

Wound Ballistic Study in Varanasi Region

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Abstract: *Introduction:* A firearm is a convenient method of destroying human life from a distance and at the same time allowing easy escape to the assailant. Locally made illegal firearms are commonly encountered in criminal cases in India and other developing countries as they are cheap and easily available to criminals. Though in western countries, suicidal firearm injury is very common, in this region of the world, it is usually used in homicide cases. The alarming increase in trend of using firearm for committing homicide has led to need of study of firearm and related cases in Varanasi region. *Material and method:* The study was carried out in the Department of Forensic Medicine, Institute of Medical Sciences; Banaras Hindu University on 54 victims of fatal firearm injuries brought to the autopsy room of the department. *Conclusion:* Despite the extent and consequences of these injuries worldwide, a systemic collection of local data on firearm morbidity and mortality is lacking, the current study helps in establishing such data for this region.

Keywords: firearm, country-made firearm, homicide, volitional activity

1. Introduction

A firearm is a thermodynamic machine in which potential energy of the gun powder is transformed into the kinetic energy of the projectile [1]. It is a specialized device to propel a projectile (shot/bullet/missile) by the expansive force of gases generated as a result of combustion of the propellant (powder) at its base in a closed space. This combustion results in building up of optimum pressure which forces the missile out of the muzzle with sufficient velocity resulting in firearm injury [2]. Firearms in criminal investigation and trials have been assuming an ever increasing importance. Mainly due to the following factors like heinous crimes in which firearms are involved are increasing in frequency as well as the ballistics evidence is easily understood and accepted by the courts [3]. Legislation intended to reduce availability often seem to have impact only on those with lawful need of reason for possession rather than on those with intent to use firearm for criminal purpose⁴. The present study is done to gain an inside into the epidemiological and medico-legal trend of deaths due to firearms injuries to help in the process of criminal investigation and administration of justice in courts. According to the recent statistical data published by NCRB for 2016 the maximum number of firearm related deaths was reported in U.P. Out of the 4889 murder committed in this state, firearms accounted for 1483 murders. This is 30.33% of all murders committed in U.P among these only 181 victims were murdered by the use of licensed firearm, rest 1302 were murdered by the use of unlicensed firearm. U.P. has reported maximum number of seizure of arms under Arms act, 1959 followed by M.P. and Rajasthan [5].

2. Material and Method

A total 54 cases of fatal firearm injuries were studied. This study was carried out in the Department of Forensic Medicine, Institute of Medical Sciences; Banaras Hindu University. The autopsy was done in post-mortem room of this department. History and background of the case was

obtained from relatives and investigating officers of the cases respectively.

3. Observation and Result

Table 1: Incidences of fatal firearm injuries in medicolegal autopsies

Total number of autopsies	Fatal firearm injuries	
	Total number	Percentage
3534	54	1.52

The above table shows that total number of fatal firearms injury cases was 54 (1.52%).

Table 2: Age and sex distribution of victims of fatal firearm injuries

Age group (year)	Male	Female	number	Percentage
11 to 20	2	-	2	3.7
21 to 30	21	-	21	38.88
31 to 40	15	-	15	27.77
41 to 50	8	1	9	16.66
51 to 60	5	-	5	9.25
61 to 70	1	-	1	1.85
71 to 80	1	-	1	1.85

The above table shows age and sex distribution of victims of firearm injuries. It is observed that most of the victims (98.15%) were male and only one victim (1.85%) was female. Over majority (66.65%) were young adult in the age group of 21-40years. 13% were old aged (51years or above)

Table 3: Manner of death in fatal firearm injuries

Manner	Number	Percentage
Accident	5	9.25
Homicide	44	81.48
Suicide	3	5.55
Not known	2	3.7

Above table shows manner of death in fatal firearm injury, homicide account for maximum percentage 81.48% followed by accident 9.25% and suicide 5.55%. In 3.7% of cases manner of death was not known.

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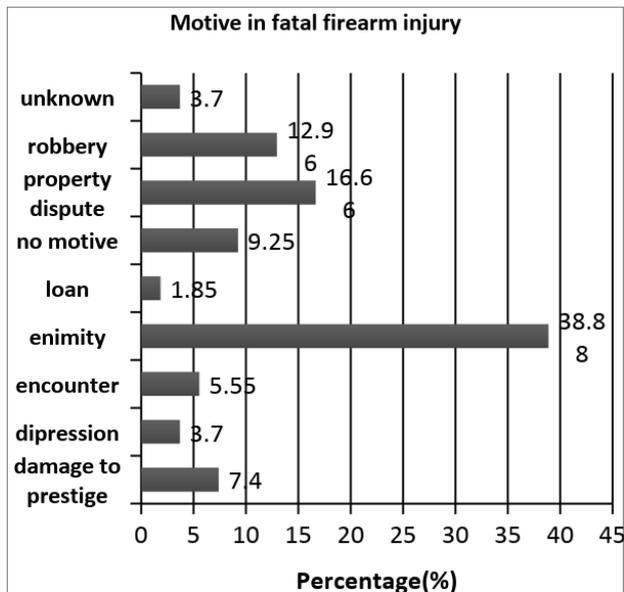


Figure 4: Motive in fatal firearm injuries

The above figure shows that in majority of cases motive was enmity (38.88%) followed by property dispute(46.66%), robbery(12.96%) encounter(5.55%) depression (3.7%) and loan(1.85%). No motive was reported in 9.25% of cases and in 3.7% of cases motive remains unknown.

