**Conclusion:** In 73.04% (84) cases, only a single body region was inflicted upon by use of firearm weapon. In fatal cases (11) of firearm injuries, head (54.55%) was the most commonly targeted body part followed by chest (36.36%) and abdomen (9.09%). This study indicated that the most common victims of firearm injuries were young males of bread earning age. Certain changes may minimize mortality and disability due to firearm injuries, also reducing the costs to the community. So, there is a need to decrease the number of firearms used and sold in India.

**Keywords:** Firearm Injury, Prospective study, Jaipur

## Introduction

Firearm is any instrument or device designed to propel a projectile by means of explosion of gases

generated by combustion of an explosive substance<sup>1</sup>. Invention of fire was the greatest invention for the human being but the invention of firearm weapon

**Corresponding Author:** Lovekumar Bhagora, Associate Professor, Dept. of Forensic Medicine, Nootan Medical College & Research Centre, Sakalchand Patel University, Visnagar, Mehsana.

**Email ID:** lovebhagora2000@yahoo.com

**Mobile:** 9586502020

has come as curse to this world, it has become the most dreaded killing tool used by human being. It is improving day by day from primitive matchlock system of fire arm to the present automatic and semiautomatic weapons<sup>2</sup>. Firearm injury is a global problem and causes considerable problems in a developing country like ours, where poverty and violence are common. Gunshot injuries in civilian environment are now a common phenomenon globally with wide regional variation worldwide<sup>3</sup>. Most firearm injuries are the result of enmity, communal clashes, domestic disputes, or suicides. Firearms have been used, and continue to be used, both for homicidal and suicidal purposes, offering an easy and quick mode of injury or death.

The availability of fire arm known as small arms and light weapons has been described as a cancer spreading across the developing world<sup>4</sup>. It destabilizes political, social, and economic systems, and leads to disability and death.

This study was thus undertaken to assess the medico-legal profile of gun-shot injuries in Jaipur region and also to suggest few recommendations which may prove useful in bringing down the toll of firearm injuries in this region.

### Aims and Objectives

1. Study distribution of Fire-Arm Cases according to Major Body Part Involved Among fatal and non fatal Fire-arm Injuries.
2. Correlation of fire arm injuries with manner of injuries according to body region involved.
3. To suggest recommendations for preventing fire arm injuries so precious human life can be saved.

### Material and Methods

After seeking due permissions and ethical clearances, this study was initiated at the Department of Forensic Medicine, SMS Medical College, Jaipur in Mid May, 2014. The proposed study period was of one year or until the achievement of the pre-determined sample size of 115 cases. 23,584 medico-legal cases reported at the Department of Forensic Medicine, SMS Hospital, among them 115 firearm injuries cases were included in study after satisfying the inclusion and exclusion criteria. Each

living victim was medico-legally examined after receiving written informed consent for the same. The personal details pertaining to socio-demographic profile were recorded in detail followed by physical examination regarding the wounds sustained, their number, size, shape, site and characteristic features of firearm injuries, extent of injuries, clinical condition of the patient and final outcome. The cases either received dead or who succumb to the firearm injuries sustained in due course of treatment were subjected to post mortem examination at the mortuary of SMS Hospital, Jaipur. The details of firearm wounds were noted as mentioned above along with the examination into cause of death in those cases. All the observations were recorded in the pre proposed Proforma as detailed above. These were then transferred to Microsoft excel data sheet and statistically analyzed using SPSS statistical software into quantitative data in tabulated.

### Result

**Table 1: Distribution of 115 Victims of Firearm Injuries according to number of body regions affected with gun-shot injuries.**

Number of Body Region involved	Number of cases	Percentage
Single	84	73.04
Two	21	18.26
More than two	10	8.70
Grand Total	115	100

A single body region was involved in 73.04% cases and in rest of the 31 cases more than one body region was involved, being two in 18.26% cases and more than 2 in 8.70% cases.

**Table 2: Distribution of 115 Victims of Firearm Injuries according to the primarily targeted body part in gun-shot injuries. n = 115**

Body Part affected	No. of cases	Percentage
Periphery	38	33.04
Chest	36	31.30
Abdomen	21	18.26
Head & Face	17	14.78
Neck	03	2.61
Total	115	100

The commonest targeted body parts were the peripheries including the upper and lower limbs (33.04%). The next to follow was the chest in 36 cases (31.30%). Abdomen including pelvis was targeted

in 18.26% cases and head was the soft target in only 14.78% cases. Least affected body part was neck with only 3 cases.

