

MEDICO-LEGAL INTERPRETATION OF CASUALTIES PRESENTING WITH TRAUMA TO A TERTIARY CARE HOSPITAL IN SRI LANKA

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ABSTRACT

Background

Even though traumatic injuries are the leading cause of hospitalization in Sri Lanka, demographic profile, causes, and severity of injuries sustained have not been reported. This data will be of assistance to policy makers in the effective prevention of violence and health care costs

Results

Of the 626 casualties, 535 (85.5 %) were due to assault, and 72 % of them were assaulted with a blunt weapon. Of the assaults, 75 % were in the 20 – 49year age group and 53.5 % occurred between 4 pm and 10 pm. Of 55 (8 %) casualties with accidental injuries, 38.2 % were caused by falls and 38.2 % by burns. Of 18 (2.9 %) child abuse cases, 61.1 % were sexually abused. The highest frequency of, both, assaults and accidents was between 6 pm and 8 pm, while all instances of child abuse occurred between 8 am and 8 pm. Abrasions were seen in 45.4 %, contusions in 40.7 %, lacerations in 29.2 % and fractures in 21.6 %, while 12.3 % did not have any injuries. Injuries sustained were non-grievous in 65.5 %, grievous in 30.7 %, endangering life in 1.4 % and fatal in the ordinary course of nature in 2.4 %.

Conclusion

Being aware of the types, weapons, time of day, age and sex of victims, subjected to violence will be beneficial to reduce these and thereby reduce the economic, physical and psychological burden to the country.

Keywords: *Assault; Child abuse; Grievous; Medico-legal examination; Traumatic injuries*



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BACKGROUND

Trauma is defined as a deeply distressing or disturbing experience, which may be caused due to a physical injury or a stressful situation¹. Injuries are a leading cause of death, hospitalization, and disability throughout the world and according to the World Health Organization (WHO) accounting for 9 % of all deaths annually². According to the Ministry of Health in Sri Lanka, trauma and other injuries were the leading cause of hospitalization since 1995. The trauma burden is felt across all districts. It was ranked as the number one reason for admissions in 18 of the 25 districts. In the seven other districts, it was always among the top five³. Trauma is commonly seen in assaults, accidental and self-inflicted injuries.

Assault is an act, which creates an apprehension of an imminent harmful or offensive contact with a person⁴. Section 342 of the penal code of Sri Lanka declares that “Whoever makes any gesture or any preparation, intending or knowing it to be likely that such gesture or preparation will cause any person present to apprehend that he who makes that gesture or preparation is about to use criminal force to that person, is said to commit ‘an assault’⁵. Assault is a common problem worldwide and a major contributor to death, disease and disability. According to the WHO report 2014, almost half a million are murdered around the world each year. Homicides are one of the leading causes of death in males and intimate partner violence is the leading cause in women⁶. Physical assaults vary from minor assaults such as shoving and pushing which may not result in any physical harm, to serious assaults which may leave temporary or permanent physical damage. This may include using a firearm, any sharp or blunt weapon or just using physical force. Assault patterns differ in various parts of the world according to the economy, laws prevailing in the area and weapon accessibility⁷.

Accidental injuries (unintentional injuries) can be subdivided into injuries due to falls, road traffic, fires, poisoning, and drowning⁸. Most of the accidental injuries occur due to unsafe conditions of living, working, traveling and lack of preventive efforts⁹.

Self-inflicted injuries are one of the leading causes of death worldwide and is a significant public health problem. It can cause death as well as cause ill-health and disability.

An abortion is defined as the deliberate termination of a human pregnancy, most often performed during the first 28 weeks of pregnancy before the foetus is able to survive independently¹. Illegal abortions can lead to acute life-threatening complications, as well as long term disability and morbidity.

Numerous studies have been conducted both globally and in South Asian countries, exploring factors related to assault injuries and other injuries separately. However, there is a paucity of information on all types of traumatic injuries sustained and the medico-legal category of hurt (severity of injuries). This study analyzed the circumstances of the incident, injuries and causation of the victims of all forms of trauma who underwent medico-legal examination at the Teaching Hospital Peradeniya, Sri Lanka. This institution is one of two tertiary care hospitals in the Central Province of Sri Lanka, serving a population of 2.5 million, and which receives referrals from several other areas of the country.

The main objectives of this study was to highlight the pattern and profile of medico-legal cases of trauma presenting to the hospital, which not only highlights the value system among individuals in the community, but also provides vital data for administrators, health officers, philanthropists, social workers, non-

governmental organizations to devise strategies in order to reduce these incidents.