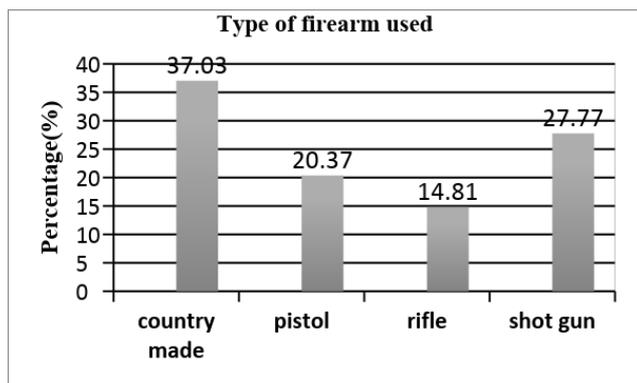


Figure 5: Type of firearm used

Above table shows country made firearms (37.03%) were used in maximum cases followed by shotgun (27.77%), pistol (20.37%) and rifle (14.81%).

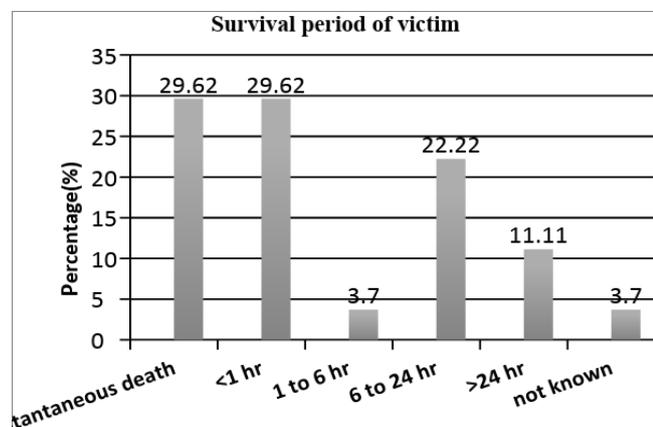


Figure 6: Survival period of victim

Above table shows that in 29.62% of cases victim's death was instantaneous. Victim survived for less than one hour in

29.62% of cases followed by 6-24 hours (22.22%), the survival for more than 24 hours was observed in 11.11% of cases. Survival of 3.7% of victims could not be ascertained as only dead body was recovered.

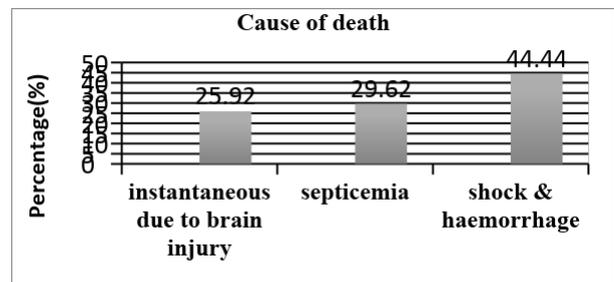


Figure 7: Cause of death

The above table on cause of death in fatal firearm injury shows that maximum (44.44%) victims died due to shock and haemorrhage followed by septicemia(29.62%) and 25.92% of victims died instantaneously due to brain injury.

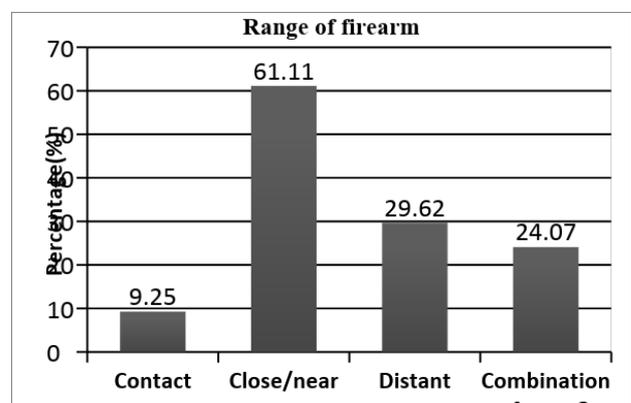


Figure 8: Range of firearm

Table given above on range of firearm discharge shows that maximum number of victims (61.11%) of fatal firearm injuries were shot from close/near range. This was followed by distant range in 29.62% and in only 9.25% of cases range was contact. In 24.07% of cases range was combination of near and distant.

