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Original Article

Referral Pattern to Pediatric Orthopedic Clinic at Tikur Anbessa Specialized Hospital

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Abstract

Background: *Pediatric musculoskeletal problems are increasingly becoming a major public health problem worldwide. Developing countries are disproportionately affected by this issue. However, there is a scarcity of epidemiological data describing the magnitude of these issues in low resource settings. Understanding the pattern and burden of musculoskeletal problems helps in objectively understand the issue. This in turn will aid in the formulation of evidence driven policy and decision making. This study tries to summarize the pattern of all pediatric orthopedic conditions seen at Tikur Anbessa specialized hospital over the study period.*

Objective: *To describe the pattern of patient referral to the pediatric orthopedic clinic in Tikur Anbessa Specialized Hospital.*

Methods: *Hospital-based retrospective record review was conducted from January 2022 to January 2023, at Tikur Anbessa Specialized Hospital. Data were collected from medical records of all pediatric patients seen at the pediatric orthopedic clinic at Tikur Anbessa Specialized Hospital and diagnosed with orthopedic conditions were included in the study to determine the pattern of patient referral. Descriptive statistics were computed to describe the study population and variables.*

Result: *Of the pediatric patients who visited pediatric Orthopedics clinics 195 (32.3 %) were due to trauma, 139 (23.1 %) were due to a congenital disorder, 72 (11.9%) were due to developmental problems, 55 (9.1%) were due to neuromotor problems, 46 (7.6) were due to infection problems, 27 (4.5) were due to tumors, 24(4%) were due to metabolic (all constituting rickets) problem and 46 (7.6 %) constitute miscellaneous conditions.*

Conclusion: *The most common musculoskeletal diseases/conditions were trauma, followed by congenital disorders and developmental disorders/diseases.*

Keywords*: Pediatric Orthopedics, Referral pattern, Referral patterns of Pediatric patients.*

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Background

Musculoskeletal (MSK) diseases, defined as diseases that affect the locomotor system including muscles, bones, joints, tendons, and ligaments, have a growing impact worldwide (1).

Musculoskeletal diseases are a major contributor to the global burden of disease and disability, and disproportionally affect low- and middle-income countries; however, there is a lack of epidemiological data from low- and middle-in-come countries. Affected children often face in-creased morbidity, social isolation, and econom- ic hardship (2).

According to the World Health Organization, MSK Diseases (MSKD) are the second leading cause of years lived with disability and the largest contributor to persis-tent pain globally. However, data relating to the spectrum and burden of pediatric MSKD globally are limited, with few studies from low- and middle-income countries (LMIC), of which only a handful are specific to East Africa, although the burden of disease is thought to disproportionally affect LMIC (3).

The causes and pattern of pediatric injuries have been reported to be influenced by age, gender, environmental and socio-economic factors (4). Children sustain injuries from several causes including road traffic injuries (RTCs), falls from heights, burns as well as during birth. Several studies reported that land transport-related injuries continue to dominate among the various causes of trauma in children in developed and as well as developing countries (5).

According to the 2020 report on child mortality pub-

lished by the United Nations Inter-Agency Group for Child Mortality Estimation, injury is the leading cause of mortality for children, adolescents, and youth aged 5–24 years (6). Children from low and middle-income countries (LMICs) are disproportion- ately affected, accounting for over 90% of uninten- tional injury-related mortalities globally (7).

There are few studies from developing countries describing the prevalence and potential risk factors of Pediatric trauma. A study on the epidemiology of pediatric trauma can help to formulate effective injury prevention programs and hence decrease the pediatric trauma burden and disability level (8).

Fractures are a common and significant injury in childhood, but information about the pattern of fractures among children is scarce (9). Fractures of the long bones were more often caused by falls whereas fractures of the axial skeleton, hand, and foot were often caused by collisions, blunt trauma, and traffic accidents (10).

Fractures were more often caused by falls, followed by road traffic accidents in children presenting toTikur Anbessa Specialized Hospital, a tertiary teach- ing hospital in Ethiopia (11).

