



E-ISSN: 2707-8353

P-ISSN: 2707-8345

IJCRO 2023; 5(1): 70-74

www.orthocasereports.com

Received: 01-01-2023

Accepted: 06-02-2023

Ranjeet Singh Choudhary

Ex. Post Graduate Student,
Department of Orthopaedics,
K S Hegde Medical Academy,
P.O, Deralakatte, Mangaluru,
Karnataka, India

Dr. Lawrence John Mathias

Professor, Department of
Orthopedic, K S Hegde
Medical Academy, P.O
Deralakatte, Mangaluru,
Karnataka, India

Dr. Haridas Somayaji

Associate Professor,
K S Hegde Medical Academy,
P.O Deralakatte, Mangaluru,
Karnataka, India

Corresponding Author:

Ranjeet Singh Choudhary

Ex. Post Graduate Student,
Department of Orthopaedics,
K S Hegde Medical Academy,
P.O, Deralakatte, Mangaluru,
Karnataka, India

Fracture pattern in Paediatric age group

Ranjeet Singh Choudhary, Dr. Lawrence John Mathias and Dr. Haridas Somayaji

DOI: <https://doi.org/10.22271/27078345.2023.v5.i1b.144>

Abstract

Background: Use of technology and changing individual lifestyle patterns are new parameters which contribute to pre-existing causes/factors in paediatric fractures.

Aim: To study the epidemiology of paediatric fracture pattern in a rural/semi urban population of India and to identify the dietary and individual lifestyle determinants in given population for fracture occurrence, and to compare the results available from developed and developing countries and find out changing pattern of paediatric fractures, if any and to suggest preventive measures to reduce burden to such trauma in said population.

Methods: Between Jan 2019 and June 2020 inclusive from age 2-18 years, 181 paediatric Orthopaedic trauma patients presenting to our hospital were prospectively studied. Information was noted in a prescribed questionnaire. Final data was analysed in form of pie chart, bar diagram and scatter diagram.

Results: In this study 181 paediatric patients with age range from 2-18 who reported to our emergency /Out patient department with fractures were included. Most common patients studied belonged to age group 8-10 years. Males (128 i.e. 70.7%) were more commonly affected than females (53 i.e. 29.3%). Fractures involving Upper limb (79.%) isolated distal radius followed by distal humerus) were far more common than lower limb fractures (19.9%) tibia being most common bone involved). More than 60% of subjects were spending more than 1 hrs. of a day as screen time(including TV/mobile) and subsequently 55% of children had were spending less than 60 minutes in a given day for outside physical activity/sports.

Conclusion: Kids in developing countries are seen to be involved in more sedentary lifestyle and use of technology has become a necessity in everyone's life leading to high screen time. Previous known factors as poor nutrition status and low awareness/preventive strategies for fracture occurrence remain the same and thus an effective program focused on these new challenges needs to be developed to reduce fracture in this group of vulnerable populations.

Keywords: Public health, screen time, paediatric trauma, epidemiology

Introduction

Fractures in the paediatric age group are a major public health concern. Upper extremities are way more common than those involving lower extremity. Overall, the radius is the most involved long bone, followed by the humerus ^[1, 2]. Tibia is a lot more commonly broken than the femur in lower limb fractures. Various factors responsible for fracture in children are dependent on socio-economic and cultural differences, clinical factors, seasonal and climatic differences, time of day and individual patient-related factors such as age and gender ^[1, 2, 3, 4, 5]. In previous studies, it is found that as child ages fracture incidence increases linearly with a peak age of 11 – 12 years among girls and 13-14 among boys. Overall boy to girl ratio of incidence of fracture is found to be 1.5:1 which in turn is related to behaviour changes in boys Fracture at early age of life is linked with a high risk of subsequent fractures at a later age. Various studies have given opposite views on the effect of socio- economic difference on the incidence of fracture in children; nevertheless, more serious fractures such as one involving femur have been linked to poor socio-economic status. Individual clinical factors for risk of a fracture include high/low BMI, inactivity, use of drugs, and low calcium and vitamin D intake, low bone mineral density.

