Patterns, Treatment Modalities and Outcomes of Extremity Fractures in Children Presenting at Moi Teaching and Referral Hospital, Eldoret Kenya

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Patterns, Treatment Modalities and Outcomes of Extremity Fractures in Children Presenting at Moi Teaching and Referral Hospital, Eldoret Kenya

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***Abstract*- Background:** Fractures in children mostly from unintentional injuries represent a major public health concern, and 90% occur in low- medium income countries. The prevalence of extremity fractures in children is increasing; these fractures primarily affect the distal radius/ulnar, the distal humerus, and the epiphyseal bones. This underscores the need for high-quality musculoskeletal treatment in sub-Saharan Africa. Although there is growing evidence of greater operational treatment, the majority of these fractures are managed nonoperatively. There is more emphasis locally on technical outcomes as indicator of successful intervention at the expense of functional outcomes using Pediatric Quality of Life (PedsQL). There is paucity of published data locally on this subject and patient reported outcomes in children, highlighting a research opportunity locally at Moi Teaching and Referral Hospital (MTRH), Eldoret. The study will enable guide treatment, educate parents and set expectations about quality of life and return to activities after treatment.

Objective: To describe the patterns, treatment modalities and outcomes of extremity fractures in pediatric patients at Moi Teaching and Referral Hospital?

Methods: A descriptive prospective study design was conducted at MTRH on children aged 2-14 years with extremity fractures between May 2023 and April 2024. Consecutive sampling was done until a sample size of 478 was achieved. Data was collected via interviewer administered structured questionnaire. Health related quality of life was determined through filling in the PedsQL measurement tool at 6 and 12 weeks. Continuous variables such as age were analyzed using means, median and their corresponding standard deviation and interquartile ranges. Categorical variables such as gender were summarized as proportions or percentages. A *p*- value < 0.05 was considered statistically significant.

Results: The age range was 2-14 years with a median of 6 (IQR: 4, 10) years. Males were majority (59.8%). However, for children aged 8-12 years, females were a majority 74(51.1%). Majority of fractures occurred at home, with distal radius 191 (30%) being the commonest injured part. Falls 248 (56%) was commonest mechanism of injury. Majority of fractures were treated non-operatively with casting (63.3%). Lower PedsQL scores were reported at 6 weeks, improving by 12 weeks. Lower limb scores (26.1) were worse than upper limb (40.6) at 6 weeks, and similarly at 12 weeks (86.8 versus 89.3). Girls had lower PedsQL scores than boys.

Conclusion: Majority of fractures occurred at age 8-12 years at home, with upper limb mostly affected and the commonest mechanism was a fall. Most of the fractures were managed non operatively. Lower extremity fractures had poor PedsQL scores compared to the upper ($p< 0.05$), with girls generally having poorer health related outcomes than boys (with $p< 0.05$).

Recommendations: Safety education should be given to minimize falls. More options of surgical implants should be made available. There is need for more research to address low PedsQL score for injured girls and lower limb fractures to be given more attention in terms of rehabilitation.

***Index Terms*-** Activity limitation, extremity fracture, functional outcome, patterns and treatment outcomes

I. Introduction

Fractures are extremely common finding in children, representing a major public health problem across the region (Valerio et al., 2010). Fractures are a significant cause of morbidity in children, with the highest burden seen in low- and middle-income countries. As a result of increased funding and technology the global burden of disease has shifted from communicable diseases like HIV, Tuberculosis to non-communicable diseases and injuries, especially from road accidents (Yusuf et al., 2019). Multiple studies suggest that extremity injuries are on the rise in children highlighting the need for quality musculoskeletal care in sub-Saharan Africa (Galukande et al., 2016; Kisitu Dan, 2014; Naddumba, 2016).

MTRH sees significant cases and related burdens weekly and locally, limited published and non-published data exists on pediatric extremity fracture prevalence and patient-reported outcomes. More focus on technical outcomes as indicator of successful intervention at the expense of functional outcomes. A study done in Nairobi (Ng'ang'a, E and Mutiso, 2017), on

children's fracture patterns lack patient-reported outcomes, highlighting a research opportunity at MTRH.

