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Original article

Medicolegal analysis of usage of weapon and pattern of external injuries of homicide in Bhavnagar, India - A 1- year study

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ABSTRACT

Background: The study has been undertaken to analyse the type of weapon commonly used, pattern of external injuries, and most affected body part overall.

Methods: A total of 38 homicidal deaths occurred in Bhavnagar, Gujarat, India in a period of 12 months were analysed.

Results: In majority of cases (52.63%), the assault was exclusively due to blunt force. The most common injury considering the total number of injuries in all these homicide cases was contusion (28.60% of total injuries). Abrasion and contusion are most commonly found in upper limbs (78.94% and 57.89% respectively), particularly over arms (31.58%). Lacerations were found mostly over the head & neck (42.1%). Face and neck found having all types of external injuries. Stab injury was most commonly found over torso (21.05%), particularly over thorax (10.53%). Most commonly injured area was head & neck (28 cases, 73.68%) and the most common injured body part was arm (23 cases, 60.53%). In blunt force injury cases, head & neck was most commonly injured (47.37%), and in sharp force injury cases, torso was most commonly injured (21.05%). Objects like axe and sword were used infrequently (2.63%), as they are not comparatively easily available and are relatively heavy.

Conclusion: We can conclude that if blunt force was used, the head will be the target of choice (p value is 0.00743). The pattern of injuries found on the body are differing, with

I. Background

Homicide cases are often intriguing and challenging to the investigative agencies. They often have local or regional characteristics, as well as various intricacies, which require thorough analysis and understanding for the administration of justice and to deter such incidents from recurring. Murder is the highest level of aggression found in all cultures (Mohanty, 2004). The United Nations Office on Drugs and Crime (UNODC) considers homicide an indicator for determining a country's level of violence and safety (Nunes, 2012; United Nations: Office on Drugs and Crime, 2017). This retrospective study is undertaken to analyse the usage of weapon for assault and the pattern of external injuries found on the dead body of victims of homicides in Bhavnagar region. It aims to find out type of frequently used weapon to commit homicide, frequent types of external injuries found on the body, most affected body part according to various types of injuries, most affected body part according to various types of causative force of injuries and relation of the weapon used to targeted a particular body part. The knowledge thus gained can be highlighted to reveal the behavioural

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psychology of the aggressive state of mind of the criminal and trauma effects on the human body in homicidal cases. This information is critical in the medico-legal investigation of a homicide case, thereby facilitating the proper forensic investigation of such cases.

II. Material and Methods

This is a retrospective cohort record-based study of 12 months duration, of the year 2018, performed at the mortuary complex of a tertiary care centre of Bhavnagar region of Gujarat, India in which a total of 38 cases were studied. The study protocol was approved by Institutional Review Board, Government Medical College, Bhavnagar vide No.876/2019.

Data regarding the types of weapons used (i.e. blunt objects, sharp objects, firearms, etc.) and the pattern of external injuries (type & location of the injuries) found on the dead body is collected from police papers & from the post-mortem report of the deceased in a pre-designed pro forma maintaining confidentiality.

Inclusion criteria: The cases which were registered by police officials as homicides and the cases in which the manner of death was determined as homicide by autopsy surgeon during the study period were included in this study.

Exclusion criteria: The cases which were registered by police officials as non-homicidal, the cases in which manner of death was determined as non-homicide by autopsy surgeon, and any case subjected for autopsy as alleged homicide but was later registered as non-homicidal based on the autopsy findings, circumstantial evidence or investigation by the police were excluded.

III. Results

Homicidal cases accounted for 38 cases (3.63%) out of 1048 total autopsies performed in the study period.

In 23 cases (60.53%), a 'stick' was considered as the alleged weapon of offense as per the police and the '*panchas'* (witnesses at the inquest) (The procedure of an inquest is called '*Panchanama'* in Gujarati language) (Table 1).

Table (1): Distribution of cases according to the type of alleged weapon of offence

Type of Weapon		Cases (n=38)	%
Blunt objects	Stick	17	44.74
	Stick and Axe	1	2.63
	Stick and Manual	1	2.63
	Manual	1	2.63
Sharp objects	Stick and Knife	4	10.53
	Knife	8	21.05
	Knife and Sword	2	5.26
	Sword	1	2.63
No weapon used		3	7.89

N: Number of cases, %: Percent.

