



Research article

Magnitude, mechanism and outcome of pediatric trauma at university of gondar comprehensive specialized hospital, 2023

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ABSTRACT

Introduction: Trauma is the leading cause of mortality among children older than one year. In fact, injuries alone account for a greater number of deaths in children than all other causes combined. Among children under the age of 19, accidental injuries contribute to 65 % of all injury-related deaths. Limited research on childhood trauma in Ethiopia makes it difficult to fully understand its processes, patterns, and effects. In this research, we thoroughly examine the mechanisms, patterns, and outcomes of pediatric trauma cases at the University of Gondar Comprehensive Specialized Hospital, located in Northwest Ethiopia, in the year 2023.

Methods: This cross-sectional study was conducted on a randomly selected sample of 405 pediatric patients who visited the University of Gondar Comprehensive Specialized Hospital between January 1, 2023, and December 30, 2023. Data were extracted from each medical chart using a structured checklist. The collected data were entered into Epi-data 3.1 for cleaning and analyzed using SPSS version 25. The results were reported using tables and text.

Results: A total of 405 patients, consisting of 265 males (65.4 %) and 140 females (34.6 %), were included in this study. The patients had a mean age of 7.1 years and a standard deviation of 4.3. The majority of the patients, 303 (74 %), were under the age of 10. More than half of the trauma cases, 222 (54.8 %), occurred in children from rural areas. Fall-down accidents accounted for 187 (46.2 %) of the cases. The second most common cause of trauma was road traffic incidents with collisions, accounting for 53 (13.1 %) cases. In terms of anatomical location, face and head trauma were the most common, accounting for 165 (40.7 %) cases. This was followed by extremity trauma (upper and lower extremities) in 159 (39.3 %) cases and abdomen and pelvic trauma in 103 (25.4 %) cases. The majority of children, specifically 373 (92.1 %), were discharged with improvement.

Conclusion: Pediatric trauma continues to be a significant issue of public health importance. It is predominantly observed in boys residing in rural areas, with fall-related injuries being the most prevalent cause. Moreover, a majority of the affected individuals experience trauma to the head and face. Therefore, it is imperative to emphasize the necessity of educating the general population about the potential risks associated with pediatric trauma, especially concerning incidents involving falls and motor vehicle collisions. Educating children about the potential hazards linked

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to activities like climbing trees, crossing roads, and interacting with animals is of utmost importance.

1. Introduction

Any physical injury inflicted upon the body due to abrupt exposure to forces surpassing an individual's capacity to endure or due to a deficiency in oxygen or warmth is commonly known as trauma [1]. Trauma, whether resulting from a non-intentional or violent act, occurs with varying degrees of swiftness and triggers immunological, metabolic, and hypothalamic-pituitary-adrenal axis reactions that ultimately restore homeostasis. Despite the existence of numerous distinct mechanisms by which injuries can transpire, trauma can be broadly classified into three main categories: blunt, deceleration, and penetrating trauma [2].

Trauma is the leading cause of mortality among children older than one year. In fact, injuries alone account for a greater number of deaths in children than all other causes combined. Among children under the age of 19, accidental injuries contribute to 65 % of all injury-related deaths. From 1972 to 1992, motor vehicle collisions (MVCs) emerged as the primary cause of death for children aged 1–19 years, based on data from the United States. This was closely followed by drowning and instances of homicide or suicide, often involving weapons. Shockingly, approximately 20,000 children and teenagers lose their lives due to injuries every year. Moreover, for each child who tragically passes away from injury, an additional 40 children are admitted to hospitals, and 1120 receive treatment in emergency rooms. Each year, it is projected that approximately 50,000 children will endure long-term disability, with the majority of these cases stemming from closed-head traumas. As a result, pediatric trauma continues to pose a significant threat to the health and overall well-being of children [3].