Studies suggest that most fractures occur in the radius/ulnar, followed by distal humerus fractures and this varies according to different regions. This incidence varies due to the fact that the childhood age definition according to WHO is between 0-19 years and in some other countries its between 0-16 years. Hence some variations in the statistics are expected with geographic and demographic variations due to different age definitions (Bilge et al., 2022). Childhood fractures commonly occur on the playground, during sports and growth spurts, which impacts life and hence this has prompted needed epidemiological prevention studies (Joeris et al., 2014).

There is emerging evidence of increased surgical management due to various reasons but ultimately a majority of children's fractures are treated non-surgically and others are treated operatively (Odatuwa-Omagbemi et al., 2023). The main reasons for increased surgical include but not limited to this are: continuous innovations in the medical field, parents and patients being aware of recent advances in treatment modalities and hence demanding what they deem to be the best, to the training programs for orthopedic residents and fellows that have become more focused on operative management at the expense of non- operative treatment.

A study of patient reported outcomes (functional outcomes) will enable us the healthcare providers educate parents and set expectations about quality of life and possible return to activities post fracture. Treatment outcomes will also enable us healthcare providers put more emphasis in areas reporting poor functional outcomes, in terms of more attention and rehabilitation. This is meant to bridge the gaps/ unmet needs identified in specific objectives of the study. Studies have suggested that functional outcomes are more meaningful indicator of effectiveness of an intervention than clinical outcomes(bony union & alignment) and hence the use of a tool that measures this is more beneficial (Horsch et al., 2022).

PedsQL is a multidimensional measurement model for assessing the health-related quality of life (functional outcome). It consists of physical, mental and social health general score characteristics specified by W.H.O (Varni et al., 2003).Past studies demonstrated that low mean PedsQL scores were seen in injured children who later improve over 12-24 months with lower scores being reported in lower extremities and among girls (Dipnall et al., 2022). It has been noted that lower extremity fractures cause significant initial decline in children's health related quality of life well-being, which cause lasting effects (Ding et al., 2006).

II. METHODS

:

Settings: The study was conducted at MTRH pediatric orthopedic ward, pediatric orthopedic clinic and plaster room with institutional approvals and licenses

Design: A descriptive prospective study design was employed, involving 460 children aged between 2-14 years of age with an extremity fracture between May 2023 to April 2024 based on the eligibility criteria.

Children encountered with an extremity fracture who met the inclusion criteria were recruited after initial investigation and stabilization and data was collected according to flow chart below:

