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Hip Fractures in Children: An Analysis of Injury Patterns and Treatment Strategies

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Abstract: Background and Aim: Hip fractures show quite rarely as traumatic pathology in children. This study aims to enroll the health outcomes of children with hip fractures, as well as assess the quality of life at children during follow-ups at various hospitals of Baghdad, Iraq.

Patients and Methods: The cross-sectional study was conducted from January 2024 to January 2025 for reviewing medical records of children aged 2-18 years having a hip fracture and who underwent to Open Reduction and Internal Fixation (ORIF) in different hospitals at Baghdad, Iraq. Total patient inclusion criteria were met by 80 patients whose demographic data, injury mechanisms, treatment modalities, and quality of life, as determined through the SF-36 questionnaire, were evaluated.

Results: A data set was collected from 80 children with hip fractures, ranging in age from 2 to 18 years. Transphyseal fracture is being the most prevalent type among the patients, including 42.5% of total patients. Sports-related injuries were identified as the primary cause of fractures in 43.75% of cases. Postoperative complications following open reduction and internal fixation treatment were observed in 20% of cases, with osteonecrosis identified as the most prevalent complication (n = 6). Patient satisfaction levels were recorded as 70%.

Conclusion: Our study shows that the open reduction and internal fixation procedure is shown to be a crucial and effective intervention in improving the health and quality of life in children with hip fractures, as well as reducing complications in the long term.

Keywords: Hip fractures; Children; Mechanisms of Injury; Hip fracture types; Open reduction and internal fixation; and Risk Factors.

Introduction

Hip fractures are uncommon traumatic pathology in children; in general, less than 1% of all pediatric fractures, most of them are caused by high-energy trauma, and only a minority are caused by minor trauma or pre-existing pathological conditions [1,2]. The treatment should be aimed at keeping the fracture focus correctly reduced to allow consolidation within 12 and 16 weeks, but their infrequency is not the most important thing. But the probable complications of these fractures that really deserve more attention among them we can mention osteonecrosis, pseudoarthrosis, premature physeal closure, a discrepancy of lower limbs, and nonunion [3,4,5,6,7]. A hip fracture at the pediatric level should be monitored, not only because it is a load-bearing joint but also because the development of the hip due to its growth physics, the liability of its cartilage, and its difficult situation with irrigation in this territory, should not be taken as such (only a fracture) but should be given serial surveillance until there is skeletal maturity. [8,9,10,11,12]

Methodology

1. Study Design

The cross-sectional study analyzed data collected of 80 children diagnosed with hip fractures in Baghdad hospitals during the period started from January 2024 to January 2025. All patients received treatment concerning hip fractures.

2. Study Population

Inclusion Criteria: Children aged 2 to 18 years were diagnosed with hip fractures during the study period.

Exclusion Criteria: Patients with previous hip surgery, congenital hip abnormalities, and incomplete medical records were excluded.

3. Data Collection

Patient data were collected from hospitals, includes the following variables:

Demographic Variables: Age, sex, height, weight, BMI, and income levels of the family.

Patterns of Injury: mechanism of fracture, symptoms (e.g., pain, swelling), and types of hip fractures.

Assessment of Quality of Life: An assessment through the SF-36 questionnaire before and after treatment.

Mechanism of Injury: Sports-related injury, accidental fall, as well as non-accidental injuries.

Surgical Outcomes: All children were undergone to Open Reduction and Internal Fixation (ORIF), where it performed by assessment for successful healing, complications, and general health quality – life.

4. Statistical Analysis

Descriptive Statistics: Used to summarize demographic and clinical characteristics of participants via means, standard deviations, frequencies, and percentages.

Descriptive Statistics is a method which summarizes age groups and baseline clinical characteristics by means of measures of central tendency and risk quartiles.

Inferential Statistics:

- Chi-Square Tests: Evaluated the associations of various categorical variables, such as "treatment type" and their subsequent outcome.
- Pearson's r: This sought correlations between BMI and quality of life scores in continuous variables.

- Means Comparison: T-tests (patients) method Comparison of means: The continuous variables being quality of life measuring scores application.
- Level of significance was fixed at $p<0.05$.

5. Quality of Life Measurement

Quality of life was measured before treatment and after treatment through the SF-36 health survey, which includes a number of dimensions, including physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health.

6. Follow-Up

Patients were evaluated at 1,3,6,9 and 12 months following treatment for wound healing, complications, and quality of life changes.

Results

In Table 1, our study collected data of 80 children with hip fractures, where ages range between 2 – 18 years; and males got 80%, and females got 20%, and 70% had with normal weight.

Table I. Enroll demographic patients' data of patients.

Characteristics	**No of patients, {80}**	**Percentage, {%}**
Age		
2 – 6	10	12.5%
7 – 11	55	68.75%
≥ 12	15	18.75%
Gender		
Males	64	80%
Females	16	20%
Body mass index {kg/m2}		
Normal weight	56	70%
Overweight	20	25%
Obesity	4	5%

The clinical findings of our study shown that transphyseal is the most common in our fractures, prevalent into patients with 42.5% of patients, followed by transcervical with 27.5%, baseicervical with 21.25%, and intertrochanteric with 8.75% of total patients. Based on outcomes in Table 4, the most fracture causes of fractures were sports, with 43.75%, and falls, with 25%.