Wooden stick and knife were the weapons of choice as blunt and sharp weapons respectively. In 3 cases (7.89%) in which no weapon was used, and the victims were newborns. In these three cases, first one had blunt force injuries because she was thrown onto a pile of sand from a running motorbike. Second one died because of drowning as he was thrown into a water tank, and no injury was found on his body. Third one died because of an act of omission and no injury was found on his body. In 26 cases (68.42%), 20 cases were opined to be caused by blunt force exclusively, and 6 cases in which the injuries were opined to be caused by both blunt and sharp force (Table 2).

Table (2): Distribution of cases according to the opinion given regarding causation of injuries

Opinion	Cases (n=38)	%
Exclusively Blunt force	20	52.63
Exclusively Sharp force	10	26.31
Both Blunt and Sharp force	6	15.79
No external injury	2	5.26

N: Number of cases, %: Percent.

Abrasion was found in most of the cases (68.42%), followed by contusions (52.63%), while the cases having chop wound were a few (7.89%). The most common injury in all these homicide cases was contusion (28.60% of total injuries), and the least common being chop wound (1.17% of total injuries) (Table 3). Data for 'surgical sutured wound' in Table (3) includes only the injuries which were produced as a result of the assault and subsequently sutured by the doctor.

Table (3): Distribution of cases according to the type of injuries

Type of Injury		No. of cases having the injury	% (n=38)	Total number of injuries in all cases	% (n=514)
Blunt force	Abrasion	26	68.42	130	25.29
	Contusion	20	52.63	147	28.60
	Laceration	14	36.84	45	8.75
Sharp force	Incision	6	15.79	29	5.64
	Stab	8	21.05	69	13.42
	Chop	3	7.89	6	1.17
Surgical sutured wound		12	31.58	47	9.14

N: Number of cases, %: Percent.

Table (4): Distribution of injuries according to the anatomical site (n=38)

Type Site	Blunt force						Sharp force						Surgical Wound	%
	Abra-sion	%	Contu-sion	%	Lacer-ation	%	Inci-sion	%	Stab	%	Chop	%		
Scalp	1	2.63	7	18.42	9	23.68	3	7.89	-	-	1	2.63	7	18.42
Face	11	28.95	4	10.52	6	15.79	2	5.26	1	2.63	1	2.63	3	7.89
Neck	7	18.42	1	2.63	1	2.63	2	5.26	1	2.63	2	5.26	1	2.63
All Head	19	50	12	31.57	16	42.1	7	18.41	2	5.26	4	10.52	11	28.94
Thorax	5	13.16	7	18.42	-	-	-	-	4	10.52	-	-	2	5.26
Abdomen	5	13.16	1	2.63	-	-	-	-	1	2.63	-	-	2	5.26
Groin	1	2.63	1	2.63	-	-	-	-	-	-	-	-	-	-
Back of trunk	7	18.42	4	10.52	-	-	1	2.63	3	7.89	-	-	2	5.26
Whole torso	18	47.38	13	34.19	-	-	1	2.63	8	21.05	-	-	6	15.79
Arm	12	31.58	12	31.58	-	-	-	-	1	2.63	-	-	3	7.89
Elbow	4	10.52	2	5.26	-	-	-	-	1	2.63	-	-	-	-
Forearm	9	23.68	5	13.16	1	2.63	2	5.26	2	5.26	-	-	-	-
Hand	5	13.16	3	7.89	-	-	3	7.89	-	-	1	2.63	-	-
Whole UL	30	78.94	22	57.89	1	2.63	5	13.16	4	10.52	1	2.63	3	7.89
Thigh	2	5.26	3	7.89	-	-	1	2.63	3	7.89	-	-	3	7.89
Knee	4	10.52	4	10.52	1	2.63	-	-	1	2.63	-	-	-	-
Leg	2	5.26	1	2.63	1	2.63	2	5.26	2	5.26	-	-	3	7.89
Foot	2	5.26	3	7.89	1	2.63	1	2.63	1	2.63	-	-	1	2.63
Whole LL	10	26.32	11	28.94	3	7.89	4	10.52	7	18.42	-	-	7	18.42