Congenital abnormalities affect between 1% and 2% of all live births. Of these, around 10% have upper-limb deformities. Some of these deformities occur in isolation, but there are some associations with systemic syndromes (12). The prevalence of congenital limb deficiencies is reportedly 4.91 per 10,000 live births in South America (1967–1992), 5.5 per 10,000 total births in Alberta, Canada (1980–2012), and 6.9 per 10,000 total births in Northern Netherlands (1991 –2010). According to the International Clearinghouse for Birth Defects Monitoring Systems (IBDMS), the prevalence of congenital limb deficiency in Japan is reportedly 3.81 per 10,000 total births (2007–2011) (13). Congenital disorders, non-congenital deformities, and traumatic conditions are the most common musculoskeletal disorders affecting Zambian children aged less than 15 years (14).

Approximately 6% of all childhood malignancies are malignant bone tumors, of which the two most frequently encountered are osteosarcoma and Ewing sarcoma. In the United States, the annual incidence in children under 20 years of age is 8.7 per million (15).

The epidemiology of musculoskeletal infection is evolutionary. The potential for change in the epidemiology of musculoskeletal infection within a given community suggests that a periodic review may be beneficial to ensure that the current methods of evaluation and treatment go with the current manifestations of the disease (16). Musculoskeletal pathologies due to trauma were caused by various mechanisms of injury. Fall from height was the most common cause of trauma in children. That was followed by road traffic accident-related injuries. Sports-related traumas and domestic violence were the 3rd and 4th commonest causes of trauma respectively (17). There havebeen reports on the variation of specific patterns of various foot deformities across the world (18). De- formities like clubfoot, pes cavus, flatfoot, and meta- tarsus adductus represent some of the commonly seen foot pathologies (19).

There are many children with different orthopedic/ musculoskeletal problems referred to Tikur Anbessa Specialized Hospital pediatric orthopedic clinic. However, there is a lack of studies describing the pattern of these referrals. This study aims to describe the pattern of referral to a pediatric orthopedic clinic, at Tikur Anbessa Specialized Hospital, for whom the final diagnosis was orthopedic condition/s.

Methods and Materials

Study design

One year hospital-based retrospective record review was conducted from January 2022 to January 2023, at Tikur Anbessa Specialized Hospital.

Study area

Tikur Anbessa Specialized Hospital was established in 1961 by Emperor Haile Selassie I as “Prince Mekonnen Memorial Hospital” and got its current name in 1976. The School of Medicine at Tikur Anbessa Specialized Hospital was established in 1972 under AAU and is one of the earliest medical schools in the country. The school has been providing quality medical education to students from Ethiopia and other African countries for more than five decades. It is now treating over 500 thousand outpatients and more than twenty-one thousand inpatients annually.

Study populations

The study population included all pediatric patients who were diagnosed with orthopedic problems or conditions at Tikur Anbessa Specialized Hospital, pediatric orthopedic clinic from January 2022 to January 2023.

Eligibility criteria

All pediatric patients diagnosed with orthopedic problems or conditions at Tikur Anbessa Specialized Hospital, pediatric orthopedic clinic from January 2022 to January 2023. Patients with incomplete charts, or charts that not feasible were excluded from the study.

Sample size determination

All medical records that fulfill the eligibility criteria were included in this study.

Study variables

Age, sex, region of referral, diagnosis, and causes of the injury or trauma.

Data collection procedures
Data collection was done by two trained junior orthopedic residents. Demographic data, referring institution, and final diagnosis were collected retrospectively on all patients who were evaluated at the pediatric orthopedic clinic.

The HIMS logbook of the pediatric orthopedic clinic was used as a sampling frame. After selecting the patient's registration number on the logbook, the patient's chart, electronic medical records, and x-rays were traced and considered to extract selected information.

Data analysis procedures
The collected data was processed and analyzed by using SPSS version 26. Descriptive statistics were computed to describe the study population and variables.

Results
Between January 2022 and January 2023, 2824 patients who were under 15 years of age visited pediatric Orthopedics clinics in Tikur Anbessa Specialized Hospital. Of these 662 patients are new patients that came from eight regions and two city administrations within the country.

