



Research Article

Proportion and Associated Factors of Delayed Presentation among Patients with Open Fracture at Tibebe Ghion Specialized Hospital, Bahir Dar, North West Ethiopia

Solomon Melkamu¹, Worku Belay¹, Lemlemu Maru^{2*}

¹Department of Orthopedics and Traumatology, College of Medicine and Health Sciences, Bahirdar University, Ethiopia

²Department of Public Health, College of Health Science, Assosa University, Ethiopia

***Corresponding Author:** Lemlemu Maru, Department of Public Health, College of Health Science, Assosa University, Ethiopia

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Abstract

Background: Clinical experience shows most patients with open fracture present late in Ethiopia. Delayed treatment associated with worst outcome and can worsen disability. Understanding associated factors for delayed hospital presentation will assist in guiding proper open fracture management.

Objective: This study aims to assess the proportion of delay in hospital presentation and associated factors among patients with open fracture.

Methods: this is institution based cross sectional study. We examined the records of 309 patients with open fracture ho presented to Emergency Department at Tibebe Ghion Specialized Hospital in Bahr Dar Ethiopia.

We used bivariate and multivariate logistic regression to evaluate the association between presentation to a hospital within 2hrs after the injury (delayed presentation) and seven covariates: age, sex, occupation, address, injury mechanism, injured limb and site of fracture.

Results: Men accounted for about 84.8%, with a mean age of 30.33 years. The most common injury mechanism was Bullet/Blast injury in 165 (53.4%) patients, followed by road traffic accident in 75 (24.3%) patients. About 90.9% of open fractures did not present to the hospital within the Lancet Commission on Global Surgery recommended 2 hours' time frame. Being from rural areas independently increased the risk of delayed presentation (Adjusted odds ratio, 3.327(95% CI 1.140 to 9.712)). Relative to other mechanism of injury, Bullet/Blast injury demonstrated a 69.3% reduced risk of late presentation after having open fracture (adjusted OR 0.307 (95% CI 0.122 to 0.776)).

Conclusions: our study shows a significant delay among open fractures in our set up from trauma to hospital arrival and identify factors for delayed presentation. Interventions are needed to improve access to fracture care. We recommend further prospective multicenter research to identify many more factors responsible for open fracture delayed presentation.

Keywords: Delayed presentation; Open fracture; Tibebe Gion Specialized Hospital

1. Introduction

Globally, injuries account for over 10% of disability-adjusted life-years, 90% of which occur in low-income and middle-income countries like Ethiopia. Injuries are an important growing global public health problem, and common cause of mortality and morbidities. According to the world health organization (WHO) report, more than 5 million people die each year because of injuries. It is responsible for 10% of death worldwide, nearly 32% more than the combined number of fatalities that result from malaria, tuberculosis, and HIV/ AIDS. For one death from injury, 3 to 10 more people will survive from injury and develop a permanent disability that is a devastating and a costly outcome of the society. In young people between the ages of 10 and 24 years around 97 % of deaths occur in LMIC, over 40 % of deaths are related to injuries, and road traffic injuries are the most common cause followed by a fall down accidents. Especially road traffic accident result in the deaths of approximately 1.35 million people around the world each year and leave between 20 and 50 million people with non-fatal injuries [1-3].

MSK injuries are one of the commonest reasons for visiting emergency department. Increasing road traffic accident is reason for having high incidence of MSK injuries. Trauma is the one of the commonest causes of preventable death in Ethiopia. Trauma accounts for 27% of emergency hospital visits in Tikur Anbessa Specialized Hospital, and 55.6 % of emergency visits of Amhara Regional State Referral Hospitals were due to injury [4-7].

Incidence of adult fracture believed to be 1,351/100,000/year. Open fracture is defined as an injury where the fracture and the fracture hematoma communicate with the external environment through a traumatic defect in the surrounding epithelial tissue. Pillars of open fracture management includes early high dose intravenous prophylactic antibiotics, administration of tetanus prophylaxis, giving combination of analgesics with different mechanism of action, 'one look physical examination 'with picture, appropriate splitting and meticulous early lavage and debridement with skeletal stabilization in the operating theatre. Giving high dose IV antibiotics within 3 hours of the injury will significantly reduce subsequent infection risk [8, 9].