Figure 9: Situation of entry wound.

Situation of entry wound	Number	Percentage
Head	18	33.33
Face	1	1.85
Neck	3	5.55
Chest	29	53.07
Abdomen	12	22.22
Upper extremity	3	5.55
Lower extremity	3	5.55
Multiple body parts	11	20.37

Table given above shows that in maximum (53.07%) victims, location of entry wound was on chest, followed by head (33.33%), abdomen (22.22%), multiple body parts (20.37%). Upper extremities, lower extremity and neck were involved in 5.55% each. In only 1.85% cases entry wound was found on skull.

4. Discussion

Use of firearms for the purpose of homicide provides a great deal of surety with respect to fatal injuries to victims. Firearms are available easily and are cheap. Even physically weaker person can use this lethal weapon to hurt physically stronger person. There are a number of factors that are likely to make firearm both physically and psychologically easier to kill with in comparison to the other commonly used non-firearm weapons of homicide. It usually requires less proximity, less strength, less agility, less skill and squeamishness and offer less opportunity for self-defense to the victim. In our study we found that most of the victims were male, it is supported by the fact that males generally are more aggressive and being more exposed to stress and frustration in day to day activities tend to react more likewise the age group with highest percentage of involvement is young adult, as this age group bears family responsibilities and hence interact with people more. They are more likely to get violent or become victim of such incidences once they are involved in any sort of clash.

Manner of death found in this area is in highest frequency for homicide. Though homicide due to firearm is decreasing due to strict laws regarding licensing of firearms as well as encounter of many high profile criminals but still the use of country made firearms is increasing. Accidental firing in wedding ceremonies account for 9.25%, which is the second highest. This is due to the fact that personal firearm weapons are a prestige symbol for land lords, local leaders, business men, gangster and politicians in this region and ceremonies are a great opportunity to flaunt these lethal weapons.

The conducted study reveals that the motive behind fatal gunshot cases is enmity in maximum number of cases. Through the use of firearm there are high chances of victim's death and hence a surety of revenge.

In developing countries, in some rural and poor areas of other countries, in subversion and terrorism, and sometimes in juvenile hands, weapons and ammunitions may be "home-made". These are common in India, here the name country made is well understood [6]. Country made firearms are cheap, easily available and do not require license. They also provide great tissue damage and no precise targeting is required. This has led to an increase in use of these firearms in recent times.

The survival of the victims depends on the cause of death, i.e. whether from shock and haemorrhage, injury to a vital organ or septic complications. Likewise the amount of activity a victim can perform depends on many factors. The victim may not be aware of the injury initially. Pain is suppressed by adrenaline response of "flight or fight" and vigorous activity may be maintained for a period of up to a few minutes when the will exists (volitional activity). Such activity will cease when physical factors, such as blood loss lead to immobility, loss of consciousness or death.

Extensive destruction of the frontal lobes of brain may permit some activity before death occurs. If the injury involves the motor area of brain, brainstem, basal ganglia, medulla or cervical cord or there is laceration of the heart or

aorta, the victim becomes incapacitated immediately. The amount and rapidity of blood loss will also help to form an opinion about the amount of physical activity possible[7]. Most of the victims had close contact wounds as a close contact provides surety of shot hitting the intended target (victim) as well as eliminates the possibility of mis-aiming. There is no need to be in very near proximity of victim as it may increase the chances of victims defending him.

Common area of injury is the chest as it provides a larger area for aiming. In chest even if shot penetration is minimal severe damage to the pleura and lungs may occur from the impact, and death may occur from a haemothorax with or without lung laceration or contusion [6]. Not all the assailants are sharp shooter and so majority of them aim at chest to increase the probability of shot hitting the target (victim). Chest also contains vital organs and rupture of any of these vital organs or combination of these organs produces death for sure.

5. Conclusion

The results of our data analysis confirm those of other literature reports. However, few differences have been observed with regard to the incidence of fatal firearm injury, type of weapon used and motives.

The overall incidence of fatal firearm injury has reduced as compared to previous studies conducted in this area. One of the reasons for this is legal restriction on license to personal firearm weapons. Though overall incidence of fatal firearm injury is reduced because of legal restrictions, the incidence of firearm injury due to country made gun has increased which are illegally produced, easily available and are cheap.

Single firing was prominent in our study, but this is not the case everywhere with some regions of the world having a predominance of multiple homicidal firing.

In our region homicides are more common than any other manner of death.

To prevent such killing, there should be combined effort from all sections of society, strong and effective measures should be taken to control the use of unlicensed arms. There is need to eliminate illegal gun making units in our region in order to decrease the rate of firearm fatalities. There should be social stability and creation of proper political environment.

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Conflict of interest: Nil

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Ethical clearance

The present study was approved by “Institutional Ethical Committee” of Institute of Medical Sciences, Banaras Hindu University, Varanasi. All the information has been taken under consideration of Medical Ethical Committee.

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