Of the 662 patients, 59 were excluded from the analysis due to a lack of documented diagnosis on the chart and electronic medical record.

Patient characteristics:
Among 603 patients seen at pediatric Orthopedics clinics during the study period, 342 (57%) were male, and the median age was 6 years.

The top three areas of patient inflow were from Oromia region 271 (44.9%), Addis Ababa city 227 (37.6%) followed by Amhara region 33 (5.5%) and there was no patient referred from Tigray region (table1).

Table 1: shows cases referred from each region and city.

	Oromia	**Addis Ababa**	**Amhara**	**Harar**	**SNNP**	**Somali**	**Gambela**	**Benishangul Gumuz**	**Dire Dawa**	**Afar**
	271	227	33	18	17	14	9	7	5	2
	44.9%	37.6%	5.5%	3%	2.8%	2.3%	1.5%	1.2%	0.8%	0.3%
Trauma	64	116	10	0	1	1	0	0	1	1
Infection	19	11	6	0	0	1	4	2	0	0
Tumor	9	0	2	3	5	5	2	1	0	0
Congenital MSK Disorders	74	44	5	8	3	2	1	0	0	1
Developmental MSK disorders	46	17	4	0	3	0	0	1	1	0
Metabolic	17	8	0	1	0	4	0	0	0	0
Neuromotor Disorders	20	26	2	1	2	1	0	2	1	0
Miscellaneous	22	5	4	5	3	0	2	1	2	0

Most traumas and neuromotor disorders were referred from Addis Ababa city 116(59.5%) and 26(47.3%) respectively. While most of the congenital, developmental, metabolic disorders, infections, and tumors were from Oromia region 74 (53.3%), 46(63.8%), 17(77.3%), 19(42.2%), and 9(33.3%) respectively (table 2).

Table 2: shows the frequency of cases of the patients.

Problems/Diseases	**Frequency**	**Percent**
Trauma	195	32.3
Congenital Disorder	139	23.1
Developmental disorder	72	11.9
Neuromotor Disorder	55	9.1
Miscellaneous	46	7.6
Infection	45	7.5
Tumor	27	4.5
Metabolic	24	4.0
Total	603	100

Table 3: shows the distribution of the trauma within the body.

Locations of trauma within the body						
Trauma	Upper limb injuries	Lower limb injuries	Shoulder girdle injuries	Pelvic girdle injuries	Total	Percent
Supracondylar humerus fracture	31	0	0	0	31	15.9%
Femur shaft fracture	0	26	0	0	26	13.3%
Tibiofibular fracture	0	19	0	0	19	9.7%
Radioulnar fracture	16	0	0	0	16	8.1%
Soft tissue injury	7	5	0	0	12	6.2%
Clavicle fracture	0	0	12	0	12	6.2%
Isolated ulna fracture	11	0	0	0	11	5.6%
Isolated Radius fracture	8	0	0	0	8	4.0%
Metacarpal fracture	8	0	0	0	8	4.0%
Metatarsal fracture	0	6	0	0	7	3.6%
Humerus shaft fracture	7		0	0	6	3.1%
Distal femur fracture	0	6	0	0	6	3.1%
Toe	0	6	0	0	6	3.1%
Finger fracture	6	0	0	0	6	3.1%
Humerus lateral epicondyle	6	0	0	0	6	3.1%
Elbow Dislocation	4	0	0	0	4	2.1%
Femur neck fracture	0	4	0	0	4	2.1%
Pelvic ring injuries	0	0	0	4	4	2.1%
Hip Dislocation	0	2	0	0	2	1.5%
Proximal humerus	1	0	0	0	1	0.5%
Total	105	74	12	4	195	100%

Most of the trauma occurred in the upper limb 105/195 (54% of the trauma) accounting for 17% (105/603) of all conditions. And forearm fracture (including radioulnar, isolated radius, and ulna fracture) was observed in 35 (18%) of the trauma patients, followed by supracondylar humerus fracture 31 (16%) and femur shaft fracture 26 (13%). No multiple traumas were found (table 3).