Childhood injuries are impacted by various factors, such as the surrounding environment, individual behavior, gender, and age. However, among these factors, age and gender emerge as the most crucial variables shaping the patterns of injury. Notably, male children below the age of eighteen exhibit higher rates of injury and mortality, a trend that can be partially attributed to their more assertive behavior and involvement in contact sports [3,4]. In the infant and toddler age groups, falls are a prevalent source of significant injury, while bicycle-related injuries, whether involving motor vehicles or not, are the primary perpetrators of harm among older children and adolescents [5,6]. Blunt trauma accounts for the majority of pediatric trauma cases, while penetrating injuries make up only about 10–20 % of all hospitalizations for pediatric trauma in most medical facilities [7].

The majority of penetrating injuries are predominantly attributed to gunshot wounds, which also exhibit a significantly higher fatality rate compared to injuries caused by blunt mechanisms. In recent times, there has been a concerning rise in the occurrence of pediatric penetrating trauma, particularly in the context of thoracic injuries. Unfortunately, the prevalence of penetrating injuries among adolescents aged 13–18 has witnessed a surge, primarily due to the widespread availability and utilization of firearms, coupled with an increased vulnerability to urban violence [4].

Due to the considerable hospital admission rate and the requirement for extensive medical and surgical intervention, severe trauma imposes a substantial emotional and financial burden on families, society, and the global community [8]. The economic crisis stemming from trauma persists even after patients are discharged from the hospital, owing to the enduring long-term complications that impact their lives [9,10]. The number of bodily organs injured and the severity of the damage have a significant impact on a child's mortality rate following trauma [8].

In Ethiopia, injuries were responsible for a staggering 25,000 deaths among children aged 0 to 14 in 2015. This number exceeds the estimate provided by the global burden of illness projects by more than double [11]. A projection for pediatric trauma in Ethiopia in 2015 indicated that the number of deaths would continue to rise until 2030. It is expected that the annual mortality rate from injuries will increase to 26,463, 27,807, and 30,364 in 2015, 2020, and 2030, respectively [12].

The primary causes of trauma-related problems in low-to middle-income countries like Ethiopia are numerous and include a lack of a formal triage system and an effective prehospital response [13], inadequate staffing levels in emergency department management, and a lack of basic surgical services [14]. The World Health Organization recommends developing first-responder training programs and Emergency Triage, Assessment, and Treatment Plus (ETAT +) training to address these issues [15].

The Ethiopian federal ministry of health has also been working to reduce the burden of pediatric trauma by implementing ETAT + strategies [15], and the Ethiopian health sector program prioritizes injuries and violence prevention [16]. However, despite these efforts, many Ethiopian children continue to struggle with trauma. Limited research on childhood trauma in Addis Ababa and Agaro, Ethiopia, makes it difficult to fully understand its processes, patterns, and effects [17,18]. Understanding the pattern of trauma in each location is crucial for making informed health-related policy decisions and implementing preventative efforts, as many trauma incidents are avoidable, especially among children [19,20]. The primary objective of this study was to thoroughly examine the mechanisms, patterns, and outcomes of pediatric trauma cases at the University of Gondar Comprehensive Specialized Hospital, located in Northwest Ethiopia, in the year 2023.

2. Methods and material

2.1. Study design, setting and population

This cross-sectional study was conducted at the University of Gondar Comprehensive Specialized Hospital, located in the Gondar Zone of the Amhara Region in north-western Ethiopia. According to the 2015 report of the Central Statistical Agency of the country, the

city has a population of 323,900 [21]. The city is home to one public comprehensive specialized hospital, which is one of the oldest teaching hospitals in the country. It provides healthcare services to more than 7 million people in the city and surrounding catchment areas [22]. During the study period from January 1, 2023 to December 30, 2023, a total of 1269 pediatric patients with trauma visited the emergency department of the University of Gondar Comprehensive Specialized Hospital.

2.2. Population, eligibility criteria

Children under the age of 16 who sought treatment at the emergency department of the University of Gondar Comprehensive Specialized Hospital and were injured between January 1, 2023, and December 31, 2023, were included. Only pediatric trauma cases with complete and registered variable information were included in the study, while those with incomplete information were excluded.

