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**Audit Of Trauma Patients Presenting At
The Emergency Department Of Patan Hospital, Nepal**

**Degree Project in Medicine
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Abstract

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Introduction: Like most low-middle income countries, Nepal is heavily burdened by traumatic injuries. While traumatic injuries claim a significant part of the annual mortality, the subject is deficiently investigated. To imply preventive measures and evaluate the present situation, policymakers need accurate sources of information.

Aim: This study aimed to investigate trauma mechanism, type of injury, primary management outcome, and time from injury to triage in patients presenting with injuries at Patan Hospital.

Method: This cross-sectional study was conducted between 1st -16th of March 2020, at the emergency room (ER) of Patan Hospital, Lalitpur. The study included all patients presenting with injuries during office hours, only excluding patients seeking care for an old injury due to infection or those who were dead upon arrival. The data was gathered using triage notes and personnel at the ER.

Results: The studied sample included 69 patients, consisting of 49 men and 20 women. The women's mean age was 40 years, whereas the men had a mean age of 27 years. The most common injury-type was falls with 31 cases, followed by road traffic accidents and workplace accidents. Superficial injuries were prominent at 27%, followed by open wounds for men compared to fractures and joint disorders for women. Most patients, 74%, were discharged from the ER after improvement of their condition. The median time between

injury and triage was 2 hours for men and 2.75 hours for women, and only 26% reached the hospital within 30 minutes post-injury.

Conclusions/implications: In Lalitpur, falls are the predominant cause for traumatic injuries, often resulting in mild conditions manageable in the ER. Few receive medical assessment within 30 min post-trauma, disclosing a need to strengthen transportation means to the hospital. Though lacking statistical evidence, men and women could have different injury panoramas, emphasizing the need for further studies in this setting.

Keywords: Traumatic injuries, Emergency room, Nepal.

Abbreviations

ER	=	Emergency Department
WHO	=	World Health Organisation
HIC	=	High Income Country
LMIC	=	Low-middle Income Country
PAHS	=	Patan Academy of Health Sciences
OPD	=	Out-Patient Department
MoT	=	Mechanism of Trauma
ICD	=	International Statistical Classification of Diseases
CCS	=	Clinical Classification Software
PM	=	Primary Management Outcome
Ad	=	Admitted
Im	=	Improved
Re	=	Referred
LAMA	=	Left Against Medical Advice
IRC	=	Institutional Review Committee
RTA	=	Road Traffic accident
WA	=	Workplace Accident
KA	=	Kitchen/cooking related Accident

Background

Introduction

Deadly accidents and acts of violence are often avoidable yet stand for an estimated 8% of the global mortality[1]. For every life cut short by trauma, hundreds more are injured, resulting in 6% of all years lived with disabilities being a result of a traumatic event[2]. Estimations made predicts a continuous increase, indicating the urgent need for global action[2].

According to the World Health Organisation (WHO), the most profound strategy to address traumatic injuries is by implementing preventive measures. In the injury surveillance guidelines presented by the WHO, it is proclaimed that high-quality data regarding the mechanism of trauma, 'when, where, and to whom accidents occur' are essential for developing, monitoring, and evaluating injury prevention strategies [3]. Whereas most High-Income Countries (HICs) for decades have registered this crucial information, some parts of the world are lagging[4-6].

Even though 90% of the deadly traumas occur in Low-Middle Income countries (LMICs), only a few have national trauma registers. This, combined with a widespread issue of underreporting in the official statistics, results in the fact that LMICs often lack sufficient data to direct and urge policymakers in the matter[2, 6, 7]. In summary, the need for more research regarding traumatic injuries in Low-Middle income settings is urgent.

Traumatic injuries – A global burden

While all people are at risk, some traumatic events are more common in different social groups and geographical areas. In high-income countries (HICs), suicide is prominent, compared to low-middle income countries where road traffic accidents surmount. Homicide is the number one injury-related cause of death in LMICs of America, while road traffic accidents are prominent in the Western-Pacific[2]. Almost twice as many males as females meet an injury-related death. Men are highly overrepresented in all investigated categories, except for fire-related accidents where women are affected more often [2, 8].

Globally the younger age groups are the most affected. During the years 2007-2017 road traffic injuries were ranked as the most common cause of death for all aged 15-29 [2]. Furthermore, as the second most common for people aged 15-44, only outnumbered by non-communicable diseases [9]. In summary, traumatic injuries claim the life of the working youth.

Combined, it leads to tremendous costs, both in health care and lost workforce [7]. It is claimed that road traffic-related injuries cost 1.9 trillion US dollars a year. In the developed world, safety nets are intercepting those who cannot work themselves. However, this financial security is still unusual in the developing world [10]. Thus, losing a family provider can push families into poverty [2, 11].

Traumatic injuries in the developing world

The risk of dying from a traumatic injury is more than double in LMICs compared to HICs [12]. Multiple reasons are given for this discrepancy, including insufficient access to qualitative trauma care and rehabilitation, combined with hazardous life conditions [2, 13]. Prominent is the high rate of road traffic accidents, where rapid motorisation without

developing sufficient roads and road traffic regulations has been stated as major reasons [14, 15]. Lack of safety regulations and an uneducated workforce results in hazardous workplace conditions, a significant issue in developing countries [10, 16]. The most injury affected occupations are logging, mining, fishing, and agriculture. All of which are common in LIMCs [10, 17, 18].

As mentioned previously, the lack of reliable data regarding traumatic injuries complicates the implementation of preventive measures. Methods commonly used when investigating traumatic injuries in LMICs are population-based surveys and hospital records reviews [19, 20]. When collecting information from the injured, outer circumstances leading up to the injury usually are well recorded. Though the nature of the injury is often insufficiently described. Compared to studies using hospital records, where the medical aspects are accurately given, but the outer circumstances, the trauma mechanism, is seldom recorded in detail [21]. Battling said dilemma, cross-sectional audits presenting at emergency departments investigating both trauma mechanism and the type of injury could be conducted [22, 23]. Limitations to this method consist of inclusion biases, where access to healthcare, different hospital specialisations, and time limitations play major roles. Thus, collaborations between health care facilities and extensive time frames are desirable for accomplishing reliable estimations.

Nepal at a glance

Nepal is considered one of the world's fastest-growing economies; in recent years, the gross domestic product has increased by over 6% annually. This has been possible mostly due to development in the private sector, tourism, agriculture, and labour migration [24].

Consequently, there has been a decline in poverty. Since 2010, the amount of people living below the international income poverty line has decreased from 24.3% to 9.3% in 2018 [24].

When assessing multidimensional poverty, a staggering 34% of the population classifies [25, 26]. Still, the improvement from 2006, when 64.7% of the population lived in multidimensional poverty, is indisputable.

Despite all the country's progress, it is still ranked among the poorest countries in the world. Nepal has a Human Development Index at 0.578, placing it in 157th place among the 187 countries listed in the United Nations Development Programme [27]. The economic growth of Nepal is unevenly distributed. Economic inequality hinders the poverty reduction by preventing the unprivileged poor to share in the nation's progress [28]. Prominent in Nepal is the striking difference between urban and rural regions [11]. At least 80% of the population lives in rural areas, heavily burdened by poverty [11] [29] [18].

Health in Nepal

The healthcare system in Nepal consists of public and private hospital services, mainly located in urban areas. Smaller primary healthcare facilities provide care in the rural parts of the country [30]. Despite a constitutional declared right to free health care, only 6% of the current governmental expenditure goes to public health [18]. Thus, private out-of-pocket financing is still the primary way of funding medical treatment in Nepal [30-32].

Consequently, the unprivileged poor face difficulties receiving the care they are entitled to. This results in people selling their assets to pay for lifesaving treatments, and patients leaving care facilities against medical advice [33].

Hence, the prerequisites for access to qualitative healthcare varies substantially, where the less privileged rural population is unfavoured [11]. In addition to economic barriers, infrastructural challenges conclude, poorly maintained roads and inadequate means of transportation contributes to the fact that only 62% of the population have access to a health

care facility within 30 minutes[32]. Additionally, many health facilities face difficulties in providing qualitative care. The lack of essential equipment and enough supplies is prominent [30, 33-35]. Public healthcare facilities are provided with a list of 40 subsidized drugs, though substantially, these subsidized drugs are often unsuitable or out of stock [11].

In 2018, though Nepal had at least 20 medical academies producing skilled physicians, their doctor's density index was only 0.67 per 1,000 inhabitants, which is far from the WHO guideline recommendation of 2.3 [18, 36]. Consequently, health care professionals are often burdened with heavy workloads[34], which contributes to the unacceptable doctor's density index by causing physicians to seek better working conditions abroad or in the private sector[37].

Nevertheless, the overall health situation in Nepal is steadily improving. Mirrored in decline in maternity mortality, infant mortality, and a prolonged life expectancy [18].

Following the global epidemiological transition, Nepal has seen a drastic decline in communicable diseases and the rise of non-communicable diseases, signalling a better standard of living [38]. Disorders such as tuberculosis, diarrhoea, neonatal disorders, and lower respiratory infection decrease, while chronic obstructive pulmonary disorders, diabetes, and cardiovascular diseases increase[39].