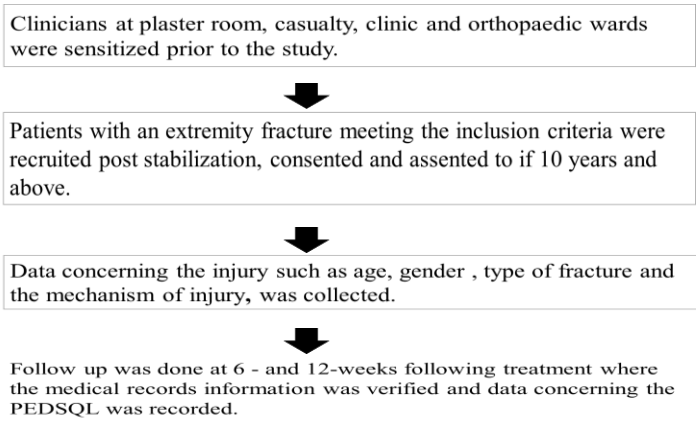


FIGURE 1: Study procedure

RECRUITMENT SCHEMA

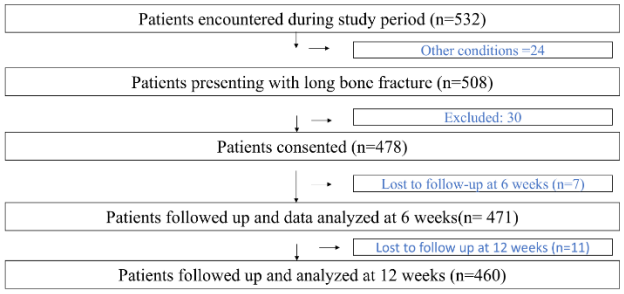


FIGURE 2: Schema

III. RESULTS: SOCIODEMOGRAPHIC AND CLINICAL CHARACTERISTICS

Demographic clinical characteristics

	Total N=460
Age (years)	
Median (IQR)	6.0 (4.0-10.0)
Range	2 – 14
Sex	
Male	275 (59.8%)
Female	185 (40.2%)
County	
Uasin Gishu	403 (87.6%)
Nandi	23 (5.0%)
Elgeyo Marakwet	17 (3.7%)
Others	17 (3.7%)
Parent/Guardian Relation	
Mother	327 (71.1%)
Father	92 (20.0%)
Others	41 (8.9%)
Place Of Injury	
Home	341 (74.1%)
School	71 (15.4%)
Public playground	19 (4.1%)
Road	17 (3.7%)
Others	12 (2.6%)
Sport	
No	294 (77.8%)
Yes	84 (22.2%)
Specify Sport	
Football	80 (95.2%)
Volleyball	4 (4.8%)
RTA	
No	362 (92.8%)
Yes	28 (7.2%)
Specify RTA	
Pedestrian	15 (57.7%)
Bicycle	4 (15.4%)
Pillon	6 (15.4%)
Passenger	2 (7.7%)
Tractor accident	1 (3.8%)
Fall/Child's play	
No	116 (25.2%)
Yes	344 (74.8%)
Specify height	
Same height	96 (27.8%)
<1m	119 (34.5%)
1-5m	93 (27.0%)
>5m	37 (10.7%)
Others specify	
During physiotherapy	1 (25.0%)
Hit by sheep	1 (25.0%)
Chaff cutter	2 (50.0%)

FIGURE 3: Demographic clinical characteristics

TABLE 1: Patterns of the extremity fractures by age group

	2-4 years N=124	5-7 years N=144	8-12 years N=145	>12 years N=47	p-value
Limb category					0.009
Upper Limb	90 (23.8%)	124 (32.8%)	126 (33.3%)	38 (10.1%)	
Lower Limb	34 (41.5%)	20 (24.4%)	19 (23.2%)	9 (11.0%)	
Limb					0.007
Humerus	43 (23.0%)	64 (34.2%)	67 (35.8%)	13 (7.0%)	
Radius/Ulna	47 (24.6%)	60 (31.4%)	59 (30.9%)	25 (13.1%)	
Femur	20 (39.2%)	11 (21.6%)	11 (21.6%)	9 (17.6%)	
Tibia/Fibula	14 (45.2%)	9 (29.0%)	8 (25.8%)	0 (0.0%)	
Segment					<0.001
Proximal end	3 (12.5%)	3 (12.5%)	14 (58.3%)	4 (16.7%)	
Diaphyseal	45 (28.8%)	39 (25.0%)	45 (28.8%)	27 (17.3%)	
Distal end	76 (27.1%)	102 (36.4%)	86 (30.7%)	16 (5.7%)	
AO class					<0.001
Proximal humerus	1 (6.7%)	1 (6.7%)	10 (66.7%)	3 (20.0%)	
Diaphyseal humerus	4 (17.4%)	6 (26.1%)	9 (39.1%)	4 (17.4%)	
Distal humerus	38 (25.5%)	57 (38.3%)	48 (32.2%)	6 (4.0%)	
Proximal radius/ulna	2 (28.6%)	1 (14.3%)	4 (57.1%)	0 (0.0%)	
Diaphyseal radius/ulna	15 (24.2%)	14 (22.6%)	18 (29.0%)	15 (24.2%)	
Distal radius/ulna	30 (24.6%)	45 (36.9%)	37 (30.3%)	10 (8.2%)	
Proximal Femur	0 (0.0%)	1 (50.0%)	0 (0.0%)	1 (50.0%)	