The Lancet Commission on Global Surgery determined that essential facilities for surgical care should be available within 2 hours for patients with severe injuries, including open fractures. Passing this benchmark time increases the risk of complications and mortality [1]. Delayed presentation and surgical care still a great problem. About five billion peoples are unable to get safe and affordable surgical care. According to Lancet Commission on Global Surgery, delay to surgical care occurs in three phases. The first delay was seeking care, the second one delay in reaching care, and the third delay in receiving care. IN low-income and middle-income countries, timely hospital admission remains largely inaccessible, especially among patients with open fractures [1, 10].

Delayed treatment worsens the burden of trauma-related disability in low-resource settings. As Africa develops economically, injuries are increasing in

severity and numbers. Patients with injuries have limited access to operative care due to geographical, cultural, and structural barriers, as well as costs, both surgical and collateral. The authors identify the predictors of delays to hospital. According to Malawi's study, significant number of pediatric and adult patients present delayed after their trauma. The researcher demonstrated factors for delayed presentation to hospital on both inpatient and outpatient treated fracture cases. Delayed presentation to hospital in open fracture patients found to be a big problem as showed in the study done in Ethiopia at two tertiary hospital [11-13].

Injury has profound impact on the individual and the entire society. It is becoming one of the leading causes of premature death and disability. WHO study showed that injuries are responsible for death of more than 14 000 people in each day. It is one of the emerging problems through the world. Trauma death have an immeasurable impact to the community it belongs. Each trauma death usually accompanied by many more nonfatal injuries. The resulting disabilities are crippling to the patients, which increased health care cost, and loss of productivity [3, 12].

Trauma is account more than 10 % of global burden of disease. In 2013, 973 million people were in need of some type of healthcare. Injury was a substantial cause of morbidity and mortality in the developed and developing world, though more influence on middle and low-income countries [14]. To give the maximum timely care for open fractures, early presentation of patients with 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. Among all trauma, musculoskeletal injury is the leading cause of severe long-term pain and physical disability, affecting millions worldwide [10, 12].

Institution based cross sectional study in wolaita Sodo University showed 11.1% of patients discharged with long-term disability, and presence of pre-hospital treatment as a factor for complication in fractured patients. Male more like to injured than females and affects the economically productive age groups (15 - 35Yrs) , which worsen poverty of the families and at large the country [15]. In low-income and middle-income countries, timely hospital admission remains largely inaccessible, especially among patients with open fractures. Delayed presentation in open fracture negatively affect the outcome. They are associated with a high risk of complications unless treated early and appropriately [9, 10].

Study done in Malawi showed, Delayed presentation to the hospital after fracture was common. Since delayed presentation worsen trauma related mortalities and morbidities, being informed about the characteristic of patients who came late would help to improve care for injured patients [11, 12]. Outcome and survivorship in trauma patients negatively affected by delay in presentation to hospital. In trauma, patient delayed arrival to hospital is common issue especially in Africa. Study done in Uganda showed only one in every five patients with

musculoskeletal trauma arriving within the 'golden hour of trauma care'. Here in Ethiopia at TASH, significant number of trauma patients (24.6%) came after 24hrs [7, 16]. Delayed presentation and diagnosis resulted in delayed treatment in about 55.1% of injured patients. Attempt to decreased delay in presentation improve quality of care in patients with musculoskeletal injury. Delayed presentation in hip fracture delays the surgical treatment, which increased mortality rate. Trauma related death could be prevented by timely access to hospital care. longer postoperative hospital stays, greater complication rates, and increased total cost to the health care were significantly greater in the delayed surgically treated tibial fracture 4hrs [17-19].