Trauma in Nepal

Traumatic injuries are an accelerating public health issue in Nepal and stand for a significant part of the national mortality and morbidity [4, 39-41]. Even though the government of Nepal accredited injuries as a public health problem in 2014, the Institute for Health Metric Evaluations claims the amount of all-cause mortalities due to injuries increased from 6.31% to 9.21% between the years 1990 and 2017 [39, 42]. S. Gupta suggest that each year

approximately 31,000 lives could be lost due to traumatic injuries, which stand for 16% of Nepal's annual mortality [41], indicating an underestimation in the official statistics.

Furthermore, S.Gupta argues that at least 19,000 lives could have been saved if access to qualitative trauma care had been available. Additionally, K.J Newman predicts, in a study from 2018, that the injury burden will continue to increase [43].

Regarding the mechanism of trauma, Nepal follows the global trends. Traffic-related deaths in Nepal rose by almost 20% during the recent decade [39]. According to the Global Burden of Disease report in 2017, 4.1% of Nepal's total deaths are due to transport-related injuries, followed by other unintentional injuries at 3.5%, including falls, drowning, and burns[40]. Though transport injuries are the deadliest, falls are the most common mechanism of trauma[40, 41]. Heaviest burdened by injuries in Nepal are young- and middle-aged men. Additionally, trauma mechanism is unevenly distributed between the sexes, with males being more prone to obtain an injury on the road and due to violence. Females, however, more often suffer domestic burn injuries. K.T. Houson found substantial discrepancies between the reported cause of death of young females and the physician's assessment during autopsy [44]. Arguing that the official data could be inadequate, especially regarding self-harm and violence among women in Nepal.

Consequently, the National trauma care in Nepal is insufficient in meeting the demand. In combination with the previously mentioned inadequacies, lack of essential trauma care equipment has been named a primary reason [35]. This vulnerability surfaced during the 2015th earthquake, where deficiencies in trauma care were evident[45, 46]. In summary, though measures to address this urgent issue have been employed by the government of Nepal, more efforts are needed [11, 40].

Like most LMICs, Nepal lacks a national register for injury documentation [2, 40]. Thus, policymakers require other information sources essential for developing injury prevention strategies and evaluating the trauma care given[3]. There are some studies published on this subject. However, many have been claimed to underestimate the actual burden of injuries. Additionally, although an apparent discrepancy between the sexes has been stated, only a few reviewed studies had examined it further [4].

This cross-sectional study attempted to provide a greater understanding of the panorama of traumatic events presented at Patan Hospital in Lalitpur, Kathmandu Valley. An understanding which could aid in the development of prevention strategies by emphasising which mechanism of traumas are most common and thus highlight where measures should be directed. Furthermore, evaluate the need for development of the trauma care in the region [3].

Aim

This study aimed to answer the following objectives regarding patients presenting with traumatic injuries at the emergency room at Patan Hospital, Lalitpur.

Scientific issue

Which is the most common mechanism of trauma?

Which are the most common types of injuries?

Which is the most common primary management outcome?

What is the time frame from injury to triage?

Which mechanism of trauma most often result in admittance?

Are there any differences between males and females regarding, age, mechanism of injury, type of injury, primary management outcome, and time from injury to triage?

Method

Research design

This cross-sectional observational study, of patients presenting with traumatic injuries, was conducted at the ER of Patan Academy of Health and Sciences (PAHS), Kathmandu Nepal.

Setting

The city Patan is situated in the district of Lalitpur, south of the capital Kathmandu, and is the 3rd largest city in Nepal [47]. Patan Hospital was established 35 years ago by an international Christian organization with the primary goal of serving the unprivileged and poor. Patan Hospital provides care for more than 20,000 admitted patients annually and tends to approximately 320,000 outpatients a year.

When seeking care at PAHS, patients can either visit the Outpatients department (OPD) for less urgent issues or attend the ER directly. Triage is done by a nurse placing the patient in three different categories depending on the severity of the condition. The most severe cases are classified as red and must be assessed by a doctor within minutes. The next triage category is yellow, with moderate severity. Least severe cases are classified as green.

Study population

Eligible for the study were patients of all ages presenting with traumatic injuries at the ER during daytime every Nepali working day (Mon, Tue, Thu, Fri, Sun). Excluded were patients seeking care for an old injury due to infection or were dead upon arrival at the ER.

It was estimated via the triage logbook that approximately 10 patients were attending the ER due to traumatic injuries each day. Data collection was limited to daytime (08-17), giving an inclusion rate of 4-7 patients. Initially, the sample size was anticipated to be 150 people. Due

to the Covid-19 pandemic, the data collection period was limited to two weeks, stretching between 1st to 16th of March 2020. Hence, the sample size was reduced.

Data collection

After triage, the patients with injuries were placed in the trauma section of the ER. After medical assessment and primary management were determined, the patients were asked for consent to be included in the study. Either the participating patient or a guardian signed the consent form provided by the Institutional Review Committee (Ethical committee) of PAHS. (see appendix 1-2) After consent was obtained, the data collection took place, using a prepared form (see appendix 3). The information was gathered using the triage notes and if insufficient, doctors at the ER were asked to complete the medical history.

Variables

The variables studied were age, sex, district of origin, trauma mechanism, type of injury, time from injury to triage, and primary management outcome for the patients presenting with traumatic injuries.

Patan Hospital is situated in the geographical area called the Kathmandu valley, which contains 3 of the 75 districts in Nepal. Consequently, the variable “district of origin,” defined as where the patient lived, was divided thereafter. Namely into Kathmandu, Lalitpur, Bhaktapur, and other (patient living outside the valley).

Mechanism of trauma (MoT) was grouped based on the categories used in *Injuries and violence: The facts* By WHO from 2014[2]. Though adding workplace accident and Kitchen/cooking related accident, to further investigate findings from S. Gupta national survey in 2015, where the second biggest category was house or workplace accident[41].

Hence the variable mechanism of trauma was divided into; Road traffic accidents (including; drivers, passengers, and pedestrians), bicycle accidents, violence (including; abuse, assault, intended homicide, sexual violence, and self-harm) falls (including; falling from a height and falling at ground level) workplace accident, kitchen/cooking related accident (including; domestic cuts and burns) and other. The category named other was used when an injury was obtained in a manner not covered by the other five categories.

The type of injury was diagnosed by doctors at the ER using International Statistical Classification of Diseases – Tenth Edition (OCD 10), and later classified by single-level Clinical Classification Software (CCS) number 225-244 “injuries and poisoning” (see Appendix nr 4). CCS was developed as a tool for diagnosing and categorising patients in a clinically useful manner, simplifying the process of descriptively presenting the data. [48].

To investigate the objective primary management (PM) outcome, the situation concerning the patient’s departure from the ER was examined. Therefore, primary management outcome was divided into; Admitted to Patan hospital (AD), discharged due to improved health (Im), referred to another healthcare institution (Re), Left against medical advice (LAMA), and deceased at the ER. Additionally, investigate any conjoined variations between admittance and mechanism of trauma.

The time frame was investigated by examining how long it took for the patients to arrive at the triage desk, using the triage notes' time and date compared to when the alleged injury occurred.

Statistical analyses

The data were analysed using IBM Statistical Package for the Social Sciences in comparative and descriptive analyses. A difference with a two-sided p-value of <0.05 (confidence interval 95%) was considered significant. Due to the small sample size, Fischer's exact test was used to test for statistical significance for differences between gender in type of diagnosis, mechanism of trauma, time from injury, and primary management outcome. Independents-sample t-test was used to test for differences in mean age. Time from injury to triage values did not exhibit normal distribution hence were presented in medians for each sex.

Ethical consideration

This study aligned with the principles of the World Medical Association Helsinki Declaration. Ethical approval was applied for and approved by the Institutional Review Committee (IRC) of Patan Hospital (See appendix nr 5). All patients included in the study were anonymous. No data that could be traced back to the patient was written down. A consent form was used to seek consent from all participants (see appendix 1-2). The patients included could withdraw consent at any time. The study did not, in any way, interfere with the care or treatment of the participating patients.

Results

A total of 69 patents met the inclusion criteria during the data collection period between 1st - 16th of mars 2020.

Demographics

Of the 69 cases included, 49 (71%) were male, and 20 (29%) were female. The mean age for all patients was 31 years. For females, the mean age was 40 years and for men 27 years, see tab. 1. Two-sample t-test shows that the difference is statistically significant with a two-sided p-value of 0.016.

Tab. 1 Mean age for women and men presenting with traumatic injuries at the emergency room of Patan Hospital.