Fractures in the summer has been reported 2.5 times higher than that in the winter, summer holidays and increased physical activities are linked with these consistent findings. Time at which most fractures occur is reported with different peaks during day time with one study showing a peak at 2 to 3 PM, and other showing peaks at 6 PM, both peaks corresponds to the time of increased activity among children leading to fractures. Study of individual lifestyle factors and fracture patterns can help in knowing predisposing factors and

developing preventive strategies. Fractures during age bracket 2 to 18 years deserve special attention as we'd like preventive methods to decrease their number. Studies that analyze the physical and social environment within which fractures in children occur are of great value. Not many studies have shown patterns in the segments of bone fractured. In this study Details which we recorded are: Age, Sex, Mode of Injury, circumstances, anatomical site, time and Place of injury, associated Head injury if present, and were analyzed. It is hoped that with this study factors responsible for childhood fractures will be identified and based on that preventive programs can be developed to reduce incidence of such injuries.

Methodology

This study was conducted after obtaining the Institutional Ethical Committee approval. This study was conducted over a period of 18 months between Jan 2019 and June 2020. We analysed all paediatric patients in age group 2 to 18 years with fractures who presented to our department of orthopaedic surgery. Those patients with any specific pathological process known to affect bone mass and mineral metabolism or presence of any specific ongoing treatment for co morbidities known to affect bone and mineral metabolism were excluded from our study. A total of 181 patients were included for our study and informed consent was taken from them. They were administered a standardized questionnaire pertinent to the details of the injury and various epidemiological factors responsible for fracture occurrence in paediatric age group. For the quantitative parameters which were normally distributed, mean with standard deviation was used to describe the data.

Result

The study group consisted of 181 subjects with age range of 2-18 years and mean age of 9.24 years. Among them 70.7% (128) children were boys and 29.3% (53) children were girls. 143 Subject (79%) suffered fracture involving upper extremity and 36 (19.9%) subjects had fracture involving lower limb. 2 subject (1.1%) had fractures involving the spine. Overall it was seen that 98 (54.1%) of subjects sustained left side fractures and 81 (44%) sustained right side fractures. The most commonly encountered fracture site among all age-groups as shown in table 1 was Isolated Distal radius fracture (20%) followed by the distal humerus (19%). Among lower extremity fracture of Tibia/fibula (12%) were most common and followed by Femur (6%). Out of 181 fractures 18 (9.9%) involved physis, Type IV (7) Salter-Harris was most common physeal injury seen followed by Type I (6). Open fractures were 13 (7.2%) out of which Type II GA (5) was the most common followed by Type I (4). Various Socio economic status were also studied, More than 80% of them did not have a graduation degree. More than 35% of fathers had income level less than 1 lakh per year whereas more than 90% of mothers had less than 1 lakh income per year indicating that this population subgroup came from poor socio-economic background. Most of the kid's, that is around 84% who sustained fracture were undernourished and had BMI less than 18.5 and 8.8% of these children had significant past medical/surgical history (6 case of asthma, 4 cases of epilepsy on medication) and also it was noted that 8.8% of subjects had a history of fracture in the past and 10% of these children had a history of fracture in their siblings. Around 89% of children as

shown in table 2 and 3 respectively had less than 250 ml of milk consumption on daily basis and 80% of children were not consuming aerated soft drinks regularly. Among these children it was found that more than 60% of children had 1 or more than 1 hour of screen time daily and 55% of children were spending less than 1 hour daily on physical activity suggesting sedentary lifestyle in this population subgroup. Most fractures occurred between 12 PM and 6 PM and in this group most were seen around 2 PM and 6 PM. No variation of incidence was noted as per seasonal/month changes. 55.8% (101) of injuries were seen at home, 18.8% (34) injuries happened in school. 64% (116) of this population subgroup had slip and fall was the cause of the fracture and 13.2% (24) were sports injury. RTA was the cause of fracture in 16.6% (30).

Discussion

Children are gradually growing to adulthood and have softer bones and comparatively strong ligaments. Numerous studies have been done to study paediatric fracture patterns. In accordance with the study done by Sharma *et al.*^[6] and T Tandon *et al.*^[7] we notice that fractures involving Upper extremity were more common (79%) and the left side was affected in more than 50 per cent of subjects.

Overall in our series forearm bones were the most common site of fracture 39.8% (70) and isolated distal radius was most common fractured bone seen 20.4% (37), followed by the distal humerus 19.9% (36). In lower limb tibia was most commonly fractured 12.7% (23) followed by the femur 6.1% (11). Similar trends were seen in the previous study by J Cheng^[8]. Of all patient who sustained fracture 7.2% were open fractures and GA Type II was the most common open fracture observed. Our series had higher open fracture incidence which has been seen in other urban tertiary hospital setting such as one study series done in SGRRIMHS, Dehradun Uttarakhand, India by Pranav Kothiyal *et al.*^[9] where Open fractures were 9.7% of children (13 cases) and 77% cases were of GA type I followed by type III a (23%).