2.3. Sample size determination

The sample size for calculating a single population proportion was determined using a specific formula. This formula took into account several statistical assumptions. The confidence level was set at 95 %, represented by the Z-value of 1.96. The margin of error, denoted as 'd', was set at 5 %. The prevalence of childhood road traffic trauma among children visiting the emergency department of AaBET Hospital in Addis Ababa, Ethiopia, was estimated to be 39.8 %, represented by the value of 0.398 [18].

$$n = (za / 2)2 \times p(1 - p) / d2$$

$$n = (1.96)2 \times 0.398(0.602)$$

$$(0.05)2 = 368$$

After taking into account a 10 % non-response rate due to incomplete and lost cards, the final minimum sample size required for this study was determined to be 405.

2.4. Sampling techniques and procedure

All children who experienced trauma and sought medical attention at the University of Gondar Comprehensive Specialized Hospital Emergency Department between January 1, 2023 and December 30, 2023 were identified as the target population. This was done by referring to the admission registration book in the emergency department. To create a sampling frame, each child with trauma was assigned a sequential number. In this sampling frame, a sample of children was selected using a simple random sampling technique. This selection process was facilitated by a computer random number generation system in Excel. The study participants were selected through this process. To access the medical records of the selected participants, their unique medical record numbers were used to retrieve the relevant charts from the card room. During the data collection phase, if any of the randomly selected charts were missing important variables or if the chart itself was lost, it was replaced with a new randomly selected sample number from the sampling frame. In total, 405 charts were planned to be included in the analysis.

2.5. Study variables

These variables encompass socio-demographic factors such as age, sex, and place of residence. Additionally, pattern-related variables were examined, including the duration of presentation (duration from injury to presentation in the emergency department), the mechanism and nature of injury, the vehicles involved in road traffic incidents (RTI), and the anatomic sites of body injury. Lastly, pediatric trauma outcome-related variables were analyzed, which included the duration of hospital stay, hospital expenses, and the status of pediatric trauma outcomes.

2.6. Operational definitions

Pediatric trauma: pertains to any traumatic injury experienced by children who are 16 years old or younger.

A pattern of pediatric trauma: refers to the recurring ways in which injury events tend to occur within this specific age category [5].

Outcome: measures how seriously the injury threatens life loss (deceased or discharged with improvement) [23].

2.7. Data collection tool and procedure

The checklist utilized in this study was derived from prior research conducted in Addis Ababa, Ethiopia [18] and further refined based on relevant literature to align with the study's objective. To ensure accurate data collection, the data collectors underwent a one-day training session on the data collection process. Subsequently, three medical doctors utilized a structured checklist to extract data from each medical chart. The checklist encompassed various aspects, including sociodemographic variables, patterns and mechanism-related variables, and pediatric trauma outcome-related variables. Throughout the data collection process, the principal investigators diligently reviewed each questionnaire on a daily basis to ensure the completeness and accuracy of the collected

information.

2.8. Data quality control

In order to guarantee the integrity and accuracy of the data, a preliminary examination was carried out on 5 % of the total sample size, which accounted for 21 participants, prior to the commencement of the actual data collection phase. Subsequent to the pretest findings, necessary adjustments were made to ensure coherence in wording, language consistency, and overall editorial quality.

2.9. Data processing, analysis, and presentation

The collected data underwent a series of processing steps, including editing, coding, classification, and tabulation. These steps were necessary to ensure that the data could be analyzed in accordance with the objectives outlined in the research plan. The EPI DATA 3.1 version was used to enter the data, which was then exported to the IBM SPSS Statistics 25 software for further cleaning and statistical analysis. Descriptive analyses were conducted to identify patterns and relationships among different groups of data. The results were reported in the form of frequency distributions and percentages. For continuous variables, descriptive analyses were reported as mean \pm standard deviation. The findings of the study were presented using tables and texts, depending on the type of data. Careful interpretation was provided to ensure that the complete meanings and implications of the findings could be understood.