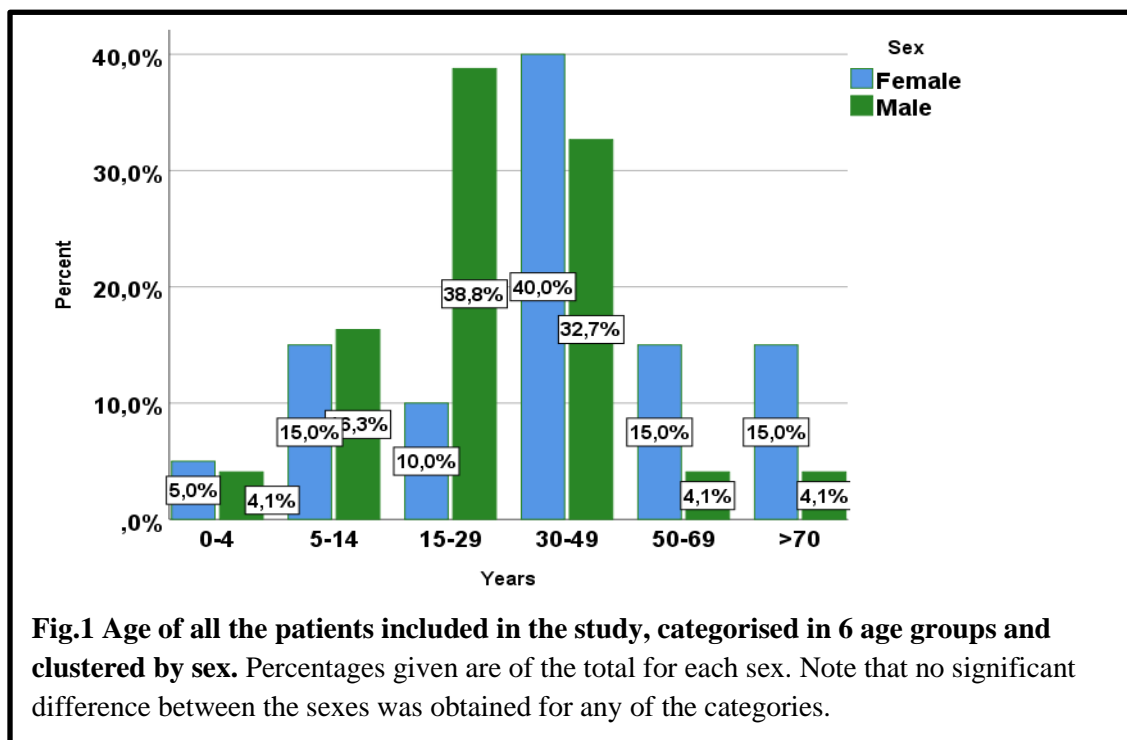
Comparing mean age between the two sexes reveals a statistically significant difference with females being older, p-value 0.016. The mean age for both sexes were 31 years, for women 41 and for men 28 years.

Gender	Mean	Count	Std. Deviation	Std Error mean
Female	39,95	20	23,739	5.308
Male	27,49	49	16,830	2.404
Total	31,10	69	19,744	

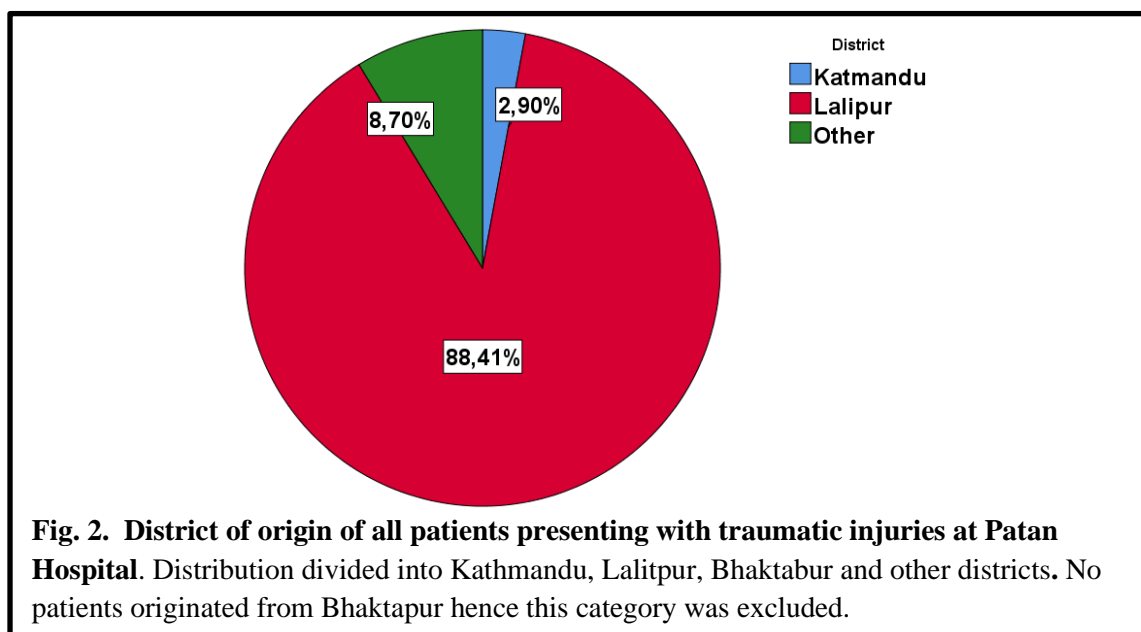
Std= Standard

In the studied sample, 24 patients (35%) were 30-49 years of age, making this the biggest age group. The second-largest group was patients aged 15-29, consisting of 21 people. Of all patients included, 49 (71%) were in working age, defined as 18-65 years. The study counted 14 children, determined by the medical measurements of Patan Hospital as up to 14 years old, and 55 adults. Of the total sample, 19 were men aged 15-29, standing for 28% of all patients included, making this the group most often presenting with injuries at Patan Hospital. Fig. 1 depicts age distribution categorised in 6 age groups and clustered by women and men, respectively. For women, the majority were in the age group 30-40 (40%), and 6 patients (30%) were over 50 years of age. While looking at males, the majority were in the age group

15-29, and only 4 (8%) were over 50 years old. Though females and males' distribution differ between the age groups, Fischer's exact test reveals no statistical significance.



Of the 69 included patients, 2 (3%) originated from Kathmandu, 6 (9%) from outside the valley, and the rest, 61 (88%) cases were from Lalitpur, see fig.2. None of the included patients originated from Bhaktapur. Hence this category was excluded. One of the Kathmandu



residences were admitted due to “Open wound of head and neck” (CCS code 235) inflicted by self-harm, categorised as violence. The other one presented with superficial injury (CCS code 239), due to a fall and were discharged from the ER after improvement of the condition.

Mechanism of trauma

The most common mechanism of trauma was falls, 31 cases (45%), followed by road traffic accidents with 13 cases (19%), and workplace accidents with 10 cases (15%), shown in tab.