N: Number of cases, %: Percent; UL: upper limb; LL: lower limb

Abrasion and contusion are most commonly found in upper limbs (30 cases, 78.94% and 22 cases, 57.89% respectively), particularly over arms (12 cases, 31.58% of each type of injury) and were least in the scalp and groin and present in only1 case each (2.63 %). Lacerations were found mostly over the head & neck in 16 cases (42.1%) and not found on the torso. Face and neck found having all types of external injuries, in which abrasions being most common, present in 11 cases in the face (28.95%) and 7 cases in the neck (18.42%). Stab injury was most commonly found over torso in 8 cases (21.05%), particularly over thorax in 4 cases (10.53%) (Table 4). Most commonly injured area was head & neck (28 cases, 73.68%) and the most common injured body part was arm (23 cases, 60.53%), followed by scalp (21 cases, 55.26%) and then face (19 cases, 50%), and least common being groin (2 cases, 5.26%) (Table 5). In blunt force injury cases, head &

neck was most commonly injured (47.37%), and in sharp force injury cases, torso was most commonly injured (21.05%) (Table 5).

Defence injuries were found in 13 (34.21%) cases in which 6 cases have blunt force, 2 cases have sharp force, and 5 cases have both blunt and sharp forces (Table 6).

Table (5): Distribution of injuries and force applied

Site	Cases	% (n=38)	Only blunt force injury cases	Only sharp force injury cases	Both blunt and sharp forces
Scalp	21	55.26	15	3	3
Face	19	50	12	4	3
Neck	11	28.95	4	5	2
Head (scalp & face) and neck combined	28	73.68	18	6	4
Thorax - Ribs	15	39.47	6	5	4
Abdomen	8	21.05	4	4	0
Groin	2	5.26	1	1	0
Back	15	39.47	7	4	4
Whole torso	25	65.79	11	8	6
Arm	23	60.53	12	5	6
Elbow	6	15.79	5	1	0
Forearm	14	36.84	8	1	5
Hand	8	21.05	3	2	3
Whole Upper Limb	25	65.79	14	5	6
Thigh	12	31.58	5	5	2
Knee	6	15.79	2	2	2
Leg	7	18.42	3	2	2
Foot	5	13.16	2	2	2
Whole Lower Limb	18	47.37	8	6	4

N: Number of cases, %: Percent

Table (6): Distribution of cases according to types of defence injuries found (n=13 cases)

Type	Blunt force	%	Sharp force	%	Both blunt and sharp forces	%
Only active	0	0	0	0	0	0
Active and Passive	3	23.08	2	15.38	3	23.08
Only Passive	3	23.08	0	0	2	15.38

N: Number of cases, %: Percent.

IV. Discussion

Most commonly alleged weapon of offence as per the police and the panchas is wooden stick, also called '*Lakdi'* or *'Dhoka'*, consistent with the findings by Buchade & Mohite (2011) and Mittal et al. (2005). When any person comes in heat of passion at any place, these types of hard and blunt objects are easily available (Pelletier & Pizarro, 2019). While in our study, objects like axe and sword were used infrequently, used in 01 (2.63%) case and 03 (7.89%) cases respectively, as they are not comparatively easily available and are relatively heavy. We found that the majority of homicide cases included in our study involved blunt force injuries 26 (68.42%) cases, consistent with Prajapati et al. (2010).

Chop wound found being the least common injury in both, in the total number of cases and also in the total number of injuries, because of the less frequent use of relatively heavy objects like axe and sword as weapon of offense.

