Original Research Article

Evaluation of Characteristic Findings Suggestive of Manner of Firearm Injury: An Autopsy Based Retrospective Study

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Abstract

Incidence of deaths due to firearm weapons are rising in developing countries. There are only a few studies published on firearm injury in Gujarat. Pattern wise distribution of firearm injury is largely uncovered. This study is on characteristic findings suggestive of manner of firearm injury. Here a retrospective study of15 years is conducted. In this study, young aged males are affected the most as they are socially most active so are having high probability of interpersonal violence. On the spot death of the victim is observed in 85% cases. Rifled firearm is most commonly used. Single shot observed in majority of cases. Homicide is observed more than suicide. Stricter legislation on the ownership and use of firearm weapon is needed. Increase in suicidal pattern in police officials by using firearm weapon is major concern and proper psychological evaluation with mental support will definitely reduce this mortality.

Keywords: Firearm injuries, Rifled firearm, Shotgun firearm, Entry wound, Exit wound, Manner of death.

Introduction

Deaths due to firearm weapons are rising in developing countries. Nowadays Firearm weapons are easily available in large scale in India and other parts of the world. Firearm mostly used for homicidal as well as suicidal purpose because of very easy and quick method of death. [4]

This study represents a pioneering effort in Ahmedabad, Gujarat, focusing on firearm-related fatalities, an area under-researched until now. Our primary aim is to analyze distinct patterns indicative of the nature of firearm injuries. The investigation encompasses a range of socio-demographic factors, the types of firearms involved, temporal distribution of incidents within a day, locations of injuries, number

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of shots fired, firearm range, survival durations, and causes of death. These parameters collectively aim to provide a comprehensive understanding of the circumstances surrounding firearm-related deaths in the Ahmedabad region.

Materials and Method

The present retrospective study was conducted in the Department of Forensic Medicine and Toxicology of the B. J. Medical College, Ahmedabad. Which includes post mortem of firearm injuries conducted under Post mortem room of Civil Hospital, Ahmedabad. 15 years data from 1st January 2009 to 31st December 2023 was collected from post mortem notes of the deceased. During this period, a total of 57,862 post mortem were conducted, out of which 40 cases were of firearm injuries under B.J. Medical college.

This study presents data from a variety of autopsy reports which have been evaluated, focusing on their investigative findings in order to better understand of the characteristics of firearm wounds and the differences between suicidal, homicidal, and accidental fatal gunshot injuries. The data was collected in a proforma prepared for this study purpose. The collected data as analysed using Google form and Google sheet.

Result

Majority of the incidence of firearm deaths were homicidal 24 cases (60%) in nature followed by suicidal 11 cases (27.5%) and accidental 4 cases (10%) deaths, only in one (2.5%) case the manner of death had remained undetermined (Table-1).

Table 1: Manner of incidence and Age and gender wise distribution of firearm injury cases

Age(years)	Gender	Homicide	Suicide	Accident	unknown	Total
0-20	Male	01	01	01	00	03
	Female	01	00	00	00	01
21-40	Male	16	07	01	01	25
	Female	01	00	00	00	01
41-60	Male	04	03	02	00	09
	Female	01	00	00	00	01
>61	Male	00	00	00	00	00
	Female	00	00	00	00	00
Total		24	11	04	01	40

Table-1: Showing distribution of cases according to manner of incidence and age and gender.

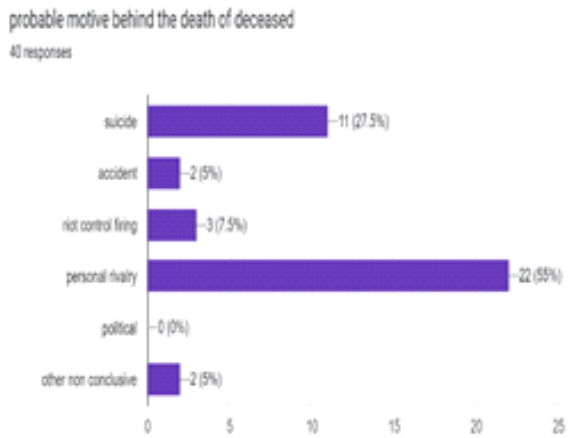

Fig. 1: Showing distribution of cases according to motive behind the death.

Most commonly affected gender was male with 37 (92.5%) cases as they are socially most active so are having high probability of interpersonal violence. While in female 3 (7.5%) cases of homicide were observed. The most commonly involved age group was 21-40 years with 26 (65%) cases, while least commonly involved age group was more than 60 years with zero case. In 24 cases (60%) the place was outdoor, 10 cases (25%) home and 6 cases (15%) work place. More cases occurred in daylight [30 (75%) cases] than in night [9 (22.5%) cases] and one case (2.5%) had no history.