Locations of trauma within the body

The mechanism of injury for 25 (12.8%) out of the 195 patients who sustained trauma is missing. One hundred fourteen (67% of the 170 for whom the causes of injury are known) are due to fall down injury. While the rest are caused by road traffic injury, metal injury, stone injury, birth trauma, fight, sport, and bullet injury 24(14%), 12 (7%), 7(4%), 5 (3%), 4(2%), 3(1.8%), and 2(1.2%) respectively (figure 1). The data about the nature of 20 (11.4 %, excluding soft tissue injury) fractures, whether they were open or closed were missing. One hundred fifty one (excluding the soft tissue injury) (92%) of the frac- tures were closed while the rest were open (table 4).

Developmental dysplasia of the hip accounted for 20 (27.8%) of the observed developmental disorders, and 3% of all the conditions. Followed by genu varus deformity accounting for 16.8% of the observed developmental disorders. Nine (45%) of the developmental dysplasia of the hip occurred on the left side and 7 (35%) were bilateral. It was noticed that females were affected more than males, two times. No secondarycauses of the disorders were found.

The most commonly observed infections were chronic osteomyelitis 17 (38% of all infections), accounting for 2.8% (17/603) of all the conditions. Followed by arthritis accounting for 29% (13) of all infections and 2% of all cases.

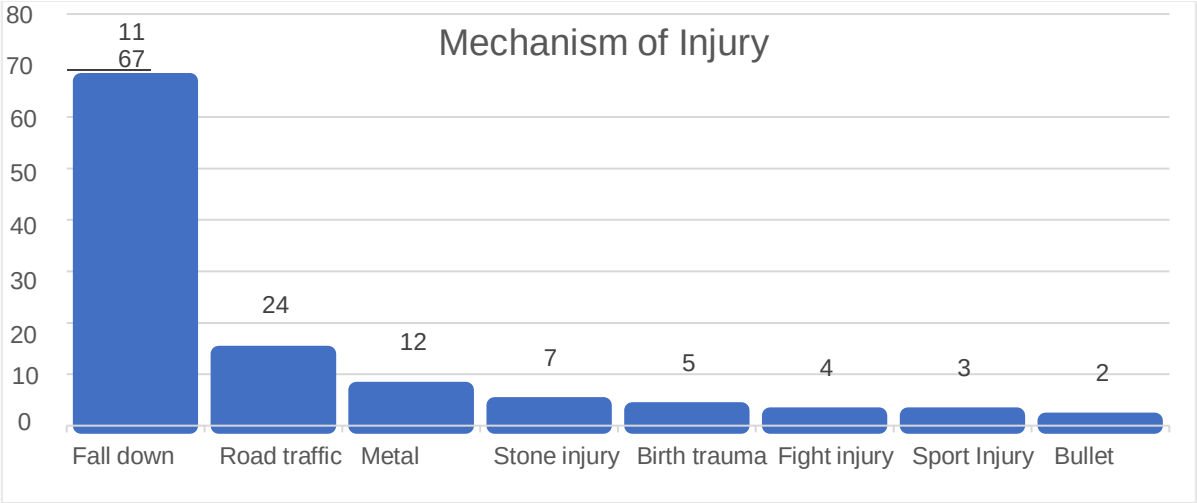

Figure 1: shows the mechanism of injury for patients presented with trauma.

Table 4: Showing the observed nature of the fractures.

Fracture	Nature of fracture	
	Closed	Open
SCH fracture	26	1
Radioulnar fracture	18	1
Femur shaft fracture	17	1
Clavicle fracture	11	0
Humerus shaft fracture	9	0
Isolated Radius fracture	8	0
Isolated ulna fracture	8	0
Metacarpal fracture	8	0
Tibiofibular fracture	8	4
Distal Radius	6	1
Distal femur fracture	6	0
Toe	5	0
Elbow Dislocation	4	0
Metatarsal fracture	4	3
Pelvic ring injuries	3	0
Humerus lateral epicondyle	3	0
Finger fracture	2	2
Hip Dislocation	2	0
Femur neck fracture	2	0
Proximal humerus	1	0
Total	151	13
Percent	92%	8%

The most commonly observed neuromotor problems were Erb`s palsy 26 (47%), accounting for 4% (26/603) of all the cases, followed by cerebral palsy 20 (36%) also accounting for 3% (20/603) of all the conditions.

