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ORIGINAL ARTICLE

PREVALENCE OF DELAYED PRESENTATION OF OPEN LONG BONE FRACTURE PATIENTS AT TWO ETHIOPIAN TERTIARY HOSPITALS

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ABSTRACT

Background: *Clinical experience shows most patients with open long bone fractures present late in Ethiopia and is associated with poor outcome.*

Objective: *This study aims to assess the prevalence of delay in hospital presentation among patients with open long bone fractures.*

Methods: *This is a prospective observational sub-study of the ongoing Open Fracture Irrigation Study (OFIS), a randomized control trial (RCT) in progress at Tikur Anbessa and Hawassa University Hospitals. The data is extracted from the OFIS data registry into Microsoft Excel, then exported to SPSS version 25.*

Result: *A total of 301 open long bone lower extremity fractures were included. Men accounted for about 85%, with a mean age of 32 years. The most common injury mechanism was road traffic incidents in 171 (57%) patients, followed by a gunshot in 50 (16.6%) patients. The majority (71%) were Gustilo-Anderson grade III. About 85% of open fractures did not present to the hospital within the Lancet Commission on Global Surgery recommended 2 hours time frame. Similarly, once the patient presented to the hospital, more than 65% were not operated on within 24 hours of their presentation.*

Conclusion: *This study shows a significant delay among open long bone fractures in our set up from trauma to hospital arrival and arrival to operation. We recommend further research to identify factors responsible for open long bone fracture delayed presentation.*

Keyword*: open fracture, delayed presentation, Tikur Anbessa Specialized Hospital, Hawassa University Comprehensive Specialized Hospital, Addis Ababa University, Ethiopia*

INTRODUCTION

According to the World Health Organization (WHO) report, about 5.8 million people die each year due to trauma. Trauma death accounts for 10% of deaths worldwide, which means 32% more than the number of fatalities that result from malaria, tuberculosis, and HIV/ AIDS combined (1). Several others are injured for every person who dies, many of them with permanent sequelae and disability. It is one of the emerging problems throughout the world. However, it has a more significant effect in low- and middle-income countries (LMIC) since approximately 90% of deaths due to injuries occur in countries with limited resources(1–3).

Trauma is one of the most common causes of preventable death in Ethiopia. Though the available data is limited, trauma accounts for 27% of emergency hospital visits. Almost half of the surgical emergency department visits to Tikur Anbessa Specialized Hospital (TASH) and Amhara region were due to trauma, with a prevalence of 55.6%(4). Among all the trauma, musculoskeletal trauma is the leading cause of severe long -term pain and physical disability, affecting millions worldwide.

In resource-limited settings, open long bone fracture is one of the most common conditions encountered during clinical activities. The management remains a significant challenge with devastating disability in the working adult age group. More than 20% of all adult fractures presenting to TASH were open fracture, and a considerable number (35%) of these occurs on the tibia. According to Gustilo- Anderson open fracture classification, 50% of the fracture was Gustilo grade III (33.3- IIIA, 13.9% - IIIB, and 2.7% was IIIC), followed by grade II (27.7%) and grade I (22.3%) respectively (5,6).

An open fracture is one of the emergency conditions faced by an orthopedic surgeon during practice. Timely and appropriate management of the open fracture is crucial for a good outcome. The pillars of open fracture treatment include initiation of high dose intravenous (IV) antibiotics, administration of tetanus prophylaxis, giving cocktails of analgesia which has a different mechanism of action, 'one look physical examination,' appropriate splinting and meticulous early lavage and debridement with skeletal stabilization in the operating theatre. Various studies suggest that giving high dose IV antibiotics according to the institutional protocol within 3 hours of the injury will significantly reduce subsequent infection risk.

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Scholars advocate doing the 'one look physical examination' concept for all open fractures at the emergency room. One look examination entails opening the wound only once, taking a digital picture after taking verbal consent from the patients or families, and dressing it in saline-soaked gauze to prevent repeated wound exposure by different level of health professionals, including nurses and medical interns, residents (junior to senior) and consultants.

The index health professional needs to open the wound, take an appropriate picture, and share the image with other health care providers that are being consulted. Rather than exposing the wound repeatedly at the emergency department, this technique reduces the rate of contamination and significantly reduces the risk of infection(7–16).

To give the maximum timely care for open fractures, early presentation of patients with long bone fractures to a health care facility is critical. Our clinical practice and few studies done in resource-limited countries show most patients with open fractures present delayed to seek the appropriate care and end up with numerous complications, including prolonged hospital stay due to their delayed presentation (2,3). We used the Lancet Commission for global surgery definition of delay for open fracture in this study. The commission defines delay as presented to the hospital after 2 hours of trauma. (2,17).