Head > neck region were the most common target in suicidal case (100%), while in homicidal cases chest> abdomen> head region were more involved (graph no.5). Overall brain was most commonly involved vital organ, while heart is least commonly involved

organ. Brain is involved in 100% cases of suicide. While homicide involves any vital organ. Here, in 1 accidental case lung was involved (graph no.3).

All suicidal, accidental and 79% of homicidal cases died on the spot. Rest one victim died within 12 hours and two victims survived more than 11 days. Single firearm entry wound was found in 34 cases of which all 11 cases were of suicide. In 23 cases no exit wound were present, in which 18 cases were of homicide. Single bullet was recovered from 20cases, out of which 13 cases were of homicide and 5 recovered from suicide. In 81.81% cases of all suicidal cases, the direction of projectile was upward, backward, right to left, while in majority of homicidal cases the direction was downward, backward, right to left observed.

Observation of suicidal firearm wounds suggests most commonly involved Site – temporal region> undersurface of chin> Forehead. The direction of injury is upward, backward and towards right to left in all suicidal cases (chart no.2).Gunshot residue are present over hands, clothes and skin involved in firearm injury case. There is single shot observed in all suicidal cases. All the 65% of contact shots were showing some characteristics of entry wound i.e., muzzle imprint, abrasion collar, grease collar, singing of hair, burning, tract of the wound shows blackening, tattooing and cherry red color blood (graph no.4). all the characteristics of entry wound are present in 2.5% cases of suicide, 2.5% cases of homicide and 0% cases of accidental cases. 2 cases show burst head effect. The reason behind suicide was depression due to financial loss, failure of love affair etc (graph no.1). In present study, characteristics of entry wound were seen in suicide >homicide >accident order. With help of above-mentioned information, we can state that, the range of firearm weapon is inversely proportion to the characteristics of the entry wound.

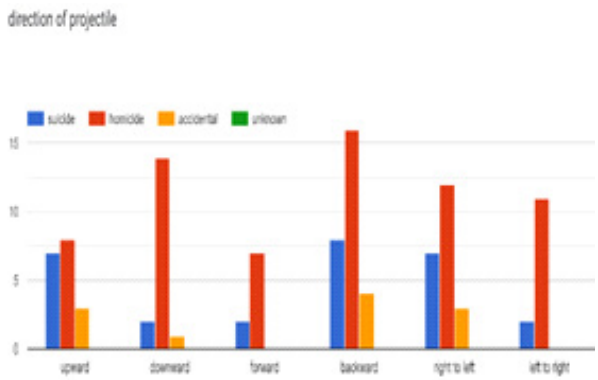

Fig. 2: Showing distribution of cases according to the direction of projectile.

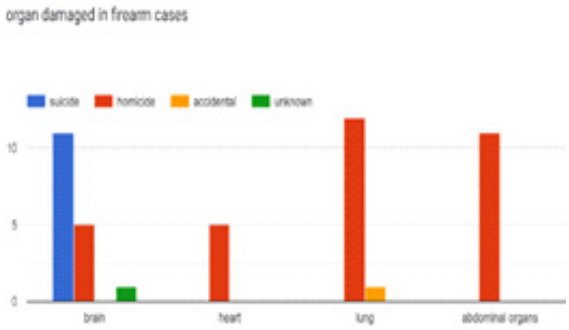

Fig. 3: Showing distribution of cases according to the organ damaged.

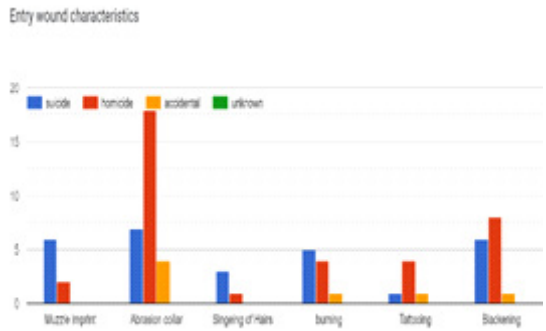

Fig. 4: Showing distribution of cases according to the entry wound characteristics.

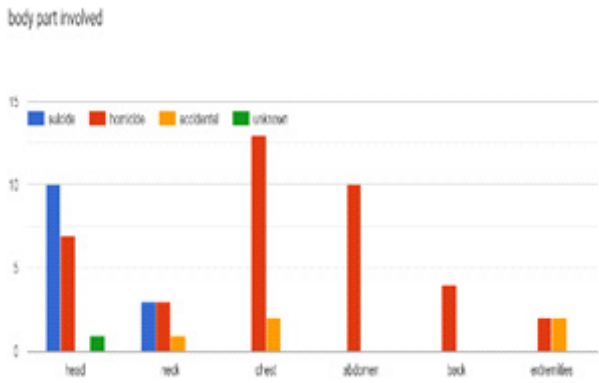

Fig. 5: Showing distribution of cases according to the body part involved.