Musculoskeletal injuries are common in our set up, accounting a big share in patient visiting department of emergency. Although our clinical experience shows significant delay to presentation of open fracture, it has not been quantified yet in our facility. There is no study in our hospital, which showed the prevalence, associated factors contributing to delayance as well as prevention or treatment strategies of this problem. Being informed on this problem in our facility will help to allocate resources, and to early intervene. Gaining insight regarding prevalence in delay to hospital presentation and associated factors will improve health care, and allows early intervention to decrease trauma related mortalities and morbidities. Quantifying the burden of delay presentation to hospital is not only important to health policy makers, but also to assess surgical health care facility. To our knowledge, this is the first study done in our facility in determining proportion of delayed

presentation and assessing associated factors on open fracture. We hope, it will be the benchmark for further study on this big problem.

2. Methods and Materials

2.1 Study area

The study was conducted in the department of orthopedics & trauma surgery in TGSH. Tibebe Ghion Specialized Hospital is one of the biggest teaching specialized university hospitals in Amhara region and in the country at large. It serves 2000 people per day. The hospital has more than 500 beds in all its wards and over 67 beds in orthopedics and trauma surgery ward; total of 10 orthopedic surgeons (two of them are on fellowship) and 30 residents specializing in orthopedic surgery. Operations are done 4 days in a week as elective case and daily for emergency cases. The department has its own major operation room with two operating tables. Although there is no a dedicated trauma bay, there is organized Emergency department with trained personnel to handle patients with musculoskeletal injury including open fracture. According to 2012 E.C Health Management Information System (HMIS) report of TGSH, about 795 patients with musculoskeletal injury visited Emergency department.

2.2 Study design and period

Institutional based cross-sectional study design was used among patients with open fracture visited Emergency Department at Tibebe Ghion Specialized Hospital from October 11, 2020 to July 30, 2021.

2.3 Source population

All Patients with open fracture visited Emergency department in Tibebe Ghion Specialized Hospital from October 11, 2020 to July 30, 2021.

2.4 Study population

Patients with a diagnosis of open fracture visited Emergency department at Tibebe Ghion Specialized Hospital, and fulfill inclusion criteria from October 11, 2020 to July 30, 2021.

2.5 Inclusion criteria

All Patients with open fracture.

2.6 Exclusion criteria

- Patients with missing dates of presentation and/or injury.
- Patients with unclear documentation on their diagnosis.

2.7 Sample size

Sample size calculated based on study conducted across 49 hospitals in 18 low-income and middle-income countries prospective observational sub study of the ongoing INORMUS in Fracture Care, taking the prevalence of delayed presentation of open fracture as 71.9%(10). Therefore, with single proportion formula sample size was:

$$n = \frac{(z_{\alpha/2})^2 \cdot pq}{d^2}$$

With 95% confidence interval

Where n = required optimal sample size

Z= standard normal distribution (Z=1.96), CI of 95% = 0.05

p= prevalence of delayed presentation (71.9%), p will be 0.719

q= 1-p = 0.281

d= Absolute precision or tolerable margin of error= 5 % (0.05)

: $n = \frac{(Z^2 \cdot p \cdot (1-p))}{d^2} = \frac{(1.96)^2 \cdot 0.719 \cdot (0.281)}{(0.05)^2} = 310.461 = n = 311$