FIGURE 4: Place of injury

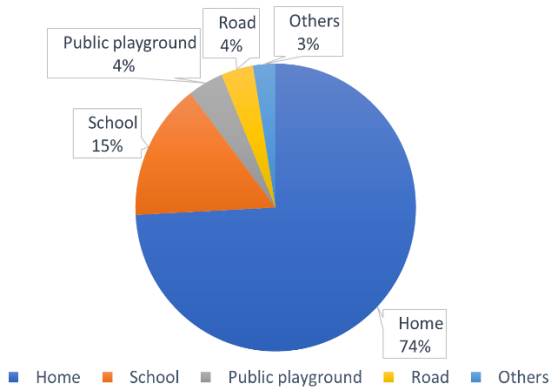


FIGURE 5: ANATOMIC DISTRIBUTION OF FRACTURES

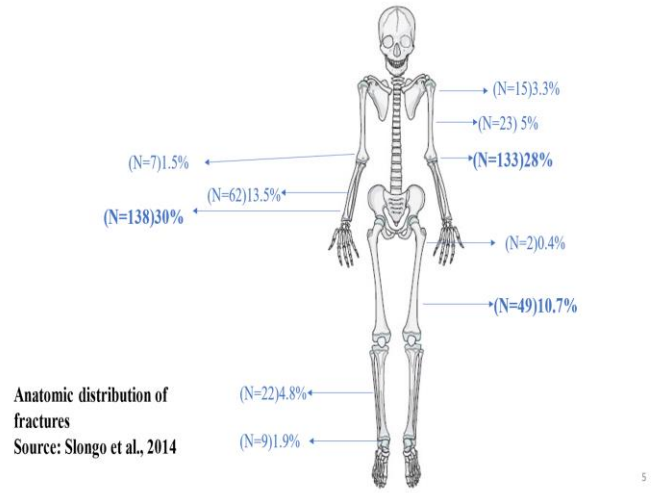
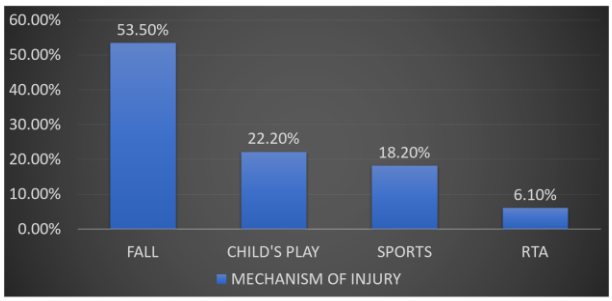


FIGURE 6: MECHANISM OF INJURY



Most of the injuries were caused by a fall from a height, followed by child's play, then sports and finally RTA's

Falls-248

Child's play-96

Sport- 84

RTA-28

Others (hit by cow-2: chaff cutter-2)- 0.8%

FIGURE 7: DEFINITIVE TREATMENT

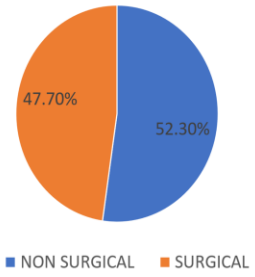
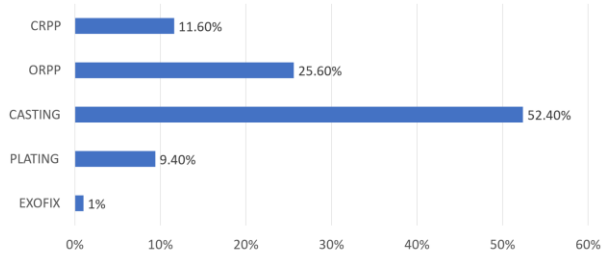