METHODOLOGY

A retrospective descriptive study was conducted on casualties that were admitted to the Teaching Hospital Peradeniya, Sri Lanka during a five-year period, following injury. All those who were issued a Medico-legal Examination Form (MLEF) and consented for examination were included, while those who did not consent for examination were excluded; all road traffic accident casualties were also excluded, as this subset had been studied separately.

The information gathered from the patients included age, gender and history of the incident; and subdivided into assault, accident, self-inflicted, child abuse, abortion, animal attack or produced by the police for examination. Following examination, the types of injuries present were classified and the severity (which is referred to as the 'category of hurt') assessed in accordance with the penal code of Sri Lanka. Injuries which cause an existing threat to life and which may result in death are classified as EL, while those injuries which will result in death without prompt and proper medical care are classified as FIOCN. All injuries that do not fall under grievous or above is classified as non-grievous.

To reduce observer and record bias in the study, history taking and examination was done by the first author only, who is a board-certified specialist in forensic medicine.

The documented findings were entered to a Microsoft Excel spreadsheet. The data was analyzed using SPSS version 22.0.

RESULTS

Demographic profile related to casualties

Among the 630 medico-legal cases registered and a MLEF issued during the study period, four did not consent for examination. -, There were 465 (74.3 %) males and 161 (25.7 %) females.

The majority of the victims of assault (77.8 %), those produced by the police for examination (75 %), victims of animal attacks (66.7 %) and accidents (61.8 %) were males, while self-inflicted injuries were seen in both females and males in equal proportions. Most of the child abuse victims were females (72.2 %).

The mean age of the study sample was 34 years. Of the assaults, 75 % were in the 20–49 year age group, while 66.7 % of those that had self-inflicted injuries were in the 30–39 age group, 60 % of those arrested by the police were in the 40–49 year age group and all child abuse cases were less than 19 years of age (Table 1). One of the two cases of illegal abortion was 22 years old while the other was 44 years old.

Table 1: Types of incidents according to the age group

Age group	Assault	*Accident	Child Abuse	Self-inflicted	Police examination	Animal attack
0-9	4 (0.8%)	11 (20%)	8 (44.4%)	-	-	2 (40.0%)
10-19	44 (8.2%)	9 (16.4%)	10 (55.6)	-	-	1 (20.0%)
20-29	158 (29.5)	12 (21.8%)	-	2 (33.3%)	1 (20%)	-
30-39	141 (26.4%)	8 (14.5%)	-	4 (66.7%)	-	-
40-49	103 (19.3%)	4 (7.3%)	-	-	3 (60.0%)	-
50-59	56 (10.5%)	7 (12.7%)	-	-	1 (20%)	2 (40.0%)
60-69	16 (3.0%)	2 (3.6%)	-	-	-	-
70-79	11 (2.1%)	2 (3.6%)	-	-	-	-
80-89	2 (0.4%)	-	-	-	-	-

*Accidental injuries were due to falls, burns, blunt weapons, explosives and exclude RTA

Type of incident and injuries sustained

Of the 626 patients presented for medico-legal examination, 535 (85.5 %) were due to assault, 55 (8.8 %) were victims of accidents, 18 (2.9 %) were victims of child abuse, 6 (1.0 %) had self-inflicted injuries, 5 (0.8 %) were attacked by animals, 5 (0.8 %) were produced by the police for examination and two were following illegal abortion.

Of the injuries listed in the MLEF, the presence, and not the quantity, of the commonest eight types of injuries (i.e. abrasions, contusions, lacerations, fracture, cut, burn, gunshot and stab) were documented. Individuals with more than one type of injury were included under each type of injury, and therefore the total of all injuries exceeds the sample size.

Of the 626 persons examined 284 (45.4%) had abrasions, 255 (40.7 %) had contusions, 183 (29.2%) sustained lacerations, 135 (21.6 %) had fractures, 66 (10.5 %) had cuts, 28 (4.5%) sustained burns, 18 (2.9%) had gunshot injuries and seven (1.1%) had stabs.

Seventy-seven (12.3 %) of those examined did not have any injuries.

Time of the incident

The time of assault was available in 528 of the 535 cases. Majority of the assaults (76%) were observed between 10 am and 10 pm whilst the highest number of assaults (26%) were observed between 6 pm and 8 pm. The lowest frequency of assaults (1.1 %) were between 2 am and 4 am.

The time of accident was known in 53 of the 55 cases. The number of accidents between 10 am and 10 pm were 35 (66 %) with the highest incidence (18.9%) observed between 6 pm and 8 pm. The lowest number of accidents (5.7 %) were between 2 am and 6 am, with none occurring between 2 am and 4 am.