2. None of the included patients had suffered an injury due to a bicycle accident. Thus, this category was excluded.

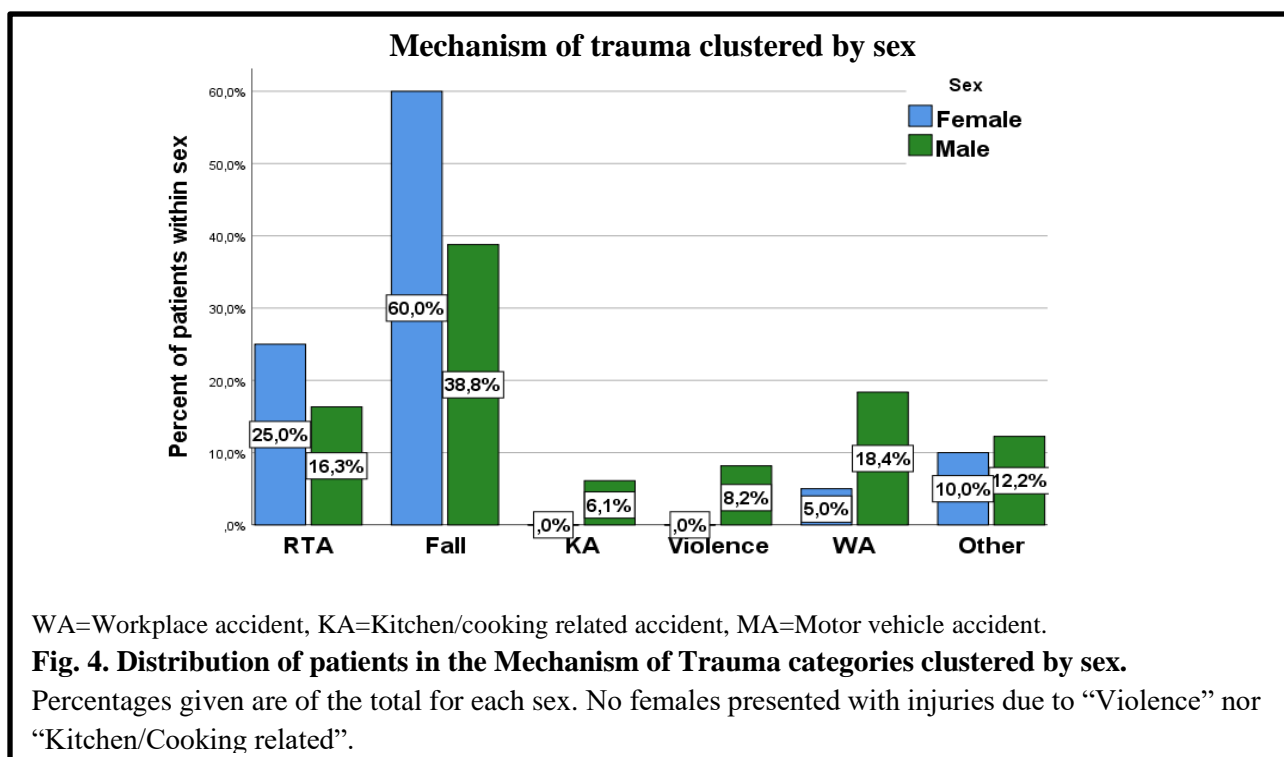
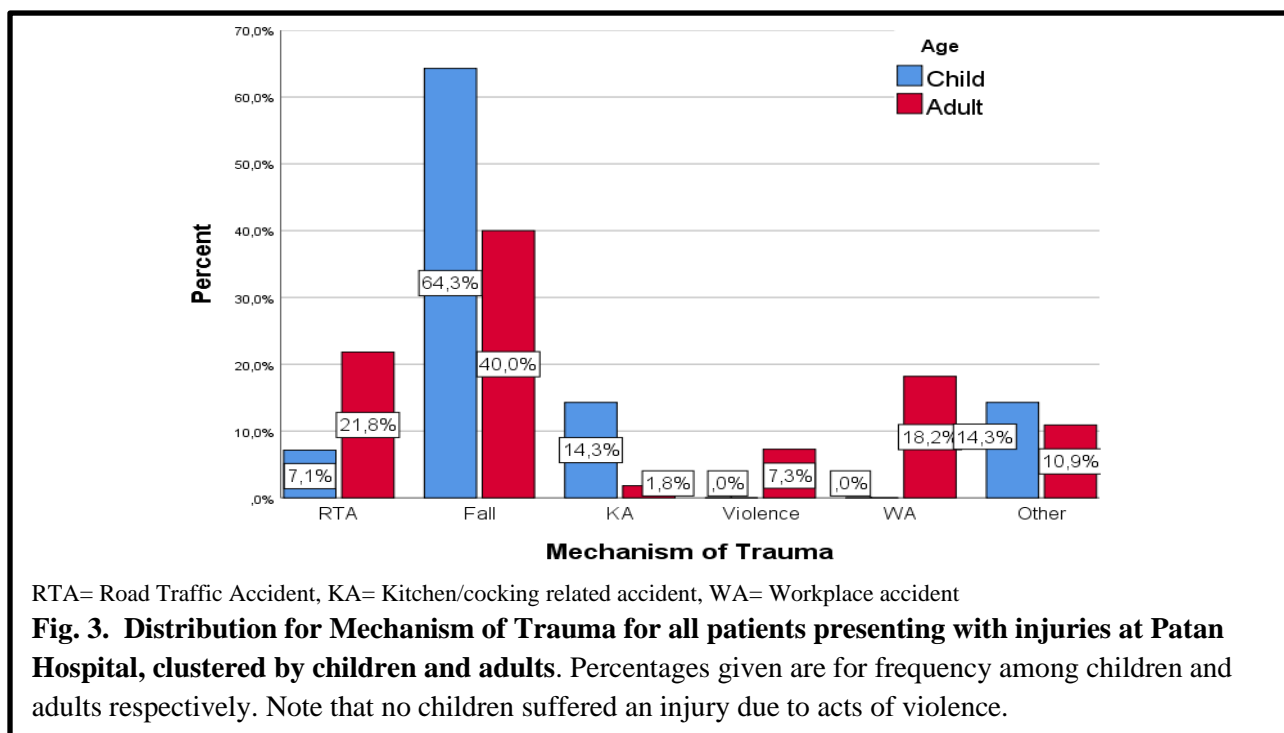
Tab. 2. Mechanism of Trauma for patients presenting with injuries at Patan Hospital.

Trauma mechanism was divided into 6 categories. Percentages of the total sample reveals falls as the most common mechanism of injury, followed by Road Traffic Accident.

Mechanism of trauma	Females	Males	Total	Percent
MoT Fall	12	19	31	45%
Road Traffic Accident	5	10	13	19%
Workplace Accident	1	9	10	15%
Other	2	6	8	12%
Violence	0	4	4	6%
Kitchen Accident	0	3	3	4%
Total	20	49	69	100%

MoT= mechanism of trauma

Only one child presented with a traffic-related injury, whereas this category was the second most common among adults. The trauma mechanisms for adults and children are summarized in fig. 3.



Depicted in fig. 4 is the MoT categorised by sex. Not surprisingly, the majority of both sexes presented with a fall injury. The second most common MoT for women was road traffic accidents (25%). Interestingly, for men, workplace accidents (18%) came second.

Due to small sample sizes and few observations in multiple categories, binary linear regression was unfit for statistical testing. Instead, Fischer’s exact was utilized for all categories except fall, where the Chi² test was employed. As can be seen in tab. 4, no independence could be found between the sexes, with a two-sided p-value above 0.05 for all categories.

Tab. 4. Distribution of Mechanism of Trauma for patients presenting with injuries at the ER of Patan Hospital. Demonstrates number and percentages for females and males in every MoT category. Statistical significance was tested for using Fischer’s exact test and Chi² test. With two sided p-values over 0.05 no statistically significant difference was obtained.

MoT			Gender		Total	P-value
			Female	Male		
Road Traffic Accident	Count	5	8	13		
	% of Total	7.2%	11.6%	18.8%	>0.05	
Fall	Count	12	19	31		
	% of Total	17.4%	27.5%	44.9%	>0.05	
Kitchen Accident	Count	0	3	3		
	% of Total	0.0%	4.3%	4.3%	>0.05	
Violence	Count	0	4	4		
	% of Total	0.0%	5.8%	5.8%	>0.05	
Workplace Accident	Count	1	9	10		
	% of Total	1.4%	13.0%	14.5%	>0.05	
Other	Count	2	6	8		
	% of Total	2.9%	8.7%	11.6%	>0.05	
Total	Count	20	49	69		
	% of Total	29.0%	71.0%	100.0%	>0.05	

MoT= Mechanism of Trauma

Type of injury

Tab. 5. summarizes the observed diagnoses. From the table, it can be seen that, by far, the most common diagnosis presented at the ER of Patan Hospital was “Superficial injury: contusion” (CCS code 239), followed by “Open wound on head, neck, and trunk” (CCS code 235). Several patients presented with multiple injuries, resulting in 8 cases with two different

diagnoses. Open wounds on extremities (CCS code 236) was the diagnosis most often combined with another.

Tab. 5. Ranked traumatic injuries at the ER of Patan Hospital, diagnosed by Clinical Classification Software. The trauma categorised as “Other injuries” consisted of a foreign body in a phalange. For the 69 patients included in the study a total of 78 diagnoses was observed.

	Frequency	Percent
Superficial injury, contusion	21	26.9%
Open wounds of Head, neck and trunk	13	16.7%
Open wounds of extremities	11	14.1%
Joint disorders and dislocations	9	11.5%
Fracture of lower limb	8	10.3%
Fracture of upper limb	7	9.0%
Crushing injury or internal injury	3	3.8%
Burns	2	2.6%
Skull and face fractures	1	1.3%
Other fractures	1	1.3%
Intracranial injury	1	1.3%
Other injuries	1	1.3%
Total	78	100.0%

ER= emergency room

The oldest patient included, 87 years old, had suffered a fall accident, resulting in a fractured hip (CCS code 230). Two patients aged 78 were included; one had “Fracture of upper limb” (CCS code 229), and the other one “Fracture of lower limb” (CCS code 230), both due to falls. The youngest two patients included were one year of age, presenting with burns (CCS code 240) due to Kitchen/Cocking related accidents.

Both sexes had “superficial injury” (CCS code 239) as the most common, seen in tab. 6. Only 2 females presented with “open wounds” compared to 20 males. Still, Fischer’s exact test shows no significant difference. In the diagnosis categories “Fracture of lower limb” “Fracture of upper limb” and “Joint disorders” the males frequency mirrors the females.

Tab. 6. Traumatic injuries classified by Clinical Classification Software, number for each gender and in total. Most common for both sexes were “Superficial injury; contusion”. Only 2 females, compared to 20 males presented with “open wounds”.

		Sex		Total
		Female	Male	
CCS	Superficial injury; contusion	5	14	19
	Open wounds of extremities	1	10	11
	Open wounds of head, neck and trunk	1	10	11
	Fracture of lower limb	4	4	8
	Joint disorders and dislocations	4	4	8
	Fracture of lower limb	3	3	6
	Burns	0	2	2
	Other fractures	0	1	1
	Crushing injury or internal injury	1	0	1
	Intracranial injury	0	1	1
	Other injuries and conditions due to external causes	1	0	1
	Total	20	49	69

CCS= Clinical Classification Software

Primary management outcome

The majority of the patients (74%) were treated and discharged from the ER after improvement of their conditions. 12 (17%) of the 69 included patients were admitted for in-hospital care, and 6 (9%) were referred to other hospitals, shown in tab. 7.

Tab. 7. Frequency and percent for each primary management outcome category.

Shown in numbers and percentages of the total sample. 74% was discharged from the ER after improvement of their condition. 38% of the patient suffering from injuries caused by RTA needed admittance. None of the injured died at the ER during the study period, hence this category is excluded.