We noted that 9.9% (18 cases) involved physis, and most common was Salter-Harris type IV (7 cases). In literature Pranav Kothiyal *et al.*^[9] in there study had 19.40% physeal injuries (26 cases) and most common physeal injury was Salter and Harris type II (61.5%), followed by Salter and Harris type I, III and IV as 23%, 4% and 11.5% respectively. Our studied population came from rural to semi-urban populations and the majorities were from poor socio-economic status. Such factors has been shown to play role in fracture incidence in the paediatric age group as noted by M.R.G. Menon^[10] *et al.* In our series children came from economically deprived families and had poor nutrition status which was seen with a low BMI among them which was in contrast with studies from developed world as one by Alexander Joeris *et al.*^[11] who showed that overweight and obese children are at increased risk of sustaining a fracture. Significant past medical history such as bronchial asthma as seen by Raymond G. Schlienger *et al.*^[12] showed that the risk of fracture tends to increase with increasing intake of drugs like steroids. Similarly history of neonatal seizures which would expose children to long term use of drugs such as anti-epileptics cause childhood osteoporosis and is one of the contributing factors in paediatric fractures. Though our study was not a case-control study nevertheless we noticed that kids in our series

with significant past medical/surgical history constituted 8.8% (16 cases, 8 with history of asthma, 6 with epilepsy history with regular treatment).

History of fracture in past and history of fracture in siblings (8.8% and 10% respectively) were seen in our study, which were similar to studies in literature as in Cate M. Cameronin *et al.* [13] study where they observed that approximately 20% of children who experienced an injury in the early years of life experienced up to six recurrent episodes of hospital-treated injury within 3 years.

In past Li Chen *et al.* [14] concluded that those with daily soft drinks consumption had a hazard ratio (95%CI) of 4.69 (95% CI: 2.80–7.88) for incident fracture and Goulding A *et al.* [15] noticed that children who avoided drinking cow's milk for prolonged periods more prone to fracture. Our study population though did not have regular consumption of aerated soft drinks on a but less daily milk consumption leading to higher fracture incidence was in accordance with the previous study.

Physical activity of more than 45 minutes on daily basis has been proved to have a positive effect on bone mineral density at the femoral neck as seen by Luis Gracia-Marco *et al.* [16] and similarly McVeigh JA *et al.* [17] showed that high levels of TV watching were associated with lower BMC; conversely lower levels of TV watching were associated with better bone health. In our study series children who sustained a fracture, more than 60% were spending less than 1 hour daily in outside physical activity making them susceptible for weak bones and thus fractures. Further, these children were found to be spending more than 60 minutes on daily basis in watching TV/Mobile and this sedentary lifestyle pattern was also a factor for fracture in such children as seen in as shown in previous studies.

D. Segal *et al.* [18] noticed fracture incidence variation as per time of day. We noticed as far as time of fracture was concerned our series fractures were most commonly seen at around 2:00-3:00 PM. And during 6:00 PM. Time interval. School lunchtime and evening playtime with higher physical activity may explain this trend.

Although summers have been traditionally seen as a time of year when the higher incidence of fractures in children is seen as contributing to summer holidays and increased playtime as shown in a study by L.V. Barr [19] Our series had no such peak and fracture occurrence was seen in a uniform pattern throughout the year.

Our series showed 64% (116) subjects had slip and fall as cause of the fracture and 13.3% (24) were due to sports injury followed by RTA in 16.6% (30). 55.8% (101) of injuries were seen at home, while 18.8%

(34) injuries happened in school. Tandon *et al.* [7] and Sudesh Sharma *et al.* [6] in there study observed trend similar to our observation.

Limitation of our study was the sample size which was too small to draw conclusions for a whole population. Thus, studies with larger sample size would be more appropriate for drawing conclusions for a population. Further case control study design would help us to give exact significance of parameters observed in our study and would help in giving preventive strategies in future. Many studies have been done in the past regarding epidemiology of fracture patterns in children. Need of hour is study which would give exact and more precise etiology/contributing factors in fracture occurrence in children. With available data future interventional study among two subset of

population can be done and where one population is educated/made aware of these contributing factors in fracture occurrence in children and whether incidence of fracture reduced in such population over time as compared to other population can prove to beneficial to the general population in large.