The miscellaneous conditions were selected because these cases either could not be classified under the other seven groups (Trauma, Congenital, Disorder, Developmental disorder, Infection, Neuromotor Disorder, Tumor, and Metabolic diseases) or they have systemic manifestations within the body which make the data grouping and analysis difficult. It consisted of 46 disorders (7.6% of all the conditions).

Discussion

This study aims to describe a pattern of patient referral to the pediatric orthopedic clinic at Tikur Anbessa Specialized Hospital, a tertiary teaching hospital in Addis Ababa, Ethiopia.

Over twelve months, 603 new pediatric patients with musculoskeletal diseases/ disorders were identified in this study. The majority of patients did not have referral paper attached to their charts. This may be because the country is replacing the charts with digital medical records.

Although referral papers could not be found for most of the patients the residence of the patients could be inferred from their charts and HIMS logbook. Most of the patients were out of Addis Ababa, where TikurAnbessa Specialized Hospital is located, a place where this study is conducted. The three most common mus- culoskeletal diseases found in this study were trauma, followed by congenital Musculoskeletal disorders, and developmental musculoskeletal disorders. These findings are similar to a study on an Audit of Pediatric Orthopedic surgical admissions in a Tertiary Health Cen-

tre in Enugu, Nigeria, where they found trauma as the most prevalent case (17). These findings are different from that of the study on Patterns of Musculoskeletal Diseases seen in Zambian Children, where they found congenital anomalies to be the commonest followed by deformities and trauma (14).

The most common mechanism of injury was fall down injury accounting for 67% of the causes of trauma followed by road traffic injury which accounts for 14% of the causes. This may be explained by the fact that children are adventurous and explorers they are often predisposed to an increased risk of falldown injuries. These findings are similar to the study on the Audit of Pediatric Orthopedic Surgical Admissions in a Tertiary Health Centre in Enugu, Nigeria (17), and the study on patterns of long bone fracture in the pediatric population at Kenyatta national hospital Kenya (20), theyfound fall injuries as the commonest cause of trauma in a pediatric population, followed by road traffic inju- ries.

As to the trauma, most fractures were observed in the upper limb accounting for 57% of the injury in this study. This finding is similar to the result of a study on patterns of long bone fracture in the pediatric population at Kenyatta National Hospital Kenya, where the commonest fractures were found to involve the upper limb (20).

The most common fracture involved forearm bones (including radioulnar, isolated radius, and isolated ulna fracture altogether), followed by supracondylar humerus fracture and femur shaft fracture. This result differs from the study on pattern of childhood limb fracturesat Tikur Anbessa Specialized Hospital, where the most common fracture involved the humerus (11).
The most common congenital anomaly identified was clubfoot accounting for 62% of the observed congenital anomalies. This finding is similar to a study on patterns of pediatric orthopedic pathology in Zambian children where clubfoot was the commonest congenital anomaly (14).
Some of the limitations of the study are being conducted only in a single institution, a retrospective nature, difficulty in accessing X-rays of some study participants, and a short study period.

Conclusion
The top three musculoskeletal disorders presenting to TASH pediatric orthopedic clinic were trauma, congenital anomalies and developmental disorders. And one-third of all the cases were trauma. Most of the patient flows are from the Oromia region.

Recommendations
A prospective multicenter study should be done to establish the national musculoskeletal burden. Development of safety guidelines to reduce the risks of fall injury and road traffic injury.

Ethical Considerations
The study was conducted after being granted ethical clearance from Addis Ababa University Institutional Review Board (ERB/OTHO/461/14 /2022). No personal identifiers of the patient were used in the research report. Patient confidentiality was maintained throughout the research project.

Conflicts of interest
None

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