		Frequency	Percent
		PM	Improved
	Admitted	12	17.4
	Referred	6	8.7
	Total	69	100.0

PM= Primary management outcome, RTA= road traffic accidents, ER=emergency room

Of the patients referred, 3 (50%) were referred to another hospital due to lack of neurosurgeons, one was referred for vascular surgery, and the last two patients were referred

to the Outpatient Department (OPD). No deaths due to injuries were observed at the ER during the study period.

Half of the patients admitted to Patan hospital had suffered a fall injury, and 3 (25%) had sustained an RTA. See tab. 8. Two of the admitted were diagnosed with multiple diagnoses. One had “open wounds of extremities” (CCS code 235) and “fracture of upper limb” (CCS code 229), the other one was diagnosed with both “other fractures” (CCS code 231) and “crushing injury or internal injury” (CCS code 234). Among the admitted patients, 4 (29%) had “fracture of upper limb” (CCS code 229), making it the most common traumatic diagnose for admitted patients at the ER of Patan Hospital during the study period. Though 50% of the admitted had suffered a fall accident, the trauma mechanism causing injuries that needed to be admitted most often was RTA. 38% of the patients presenting with RTA were admitted, compared to 19% of the patients presenting with falls. Though, using Fischer’s exact test, no statistically significant difference was found.

Tab. 8. Frequency and percent for each mechanism of trauma category among the 12 admitted patients. Two of the admitted patients was diagnosed with multiple diagnoses.

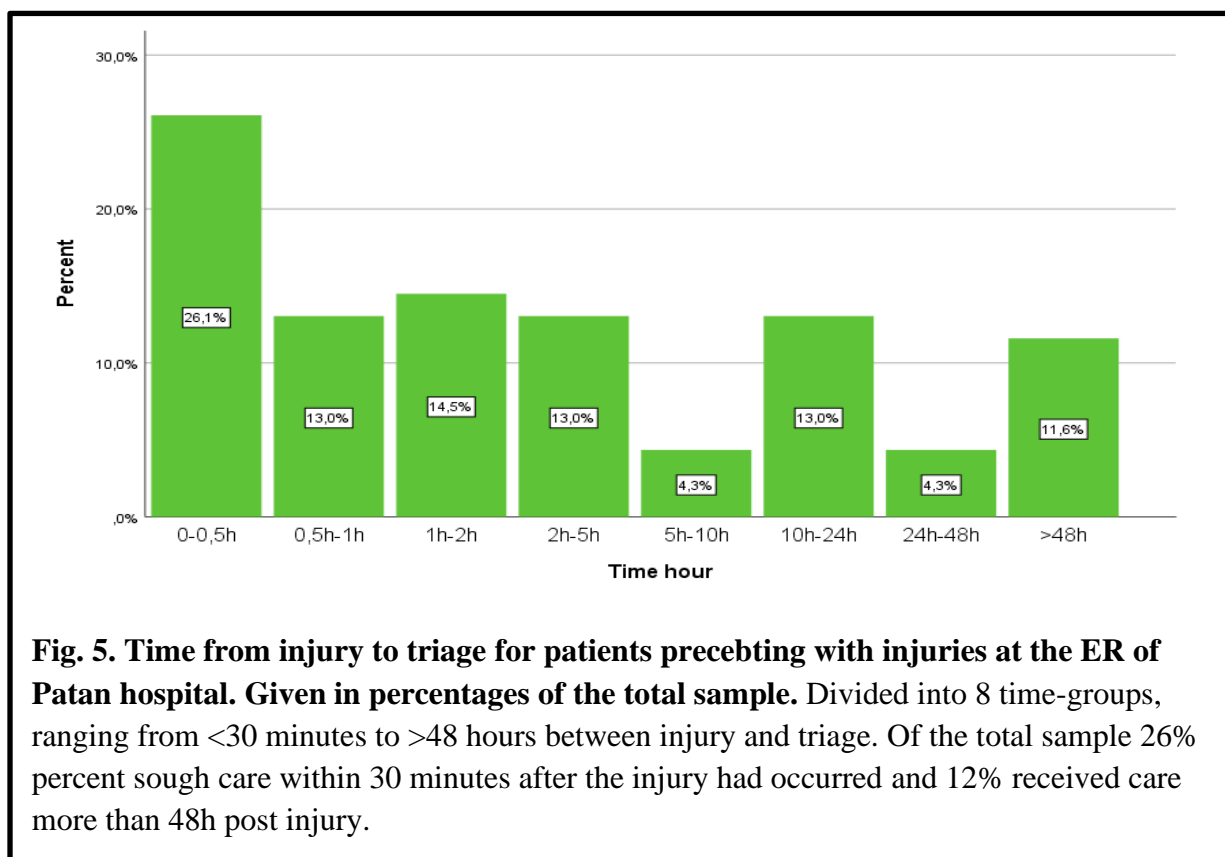
		Frequency	Percent
MoT	Fall	6	50.0
	Road Traffic Accident	3	25.0
	Kitchen Accident	1	8.3
	Violence	1	8.3
	Workplace Accident	1	8.3
	Total	12	100.0

MoT= mechanism of trauma

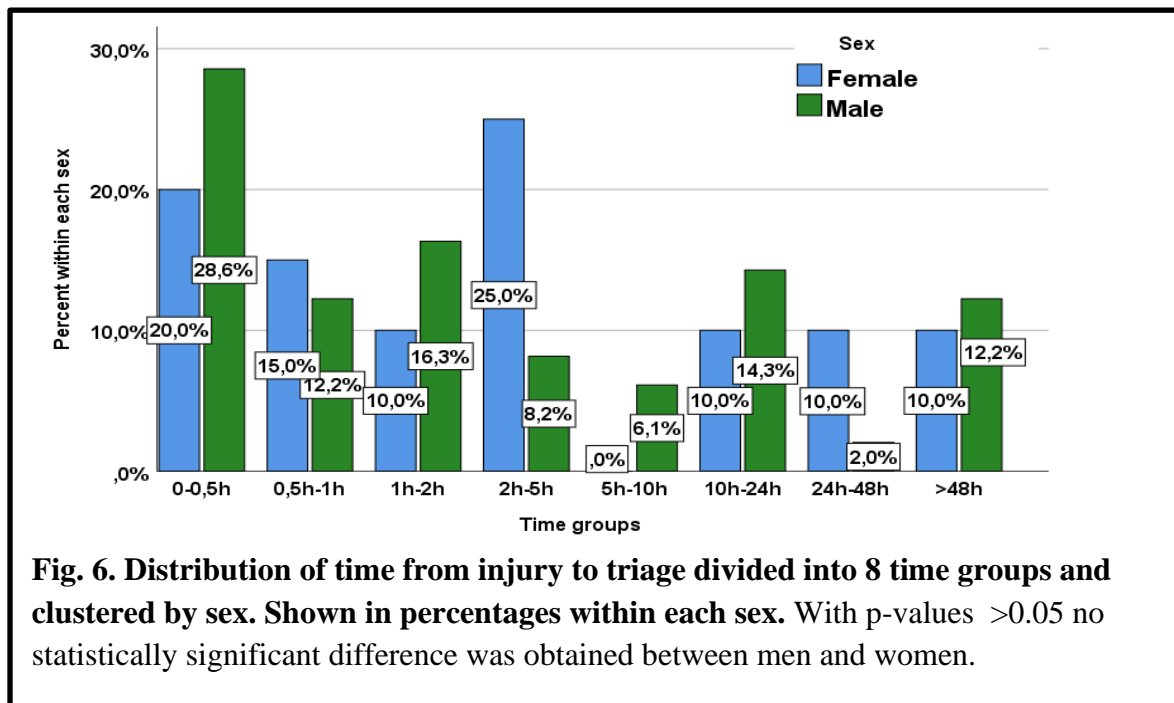
In total, 12 patients were admitted, 5 (42%) females, and 7 (58%) males. 25% of the females seeking care were admitted, compared to 14% of the males. However, Fischer’s exact test showed no significance.

Time from injury to triage

The overall time frame between injury and triage is shown in fig. 6. 26% of the patients received medical care within 30 minutes of the trauma. Of these, 33% presented with "open wound on extremities" (CCS code 236), 22% with "wound on head, neck or trunk" (CCS code 235), and 22% with "Superficial injury: contusion" (CCS code 239). 16% of the patients included sought care more than 24h post-injury, time groups 7 and 8. Of those receiving care more than 24h post-injury, 36% suffered from joint disorders (CCS code 225), 27% from "Superficial injury: contusion" (CCS code 239) and last 18% were diagnosed with "fracture of lower limb" (CCS code 230). 16% of the patients reaching the hospital >24h post-injury were admitted, compared to 17% of the total sample.



The data does not exhibit normal distribution, hence the median instead of mean was calculated. The median time for women and men was 2.75h and 2h, respectively. In fig. 6 below, time groups clustered by sex are presented. 29% of males reached the hospital within 30 minutes and 20% of females. Of the women, 20% received care 24 hours post-injury, compared to 14% of the men. Though, Fishers' exact test shows no statistically significant difference.