FIGURE 8: DEFINITIVE TREATMENT



TREATMENT OUTCOMES

TABLE 2: AVERAGE PEDSQL SCORES

FUNCTIONAL SCORES	6 WEEKS	12 WEEKS
AVERAGE PHYSICAL SCORE	**38**	79.3
AVERAGE PSYCHOSOCIAL SCORE	**71**	91.9
AVERAGE TOTAL MEAN SCORE	**62.7**	88.9

TABLE 3: PEDSQL SCORES BY FRACTURE REGION

FUNCTIONAL SCORES	6 WEEKS			12 WEEKS		
	Upper Limb	Lower Limb	P-value	Upper Limb	Lower Limb	P-value
PedsQL Physical function score	40.6	**26.1**	**<0.001**	80.8	**72.1**	**<0.001**
PedsQL Psychosocial function	71.8	**67.3**	0.064	92	**91**	0.86
PedsQL total mean score	64.3	**55.4**	**<0.001**	89.3	**86.8**	0.023

TABLE 4: PEDSQL versus GENDER

FUNCTIONAL SCORES	6 WEEKS			12 WEEKS		
	FEMALE	MALE	P-value	FEMALE	MALE	P-value
PedsQL Physical function score	**36.8**	38.7	**0.02**	**78.8**	80	0.65
PedsQL Psychosocial function	**69.4**	73.4	**0.03**	**91.4**	92.7	0.15
PedsQL total mean score	**61.7**	64.1	0.11	**88.2**	89.8	0.07

IV. Discussion:

Socio-demographic characteristics

The median age was 6 years with an IQR of 4-10 years, which concurred with other studies that had a similar age on childhood fractures in Shenzen (Qiu et al., 2022) and Kenya (Ng'ang'a, E and Mutiso, V 2017). This age is associated with children who have just started school and for those who are unable are found playing on the streets, playing in an environment that's is not suitable for them, coupled with a lack of health education regarding the prevention strategies that should be employed.

It however contrasted with an Italian study had a median age of 8.8 years (Valerio et al., 2010), which suggested that children there at that age live more sedentary lifestyles with unhealthy behaviors like increased consumption of energy dense snack foods or carbonated beverage, which combined with increased sports participation increased the risk of fractures at that age.

It was found that males were a majority forming 59.8% of the children encountered and this concurred with results in other studies done at Aga Khan University Hospital, Nairobi (Ndung'u et al., 2019), KNH (Ng'ang'a, E and Mutiso, V 2017) and Italy (Valerio et al., 2010). This could be attributed to the fact that males are more adventurous, intense and more likely to engage in high risk play and sports as compared to girls. The trend was the same across all age groups apart from the 8-12 years age group, where females were more. This coincides with the peak height velocity encountered at that age which is associated with decreased bone density.

A majority of fractures were as a result of a fall (53%), which concurs with other studies in Turkey (Bilge et al., 2022), Italy (Valerio et al., 2010), KNH (Ng'ang'a, E and Mutiso, V 2017) and Switzerland (Joeris et al., 2014). Falls are as a result of the increase in motor ability as children grow and increased involvement in physical activity which increases the risk of fractures from falls as they build confidence. Unlike adults, children do not possess matured cognitive and perceptuo-motor abilities to avoid accidental injuries. As such their physical strength outweighs judgment, and protective reflexes are not fully developed making them a high-risk group for fractures. This study however contrasts with a study done in Nigeria (Nwadinigwe et al., 2006) and Mumbai (Tandon et al., 2007) that reported higher incidences due to RTAs as pedestrians. This could also be attributed to local childcare practices where it was found that in Enugu, Nigeria most children are found hawking, while in Mumbai most children use motorcyclists as pilon passengers, risking exposure to road traffic accidents. Increased road traffic accidents could also be attributed to a lack of traffic control policies, and enforcement of road signs, including lack of zebra crossing points, separate tracks for children riding bikes, lack of sidewalks or separate lanes for those walking on the roads, and other such safety measures not being adhered to.