**Table 3: Distribution of 11 Victims of Firearm Injuries according to the targeted body part in gun-shot injuries and cause of death in fatal cases.**

Major Body Part Involved	Cause of Death			Total No. of cases	Percentage
	Coma	Haemorrhagic Shock	Septicaemic Shock		
Head	05	00	01	06	54.55
Chest	00	04	00	04	36.36
Abdomen	00	01	00	01	09.09
Neck	00	00	00	00	00
Periphery	00	00	00	00	00
Total	05	05	01	11	100

The anatomical locations of fatal gunshot injuries were determined in all 11 cases. The head (54.55%) was the most common site of fatal gun-shot injuries followed by chest (36.36%). In 9.09% cases the fatal gunshot was an abdominal region and resulted in

death due to haemorrhagic shock. A single case of head injury died due to septicaemic shock. All cases of fire arm injuries on the chest region also died due to shock and haemorrhagic.

**Table 4: Distribution of 115 Victims of Firearm Injuries according to the targeted body part in gun-shot injuries and manner of incidences.**

Body Parts	Manner of Incidence				Total No. of cases	Percentage
	No. of Homicidal case	No. of Accidental case	Unknown Cases	No. of Suicidal case		
Periphery	32	06	00	00	38	33.04
Chest	28	07	01	00	36	31.30
Abdomen	17	02	02	00	21	18.26
Head	11	03	01	02	17	14.78
Neck	02	01	00	00	3	2.61
Total	90	19	04	02	115	100

Trunk region was the commonest target in homicidal cases in 50% cases with extremities being the next common site of gun-shot injuries. Head was the vulnerable target in suicidal cases (100%).

Accidental gun-shot injuries was seen in all body parts almost with equal preponderance. The least commonly affected body part was neck in all types of cases.

**Table 5: Distribution of 115 Victims of Firearm Injuries according to the targeted body part in gun-shot injuries and range of fire.**

Body Parts	Range of fire					Total	Percentage
	Distant	Undetermined	Contact	Close	Near		
Periphery	22	12	02	02	00	38	33.04
Chest	15	19	01	00	01	36	31.30
Abdomen	11	09	00	01	00	21	18.26
Head	11	01	05	00	00	17	14.78
Neck	01	01	00	01	00	03	2.61
Total	60	42	08	04	01	115	100

The distant shots were targeted to all body parts with almost an equal preponderance with maximum numbers in extremities (36.66%). Whereas, the contact wounds were majorly targeted on the head region of body (62.5%) cases.

**Table 6: Distribution of 115 Victims of Firearm Injuries according to the vital organ primarily affected in fatal cases.**

Vital Organ Primarily affected	Number of cases	Percentage
Brain	06	54.55
Heart & Lung	02	18.18
Intestine	01	9.09
Liver	01	9.09
Undetermined	01	9.09
Total	11	100

Out of 11 fatal cases of gun-shot injuries, brain was the most commonly affected vital organ (54.55%) followed by heart (18.18%), liver & Intestine in one case each. In a single case of gunshot injury of an unidentified individual whose dead body was recovered as partially skeletonized being in the advanced stage of putrefaction, foreign bodies were recovered from both skull and thoracic cage due to which the vital organ primarily affected could not be assessed definitely.

### Discussion

In 73.04% cases, only a single body region was inflicted upon by use of firearm weapon. In 18.26% cases there was involvement of two body regions and in 8.7% cases, more than two body regions were affected.

Chest (31.3%) remained the most commonly targeted body region in this study followed by abdominal region (18.26%) and, head & face (14.78%). These results bear slight variation with those of Kumari S et al<sup>5</sup> (most common site was abdomen- 30.9%, followed by chest- 21% and head- 16%). In 33.04% cases firearm wounds were found on peripheries and neck was the least affected part of the body (2.61%); and those of Sachan R et al<sup>6</sup>, where abdomen followed by head & neck was the commonest site.