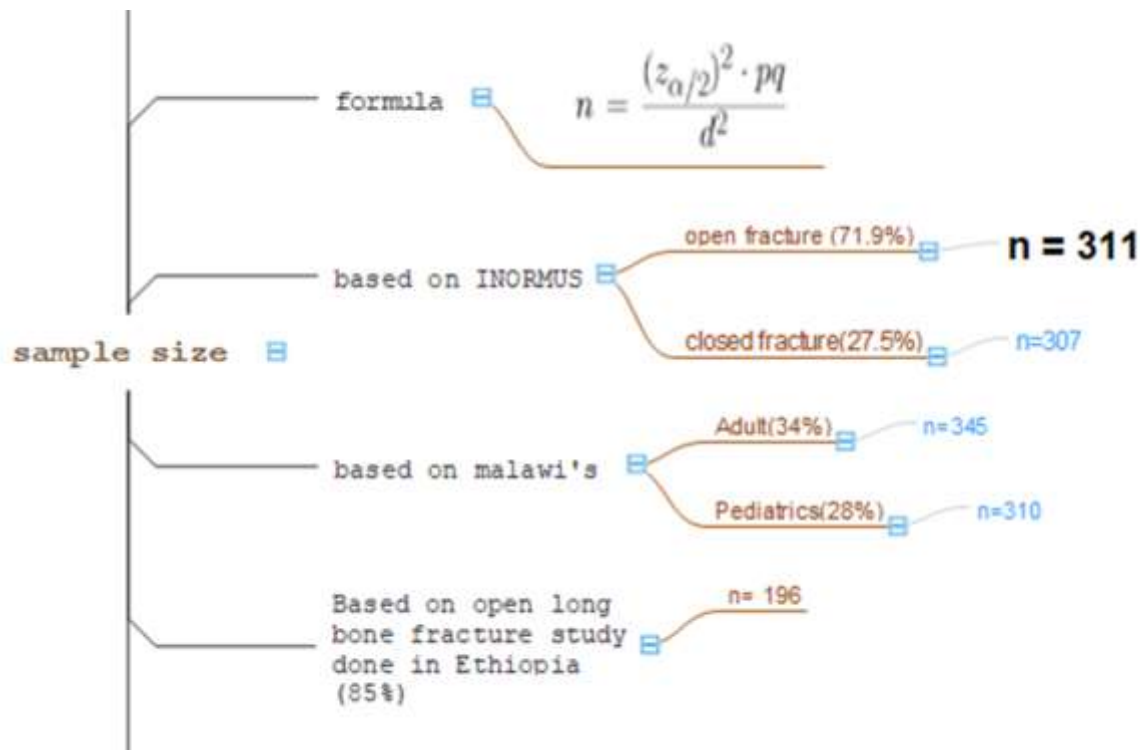


Figure 2: Sample size determination.

2.8 Sampling technique

Systemic random sampling was applied among patients diagnosed with open fracture and visited Emergency Department at TGSB from October 11, 2020 to July 30, 2021 was taken by reviewing morning session reports, HMIS and patients chart.

2.9 Data collection procedures

Data collection tools was adopted from reviewing different literatures. Data collection checklist

contained time taken from injury to hospital arrival, sociodemographic factors and injury factors. Data was collected from morning presentation reports, hospital emergency registration and patients chart. Two trained data collector was assigned for data collection, and we followed the data collection process.

2.10 Study variables

2.10.1 Dependent variable: Delayed presentation.

2.10.2 Independent variables: Age, Sex, Address, Occupation, Mechanism of injury, Injured limb, Fracture site.

2.11 Operational definitions

2.11.1 Delayed presentation: For patients with open fractures defined as being delayed more than 2 hours from time of injury to hospital presentation according to Lancet Commission for global surgery.

2.11.2 Fracture site

- Proximal humerus fractures was categorized as shoulder injury.
- Supracondylar humerus fracture will be included in elbow injury.
- Radial head fractures categorized as elbow and distal radial fractures as wrist, all other radial fracture as forearm injury.
- Femoral neck, peritrochanteric, and subtrochanteric femoral fractures recorded as hip injuries.
- Knee injuries included distal femoral and femoral condyle fractures.
- Proximal and distal tibial fractures recorded as tibial or fibular injuries.
- Patients with multiple injuries, the most severe injury was selected.

2.12 Data entry, processing and analysis

Data was coded, cleared and entered using Epi-data version 4.6 and then exported to SPSS (windows version 24) software for statistical analysis. After cross checking, cleaning made to avoid missing values, outliers and inconsistencies. The data was analyzed to determine magnitude of delayed

presentation in open fracture. Frequency and cross tabulation used to summarize descriptive statistics. Means and percentage used for nominal variables. Binary logistic regression (bivariate and multivariate) was conducted to identify associated factors for delayed presentation. In Bivariate analysis, Variables with P-value less than 0.25 was taken into multivariate analysis. Data expressed in mean \pm SD, tables, texts and $P \leq 0.05$ considered as a statistically significant.