ANATOMICAL DISTRIBUTION OF FRACTURES

The study found that a majority of the children suffered an upper extremity fracture (82.2%) and this concurred with similar other studies in New York , Turkey and Yaonde (Bilge et al., 2022); Guifo et al., 2017 & Lee et al., 2021). This is attributed to risk taking behavior, yet to be developed coordination and protective response makes them prone to more upper limb injuries than lower extremity injuries. This however contrasted with a study done in Nairobi, that had the lower limb as the majority compared to the upper limb (Ng'ang'a, E and Mutiso, V 2017). The study done at Kenyatta National Hospital received a disproportionate amount of lower limb fractures that required admission which formed a majority of the patients they admitted.

It was also discovered that the distal radius was the most fractured bone, forming 30% of the cases followed by the distal humerus at 28% of the cases. This concurred with other studies done in Turkey (Bilge et al., 2022) and Cameroun (Guifo et al., 2017). This is attributed to the fact that children are discovering new heights and speeds, which predisposes them to these kinds of fractures. This was however in contrast to the study done at Kenyatta National hospital (Ng'ang'a, E and Mutiso, V 2017) which found that most of the fracture encountered were of the lower limb. This can be explained by the fact they receive most fractures that require admission and those are lower limb fractures. It was also found that their study had a duration of three months, which probably wasn't representative of the population.

DEFINITIVE TREATMENT

Despite emerging evidence of increase in operative management, a majority of children (63%) were treated non-surgically. This concurred with studies done in Turkey (Ömeroğlu et al.,2020) and Nigeria (Nwadinigwe et al., 2006). The study however contrasts with another done in Lagos (Odatuwa-Omagbemi et al., 2023) and another done in Shenzen (Qiu et al., 2022). The study in Shenzen was a retrospective study that looked at all bone fractures in the body which probably resulted in an increase in operative management. While in Lagos a majority of patients were attended to initially by TBS, with most fractures later complicating and are then referred and hence they ended up being managed surgically.

FUNCTIONAL OUTCOME

In this study it was noted that the PedsQL score at 6 weeks was low and improved when scored later at 12 weeks. This was similar to a study done in San Francisco (Sabatini et al., 2014) and Melbourne (Dipnall et al., 2022) although with higher scores. It Concurs with their findings, though their figures had higher scores and this could be attributed to the longer follow up period of time (2 years), which allowed time to fully heal.

Girls it was reported had lower PedsQL physical and psychosocial scores compared to boys and this concurred with the study in Melbourne (Dipnall et al., 2022) and was attributed to the fact that girls have a poor perception of their well status and well-being than boys.

FUNCTIONAL OUTCOME SCORES vs FRACTURE REGION

Lower extremity fractures had lower scores compared to those with upper limb fractures, which concurred with a study by (Ding et al., 2006). This is due to inherent functional differences of the lower limb in comparison to the upper limb. Heavier load and constant use make recovery and rehabilitation more challenging for the lower limbs and hence poorer outcomes. The duration and intensity of rehabilitation needed for lower limb recovery are greater and hence early outcomes are poor as they take time before fully healing.

STUDY LIMITATION AND MITIGATION STRATEGY

I lost some patients to follow up and this was mitigated in sample size calculation where I anticipated a 20% loss to follow up to cover up for that.

V. CONCLUSION

The majority of patients were between 8 and 12 years old, with most being male, and the majority of injuries occurred at home via falls.

Most fractures were managed non-operatively with casting, while lower extremity fractures had poorer PedsQL scores than upper limb fractures, with girls generally experiencing worse health-related outcomes than boys.

RECOMMENDATIONS:

Safety education should be given by health care givers to minimize falls.

PedsQL is a tool that should be used by orthopaedic surgeons to measure functional outcomes.

More research is needed to address low PedsQL for injured girls.

More attention should be given to lower limb rehabilitation as they demonstrated lower PedsQL compared to the upper limb.