3. Results

A total of 405 patients, consisting of 265 males (65.4 %) and 140 females (34.6 %), were included in this study. The patients had a mean age of 7.1 years and a standard deviation of 4.3. The age range of the patients varied from 6 months to 16 years. The mean duration of the presentation was 25 h, with a standard deviation of 29 h. The duration of the presentation ranged from 30 min to 7 days. The majority of the patients, 303 (74 %), were under the age of 10. More than half of the trauma cases, 222 (54.8 %), occurred in children from rural areas. Fall-down injuries accounted for 187 (46.2 %) of the cases. Among the fall-down cases, 91 (48.7 %) were from falling out of trees, with fruit trees (*Cordia Africana*, *Focus Sycamores*, and *Syzygium guineense* being the main types of trees reported). Additionally, 28 (14.9 %) falls occurred while playing or running, and 23 (12.3 %) falls were from beds or chairs. Other falls included 12 (6.4 %) from stairs, 6 (3.2 %) from slippery floors, 6 (3.2 %) from fences, and 7 (3.7 %) from cliffs (Tables 1 and 2).

The second most common cause of trauma was road traffic injury, accounting for 53 (13.1 %) cases. Among these cases, the majority, 50 (94.3 %), were pedestrians. Assaults involving sticks, stones, or kicks were reported in 45 (11.1 %) cases. Table 3 and 4 Other mechanisms of injuries included horn injuries in 26 (6.4 %) cases, gunshot wounds in 21 (5.2 %) cases, horse/donkey kicks in 17 (4.2 %) cases, and thermal injuries in 12 (3 %) cases (with all except two being scalds and two being flame burns). In terms of anatomical location, face and head trauma were the most common, accounting for 165 (40.7 %) cases. This was followed by extremity trauma (upper and lower extremities) in 159 (39.3 %) cases and abdomen and pelvic trauma in 103 (25.4 %) cases. The majority of children sustained injuries in a single body region, with 341 (84.1 %) of the total trauma cases falling into this category (Table 5 and 6).

3.1. Patterns of causes of injury divided into age group

Trauma caused by falls was the most frequent in the age groups of 5–12 years old and less than 5 years old, accounting for 45 % and 31.5 % of all trauma cases, respectively. Road traffic injuries were the most common cause of trauma among children less than 5 years old, accounting for 43.3 %. Assault was most commonly seen in those aged between 11 and 16, accounting for 55.8 %. Additionally, gunshot injuries were also more common in those between 11 and 16 years old, accounting for 55 % of all gunshot cases. In contrast, animal kick and horn injuries were more common in children less than 5 years old, standing at 52.9 % and 57.7 %, respectively (Table 7).

When examining regional injuries divided by age group and outcome status, abdominal and pelvic traumas were frequent in children between the ages of 5 and 10, accounting for 47.5 % of trauma cases. Head and face injuries were common among children

Table 1
Socio- Demographic Characteristics of Injured Children visiting University of Gondar Comprehensive Specialized Hospital Emergency Department (n = 405).

Sociodemographic characteristics		Frequency (n = 405)	Percentage
Age	≤ 5	179	44.1
	6–10	124	30.6
	11–16	102	25.2
Sex	Male	265	65.4
	Female	140	35.6
Residence	Urban	183	45.2
	Rural	222	54.8
Duration of presentation	≤ 8 hours	150	37
	9–24 h	162	40
	> 24 h	93	23

Table 2

mechanism of injury of Injured Children visiting University of Gondar Comprehensive Specialized Hospital Emergency Department (n = 405).

Mechanism of injury	Frequency (n = 405)	Percentage
Fall	187	46.2
RTI	53	13.1
Assault	45	11.1
Horn	26	6.4
Gunshot	21	5.2
Horse/donkey kick	17	4.2
Thermal	12	3
Rolling stone	11	2.7
Door edge	7	1.7
Blast	7	1.7
Other (animal bite, axe, glass, torn, meat grinder, wood machine)	19	4.7

Table 3

specification of mechanisms of injuries among children visiting University of Gondar Comprehensive Specialized Hospital Emergency Department.