In fatal cases (11 cases) of firearm injuries, head (54.55%) was the most commonly targeted body part

followed by chest (36.36%) and abdomen (9.09%); similar to observations of Pradipkumar KH et al<sup>3</sup>. Head region also remained the target in both cases of suicidal deaths being the most vulnerable site for suicide with firearm weapon. But, these are variable from those of Kumar R et al<sup>7</sup> and Patowary AJ et al<sup>2</sup>; where chest followed by neck and head; and, Kumar K et al<sup>10</sup>, where chest followed by head were the most commonly offended body parts in fatal cases with 25% fatal entry wounds in abdomino-pelvic region too. In the present study, peripheries and neck were not affected in fatal gun-shot injuries as also reported by Kumar K et al<sup>10</sup>, who reported only 7% firearm wounds in lower limbs in fatal cases.

In our study Chest (28 cases) followed by abdomen (17 cases) were the most commonly targeted region in homicidal (cases 90) gun-shot injuries. Trunk region was the commonest target in homicidal cases in 50% cases with extremities being the next common site of gun-shot injuries (32 cases). Head was the vulnerable target in suicidal cases (2 case; 100%). Accidental (cases 19) firearm injuries were quite evenly distributed over all body regions, as accidents can happen anyway without a set pattern. But this findings were slight variable those from Amiri A et al<sup>8</sup> where 42.6% of entrance wounds were located in the head, 42.6% in the chest, and 16.7% in the back.; Abbas AD et al<sup>9</sup>, where The most common site of injury was the chest (67 cases; 25.0%).

Head was affected most commonly in contact wounds (05 cases) followed by periphery (two case). This is quite explainable as head is considered a soft target and a vulnerable body part for trauma of any sort. Close range fires were found in abdominal & neck regions and peripheral parts of the body. Distant fires were well distributed over all body parts possibly due to non accurate hit of target in distant fire as most assailants were not well trained for use of firearm weapons.

Brain and meninges (54.55%) were the most commonly injured vital organ in fatal cases followed by lung& heart (18.18%); similar to that reported by Kumar R et al<sup>7</sup>. However, this was not so in the observations of Kumar K et al<sup>10</sup>, who reported highest involvement of lungs (29%) followed brain, stomach and intestine (16% each). Liver and intestines were the least affected internal organs in this study (9.09%

each); which is again quite low as that reported by, Kumar K et al<sup>10</sup>; but the differences are easily attributable to the differences of the pattern of gun-shot injuries sustained by victims in the two studies. No other vital structures were observed to be affected in fatal cases of gun-shot injuries.

### Conclusion

The results of the present study support the argument that rigorous pursuit of campaign firearms without a license and country made guns may prove useful in reducing the number of firearm injuries in society. Educational efforts, and individual, community and societal approaches are needed to alleviate firearm related injuries. Government must take the following steps to prevent firearm injuries.

- Proper employment facility for the youth.
- Social stability and creation of proper political environment
- Strong and effective measures to control the unlicensed arms.
- Need to eliminate illegal gun making units in our region in order to decrease the rate of firearm fatalities.
- Private gun ownership should be strictly limited.
- The issue of medical certificates for acquiring license of fire arms should be strictly monitored for psychiatric assessment.
- Proper protective gear for the police and defense personals.
- There should be proper training of maintenance, cleaning & handling of fire arm weapons at the time of sale to minimise accidental gunshot injuries.

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**Conflict of Interest:** Nil

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**Ethical Clearance-** It is taken from the Ethical committee of SMS Medical College, Jaipur before starting of study.

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### **The following guidelines should be noted:**

- The article must be submitted by e-mail only. Hard copy not needed. Send article as attachment in e-mail.
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- As a policy matter, journal encourages articles regarding new concepts and new information.
- Article should have a Title
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- Key words
- Introduction or back ground
- Material and Methods
- Findings
- Conclusion
- Discussion
- Acknowledgements
- Interest of conflict
- References in Vancouver style.
- Please quote references in text by superscripting
- Word limit 2500-3000 words, MSWORD Format, single file

All articles should be sent to: **[medicolegalupdate@gmail.com](mailto:medicolegalupdate@gmail.com)**

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Website: [www.medicolegalupdate.org](http://www.medicolegalupdate.org)



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Sector- 32, Noida - 201 301 (Uttar Pradesh)  
Ph. 0120- 429 4015, Email: medicolegalupdate@gmail.com,  
Website: www.medicolegalupdate.org

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