VI. IMPROVEMENT AS PER REVIEWER COMMENTS

Analyze and understand all the provided review comments thoroughly. Now make the required amendments in your paper. If you are not confident about any review comment, then don't forget to get clarity about that comment. And in some cases there could be chances where your paper receives number of critical remarks. In that cases don't get disheartened and try to improvise the maximum.

ACKNOWLEDGMENT

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REFERENCES

Bilge, O., Kekeç, A. F., Atılgan, N., Yaka, H., Dundar, Z. D., Karagüven, D., & Doral, M. N. (2022). The initial analysis of pediatric fractures according to the AO/OTA fracture classification and mechanisms of injuries. *Ulusal Travma ve Acil Cerrahi Dergisi*, *28*(10), 1500–1507. https://doi.org/10.14744/tjtes.2021.24469

Ding, R., McCarthy, M. L., Houseknecht, E., Ziegfeld, S., Knight, V. M., Korehbandi, P., Parnell, D., Klotz, P., McCarthy, M., MacKenzie, E., Durbin, D., Paidas, C., Aitken, M., Jaffe, K. M., Slomine, B., Dorsch, A., Christensen, J., Berk, R., Houseknecht, E., … Klotz, P. (2006). The health-related quality of life of children with an extremity fracture: A one-year follow-up study. *Journal of Pediatric Orthopaedics*, *26*(2), 157–163. https://doi.org/10.1097/01.bpo.0000218521.98244.7e

Dipnall, J. F., Rivara, F. P., Lyons, R. A., Ameratunga, S., Brussoni, M., Lecky, F. E., Bradley, C., Beck, B., Lyons, J., Schneeberg, A., Harrison, J. E., & Gabbe, B. J. (2022). Predictors of health-related quality of life following injury in childhood and adolescence: a pooled analysis. *Inj Prev*, *28*, 301–310. https://doi.org/10.1136/injuryprev-2021-044309

Galukande, M., Jombwe, J., Fualal, J., & Gakwaya, A. (2016). Boda-boda injuries a health problem and a burden of disease in Uganda: A tertiary hospital survey. *East and Central African Journal of Surgery*, *14*(2), 33–37. https://doi.org/10.4314/ecajs.v14i2.

Guifo, M. L., Tochie, J. N., Oumarou, B. N., Tapouh, J. R. M., Bang, A. G., Ndoumbe, A., Jemea, B., & Sosso, M. A. (2017). Paediatric fractures in a sub-saharan tertiary care center: A cohort analysis of demographic characteristics, clinical presentation, therapeutic patterns and outcomes. *Pan African Medical Journal*, *27*. https://doi.org/10.11604/pamj.2017.27.46.11485

Horsch, A. A., Ghandour, M. A., Christoph, M., Klotz, M., Liebs, T. R., Lorance, A., Berger, S. M., Kaiser, N., & Ziebarth, K. (2022). Health-Related Quality of Life after Fractures of the Distal Forearm in Children and Adolescents—Results from a Center in Switzerland in 432 Patients. *Children 2022, Vol. 9, Page 1487*, *9*(10), 1487. https://doi.org/10.3390/CHILDREN9101487

Joeris, A., Lutz, N., Wicki, B., Slongo, T., & Audigé, L. (2014). An epidemiological evaluation of pediatric long bone fractures - a retrospective cohort study of 2716 patients from two Swiss tertiary pediatric hospitals. *BMC Pediatrics*, *14*(1). https://doi.org/10.1186/S12887-014-0314-3

Kisitu Dan, K. (2014). *PATTERNS OF MUSCULOSKELETAL INJURIES PRESENTING AT SELECTED PUBLIC GENERAL HOSPITALS IN THE DISTRICTS OF CENTRAL UGANDA: @2014 ABSTRACT*. Makerere University. http://makir.mak.ac.ug/handle/10570/4278

Lee, A., Colen, D. L., Fox, J. P., Chang, B., & Lin, I. C. (2021). Pediatric Hand and Upper Extremity Injuries Presenting to Emergency Departments in the United States: Epidemiology and Health Care-Associated Costs. *Hand (New York, N.Y.)*, *16*(4), 519–527. https://doi.org/10.1177/1558944719866884

Naddumba, E. . (2016). A cross-sectional retrospective study of Boda boda injuries at Mulago Hospital in Kampala-Uganda. *East and Central African Journal of Surgery*, *9*(1). https://doi.org/10.4314/ecajs.v9i1.