2.13 Data quality management

The principal investigator supervised data collectors. One day training on the contents of the data collection checklist, data collection techniques, and research ethics was given for data collectors. Any doubts/question in the method that they underwent was clarified. Pretest of the checklist was conducted in 5% of study subjects two weeks prior to actual data collection at University of Gondar hospital for validation of checklist and to make some adjustment. During the actual data collection period, the questioner was checked every night for completeness.

3. Result

3.1 Socio-demographic characteristics

Between September 1, 2021, and July 30, 2021, 311 patients were approached for inclusion, of whom two patients (0.6%) presented with missing time of presentation. 309 patients were enrolled, of whom 262 (84.8%) were men. The mean age was 30.4 (SD 13.9; 3– 86) years. More than 87% of the patients affected were younger than 46 years. Farming was the most common occupation (43.4%), followed by student

(17.2%) among patients with open fracture presented to our hospital.

3.2 Time from injury to hospital presentation

Those patients with an open fracture who presented within 2 hours after sustaining the trauma were only

28 patients (9.1%). One hundred eighty-six patients (60.2%) presented within 24 hours of the trauma, and 38 patients (12.3%) arrived after one week of the trauma.

Characteristic	Frequency (n=309)	Percentage (%)
Time from injury to hospital presentation		
Less or 2hr	28	9.1
2 to 8 hours	63	20.4
9 to 24 hours	95	30.7
25 to 72 hours	47	15.2
3 to 7 days	38	12.3
More than 7 days	38	12.3

Table 1: Time from injury to hospital presentation in open fracture.

3.3 Predictors of delayed presentation

Among sociodemographic factors, in patients with open fractures, being from rural area (adjusted OR 3.327, CI 1.140-9.712, p value 0.028) was associated with a higher risk of delays of more than 2hrs.

Relative to other mechanism of injury, Bullet/Blast injury demonstrated a 69.3% reduced risk of late presentation after having open fracture(adjusted OR 0.307, CI 0.122-0.776, P value 0.013).

Variables	Rate of delayed presentation%	Bivariate €		Multivariate[]	
		COR	P value	AOR	P value
Age group		µ 0.234		0.369	
Less or equal to 18 yrs.≠	86%(37 of 43)	0.556 (0.68-4.729)		0.606(0.204-1.805)	
Greater than 18 yrs.	91.7%(244 of 266)				
Sex		µ 0.227		0.160	
Male	90%(236 of 262)	2.479 (0.092-1.760)		2.976(0.651-13.607)	
female≠	95.7%(45 of 47)				
Address		µ 0.001		µ 0.028	
Urban	82.8%(82 of 99)	0.267(0.120-0.564)		3.327(1.140-9.712)	
rural≠	94.8%(199 of 210)				

Occupation		μ 0.213	0.740
Farmer	93%(125 of 134)	1.692(0.740-3.869)	1.215 (0.384-3.842)
Non farmer \neq	89%(156 of 175)		
Mechanism of injury		μ 0.003	μ 0.013
Bullet/Blast	95.8%(158 of 165)	3.854(1.587-9.359)	0.307(0.122-0.776)
Non bullet \neq	85%(123 of 144)		
Injured limb		0.661	
Upper limb	92.7%(115 of 124)	0.626(0.124-3.160)	
Lower limb	89.8%(150 of 167)	0.907(0.192-4.285)	
both \neq	88.9%(16 of 18)		
Site of fracture		0.457	0.938
Other upper limb sites	91%(82 of 90)	0.921(0.339-2.502) 0.872	0.714(0.664-1.323)
Elbow	97.6%(40 of 41)		
Tibia/fibula	88%(74 of 84)	0.236(0.492-3.310) μ 0.178	
Other lower limb sites \neq	90%(85 of 94)	1.276 (0.492-3.310) 0.616	
<p>¥The values are given as the percentage of patients, with the number of patients in parentheses. €Bivariate analysis was performed for each covariate with delayed presentation as the outcome measure. ¶The multivariate model included categories on binary logistic regression with $p < 0.25$. COR crude odds ratio with CI, AOR adjusted odds ratio with CI inside the parentheses. \neqReference. μ significant.</p>			

Table 2: Bivariate and Multivariate Predictors of Delayed Presentation.