Table 1: Type of bone involved

Type of bone involved	Number	Percentage
Isolated Distal radius	37	20.4
Distal Humerus	36	19.9
Tibia/fibula	23	12.7
Femur	11	6.7
Distal 1/3 rd Both bones forearm	16	8.8
Middle 1/3 rd Both bones forearm	9	5
Proximal 1/3 rd Both bones forearm	9	5

Table 2: Amount of milk consumption/day

Amount of milk consumption	Number	Percentage
0-250 ml/day	161	89
250-500 ml/day	18	9.9
More than 500 ml/day	2	1.2

Table 3: Amount of aerated soft drinks

Amount of aerated soft drinks	Number	Percentage
250 ml once a week	145	80.1
250 ml on twice a week basis	28	15.5
250 ml on daily basis	8	4.4

Table 4: Number of hours spent watching TV/Mobile

Number of hours spent watching TV/Mobile	Number	Percentage
Less than 1 hour/day	70	38.7
1-2 hour/day	54	29.8
More than 2 hour/day	57	31.5

Table 5: Number of hours of outdoor sports activity

Number of hours of outdoor sports activity	Number	Percentage
30 min./day	58	32.0
30-60 min./day	40	22.1
More than 60 min./day	83	45.9

Table 6: Amount of aerated soft drinks

Amount of aerated soft drinks	Number	Percentage
250 ml once a week	145	80.1
250 ml on twice a week basis	28	15.5
250 ml on daily basis	8	4.4

Table 7: Time of injury

Time of injury	Number	Percentage
12AM -6 AM	1	0.6
6 AM -12 PM	42	23.2
12PM -6 PM	91	50.3
6 PM -12 AM	47	26

Table 8: Fracture incidence with seasonal/monthly variations

Season	Number	Percentage
Winter 2019-2020	46	25.4
Spring 2020	38	21.1
Summer 2020	35	19.3
Autumn 2020	33	18.2
Winter 2020-2021	29	16

Table 9: Place of Injury

Place of injury	Number	Percentage
Home	101	54.5
Other place	46	31
School	34	14.5

Table 10: Mode of injury

Etiology of Fracture	Number	Percentage
slip and fall	116	64
RTA	30	16.6
sports injury	24	13.2
Minor quarrel	11	6.2

Conclusions and Summary

Conclusions

Children from rural and Semi urban backgrounds coming from poor socio-economic status are already suffering from poor nutrition and changing lifestyle and sedentary habits such as spending more time watching TV/Mobile and less outdoor activities resulting in poor bone/general health making them susceptible to fractures. Distal radius and distal humerus remains the most common bone fractures in this population. Home, where most injuries happen due to slip and fall followed by the school environment. Dietary products known to improve bone health such as milk consumption remain low in this subgroup of population.

Summary

This is an observational study done among the children who presented with fractures. Sample size was 181. It was seen that distal radius followed by distal humerus were most common fractured bone. Home followed by school was most common environment where these injuries occurred. Majority of these children came from less privileged condition and were increasingly changeing lifestyle patterns seen in urban cities such as watching TV/Mobile, Spending less time on outdoor activities making them more susceptible for poor bone health and eventually fractures. Furthermore dietary habits known to improve bone health such as drinking milk on regular basis was also not seen in these kids.

Additional Details

Consent: Consent from parents and guardians were taken and also, assent was taken for children aged 7 years and above.

Competing interests: The authors declare that they have no competing interest.

Acknowledgement: I Would like to thank Mrs Smitha shetty, department clerck, Miss Swetty. Department clerck and Mrs. Ayda Department OPD nurse in helping to collect samples.