Discussion

Introduction

This audit was conducted as an attempt to provide cross-sectional data regarding traumatic injuries at the ER of a communal Hospital in a developing country, where injuries claim a significant toll on society. Considering the limited sample size and the short period of time during which this study was conducted, solemnly trends could be identified, giving no conclusive answers to the research questions. However, it gives a brief description of the flow of traumatic injuries, applicable to Patan Hospital, Lalitpur.

Demographic

The demographic results of this study demonstrate clear trends in line with previous studies. Men were heavily overrepresented among the patients seeking care at Patan Hospital due to an injury. This finding follows the well-known fact that men are more accident-prone [3] [2] [49] [50]. Age distribution of this study indicates most injured are 15-49 years of age. Implying death rates mirrors overall injured, this finding is consistent with previous studies [1]. The mean age for trauma patients of both sexes was 31 years, with the females being older (40 ± 5.3) than the males (28 ± 2.4). Supporting this finding is results from S.Sorensens' study in 2011, where the male: female ratio for unintentional injuries was highest in adolescence and younger middle-age. Whereas the ratio decreased in the older population [8]. Hence indicating young men are injured at a higher rate than young women. Suggested reasons for this discrepancy were lifestyle and behavioural risks. Additionally, the discrepancy found in the current study could be explained by the different median age for men and women of Nepal, with women being generally older [18].

Mechanism of injury

When reviewing studies researching injuries in Nepal, there is a consensus proclaiming fall, followed by RTA, as the most common mechanism of trauma[19, 51] [40] [41]. In line with previous findings, most of the patients presenting with injuries at Patan Hospital had suffered injuries due to a fall trauma or RTA. Though workplace accidents tend to be common in Lalitpur, few studies were found on this subject. This result could be expected though, considering Nepal being a LMIC with agriculture as the main source of income[16, 18].

There was no statistically significant difference between the sexes regarding the mechanism of injury, though certain trends were observed. Only 1% of the women presented with a workplace accident compared to 13% of the men. This discrepancy could be attributed to employment rates, where women generally do unpaid housework, and men more often work in construction, industries, and agriculture [52]. Hence, exposing themselves to a greater risk of inflicting injuries[16, 17]. According to this study, more women than men could be injured in traffic; this contradicts previous findings[4]. Explanatory to this contradiction could be the limited sample size. In addition, this study shows that most women injured in traffic were pedestrians, which is supported by H. Reihanis' findings from 2017 [23].

Although fall was the most common trauma mechanism presented at Patan Hospital, a higher rate of RTA was admitted, 19% contra 38%, respectively. Indicating RTA resulting in more severely injured patients, which agree with findings from the Global Burden of Disease study 2017, and furthermore, corroborates with S. Ramirez results from 2015 [1] [7].

Type of injury

In line with previous studies, less severe diagnoses such as “superficial injury; contusion” were prominent[50, 53]. Commonly “superficial injury; contusion”, or similar, is used when the x-ray depicts unfractured bone[54]. An explanation for this trend could be the setting. Hospitals in Kathmandu valley, where Tribhuvan Hospital, mere kilometres away, is specialised in advanced trauma care, resulting in most of the major traumas being directed there.

CCS code 236 “open wounds of extremities,” CCS code 229 “fracture of upper limb,” and CCS code 230 “fracture of lower limb” stands for more than a quarter of all traumatic injuries in this study. Supporting S. Guptas’ findings in 2015, where more than half of all reported injuries in a national survey were located on the extremities [41].

Though not statistically proven, there could be a discrepancy in the type of injury between the sexes. Almost half of the men presented with “open wounds” compared to a mere 1/10 of the women. A possible explanation is that, in this study, a significant amount of the wounds were inflicted at work. As stated previously, men of Nepal tend to work away from home more often.

Primary management outcome

Surprisingly, this study indicates a higher rate of women being admitted in comparison to men. However, the findings of this current study do not support previous research, which has suggested that men tend to be more severely injured, thus requiring in-hospital care more often [2, 9, 40]. Possibly this finding is solemnly coincidental due to the small sample size and the probability of more severely injured patients seeking care at Tribhuvan Hospital in favour of Patan Hospital.

This study has been unable to demonstrate the high rates of LAMA due to insufficient private funding, suggested by previous studies[30, 41]. Though it is possible that patients classified into this category, but the method used failed to include them.

Time from injury to triage

A vital, lifesaving aspect of emergency care is time. Only 26% of the patients seeking care at Patan Hospital due to injuries received a medical assessment in the triage within 30 minutes post-trauma. This finding is contrary to a survey conducted by the government of Nepal in 2011, which claimed that 62% of households have access to healthcare facilities within 30 minutes[52]. An explanation could be that the survey included all health care facilities, and it is possible patients included in this study passed on smaller facilities in favour of Patan Hospital.

Furthermore, 16% of the patients seeking care more than 24h post-injury is admitted, compared to 17% of the total. This finding could indicate the time from injury to triage to be independent of the severity of the injury. Contradicting a study conducted in a similar setting, where the severity of the trauma coexisted with faster transport to the ER[23]. An explanation could be the limited sample size of the current study.

The median time for men was 2h and for women 2.75h, indicating a discrepancy. A study conducted in 2019 by S. Chaudhuri[55] proclaims that lack of economic funding could be a major reason for not using ambulance services. Though this study didn't investigate the means of transportation to the ER, a suggested explanation could be that men in Nepal possess greater financial resources to employ ambulance services[11]. Additionally, previous

studies have shown that men more often obtain severe injuries which require immediate care[2, 23]. However, this study failed to demonstrate this connection.

Methodological considerations

Accurate information regarding traumatic injuries is vital for the implementation of high-quality trauma care[3]. Documentation in means of paper-based medical records written by hand is used in many LMICs and is often insufficient. Both lacking complete information regarding the trauma, and are in many cases, unreadable[21]. Thus, implementing a cross-sectional study design, where the researcher can confirm and conclude documented medical history direct with the practicing physician, is preferable when conducting hospital-based research in LMICs. Though, if investigating a setting with few subjects, cross-sectional studies require a substantial time frame for reaching a large enough sample size. Which this study failed to acquire due to the Covid-19 pandemic; hence no statistical significance was obtained. Compared to a cross-sectional study conducted in Iran in 2017 with similar research questions, the time frame was substantially longer for reaching the required sample size of 150 patients[23].

However, barring sample size, this study's utilization of a spreadsheet to cross-sectionally register information about traumatic injuries is supported by the WHO injury surveillance guidelines [3]. Thus, the study design was well-motivated, but due to outer circumstances, it failed to answer the proposed research questions.

Nevertheless, several limitations in the method used can be identified. Firstly, the main inclusion criteria were "presenting with a traumatic injury during day-time every working day at the ER of Patan Hospital". Hence, excluding all patients presenting in the evening or during the night, as well as during weekends. Findings from A. Radjou's study in 2012, in a

similar setting, indicate that injury-panorama differs during the day, with the highest rates of injuries presenting between 5 pm and midnight. Furthermore, there was a clear discrepancy between weekends and working days[22]. Attending the ER costs more than seeking the OPD, thus it is possible that an economical selection took place, resulting in fewer unprivileged poor among the included patients [30, 35]. Combined with the shortcoming of conducting hospital-based research in countries with vastly differing access to health care, the inclusion criteria used may interfere with an accurate presentation of the injury panorama in Lalitpur [21].

Secondly, ethical clearance for this method was facilitated using a written consent form, though so not to interfere, consent was obtained after completion of treatment at the ER prior to the patients' departure. Thus, a few patients left without signing the consent form and were excluded from the study. However, all patients asked agreed to participate.

Thirdly, the type of injury was first determined by a practicing physician and later classified into CCS by the researcher, enabling biases to occur. Nevertheless, CCS is designed to be used clinically and claimed to be easy[48], therefore it is unlikely unfit CCS code was recorded.

Conclusively, the limited sample size only enabled the use of one statistical method, namely Fischer's exact test, still no statistical significance was obtained in the trends found. Hence, no generalization for the population of the Kathmandu valley can be made.

Conclusions and implementations

The main aim of this study was to audit and collect data regarding traumatic injuries presenting at Patan Hospital, Lalitpur. Though no statistical significance could be claimed regarding any of the results, except mean age, several trends and observations were found, which could contribute to the knowledge regarding the burden of injuries in Lalitpur.

The audit of trauma patients at the ER demonstrates the following patterns: falls are the most common trauma mechanism, though RTAs could more often result in admittance. Mild injuries such as contusions and superficial injuries are common reasons for seeking the ER of Patan, resulting in few patients being admitted for in-hospital care. The bulk of those seeking Patan Hospital due to an injury is living close by, in the district of Lalitpur. However, only 26% reach the hospital within 30 min post-trauma. Regarding differences between men and women presenting with traumatic injuries at Patan Hospital, an age difference could be concluded. The women seeking care due to a trauma tends to be older than the men.