Types of fall-down injuries	Frequency (n = 187)	Percentage
from fruit trees	91	48.7
while playing without height	28	14.9
stairs	12	6.4
Bed/chair	23	12.3
Slippery floor	6	3.2
Cliff	7	3.7
Bicycle	3	1.6
Fence	6	3.2
Other (ladder, cart, horse, ditch)	11	5.9
Characteristics of motor vehicle collisions		
Patient type	Frequency (n = 53)	Percentage
Pedestrian	50	94.3
passenger	3	5.7
Types of vehicles		
Two-wheel	5	9.4
Three-wheel	35	66
Four-wheel	13	24.6

Table 4

anatomic regions of the affected organs among pediatric patients presented to the University of Gondar Comprehensive Specialized Hospital (n = 405).

Anatomic locations of the trauma	Frequency (n = 405)	Percentage
Head	165	40.7
Abdomen	103	25.4
Upper extremity	82	20.2
Lower extremity	77	19
Thoracic region	35	8.6
Neck, Back and pelvis	7	1.7
Polytrauma (two or more regions injured)	64	15.9

less than 5 years old, accounting for 50.6 % of trauma cases. Chest and back traumas were more common in children between the ages of 11 and 16, accounting for 40 % and 57 %, respectively. Among patients with trauma to the head, there were 43 patients with depressed skull fractures (Figs. 5 and 6), 54 patients with mild head injuries, 9 patients with moderate head injuries, and 5 patients with severe head injuries, two of whom died.

In terms of upper extremity trauma, 29 patients had fractures in various bones (clavicular, radial, radioulnar, supracondylar humeral, and phalax), and three patients had traumatic amputations (Figs. 1 and 2). Among patients with lower extremity trauma, 25 patients had fractures (15 tibiofibular fractures, 8 femoral fractures, and 2 hip dislocations), and five patients had knee joint injuries (Figs. 3 and 4). Among patients with abdominal trauma, 23 patients had penetrating abdominal trauma (gunshot and blast injuries) requiring laparotomy. Additionally, 80 patients had blunt abdominal trauma, with 5 patients experiencing splenic injuries.

After triage in the emergency department, a majority of the patients were assessed and treated accordingly based on the severity of their injuries. Outcome status-related characteristics were observed after triage in the emergency department. The majority of children, specifically 373 (92.1 %), were discharged with improvement. However, 29 (7.1 %) of the traumatic children were discharged with sequelae, such as amputation, weakness, or limping. Unfortunately, three patients (0.7 %) did not survive their injuries. Among

Table 5
Characteristics of Pediatric Patients with the Cause of Injury divided into age Groups (Years) visited at the Emergency Department at University of Gondar Comprehensive Specialized Hospital Between January 1, 2023 to December 30, 2023 (n = 405).

Variables		≤5 years (n = 179)	6–10 years (n = 124)	11–16 years (n = 102)
Cause of injury	Fall-down	86	58	43
	RTI	23	17	13
	Assault	9	10	24
	Gunshot	3	6	11
	Horn	15	7	4
	Horse/donkey kick	9	8	0
	Blast	3	2	2
	Thermal	9	9	3
	Rolling stone	13	6	4
	Door edge	6	1	0
	Others (animal bite, axe, glass, torn, meat grinder, wood machine)	4	2	13

Table 6
characteristics of pediatric patients with regional Injuries divided into age group (Years0 visited at the Emergency Department at UoGCSH between 1/ January 2023 and December 30, 2023 (N = 405).

Variables		≤5 years (n = 179)	6–10 years (n = 124)	11–16 years (n = 102)
Site of trauma	Head	82	53	30
	Abdomen	37	49	16
	Upper extremity	30	28	24
	Lower extremity	36	24	17
	Chest	9	12	14
	back	1	2	4
	Polytrauma	27	19	18

Table 7
Outcome status-related characteristics of children with visiting UoGCSH Emergency Department from January 1, 2023 to December 30, 2023(N = 405).

outcome	Frequency (n = 405)	Percentage
Discharged improved	373	92.1
Discharged with sequele (amputation, weakness, limping)	29	7.1
Died	3	0.7

these fatalities, two patients had severe traumatic brain injuries, while one patient had penetrating abdominal trauma with sepsis resulting from a gunshot injury.[Fig 5 and 6](#)

In terms of hospital stay, 209 (51.6 %) patients were discharged on the same day as their presentation. Another 112 (27.7 %) patients stayed in the hospital for at least 24 h, and 84 (20.7 %) patients required a stay of more than 24 h. The average hospital expense per patient was approximately 1929 Ethiopian birr, with a standard deviation of 1380. The interquartile range (IQR) for expenses ranged from 350 to 7850 Ethiopian birr. The total cost for investigations and hospital bed payments alone amounted to 964,782 Ethiopian birr.