Even though few publications exist on the trauma patients' delay to hospital admission in low- and middle-income countries, a significant number presented with a delay. According to Malawi's study, 34% of adult patients present delayed after their trauma (2). A prospective observational study conducted across 18 low- and middle-income countries by the INternational ORthopaedic MUlticenter Study in Fracture Care (INORMUS) group showed 71.9% of open fracture patients were not admitted within 2 hours of the trauma (3). To our knowledge, this is the first study done on the prevalence of delayed presentation among patients with an open long bone fracture in our set up, and we hope it will be the benchmark for further study on this big problem in our set up.

PATIENTS AND METHODS

This study is part of the Open Fracture Irrigation Study (OFIS), an ongoing multicentre three-arm Randomized Control Trial (RCT) study aiming to assess silver diluted bleach's impact solution over normal saline in the prevention of infection among patients with open long bone fractures. We used the RCT screening data collected from August 23, 2018, to June 14, 2020, and recruited patients from Tikur Anbessa Specialized Hospital (TASH) and Hawassa University Comprehensive Specialized Hospital (HUCSH). The data is extracted from the OFIS data registry into Microsoft excel, which was then exported to SPSS version 25 for descriptive analysis. This study has ethical approval from both centers' institutional review board.

RESULTS

Socio-demographic characteristics:

A total of 301 open long bone fractures (femur and tibia) patients were presented at the two centers. One hundred eighty patients (60%) were from TASH, and about 85% of the patients were male with a male to female ratio of 5.4:1. The mean age was 32 (SD 14.23; 6 – 80) years. More than 75% of the patients affected were within the age of 18 to 45 years. Most of the patients were presented from Oromia 96 (31.9%), followed by SSNPR 88 (29.2%) and Addis Ababa accounting 56 (18.6%)

Table 1: Socio-demographic characteristics of patients with an open long bone fracture from 2018 to 2020.

Characteristics		Frequency (n= 301)	Percentage (%)
Hospital where patients were managed	TASH	180	59.8
	HUCSH	121	40.2
Sex of patients	Male	254	84.4
	Female	47	15.6
Age of patients categorized (in Years)	less than 18	27	9
	18 to 25	96	31.9
	26 to 35	96	31.9
	36 to 45	34	11.3
	46 to 55	20	6.6
	56 to 65	22	7.3
	More than 65	6	2
Region where the patients presented	Addis Ababa	56	18.6
	Afar	8	2.7
	Amhara	30	10
	Benishangul Gumiz	2	0.7
	Dire Dawa	5	1.7
	Gambella	3	1
	Harari	8	2.7
	Oromia	96	31.9
	SNNPR	88	29.2
	Somalia	2	0.7
	Tigray	3	1

Mechanism of injury and Gustilo Anderson Classification:

This cohort's most common injury mechanism is road traffic accidents accounting for 57%, with 23% pedestrians, followed by 18% occupants in a car. Gunshot injury was noted in 50 patients (16.6%). Motorcycle injury was 3.5 times higher in HUCSH than TASH.

Based on the Gustilo Anderson (GA) classification, grade III was by far common, accounting for 71.1% (IIIA- 55.1%, IIIB – 10% and 6% IIIC), followed by grade II accounting for 53 patients (17.6%) **(Table 2).**

Table 2: Mechanism of injury and Gustilo Anderson (GA) Classification of patients with an open long bone fracture from 2018 to 2020

Characteristics		**TASH (n=180)**		**HUCSH (n= 121)**		**Total cohort (n=301)**	
		Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**
Mechanism of injury	MVC pedestrian	41	22.8	29	24	70	23.3
	MVC occupant	39	21.7	15	12.4	54	17.9
	Gunshot injury	35	19.4	15	12.4	50	16.6
	Motorcycle	14	7.8	33	27.3	47	15.6
	Fight or assault	12	6.7	19	15.7	31	10.3
	Fall from height	18	10	5	4.1	23	7.6
	Struck by Object	10	5.6	3	2.5	13	4.3
	Fall from ground level	8	4.4	0	0	8	2.7
	Construction site injury	0	0	1	0.8	1	0.8
	Others	3	1.7	1	0.8	4	1.3
GA classification	GA-I	16	8.9	18	14.9	34	11.3
	GA -II	25	13.9	28	23.1	53	17.6
	GA - IIIA	102	56.7	64	52.9	166	55.1
	GA - IIIB	21	11.7	9	7.4	30	10
	GA - IIIC	16	8.9	2	1.7	18	6

Time from injury to hospital presentation and from hospital arrival to operation:

Those patients with an open fracture who presented within 2 hours after sustaining the trauma were only 46 patients (15.3%). One hundred ninety-three patients (64.2%) presented within 24 hours of the trauma, and 18 patients (6%) arrived after one week of the trauma.