Implications to be considered are as follows, the public health authorities in Lalitpur should be focusing future measures at preventing fall accidents, strengthening road safety regulations, and workplace safety, in favour of focusing on preventing acts of violence or burns. Findings regarding the type of injuries imply a need for a preparedness to attend open wounds and fractures; therefore, equipment enabling care for these types of injuries should be prioritized. Investigating time from injury to triage enlightens a need to further improve means of transporting the injured to the hospital.

Though the people of Nepal are burdened by gender-based discrimination and disparities [11], this study failed to identify such. However, a slight difference in time from injury to triage should exhort policymakers to investigate the matter further. With mainly mild injuries

presenting, few referred cases, and no observed deaths, the trauma care at Patan Hospital tends to be sufficient in meeting the current demand in Lalitpur.

Moving forward

Considering the lack of statistical significance in combination with observed trends, further studies in this setting are well motivated. Suggestively, with similar methods, though evidently larger sample sizes are needed. A more accurate representation of the traumatic injuries could be accomplished by also including patients arriving during the evening and the night. Furthermore, to broaden the sample by including patients seeking the outpatient department. By doing this, one can also circumvent the economic bias discussed above. Though, suggested corrections to the method requires the involvement of numerous researchers, and preferably a longer study period.

Populärvetenskaplig sammanfattning

Undersökning av skadepanoramata på akutmottagningen på Patans Sjukhus, Nepal. Allvarliga olyckor som leder till skador, eller rent av döden, är globalt sett ett växande problem. Undersökningar visar att så många som 8% av alla som dör förlorar livet till följd av en skada. Människor som bor i fattigare länder är drabbade i större utsträckning. Det finns många förklaringar, bland annat en mer riskfylld vardag, med bristfälligt säkerhetstänk både i trafiken, hemmet och på arbetsplatsen. Problemet ligger inte bara i att många liv går till spillo, utan även vilka det är som drabbas. Unga, arbetsföra familjeförsörjare är nämligen den gruppen som dör i störst utsträckning. Detta kan leda till att hela familjen kastas ut i fattigdom.

Nepal står inför många utmaningar, en av dem är att möta en ökande trend av skador som sker i samband med utvecklingen av landets vägar och infrastruktur. Sjukvården i landet förbättras ständigt men är fortfarande bristfällig. Vilket leder till att många av dem som skadar sig inte får den livräddande vården de behöver. Bästa sättet att hantera detta växande problem är att stärka landets

nationella säkerhetstänk med förebyggande åtgärder. Men för att göra det behöver beslutsfattarna ha tillgång till bra information om hur skadeläget faktiskt ser ut i landet.

Målet med den här studien var att samla information om skadeläget i Patan, en stad i närheten av Katmandu, genom att undersöka patienterna som sökte till akutmottagningen på Patans Sjukhus. På grund av Covid-19 pandemin behövde studien avbrytas i förtid och ganska få patienter hann därför undersökas. Endast 69st patienter som hade skadat sig undersöktes. Likt tidigare undersökningar var det unga män som skadade sig mest. Fallolyckor var den vanligaste orsaken till skada, men även trafikolyckor och arbetsplatsolyckor var vanliga. Den vanligaste skadetyper var mjukdelsskada, följt av öppna sår och benbrott. De flesta som sökte akuten på grund av skador kunde behandlas och sedan skickas hem. Några få behövde läggas in på sjukhuset, bland dem hade de flesta drabbats av någon form av benbrott. Tidsperioden mellan skada och ankomst undersöktes också. Det visade sig att för många tog det lång tid att nå sjukhuset.

Utifrån vad denna studie visar borde förebyggande åtgärder fokuseras till trafikolyckor, fallolyckor och arbetsplatsolyckor. Men även att akutintaget kan på ett tillfredställande sätt kan ta hand om de som söker med skador, då de flesta bara var lindrigt skadade. Samt att åtgärder för att underlätta transport till sjukhuset borde vidtas. Avslutningsvis, det verkar som att män och kvinnor i Nepal skadar sig på olika sätt, men det kommer krävas fler och större studier för att undersöka detta ytterligare.

Acknowledgment

I want to thank my supervisor Dr. Göran Kurlberg for his guidance and support. Special thanks to Dr. Arabind Joshi and Dr. Sanjay Paudyal for invaluable support and hospitality during my stay in Nepal. Regards go to the board members of the IRC for their patience, and help in the ethical approval process.

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References

1. Roth, G.A., et al., *Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017*. The Lancet, 2018. **392**(10159): p. 1736-1788.
2. WHO, *Injuries and violence: The Facts*. 2014, Department for the Management of Noncommunicable Diseases, Disability, Violence and Injury Prevention: Geneva.
3. Kipsaina, C., J. Ozanne-Smith, and V. Routley, *The WHO injury surveillance guidelines: a systematic review of the non-fatal guidelines' utilization, efficacy and effectiveness*. Public Health, 2015. **129**(10): p. 1406-1428.
4. Mytton, J.A., et al., *Understanding the burden of injuries in Nepal: A systematic review of published studies*. Cogent Medicine, 2019. **6**(1).
5. World Health Organisation, *Global status report on road safety: supporting a decade of action*. 2013, World Health Organisation, : Geneva.
6. O'Reilly, G.M., P.A. Cameron, and M. Joshipura, *Global trauma registry mapping: A scoping review*. Injury, 2012. **43**(7): p. 1148-1153.
7. De Ramirez, S.S., et al., *Unintentional Injuries: Magnitude, Prevention, and Control*. Annual Review of Public Health, 2012. **33**(1): p. 175-191.
8. Sorenson, S.B., *Gender Disparities in Injury Mortality: Consistent, Persistent, and Larger Than You'd Think*. 2011. **101**(S1): p. S353-S358.
9. Haagsma, J.A., et al., *The global burden of injury: incidence, mortality, disability-adjusted life years and time trends from the Global Burden of Disease study 2013*. Injury Prevention, 2016. **22**(1): p. 3-18.
10. WHO. *Protecting workers health*. 2017 [cited 2020 03-27]; Available from: <https://www.who.int/en/news-room/fact-sheets/detail/protecting-workers'-health>.
11. Oxfam International and HAMI, *Fighting inequality in nepal*. 2019, Oxfam International: Oxford.
12. Dagenais, G.R., et al., *Variations in common diseases, hospital admissions, and deaths in middle-aged adults in 21 countries from five continents (PURE): a prospective cohort study*. The Lancet, 2020. **395**(10226): p. 785-794.
13. Obermeyer, Z., et al., *Emergency care in 59 low- and middle-income countries: a systematic review*. Bulletin of the World Health Organization, 2015. **93**(8): p. 577-586G.
14. Martin, A., E. Lagarde, and L.R. Salmi, *Burden of road traffic injuries related to delays in implementing safety belt laws in low- and lower-middle-income countries*. Traffic Injury Prevention, 2018. **19**(sup1): p. S1-S6.
15. Nantulya, V.M. and M.R. Reich, *The neglected epidemic: road traffic injuries in developing countries*. BMJ, 2002. **324**(7346): p. 1139-41.
16. Baram, M., *Globalization and workplace hazards in developing nations*. Safety Science, 2009. **47**(6): p. 756-766.
17. J. Takala. *Work-related fatalities reach 2 million annually*. 2012 [cited 2020-03-26]; Available from: https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_007789/lang--en/index.htm.
18. *The World factbook*. 2020, Central Intelligence Agency: Washington DC.
19. Nepal, S., et al., *Burden of road traffic injuries in Nepal: results of a countrywide population-based survey*. The Lancet, 2015. **385**: p. S7.
20. Gupta, S., et al., *Injury assessment in three low-resource settings: a reference for worldwide estimates*. Lancet, 2015. **385** Suppl 2: p. S2.