All cases of child abuse had occurred between 8 am and 8 pm.

Assaults

Of the 535 victims of assault, 385 (72 %) were assaulted with a blunt weapon, 53 (10 %) with a sharp weapon and 16 (3 %) with both blunt and sharp weapons. In 54 (10 %) the weapon was not known. Explosives were used to assault 14 (2.6 %) persons, of whom, twelve were with firearms, while two were with bombs. Poison was used in four (0.8 %), while four (0.8 %) were bitten. In addition, there were three (0.6 %) cases of sexual assault and two (0.4 %) were burns caused by acid.

The injuries seen were abrasions (48.2 %), contusions (45.9 %), lacerations (29.3 %), fractures (21.3 %), cuts (11.6 %), gunshot injuries (2.4 %), stab injuries (1.3 %) and burns (0.4 %). Fifty-nine (11.0 %) had no injuries.

Accidents

Of the 55 casualties with accidental injuries, 21 (38.2 %) were accidental falls and 21 (38.2 %) were burns. There were five casualties each, who sustained accidental injuries due to blunt weapons and explosives. Accidental collapse of a wall caused two casualties while one accidental sharp weapon injury was seen. Of those who had fallen, 12 had fallen from a height, while 9 was at ground level. Among the 21 accidental burns, 14 (66.7 %) were due to flame, six (28.6 %) were due to hot liquids and one (4.8 %) was due to hot solids. Of the five who had accidental firearm/explosive injuries, two were due to the discharge of a firearm, two due to explosion of cartridges and one due to a gas cylinder explosion.

The type of injury sustained were, burns (40 %), lacerations (36.4 %), fractures (32.7 %), abrasions (18.2 %), gunshot injuries and contusions (7.3 %), and cuts (3.6 %). Three persons (5.5 %) did not have any injuries.

Child abuse

Of the 18 children who were abused, 11 (61.1 %) were sexually abused and seven (38.9 %) physically abused. Of the seven

who sustained injuries, all had abrasions, two had contusions and lacerations, while one each had cut, fractures and burn injuries. Eleven (61.1 %) did not have injuries.

Self –Inflicted

Of the six self-inflicted injuries, three were flame burns. There was one caused by a firearm, one poisoning and one by both sharp and blunt weapons. Three (50.0 %) had burn injuries, while injuries from blunt and sharp weapons, poisoning and shot gun injury had one (16.7 %) patient each.

Produced by police for examination

Of the five casualties brought for medico-legal examination three were those arrested by the police while two were produced for alcohol level examination. Of them two had old abrasions and three had no injuries.

Animal attacks

Of the five animal attacks four sustained dog bites while one was attacked by an elephant. All patients had abrasions; three had lacerations while two had contusion and one had fractures.

Abortion

Neither of the abortion victims had sustained injuries.

Category of injuries

The injuries were classified as either non-grievous, grievous, endangering life or fatal in the ordinary course of nature, based on their severity in accordance with the penal code of Sri Lanka⁵. Amongst the 626 casualties 410 (65.5 %) had non-grievous injuries, 192 (30.7 %) had grievous injuries, nine (1.4 %) had injuries endangering life and 15 (2.4 %) had sustained injuries that were fatal in the ordinary course of nature.

When the 535 victims of assault were considered, 359 (67.1 %) had non-grievous injuries, 160 (29.9 %) had grievous injuries, 4 (0.8 %) had injuries endangering life and 12 (2.2 %) had injuries fatal in the ordinary course of nature. The injury was non-

grievous in 25 (45.5%) of those who had an accidental injury and a similar number was grievous. Three (5.5 %) were endangering life while two (3.6 %) were fatal in the ordinary course of nature.

Both the abortion victims had no injuries while 15 of child abuse victims had non-grievous injuries (83.3 %) and three (16.7 %) had grievous injuries.

Of the 6 self-inflicted injuries two each (33.3 %) were non-grievous and endangering life while one each (16.7 %) was grievous and fatal in the ordinary course of nature. All those produced by the police for examinations had non-grievous injuries while two (40 %) animal attack patients had non-grievous injuries and three (60 %) had grievous injuries (Table 2).

Table 2: Category of hurt

	NG (%)	G (%)	EL (%)	FIOCEN (%)
Assaults	359 (67.1%)	160 (29.9%)	4 (0.8%)	12 (2.2%)
Accidents	25 (45.5%)	25 (45.5%)	3 (5.5%)	2 (3.6%)
Self-Inflicted	2 (33.3%)	1 (16.6%)	2 (33.3%)	1 (16.6%)
Abortions	2 (100%)	-	-	-
Child Abuse	15 (83.3%)	3 (16.7%)	-	-
Produced by police for examination	5 (100%)	-	-	-
Animal Attacks	2 (40%)	3 (60.0%)	-	-
Total	410 (65.5%)	192 (30.67%)	9 (1.44%)	15 (2.4%)

*NG – Non-grievous, G – Grievous, EL – Endangering life, FIOCEN – Fatal in ordinary course of nature.