Ndung'u, A., Sun, J., Musau, J., & Ndirangu, E. (2019). Patterns and outcomes of paediatric trauma at a tertiary teaching hospital in Kenya. *African Journal of Emergency Medicine*, *9*(Suppl), S47–S51. https://doi.org/10.1016/j.afjem.2018.12.004

Ng'ang'a, E and Mutiso, V. (2017). *PATTERN OF LONG BONE FRACTURES IN A PAEDIATRIC POPULATION AT KENYATTA NATIONAL HOSPITAL*. *11*(September), 54–60.

Nwadinigwe, C. U., Ihezie, C. O., & Iyidiobi, E. C. (2006). Fractures in children. *Nigerian Journal of Medicine : Journal of the National Association of Resident Doctors of Nigeria*, *15*(1), 81–84. https://doi.org/10.4314/NJM.V15I1.37124

Odatuwa-Omagbemi, D. O., Izuagba, E., Enemudo, R. E., Otene, C. I., & Ijezie, N. C. (2023). Epidemiological Pattern of Musculoskeletal Injuries in Children Aged 16 Years and Below in a Regional Trauma Centre in Nigeria. *Cureus*, *15*(4). https://doi.org/10.7759/CUREUS.38125

Ömeroğlu, Hakan and Cassiano, N. (n.d.). *Sci-Hub | Tendency towards operative treatment is increasing in children's fractures: results obtained from patient databases, causes, impact of evidence-based medicine. EFORT Open Reviews, 5(6), 347–353 | 10.1302/2058-5241.5.200012*. 2020. Retrieved April 11, 2024, from https://sci-hub.se/10.1302/2058-5241.5.200012

Qiu, X., Deng, H., Su, Q., Zeng, S., Han, S., Li, S., Cui, Z., Zhu, T., Tang, G., Xiong, Z., & Tang, S. (2022). Epidemiology and management of 10,486 pediatric fractures in Shenzhen: experience and lessons to be learnt. *BMC Pediatrics 2022 22:1*, *22*(1), 1–14. https://doi.org/10.1186/S12887-022-03199-0

Sabatini, C., Curtis, T. A., Mahan, S. T., & Sabatini, C. S. (2014). Patient-Based Outcomes After Tibia Fracture in Children and Adolescents. *The Open Orthopaedics Journal*, *8*(1), 41–48. https://doi.org/10.2174/1874325001408010041

Tandon, T., Shaik, M., & Modi, N. (2007). Paediatric trauma epidemiology in an urban scenario in India. In *Journal of Orthopaedic Surgery* (Vol. 15, Issue 1).

Valerio, G., Gallè, F., Mancusi, C., Di Onofrio, V., Colapietro, M., Guida, P., & Liguori, G. (2010). Pattern of fractures across pediatric age groups: Analysis of individual and lifestyle factors. *BMC Public Health*, *10*(1), 1–9. https://doi.org/10.1186/1471-2458-10-656/TABLES/6

Varni, J. W., Burwinkle, T. M., Seid, M., & Skarr, D. (2003). The PedsQL™* 4.0 as a Pediatric Population Health Measure: Feasibility, Reliability, and Validity. *Ambulatory Pediatrics*, *3*(6), 329–341. https://doi.org/10.1367/1539-4409(2003)003<0329:TPAAPP>2.0.CO;2

Yusuf, M., Gebrye, T., & Fatoye, F. (2019). Burden of musculoskeletal-related disorders resulting from non-fatal road traffic collisions in Africa: A protocol of a systematic review. In *BMJ Open* (Vol. 9, Issue 10, p. 32687). BMJ Publishing Group. https://doi.org/10.1136/bmjopen-2019-032687

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