21. Bhalla, K., et al., *Methods for developing country level estimates of the incidence of deaths and non-fatal injuries from road traffic crashes*. International Journal of Injury Control and Safety Promotion, 2009. **16**(4): p. 239-248.
22. Angeline Neetha Radjou, D.K.B., Ranabir Pal, Preetam Mahajan., *Injury-related mortality audit in a regional trauma center at Puducherry, India*. J Emerg Trauma Shock, 2012. **2012 Jan-Mar**; **5**(1): p. 42-48.
23. Reihani, H., et al., *Assessment of mechanism, type and severity of injury in multiple trauma patients: A cross sectional study of a trauma center in Iran*. Chinese Journal of Traumatology, 2017. **20**(2): p. 75-80.
24. The World Bank. *The World bank in Nepal*. 2019 2019-10-15 [cited 2020 03-28]; Available from: <https://www.worldbank.org/en/country/nepal/overview>.
25. Sabina Alkire, A.C., José Manuel Roche., *Multidimensional Poverty Index 2013: Brief Methodological Note and Results*, in *Oxford Poverty & Human Development Initiative*. 2013, Oxford Department of International Development Queen Elizabeth House (QEH), University of Oxford: Oxford.
26. Concecao, P., *Inequalities in Human Development in the 21st Century*. 2019, United Nation.
27. United Nations Development Programme. *Human Development Indicators Nepal*. Human Development Reports 2020 [cited 2020 03-30]; Available from: <http://hdr.undp.org/en/countries/profiles/NPL>.
28. Oxfam and Development Finance International, *The Commitment to Reducing Inequality*. 2017, Development Finance International, Oxfam: Oxford.
29. Goli, S., et al., *Regional Differentials in Multidimensional Poverty in Nepal: Rethinking Dimensions and Method of Computation*. SAGE Open, 2019. **9**(1): p. 215824401983745.
30. Prasai, D., *A review of studies on Nepal's national free health care programme*. Department of Health Services, Ministry of Health and Population, 2013.
31. Ministry of Health and Population, *Nepal Health Sector Programme Implementation Plan II (NHSP-IP 2): 2010 2015*, Ministry of Health and Population, Editor. 2008, Government of Nepal: Katmandu.
32. Mishra, S.R., et al., *National health insurance policy in Nepal: challenges for implementation*. Global Health Action, 2015. **8**(1): p. 28763.
33. Acharya, S.P., *Critical care medicine in Nepal: where are we?* International Health, 2013. **5**(2): p. 92-95.
34. Bogren, M., et al., *Health workforce perspectives of barriers inhibiting the provision of quality care in Nepal and Somalia – A qualitative study*. Sexual & Reproductive Healthcare, 2020. **23**: p. 100481.
35. Shah, M.T., et al., *Assessment of the availability of technology for trauma care in Nepal*. Injury, 2015. **46**(9): p. 1712-9.
36. World Health Organisation. *Density of doctors, nurses and midwives in the 49 priority countries*. 2010 aug, ; Available from: https://www.who.int/hrh/fig_density.pdf.
37. Pokhrel, R., *Medical Education in Nepal and Brain Drain*. Medical Journal of Shree Birendra Hospital, 2017. **16**(1): p. 1-2.
38. Rogers Alisdair, C.N., Kitchin Rob., *Epidemiological Transition*, in *A Dictionary of Human Geography*. 2013, Oxford University Press: Oxford.
39. Institute for Health Metrics and Evaluation. *What causes the most deaths?* 2019; Available from: <http://www.healthdata.org/nepal>.
40. Pant, P.R., et al., *Burden of injuries in Nepal, 1990–2017: findings from the Global Burden of Disease Study 2017*. Injury Prevention, 2020: p. injuryprev-2019.

41. Gupta, S., et al., *Injury prevalence and causality in developing nations: Results from a countrywide population-based survey in Nepal*. *Surgery*, 2015. **157**(5): p. 843-849.
42. Ministry of Health, *National health policy 2014*, M.o. Health, Editor. 2014, Government of Nepal.
43. Foreman, K.J., et al., *Forecasting life expectancy, years of life lost, and all-cause and cause-specific mortality for 250 causes of death: reference and alternative scenarios for 2016–40 for 195 countries and territories*. *The Lancet*, 2018. **392**(10159): p. 2052-2090.
44. Houston, K.T., et al., *Deaths due to injury, including violence among married Nepali women of childbearing age: a qualitative analysis of verbal autopsy narratives*. *Injury Prevention*, 2015. **21**(e1): p. e93-e98.
45. Yitzhak, A., et al., *Emergency with Resiliency Equals Efficiency – Challenges of an EMT-3 in Nepal*. *Prehospital and Disaster Medicine*, 2018. **33**(6): p. 673-677.
46. Sharma, D.C., *Nepal earthquake exposes gaps in disaster preparedness*. *Lancet*, 2015. **385**(9980): p. 1819-20.
47. Government of Nepal. *Lalitpu Metropolitan City*. 2020 [cited 2020 03-21]; Available from: <http://lalitpurmun.gov.np/en>.
48. Elixhauser A, S.C., Palmer L., *Clinical Classifications Software (CCS)*. 2014, U.S. Agency for Healthcare Research and Quality.
49. Organisation, W.H. *Injuries*. 2020 [cited 2020 03-25]; Available from: <https://www.who.int/topics/injuries/about/en/>.
50. Peden M, M.K., Sharma G., *The injury chart book: a graphical overview of the global burden of injuries*. 2002, World Health Organization: Geneva.
51. Gupta, S., et al., *Fall Injuries in Nepal: A Countrywide Population-based Survey*. *Annals of Global Health*, 2015. **81**(4): p. 487.
52. National Planning Commission Secretariat, G.o.N., *Nepal living standards survey*. 2011: Thapathali, kathmandu, nepal. p. p. 51, 80-85, 101-116.
53. Emma Haskovec, *Surgical Diagnoses Presented in the Emergency Room*. 2019, University of Gothenburg: Gothenburg.
54. Cross, C., *Reducing missed orthopedic injuries in the ER*. *Canadian Medical Association Journal*, 2014. **186**(1): p. E18-E18.
55. Giri, S.C., et al., *Transport and Pre-hospital Care Prior to Arrival in Tertiary Care Emergency Department of Eastern Nepal: a Cross sectional Study*. *Journal of BP Koirala Institute of Health Sciences*, 2019. **2**(1): p. 60-67.

Appendix

1. Consent form in English

Consent form

Research title: Audit of trauma patients presenting at emergency department of Patan Hospital, Nepal.

Researcher: Alma Alfrida Petersson, Student of medicine, University of Gothenburg, Sweden.

Research Site: Patan Academy of Health Sciences.

The aim of this study is to collect information about traumatic injuries. Your participation won't in any interfere with the care you are given. No personal information which could be traced back to You will be saved.

I hereby give my voluntary consent for myself / Mr / Ms to participate in the research. I have been fully informed about the nature, risk and benefit of participation. I am aware that I have the right to accept/withdraw from participating in the above-mentioned research whenever I wish to do so.

Rt thumb print	Lt thumb	Signature..... Participant (preferred) Guardian..... Relation..... Contact number.....	Signature..... Witness name
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2. Consent form in Nepali

मन्जुरीनामा

अनुसन्धानको विषय: पाटन अस्पतालको इमर्जेन्सी विभागमा चोटपटक वा आघात भई आएका
बिरामीहरुको विवरण

अनुसन्धानकर्ता: अल्मा पिटर्सन, मेडिकल विद्यार्थी, गोथेन्बर्ग विश्वविद्यालय, स्विडेन

अनुसन्धानस्थल: पाटन स्वास्थ्य विज्ञान प्रतिष्ठान

यस अनुसन्धानको उद्देश्य आघात वा चोटपटक सम्बन्धि जानकारी लिनु हो। यस अनुसन्धानले तपाईंलाई
दिईने उपचारमा हस्तक्षेप वा प्रभाव पार्ने छैन।

म। मेरा लाई अनुसन्धानमा सहभागी हुन मन्जुरीनामा
दिएको छु। मलाई अनुसन्धानबारे जानकारी गराईएको छ। चाहेको बखत अनुसन्धानमा भाग
लिने नलिने अधिकार म। मा नै रहेको व्यहोरा मलाई थाहा छ।

दाया	बाया	सही	साक्षी सही.....
		नाम.....	
		नाता	नाम.....
		ठेगाना.....	
		मिति	मिति.....

3. Ethical Approval



IRC-PAHS

Institutional Review Committee - Patan Academy of Health Sciences

पाटन स्वास्थ्य विज्ञान प्रतिष्ठान

Lagankhel-5, Lalitpur, Nepal लगनखेल- ५, ललितपुर, नेपाल

Ref: std2002281347

Date: 2020-02-28

Re: IRC-PAHS approval for research

Ms. Alma Petersson,

Thank you for submission of your research proposal. Your proposal has been approved by Institutional Review Committee "IRC-PAHS." We are confident that you will follow the ethical guidelines, suggested changes as per IRC-PAHS proposal submission form; and provide necessary information / materials / interim report as and when required. Submit summary report to IRC-PAHS upon completion of your study. Please do not modify the proposal after approval from IRC-PAHS.

Title of Study: "Audit of trauma patients presenting at the emergency department of Patan Hospital, Nepal."

Investigator: Alma Petersson, undergraduate student of medicine, University of Gothenburg, Gothenburg, Sweden

Co-Investigator: Arabind Joshi, Dept. of General Practice and Emergency Medicine, Patan Academy of Health Sciences (PAHS), Lalitpur, Nepal

Funding: No

This study is requirement for academic degree: Yes

For any queries please contact IRC-PAHS.

Sincerely,

Prof. Dr. Nabees Man Singh Pradhan
Member Secretary, IRC-PAHS

Prof. Dr. Jay Narayan Shah
Chairperson, IRC-PAHS

4. Clinical Classification Software

Clinical Classification Software 225-244: Injuries and poisoning

- 225 Joint disorders and dislocations; trauma-related
- 226 Fracture of neck of femur (hip)
- 227 Spinal cord injury
- 228 Skull and face fractures
- 229 Fracture of upper limb
- 230 Fracture of lower limb
- 231 Other fractures
- 232 Sprains and strains
- 233 Intracranial injury
- 234 Crushing injury or internal injury
- 235 Open wounds of head; neck; and trunk
- 236 Open wounds of extremities
- 237 Complication of device; implant or graft
- 238 Complications of surgical procedures or medical care
- 239 Superficial injury; contusion
- 240 Burns
- 241 Poisoning by psychotropic agents
- 242 Poisoning by other medications and drugs
- 243 Poisoning by nonmedicinal substances
- 244 Other injuries and conditions due to external causes