DISCUSSION

Of the 1367 medico-legal cases registered over the five-year period, 42.4 % were road traffic accidents. Since these were analyzed and published in 2017, all road traffic accidents were excluded in this study. The present study analyzed all other casualties presenting with trauma to Teaching Hospital, Peradeniya, over the five years. It has become a massive burden to the world economy, costing billions of dollars each year. Therefore, there is a need of effective violence prevention interventions to reduce these avoidable injuries.

Once the road traffic accident casualties were excluded, the majority (85.5 %) were due to assault, followed by accidents (8.8 %), child abuse (2.9 %), self-inflicted injuries (0.95 %), animal attacks (0.8 %), produced by the police for examination (0.8 %) and abortions (0.3 %).

According to studies done in India¹⁰ and Scotland¹¹, the percentage of male victims of assault were found to be 85.4 % and 80 % respectively which was similar to this study. Males dominate over females in almost all the types of casualties, with the percentage of males of accidents, animal attacks and

produced by the police for examination being 61.8 %, 66.7 % and 75 % respectively.

This may be due to the aggressive behavior, prevalent outdoor activities, more active lifestyle in the society and inclined to engage in riskier behavior¹². Self-inflicted injuries were seen equally in both females and males. However, the majority of victims of child abuse, were female (72.2 %) which is similar to the finding of a study done in Anuradhapura, Colombo South and Ratnapura districts in Sri Lanka.

There was a greater proportion (27.6 %) of all the casualties between the ages of 20-39 years with a mean age of 34 years. However, in a study done in Nigeria, 70.4% of cases were from the age groups of 20-39 years¹³. This may be due to the fact that, young people in this age group tend to be more aggressive and impulsive and marred by array of problems starting from unemployment to newer exposure of responsibilities to establish a new domain or identity in their respective work of life having cut-throat competition⁴. Considering two abortion cases one was 22 years old and other was 44 years old. In Sri Lanka, induced abortions are illegal and restricted to cases in which the mothers' life is in danger. Therefore, most of the induced abortion cases are not reported to the Government sector. Most of the women tend to have unsafe abortion due to lack of reliable source of information during decision making. Moreover, some other reasons such as poor knowledge, positive attitudes on its safety, a smaller number of affordable abortion services and their economy instability may cause to have illegal abortions¹⁴.

Among the assault casualties, the majority (72 %) were assaulted by a blunt weapon which is similar to the study done in Australia where the majority of the assault injuries were due to blunt weapons¹⁵. Frequently, the assault incidents followed small arguments and the assailant tends to

assault with bare hands as well as objects nearby. Weapons used in assault depends on its availability, intention of the assailant and the level of aggressiveness. The socio economic and geographical influences increase the level of impact¹⁶. Moreover, most of the assault incidents occurred during the evening, which may be due to their more exhaustible, irritable and irresponsible nature along with more man to man interaction after the working period¹⁰. This behavior is totally altered after midnight as it involves fewer human activities¹⁰.

Among victims who - sustained injuries caused by explosive objects, the majority (40 %) were injured by discharge of a trap gun. A trap gun is an illegally and locally manufactured smooth bore, long barreled, muzzle loading firearm in Sri Lanka. It has a victim activated trigger mechanism and is usually used to protect crops and livestock from wild animals. This is commonly seen in the dry zone in Sri Lanka, which includes Ampara, Anuradhapura, Kurunegala, Monaragala and Vavuniya¹⁷. According to the firearm ordinance in Sri Lanka, people need a license to keep a gun which is issued in limited numbers. Therefore, firearms are not readily accessible in Sri Lanka¹⁸. This may be the reason for a small number of firearm related injuries compared to other countries such as US where the total number of gun violence incidents in 2018 was 57235, (including 340 mass shooting incidents), causing 14746 deaths and 28202 injuries¹⁹.

Burn injuries are very common and is the fourth most common type of trauma observed in the world²⁰. Interestingly all the burns in this study caused by assault, were due to acid. Acid burns in Sri Lanka commonly occur due to assaults²¹ and there is an increasing occurrence of acid attacks compared with other countries in Asia and Africa which has moderate industrialization²². This is an alarm for medical, social and government authorities to explore solutions to prevent such acts and

mitigate further complications to their victims.