4. Discussion and Conclusion

We performed an institution based retrospective cross sectional study of 309 patients with open fracture who presented to Tibebe Ghion specialized Hospital in Ethiopia. We examined associations between seven covariates and presentation greater than 2hrs after injury. We found a substantial proportion of patients with open fracture were delayed in reaching a treating hospital. This study shows a significant delay in presentation of patients to hospital after sustaining an open long bone fracture. Approximately 90.9% 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

research done by Samuel et al in which 85% presented delayed, 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. Around 38 patients (12.3%) with open fractures arrived hospital after one week of the trauma which is higher than the study done by Samuel et al. in which only 18 patients (6%) were delayed more than 1wk [10-12]. This could be due to study area is warfare region and study was political instability period, and the poor inter- facility referral process in Ethiopia. This delayed presentation of trauma patients after 72 hours, which is 24.6% 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 exaggerated delayed presentation of open fracture.

Regarding the mechanism of injury, Bullet/Blast injury is the leading cause contributing about 53.4 % followed by Road traffic accident accounting 24.3% and assault around 12%. In this study, Bullet is the leading cause of injury unlike the previous research done at Amhara region by Berihun et al, which shows Assault was contributing for about 37.4%, followed by RTA 37.4% ,and research done by Samuel et al in which RTA was accounting 56.8% [5, 11]. This can be explained due to the recent political instability and civil war experienced in Ethiopia, a seasonal condition. In our study, RTA still account significant share that Ethiopia's prevention modality is not adequate to decrease RTA as a cause of injury.

Although our country met the Lancet Commission on Global Surgery benchmark that more than 80% of patients live within 2hrs distance of a hospital, in our study patients with open fracture from rural areas were more likely to be late in presentation to hospital [1]. This suggesting the role of awareness on open fracture management is unevenly distributed in the country, in addition to limited finance resource and transportation in the rural area. Our report also found, bullet/blast injury reduced risk of delayed presentation after having open fracture than other mechanism of injury. This could be related to the current condition in the region where everyone is more concerned about bullet injury in this war time.

Most injured patients from bullet injury, frustrated to bleeding more than other mechanism of injuries.

In summary, to address the Lancet Commission on Global Surgery and WHO targets for global access to surgical care, here we have shown that 90.9% of patients with open fractures were delayed in their presentation to hospital. Being from rural had significant association with delayed presentation and bullet/blast injury had negative significant association with delayed presentation.

5. Strengths and Limitations

This study had some limitations. First, the study design is cross sectional. Second, it represents only one center in Ethiopia. Our findings could not be generalizable for the whole country. Also, we were unable to consider the total distance travelled by patients and we cannot quantify the time it took patients to arrive to our hospital.

Recommendations

Prehospital transfer and interfacility referral system should be revisited to address the delays observed. Identifying other reasons responsible for delayed presentation and surgical delay should be examined in prospective research, and efforts should be exerted to address this gap and tackle the bottlenecks to provide early surgical care for open fractures.

Ethical Approval

Ethical clearance was obtained from Bahir Dar University Institutional Review Board (IRB) and letter of cooperation from Tibebe Ghion specialized hospital. Confidentiality of information was

maintained during data collection, analysis and interpretation.

Availability of Data and Materials

Data sets used and/analyzed during current study are available from the corresponding author on reasonable request.

Conflict of Interest

Authors declare that they have no conflict of interest.

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Ethical Consideration

Ethical clearances obtained from Bahir Dar University Institutional Review Board (IRB) and letter of cooperation from Tibebe Ghion specialized hospital. Confidentiality of information was maintained during data collection, analysis and interpretation.