References

- Landin LA. Fracture Patterns in Children: Analysis of 8,682 Fractures with Special Reference to Incidence, Etiology and Secular Changes in a Swedish Urban Population 1950–1979. *Acta Orthopaedica Scandinavica*. 1983 Jan 1;54(sup202):3-109.
- Randsborg PH, Gulbrandsen P, Benth JS, Sivertsen EA, Hammer OL, Fuglesang HF, *et al.* Fractures in

- children: epidemiology and activity-specific fracture rates. *JBSJ*. 2013 Apr 3;95(7):e42.
- Valerio G, Gallè F, Mancusi C, Di Onofrio V, Colapietro M, Guida P, *et al.* Pattern of fractures across pediatric age groups: analysis of individual and lifestyle factors. *BMC Public Health*. 2010 Dec;10(1):1-9.
- Saw A, Fadzilah N, Nawar M, Chua YP. Pattern of Childhood Fractures in a developing country. *Malaysian Orthopaedic Journal*. 2011;5(1):13-6.
- Worlock P, Stower M. Fracture patterns in Nottingham children. *Journal of pediatric orthopedics*. 1986 Nov 1;6(6):656-60.
- Sharma S, Bhat TA, Arfee S, Rashid M, Beigh I. Pattern of Orthopedic Fractures among Pediatric Patients attending the Emergency Department of GMC Jammu. *Foot/Ankle*;2(8):9.
- Tandon T, Shaik M, Modi N. Paediatric trauma epidemiology in an urban scenario in India. *Journal of Orthopaedic Surgery*. 2007 Apr;15(1):41-5.
- Cheng JC, Shen WY. Limb fracture pattern in different pediatric age groups: a study of 3,350 children. *Journal of orthopaedic trauma*. 1993 Jan 1;7(1):15-22.
- Kothiyal P, Vij K, Gupta P, Rawat P, Sharma N, Kushwaha AK. Patterns of fracture and its management in the 1st decade of life at a tertiary care centre in north India. *International Journal of Orthopaedics*. 2018;4(2):35-41.
- Menon MR, Walker JL, Court-Brown CM. The epidemiology of fractures in adolescents with reference to social deprivation. *The Journal of bone and joint surgery. British volume*. 2008 Nov;90(11):1482-1486.
- Joeris A, Lutz N, Wicki B, Slongo T, Audigé L. An epidemiological evaluation of pediatric long bone fractures —a retrospective cohort study of 2716 patients from two Swiss tertiary pediatric hospitals. *BMC pediatrics*. 2014 Dec;14(1):1-1.
- Schlienger RG, Jick SS, Meier CR. Inhaled corticosteroids and the risk of fractures in children and adolescents. *Pediatrics*. 2004 Aug 1;114(2):469-73.
- Cameron CM, Spinks AB, Osborne JM, Davey TM, Sipe N, McClure RJ. Recurrent episodes of injury in children: an Australian cohort study. *Australian health review*. 2017 Oct 23;41(5):485-491.
- Chen L, Liu R, Zhao Y, Shi Z. High consumption of soft drinks is associated with an increased risk of fracture: A 7-year follow-up study. *Nutrients*. 2020 Feb;12(2):530.
- Goulding A, Rockell JE, Black RE, Grant AM, Jones IE, Williams SM. Children who avoid drinking cow’s milk are at increased risk for prepubertal bone fractures. *Journal of the American Dietetic Association*. 2004 Feb 1;104(2):250-253.
- Gracia-Marco L, Moreno LA, Ortega FB, León F, Sioen I, Kafatos A, Martínez-Gómez D, Widhalm K, Castillo MJ, Vicente-Rodríguez G, HELENA Study Group. Levels of physical activity that predict optimal bone mass in adolescents: the HELENA study. *American journal of preventive medicine*. 2011 Jun 1;40(6):599-607.
- McVeigh JA, Zhu K, Mountain J, Pennell CE, Lye SJ, Walsh JP, Straker LM. Longitudinal trajectories of television watching across childhood and adolescence predict bone mass at age 20 years in the Raine study.

- Journal of Bone and Mineral Research. 2016 Nov;31(11):2032-2040.
18. Segal D, Slevin O, Aliev E, Borisov O, Khateeb B, Faour A, Palmanovich E, Brin YS, Weigl D. Trends in the seasonal variation of paediatric fractures. Journal of children's orthopaedics. 2018 Dec 1;12(6):614-621.
 19. Barr LV. Paediatric supracondylar humeral fractures: epidemiology, mechanisms and incidence during school holidays. Journal of children's orthopaedics. 2014 Mar 1;8(2):167-170.

How to Cite This Article

Choudhary RS, Mathias LJ, Somayaji H. Fracture pattern in Paediatric age group. International Journal of Case Reports in Orthopaedics. 2023;5(1):70-74.

Creative Commons (CC) License

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.