Of accidental injury victims, highest proportion was injured by accidental falls and burns. Among the accidental falls, more than half had fallen from a height. Falls are the second leading cause of accidental injury deaths worldwide and each year 646 000 individuals die from falls and 37.3 million are hospitalized²³. Considering accidental burns, the majority (66.7 %) were flame burns while 28.6 % were from hot liquids and 4.8 % were due to hot objects. Burn injuries are one of the major health problems that cause prolong physical and mental disabilities²⁴. Interestingly all the accidental blunt injuries occurred at the work place. The only sharp weapon injury, was a penetrating injury which had occurred while climbing a tree.

There is a decreasing trend of suicide in Sri Lanka since 2011²⁵. In this study, of the self-inflicted injuries, half (50 %) had burn injuries and all were flame burns. It was followed by in equal numbers of firearm/explosive injuries (16.7 %), poisoning (16.7 %) and both sharp and blunt injuries (16.7 %). All explosive injuries were caused by firearms and a gas cylinder. According to a study conducted in 2013, agrochemical poisoning was the most common method of suicide in the Eastern province of Sri Lanka, followed by poisonous seeds, hanging, deliberate train injury and self-drowning. However, according to the Sri Lankan Police 2018 report, the commonest mode of suicide in the entire country was hanging, followed by agrochemical poisoning, train injury, self-drowning and self-immolation²⁶. The difference in our study is probably due to the fact that we are considering the victims who survived after attempting suicide.

Among those who were produced by the police for examination, were those apprehended for crimes committed and drivers of vehicles for alcohol level

examination. In Sri Lanka, according to motor traffic act to charge drunken drivers, police are required to prove that the accused had consumed alcohol and has a concentration of alcohol in blood above 80mg/dl. The police officer may use a breathalyzer or produce the driver to a government medical officer for examination. Alcohol consumption is one of the major risk factors for interpersonal assaults and road traffic injuries. Majority of the assaults occurred during night hours, mostly on weekends with the street and drinking bars being the commonest venues similar to the study done by Charles and Oberaifo¹³. A study done in West Midland showed that 60 % - 70 % of victims who were suffering from physical violence had a positive blood alcohol level at the time of the attack²⁷. Moreover, the risks associated with assault injuries are similar in men and women without intake of alcohol. It has also been shown that alcohol consumption can increase the impact of an assault²⁸.

Among all casualties, there were few animal attacks; among them, dog bites were the commonest type of animal attack. Canine rabies causes approximately 59,000 human deaths globally, over 3.7 million disability-adjusted life years, and 8.6 billion USD economic losses annually²⁹. The high prevalence of dog bites in Sri Lanka, coupled with poor knowledge and dog bite management practices and the high cost of prophylactic treatment should be addressed by the policy makers and relevant authorities.

Approximately two-thirds (65.5 %) of the casualties we studied had injuries that amounted to non-grievous injuries. Among all casualty's, the majority of assault, abortion, child abuse and produced by police, had non grievous injuries. Most of the assaulted victims were assaulted by blunt weapons and among the child abuse victim's majority were sexually abused.

The commonest injuries were abrasions followed by contusions. Lacerations were the third commonest and fractures were the fourth commonest injuries. Among the assault victims, the majority had abrasions and contusions, which was due to the majority being assaulted with blunt weapons. Considering the accidental injuries, majority had burns and lacerations. This finding may be due to the fact that most of the accidental injuries were burn and fall injuries. Half of the self-inflicted injuries were flame burns. All the abortions had no significant injuries. Most of the child abuse victims had no injuries. Since more than half of the victims were abused sexually, these findings can be expected. Majority of the animal attack victims had abrasions while one person attacked by an elephant sustained fractures.

CONCLUSION

There was a high proportion of assaults among the reported cases, in which, males were the predominant group of victims. In contrast, the majority of the child abuse victims were females. Most of the casualties were observed within the age group of 20-39 years.

Proper education, awareness programs and implementing employment opportunities for the youth may reduce the number of incidents. In order to manage trauma casualties, it is important to identify the most common locations of assault and establish well equipped emergency departments with trained medical personnel. There is a need to establish Clinical Forensic Medicine Units in Sri Lanka, as proper examination, documentation and reporting is imperative to implement laws and obtain a successful conviction in a court of law.

List of Abbreviations

WHO	-	World Health Organization
MLEF	-	Medico Legal Examination Form
NG	-	Non-grievous
G	-	Grievous
EL	-	Endangering Life
FIOCN	-	Fatal in the ordinary course of nature

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