Similarly, only 87 patients (32.5%) were operated on within 24 hours after presenting to the hospital, and 40 patients (14.9%) got surgery after 48 hours of arriving at the hospital. **(Table 3).**

Table 3: Time from injury to hospital presentation and time from hospital arrival to the patients' operation with an open long bone fracture from 2018 to 2020.

Characteristics categories		**TASH (n=180)**		**HUCSH (n= 121)**		**Total cohort (n=301)**	
		Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**
Time from injury to hospital presentation (n= 301)	< 2 hours	24	13.3	22	18.2	46	15.3
	2 to 8 hours	18	10	46	38	64	21.3
	9 to 24 hours	50	27.8	33	27.3	83	27.6
	25 to 72 hours	23	12.8	15	12.4	65	21.6
	3 to 7 days	15	8.3	2	1.7	25	8.3
	More than 7 days	15	8.3	3	2.5	18	6
Time from presentation to the first operation in hours (n=268)	Operated within 24 hours of arrival	64	35.6	23	19	87	32.5
	Operated 24 to 48 hours	67	37.2	74	61.1	141	52.6
	Operated after 48 hours	27	15	13	10.7	40	14.9

DISCUSSION

This study shows a significant delay in presentation of patients to hospital after sustaining an open long bone fracture. Approximately 85% of patients present late to get the standard of open fracture care according to the lancet commission global surgery target of hospital admission within 2 hours of the trauma. The finding is higher than the study done by the INORMUS group in which 70% of patients present delayed more than 2 hours, and the research done by Kiran et al. shows 34 % of adult patients presented delayed (17,18). Around 18 patients (6%) with open long bone fractures arrived at the treating hospital after one week of the trauma, which could be due to the poor interfacility referral process in Ethiopia. This delayed presentation of trauma patients after 72 hours, which is 14.3% in our patients, is significantly associated with poor outcome, prolonged hospital stays, and a significant economic burden on the patients and treating health facilities. It will be essential to close up this gap to address this exaugurated delayed presentation of open fracture.

Delay is also noted in getting surgical intervention once the patients were admitted to the hospitals. Only 32.5% of patients with open long bone fracture get initial surgical intervention within the first 24 hours of admission. Whereas more than two-thirds of patients (71.1%) get operated on after waiting for more than 24 hours after hospital presentation, and 40 patients (13.3%) were operated on after 48 hours in-hospital stay. This delay in primary surgical intervention could be due to various factors. Lack of proper prioritization of open fracture, shortage of operating time and resources, and increased prevalence of polytrauma that should be stabilized before the surgical intervention could be some of the reasons.

Regarding the mechanism of injury, road traffic accident (RTA) is the leading cause contributing about 56.8 % (17.9 % MVC occupant, 23.3 % MVC pedestrian, and 15.6 Motorcycle injury) followed by bullet injury accounting 16.6 % and fight or assault around 10.3%. In this study, RTA is the leading cause of injury compared with the previous research done at TASH, which shows RTA was contributing for about 39.1%, followed by fall 35.1% (4). This indicates that Ethiopia's prevention modality is not adequate to decrease RTA as a cause of injury. Unlike previous studies, bullet injury is much higher than in our study (4). This can be explained due to the recent political instability experienced in Ethiopia, a seasonal condition. Among all open fractures, more than two-third, 214 (71.1%) were Gustilo grade III (Gustilo-IIIA: 166 (55.1%), Gustilo – IIIB: 30 (10%) and Gustilo- IIIC: 18 (6%)) followed by Gustilo II (17.6 %) and I (11.3 %) respectively. This study shows that most of the fractures grade is more severe than the previous research done in the same set up where Gustilo grade- III was accounting only 50%, and Gustilo IIIC was only 2.7%(6). The current finding could be explained by the fact that the injury mechanism's severity is getting worse and high energy to cause more severe soft tissue injury. Gustilo Anderson type IIIC fractures are very high in our study compared to the previous research, and it can show how much of our patients could end up with amputation due to trauma.

The most common age group involved in this open long bone injury is 18 to 45 years accounting for more than 75% of the injury. This implies the most productive age group of the nation gets affected, and it will negatively impact the country's economic growth.

Limitation of the study: The study has a limitation as it represents only two canters in Ethiopia. Our findings could not be generalizable for the whole country.

Recommendation

This study shows the two critical gaps faced in treated open fractures in Ethiopia- delay to initial presentation to hospital and delay in getting initial surgical care. Triaging, prehospital transfer, and interfacility referral system should be revisited to address the delays observed. Identifying the reasons for presentation and surgical delay should be examined in prospective future research, and efforts should be exerted to address these gaps and tackle the bottlenecks to provide early surgical care for open fractures. A prospective and multicentre study should be conducted in Ethiopia to identify factors affecting patients' hospital presentation and in-hospital treatment delay for open fractures.

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