References

1. Mukhopadhyay S, Ojomo K, Nyberger K, Meara JG. Lancet commission on global surgery. *Iran J Pediatr* 27 (2017).
2. AnHofmren, Primack A, Keusch G, Hrynkow S. Addressing the growing burden of trauma and injury in low- and middle-income countries. *Am J Public Health* 95 (2005): 13-17.
3. Violence I. *INJURIES VIOLENCE* (2014).
4. Aderaw A, Bilal S. Injury related adult deaths in Addis Ababa , Ethiopia : analysis of data from verbal autopsy. *BMC Public Health* 20 (2020): 1-8.
5. Bashah DT, Dachew BA, Tiruneh BT. Prevalence of injury and associated factors among patients visiting the Emergency Departments of Amhara Regional State Referral Hospitals, Ethiopia: A cross-sectional study. *BMC Emerg Med* [Internet] 15 (2015).
6. Elias A, Tezera C, Elias A, et al. Orthopedic and Major Limb Trauma at the Tikur Anbessa University Hospital, Addis Ababa - Ethiopia. *East Cent African J Surg* 10 (2005): 43-50.
7. Tiruneh C, Seyoum G, Regasa G, et al. Clinical Profile and Patterns of Extremity Fractures in Ortho-. *Ethiop Med J* 58 (2020):159-165.
8. Miller MD, Thompson SR. Miller ' s Review of Orthopaedics.
9. Basuki K. No Title No Title [Internet]. Vol. 53, ISSN 2502-3632 (Online) ISSN 2356-0304 (Paper) *Jurnal Online Internasional and Nasional* Volume 7 No.1, Januari – Juni 2019 Universitas 17 Agustus 1945 Jakarta (2019): 1689-1699.
10. Health FN, Associates MS. Articles Delays in hospital admissions in patients with fractures across 18 low-income and middle-income countries (INORMUS): a prospective observational study (2020).

11. Hailu S, Gebreyohanes M, Hailu S, et al. Original Article Prevalence of Delayed Presentation of Open Long Bone Frac 58 (2020): 200-204.
12. Agarwal-Harding KJ, Chokotho LC, Mkandawire NC, et al. Risk Factors for Delayed Presentation Among Patients with Musculoskeletal Injuries in Malawi. *J Bone Jt Surg – Am* 101 (2019): 920-931.
13. Nkurunziza T, Toma G, Odhiambo J, et al. Referral patterns and predictors of referral delays for patients with traumatic injuries in rural Rwanda. *Surg (United States) [Internet]* 160 (2016): 1636-1644.
14. Haagsma JA, Graetz N, Bolliger I, et al. The global burden of injury: Incidence, mortality, disability-adjusted life years and time trends from the global burden of disease study 2013. *Inj Prev* 22 (2016): 3-18.
15. Getu J, Tadesse E, Bayisa H. Factors Associated with Fracture and Its Outcome at Wolaita Sodo University Teaching and Referral Hospital , Wolaita Sodo 7 (2017): 12-29.
16. Kigera JWM. Injury to Presentation Delays among Musculoskeletal Trauma Patients in Uganda. 5 9 (2011): 2009-2012.
17. Vles WJ, Veen EJ, Roukema JA, et al. Consequences of delayed diagnoses in trauma patients Consequences of Delayed Diagnoses in Trauma Patients : A Prospective Study (2003).
18. Vidal EIO, Moreira-Filho DC, Pinheiro RS, et al. Delay from fracture to hospital admission: A new risk factor for hip fracture mortality? *Osteoporos Int* 23 (2012): 2847-2853.
19. Bhandari M, Adili A, Leone J, et al. Early versus delayed operative management of closed tibial fractures. *Clin Orthop Relat Res* 368 (1999): 230-239.
20. Long C, Titus Ngwa Tagang E, Popat RA, et al. Factors associated with delays to surgical presentation in North-West Cameroon. *Surg (United States) [Internet]* 158 (2015): 756-763.



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