4. Discussion

With a high rate of morbidity and death among children, pediatric trauma is a significant global public health issue. According to the US Centers for Disease Control and Prevention (CDC), there has been a 29 % decrease in childhood death rates among those aged 1–19 years in the first decade of this century [24]. The causes of trauma in children are multifaceted and include factors such as age, gender, socioeconomic status, environment, and behavior patterns. Falls are the most common non-fatal injuries in children, resulting in a considerable number of emergency room visits and hospital stays. Similarly, in Ethiopia, fall-down injury is the major cause of pediatric trauma, and young children less than 5 years of age and male children are particularly affected.

Motor vehicle collisions are another significant cause of pediatric trauma, particularly when children are not properly secured or restrained, increasing the likelihood of severe injuries. In our country, the majority of road traffic injuries happen to pedestrians [25]. Sports-related injuries, especially in contact sports like soccer and football, significantly contribute to the incidence of youth trauma, often resulting in fractures, concussions, and soft tissue injuries. Risk factors associated with mortality include both direct factors, such as the mechanism of injury, and indirect factors, such as a lack of health insurance. Efforts have been focused on reducing injury risk through preventive strategies [26–28]. However, it is equally important to consider how we treat injured children.

Regarding firearms, firearm usage in Ethiopia is shaped by a combination of historical, cultural, political, and socio-economic factors. Historically, conflicts both within and outside Ethiopia have contributed to the proliferation of firearms, particularly in



Fig. 1. anteroposterior x-ray of a 13-year-old male child presented with blast injury showing traumatic amputation.

rural and pastoralist communities where guns are often used for protection and hold cultural significance [29]. This widespread availability of firearms in Ethiopia has significant implications for public health and safety, contributing not only to immediate violence but also to broader impacts on community stability, mental health, and economic development [30].

Variations in socioeconomic status, geographic location, and demographic characteristics have a significant impact on the epidemiology and pattern of trauma-related injuries among the pediatric population across national borders. In our study, children from rural areas were primarily affected. There are several reasons for this, including the availability of fruit trees in the wild (to minimize the impact of this, we recommend child friendly signage in these areas) and parental awareness about the devastating impact of pediatric trauma. Children, due to a range of risk factors including age, developmental stage, parental supervision, availability of safe spaces (to address these issues, we recommend an increase in safe playing areas for children), and socioeconomic status, are particularly susceptible to trauma. Young children and teenagers, with their propensity for risk-taking behaviors, are especially vulnerable. Children hailing from socioeconomically disadvantaged backgrounds are more likely to experience trauma, as evidenced by disparities in their access to educational resources, secure housing, and healthcare (this problem can be partially mitigated by creating daycare centers for working families). The likelihood of pediatric trauma is further heightened by exposure to adverse childhood events like substance misuse and domestic violence, as well as the lack of parental monitoring [31–33]. Finally, to reduce the incidence of MVC, stringent driving license rules can help.



Fig. 2. lateral x-ray of the arm in a 7-year-old child presented with fall down injury showing supracondylar humeral fracture.

Since average child mortality is a reliable indicator of social progress, the collection of current and accurate injury patterns can have significant implications. The mortality rate in our study was 0.7 %. Advanced nations typically have lower average childhood death rates, highlighting the importance of understanding injury patterns [34]. Pediatric trauma can have both short- and long-term effects, including physical impairments, cognitive decline, emotional distress, and even mortality. In our research, while we did not evaluate the psychosocial ramifications of trauma, we did identify several enduring complications, including amputation, physical debilitation, and difficulty walking. Furthermore, the average duration of symptom presentation was approximately 25 h, which can be attributed to the fact that a significant proportion of our participants hail from rural regions. We can shorten the duration of the presentation by enhancing strong ERS facilities, improving them, promoting community awareness, and improving the infrastructure. Prompt intervention and proper care are crucial for optimizing outcomes and minimizing the impact of trauma. Advances in trauma care, such as improved prehospital triage, resuscitation techniques, and dedicated pediatric trauma facilities, have greatly contributed to better survival rates and functional outcomes for injured children [35,36]. In addition, providing training to physicians in the hospital about pediatric trauma is recommended.