Abraded contusions found during the autopsy were categorized as contusions. Abrasion and contusion are

most commonly found over upper limbs, particularly over arms as they are the main parts for assailant to grasp, and the struggle becomes evident in the form of those injuries. Abrasion was least commonly found on the scalp and groin, because they are well protected by hair and clothing respectively. Scalp and face were found to have more types of blunt force injuries than sharp force injuries, consistent with Mathews et al. (2009) and Parmar et al. (2015). Whenever head is struck with blunt force, scalp will show lacerations rather than abrasions and contusions, thus occurrence of laceration with the body area being the scalp is the highest. Though stab injuries were most commonly found over torso, particularly over thorax, sharp force injuries (incisions and stab injuries combined) were found equally over neck, thorax, arm and thigh. We cannot conclude that if sharp force was used, thorax will be the target of choice (*p* value is 0.11241). These findings are somewhat consistent with Ambade & Godbole (2006), Mathews et al. (2009), and Parmar et al. (2015), they found thorax as having most sharp force injuries, as the elective site for stabbing may be explained by the general common belief perpetuated amongst people that thorax and abdomen contain vital organs of the body and so chances of death of the person are almost sure. At the same time, it is easier for a sharp weapon to penetrate the thorax or abdomen having fatal outcome.

In our study, the study by Parmar et al. (2015), Prajapati et al. (2010), and Shah et al. (2013) Head injuries were found most commonly due to blunt instruments. The neck, thorax, arm and thigh injuries were found equally common in cases in which causation of injury was opined as sharp force. These findings are consistent with the findings of Mathews et al. (2009) and Parmar et al. (2015) in cases of blunt force injury, but somewhat differ in cases of sharp force injury. In 3 out of 20 head injury cases was the injury caused by blunt force, while in the rest of the 17 cases poly-trauma was observed. Only a single body part was found injured in 04 cases out of 10 in which the causation of injury was opined as only sharp force, while in the rest of the 06 cases, multiple parts were injured. These findings somewhat differ from the findings of Ambade & Godbole (2006). Adelson (1974) gives some sound reasons for this dominance of head injuries, which are as follows: 1. The head is the target of choice in the great majority of assaults involving blunt trauma. 2. When the victim is pushed or knocked to the ground, he often strikes his head. 3. The brain and its coverings are vulnerable degrees of blunt trauma that would rarely be lethal if applied to other area. From this study, it is obvious that head region would be targeted by an offender when having intension to kill someone, and we can conclude that if blunt force was used, head will be the target of choice (*p* value is 0.00743). Vij et al. (2010) and Prajapati et al. (2010) had also observed the same. The pattern of injuries found on the body are differing, with the weapon of choice being blunt or sharp. Overall, genital injuries were the least common, similar findings were observed by Mathews et al. (2009).

In the majority of cases, active and passive both types of defense injuries were present, and blunt force type of defense injuries were found more, consistent with findings by Subramanyam & Janardhanan (2021), Lakmali et al. (2016), and Vinoth & Sangeetha (2017), probably because of the frequent usage of blunt force for the offence. Only active type of defense injury was not found in any case, this might suggest that if a victim is struggling and resisting the injuries, there are higher chances that she/he might also get passive defense injuries.

In all over the world, homicide by firearm is common (Pelletier & Pizarro, 2019; Betz & Eisenmenger, 1997; United Nations: Office on Drugs and Crime, 2023), but in this study, firearm injury was not found in any case, because India doesn't have widespread availability of firearms.

V. Conclusions

Majority of homicide cases included in our study involved blunt force injuries. Usage of relatively heavy objects like axe and sword as weapon of offence less frequent. Scalp and face were found to have more types of blunt force injuries than sharp force injuries. We can conclude that if blunt force was used, head will be the target of choice. In the majority of cases, active and passive both types of defense injuries were present.

Limitations of this study and Recommendations

Our study was retrospective and included only one year data. Keeping in mind the aims of our study, prospective studies having minimum three-year duration with pre-designed proforma will gather more insights. The data regarding the type of alleged weapon of offense (Table 1) was taken from the inquest papers. We recommend that the data also be collected from the statements of witness (es) of the incident for more accuracy. In our study, we only gathered the data from the autopsy report, and as some injuries were found surgically sutured during the autopsy, we did not distribute those injuries in the sections of blunt force and sharp force injuries, and did not include them for the further analysis. We recommend that the nature of the surgically sutured injuries should be collected from the doctors' notes for proper distribution and analysis. The intention of the offender to kill the victim also depends upon the nature of the dispute. Keeping that in mind, the choice of the body part to target will be different. Thus, the analysis considering the motive of the offense should also be undertaken.

Declarations

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Conflicts of interest

None.

Data availability statement

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

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