In present study, 9 cases show presence of Gun Shot Residues (GSR) in cotton rub from hands out of which all were suicidal cases. Not a single case observed in homicidal case. Gun Shot Residues on clothes are present in 8 cases, and all are of homicidal cases. The Gun Shot Residues on skin of entry wound was present in 20 cases. Here the major lacuna was unavailability of reports because of that it was difficult to analyze the actual result regarding GSR.

Discussion

Majority of the incidence of firearm deaths were homicidal 24 cases (60%) in nature followed by suicidal 11 cases (27.5%) and accidental 4 cases (10%) deaths, only in one (2.5%) case the manner of death remained undetermined. Homicidal intent was predominant in most other studies [Pargi S.L. et al.[4] (78.26%), Sachan et al.[7] (92%), Kumar et al.[5] (96%), Kumari et al.[6] (88.34%)]. The preponderance of homicide gun-shot injuries is explainable as these deadly weapons are generally used in planned manner or so impulsively in planned assault. Accidental injuries with firearms are also not uncommon as users are prone to such episodes while cleaning, maintenance or erratic handling of loaded guns. Accidental injuries seen in present study in 10% cases, in Pargi et al.[4] study it was quite higher (16.52%), while in Kumar et al.[5] (1.73%) and Kumari et al.[6] it was 6.67%.

In present study, all age groups are included from zero to >60 years. The maximum number of cases are from 21-40 years of age group with 26 cases (65%). This group is more social and more active group in society. This type of findings is similar with Pargi S.L. et al.[4], Sachan R. et al.[7] and Kumar K et al.[5], where high incidence occurs between 21-40 years of age group. The result of our study is slightly contrast with study of Kumari et al.[6], who reported maximum number of cases in 11-20 years followed by 21-30 years. This variation is due to minor cultural and periodic differences. Moreover, the age group of 11-20 years is quite young for use of such deadly weapons and thus, this variation does not have much significance. The least affected age group in present study is more than 60 years.

In present study, in 91.66% cases of homicide (22 cases) the motive was personal rivalry. 100% suicidal cases are due to depression because of financial loss, failure in love, etc. in our study, 60% death occur in outdoors, out of which 79.16% are homicide. 25% deaths(10 cases) occur at home, out of which 60% (6 cases)are suicidal cases. Only 6 cases (15%)occur at workplace out of which 4 cases were of suicide, 1 of homicide and 1 of accidental manner. While comparing with other studies, our results are similar with study of Pargi S.L. et al.[4] and Kumar K et al.[5] where 79% and 66.95% incidence occur in outdoors and 21% and 33.05% in indoor places respectively.

It was observed that in our present study 75% cases occurred in daytime and 25% cases were in night time. The results are similar toPargi S.L. et al.[4]in which 90.43% cases occurred in daytime and 8.70% cases in night-time. In present study night the less numbers of gun-shot injuries (25%) witnessed which is in contrast to the findings of Kumari et al.[6] in which >50% firearm injuries occurred in night and Kumar et al.[5] (47.82% daytime and 51.31% in night).

Our study shows most common involvement of head (45%) followed by chest (37.5%) followed by abdomen (25%). Back and extremities shows 10% involvement of each. These result bears variation with those of Pargi et al.[4] [chest(31.3%)>abdomen (18.26%) head (14.75%)], Kumariet al.[6] [abdomen(30.9%)>chest (21%) head(16%)]. In Pargi et al.[4]'s study 33.04% cases of gun-shot wounds were found on periphery and neck was the least affected region (2.61%). While in Sachan et al.[7] where the most common site was abdomen followed by head and neck.

Conclusion

In present study, it was observed that in suicide male gender of police occupation involved the most, and site were temporal region with pistol, undersurface of chin and Forehead with rifle. All cases of suicide were of contact shot. The direction of bullet was upwards, backwards. Single entry was observed in all suicidal cases. Skin, clothes and hand shows presence of gunshot residues. In homicidal cases, usually male involved regardless of his profession. The site of firearm wound; range of projectile were not specific. In majority of homicidal cases the direction is observed was downward, backwards and right to left. Hands of victim never display gunshot residue. In accidental cases, male involves the most as they are likely to be familiar with guns. The distance is up to close range. The weapon is present at the crime scene. Almost all cases of suicide, homicide and accident show the characteristics of firearm entry wound. More findings are seen in cases of suicide. Cases of homicide and accident shows more or less findings depending on their range in distance.

Conflict of Interest: None.

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Ethical Clearance: Taken from ethical committee on 1 February 2024 with reference no.**23/2024.**

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