The cost of pediatric emergency department trauma care extends beyond direct medical expenses. Indirect costs, such as missed school and parental wage losses, impose a significant social and financial burden related to pediatric traumatic injuries. In our



Fig. 3. anteroposterior x-ray of the femor showing segmental femoral shaft fracture in a 9 year old pediatric patient presented with road traffic injury.

research, the mean hospital expense per patient was approximately 1929 Ethiopian birr, which is around 40 USD, with a standard deviation of 1380. Furthermore, the total cost for investigations and hospital bed payment alone amounted to 964,782 Ethiopian birr, excluding indirect costs such as parental wage loss, transportation loss, and other expenses, particularly those incurred by individuals residing in rural areas.

Prevention remains the key to reducing this burden. Public health initiatives that focus on injury prevention education, enforcement of legislation (e.g., seat belt and helmet laws), and environmental modifications (e.g., playground safety standards, traffic calming measures) have proven effective in reducing the incidence of pediatric injuries. However, the above-mentioned measure may not have much relevance in our area as the causes of pediatric trauma are different. Implementing comprehensive injury prevention strategies requires a multidisciplinary approach involving healthcare providers, educators, policymakers, and community stakeholders. By working together, we can create a culture of safety for children and significantly reduce the impact of pediatric trauma. In Ethiopia, numerous strategies have been implemented to effectively mitigate the risk of pediatric trauma and subsequently reduce



Fig. 4. anteroposterior x-ray of the femur showing comminuted distal femoral fracture in a child presented with gunshot injury.

morbidity and mortality rates associated with such incidents. Nevertheless, we firmly acknowledge that there is still considerable work to be done in order to further decrease the prevailing risk.

4.1. Prevention measures for pediatric trauma in Ethiopia

- **Education on Risks:** It is crucial to educate the general population about the potential risks associated with pediatric trauma, particularly focusing on falls and motor vehicle injuries. This can help raise awareness and promote safer behaviors among children and caregivers.



Fig. 5. axial non-contrast head CT scan in a 12 year old child showing right side epidural hematoma with depressed skull fracture following a fall down accident.

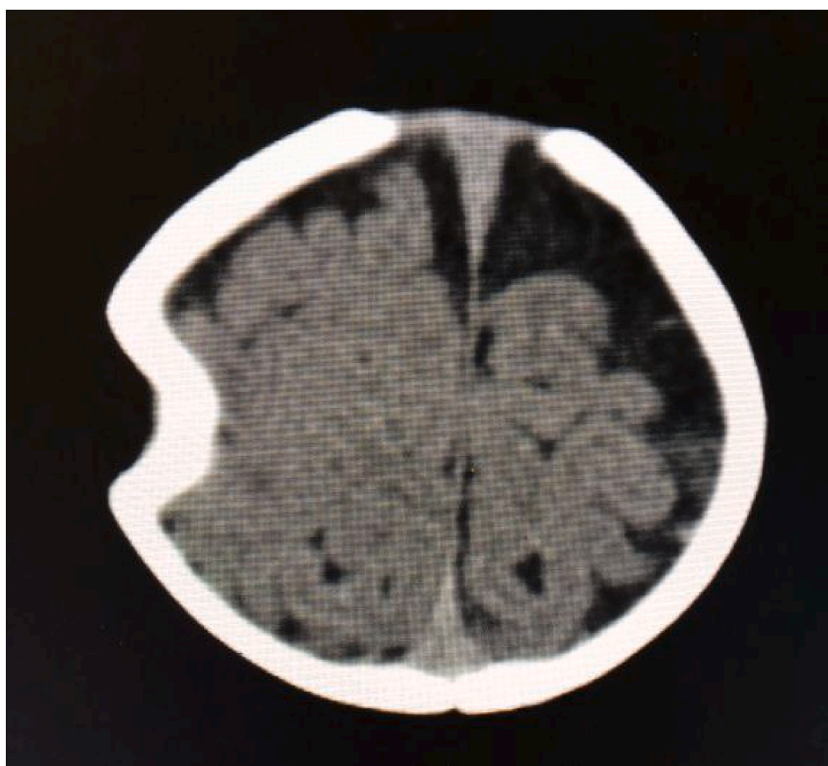


Fig. 6. an axial CT scan of a 9 month old infant presented with motor vehicle collision (he was a passenger inside the car) showing a 'Ping-pong' depression of the skull bone.

- **Targeted Programs for Rural Areas:** Since a majority of trauma cases occur in children from rural areas, implementing targeted prevention programs in these communities can be effective. These programs could include safety workshops and community engagement initiatives to address specific local risks.
- **Focus on Common Injury Causes:** Given that fall-related injuries are the most prevalent cause of trauma, prevention measures should emphasize safety in environments where children play, such as homes and playgrounds. This could involve installing safety features and providing guidelines for safe play.
- **Community Awareness Campaigns:** Launching community awareness campaigns that educate families about the importance of supervision and safe practices during activities like climbing trees or crossing roads can significantly reduce injury rates.

5. Recommendations

- We highly encourage the government to prioritize the education of the population regarding the potential hazards linked to pediatric trauma, particularly in relation to incidents involving falls and motor vehicle collisions. This can be effectively achieved through the utilization of mass media, as it possesses the capability to reach a broader audience, especially in rural areas.
- It is crucial to educate children about the potential dangers associated with activities such as climbing trees, crossing roads, and interacting with animals.
- Furthermore, we strongly advocate for the implementation of stringent firearm control measures and advocate for campaigns that raise awareness about the dangers of firearms and educate the public on safe handling and storage practices.
- **Research and Data Collection:** Recommend further research on the impact of pediatric trauma on public health and the effectiveness of various prevention strategies.

6. Conclusion

Pediatric trauma is a significant public health issue that affects children worldwide, with various causes and consequences. In this study, pediatric trauma is predominantly seen in boys, especially those from rural areas, with falls being the most frequent cause. Head and face injuries were the most common, and the majority of patients were discharged with improvement. In addition, there is an urgent need for targeted educational interventions to reduce the incidence of pediatric trauma, particularly focusing on the risks associated with falls and motor vehicle accidents. Raising awareness about safety measures in children's activities, such as climbing trees and crossing roads, is crucial to preventing such injuries. Moreover, we strongly advocate for the implementation of stringent firearm control measures.

Understanding the epidemiology of pediatric trauma is crucial to implementing preventive measures and improving the prognosis of injured children. It is imperative to reduce the societal impact of pediatric trauma by addressing the underlying risk factors through continuous research, community involvement, and policy advocacy. By prioritizing injury prevention and optimizing trauma treatment, we can strive to create safer environments for all children and promote their long-term well-being.

Ethical approval

An ethical clearance was obtained from the Ethics Review Committee of the School of Medicine, College of Medicine and Health Science, with reference number SBMLS/648/2023.

Consent

Written informed consent was taken from the patient for publication accompanying images. A copy of the written consent is available for review for the editor-in-chief of this journal on request.

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Data availability Statement

The authors of this manuscript are willing to provide any additional information regarding the study.

CRedit authorship contribution statement

Yohannis Derbew Molla: Writing – review & editing, Writing – original draft, Conceptualization. **Deresse Abebe Gebrehana:** Writing – original draft, Conceptualization. **Ahmed Maru Nega:** Writing – review & editing, Writing – original draft. **Hirut Tesfahun Alemu:** Writing – review & editing, Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Abbreviations

CDC	Center for disease control and prevention
CT	Computed tomography
MVC	Motor vehicle collision
RTI	Road traffic injury
UoGCSH	University of Gondar Comprehensive Specialized Hospital

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