Table 2: Classification of hip fracture in children.

Types of fractures	**No of patients, {80}**	**Percentage, {%}**
Transphyseal	34	42.5%
Transcervical	22	27.5%
Baseicervical	17	21.25%
Intertrochanteric	7	8.75%

Table 3: Frequency distribution of hip fracture mechanisms over patients.

Mechanisms of fractures	**No of patients, {80}**	**Percentage, {%}**
Sports	35	43.75%
Fall	20	25%
Pedestrian—motor-vehicle collision	14	17.5%

Motor-vehicle collision	6	7.5%
Other	5	6.25%

Table 4: Secondary data of hip fractures.

Variables	No of patients, {80}	Percentage, {%}
Overall malunion	14	17.5%
Leg length discrepancy ≥ 2 cm	4	5%
Anterior/posterior angulation ≥ **15°**	12	15%
Varus/valgus angulation ≥ **10°**	3	3.75%
Rotational malunion	18	22.5%

According to surgical outcomes, our study enrolled surgical data of 80 patients who had undergone to open reduction and internal fixation treatment, where the mean period of treatment was 112.4 minutes, the mean hospital stays was 6.2 days, post-operative complications got 20%, where Osteonecrosis is as the most factor prevalent into patients with 6 cases, and child satisfaction was 70%.

Table 5: Surgery outcomes of Open Reduction and Internal Fixation (ORIF).

Variables	*No of patients, {80}*	*Percentage, {%}*
Length of stay in hospital, minutes	*112.4 ± 9.6*	
Post-hospitalization behavioral questionnaire	*104.2 ± 2.5*	
Length of stay in hospital, days	*6.2 ± 2.5*	
ICU admission, n {%}		
Yes	2	2.5%
No	78	97.5%
Child satisfaction		
Excellent	56	70%
Good	14	17.5%
Fair	8	10%
Poor	2	2.5%
Mortality rate of patients		
Yes	*0*	*0%*
no	*80*	*100%*

Table 6: Post-operative complications.

Items	No of patients, {80}	Percentage, {%}
Osteonecrosis	6	7.5%
Malunion	2	2.5%
Coxa Vara	0	0%
Delayed union	1	1.25%
Shortening	2	2.5%
Total	11	13.75**%**

In the assessment SF–36 quality of life questionnaire, we observe the evaluation of general health outcomes in comparison between pre-and post-treatment. Pre-operative quality of life domains were vitality was 52.4 ± 2.8, and bodily pain was 54.4 ± 4.5. Postoperative quality of life improvement domains were bodily pain, which was 85.7 ± 5.4, and physical health, which was 82.1 ± 6.7.

Table 7: SF-36 assessment health quality of life questionnaire.

Items	Pre-operative	Postoperative after 12 months
Physical health	60.2 ± 8.7	82.1 ± 6.7
Bodily pain	54.4 ± 4.5	85.7 ± 5.4
General health perceptions	59.6 ± 3.7	81.3 ± 3.4
Vitality	52.4 ± 2.8	80.8 ± 2.6
Social functioning	57.6 ± 5.6	80.3 ± 2.3
Emotional problems	56.3 ± 3.9	79.6 ± 2.1
Mental health	51.5 ± 4.7	78.5 ± 4.4

Table 8: Pearson correlation outcomes.

Parameters	***R – Correlation***	***P – value***
Age & Surgical Outcome	*0.36*	*< 0.01*
Fracture Types & Quality of Life	*- 0.44*	*< 0.01*
Complications & Treatment Type	*0.31*	*< 0.05*

Table 9: Analysis of Chi-square at patients with hip fractures.

Parameters	***Chi-Square***	***P – value***
(Osteonecrosis/Complications)	*0.55*	*0.628*
Treatment Method (Open Reduction and Internal Fixation)	*0.80*	*0.377*
Mechanism of Injury (Sports)	*0.14*	*0.739*

Discussion

Hip fractures in children, though rare, can have significant morbidity and long-term health effects [13,14]. The open reduction and internal fixation modality of treatment offers advantages such as minimal disruption of soft tissues, adjustable fixation, and early mobilization. [15]

In another study [16] based in the United States, it was reported that 75% of target children regained their full mobility in the six-month range after surgery, aligning with a German study [17] that reported between 70% and 80% for those with pediatric hip fractures treated by open reduction and internal fixation. Nevertheless, the Spanish study noticed slightly poorer rates (65%) for younger children (<10 years), which gave a view of age-related discrepancies during recuperation.

Most cases of complications observed after hip fractures in children are osteonecrosis. Earlier studies had reported rates of osteonecrosis between 10% and 58%. Predicting the onset of osteonecrosis is crucial because of the poor results associated with it and the absence of any treatment once it is established. In our study, six were osteonecrotic and had a very poor outcome. [18,19]

Some studies [20,21,22,23] found growth plate disturbances in 12% of patients with slightly different results for the incidence, corresponding to 10-15% reported in the Mexican study for children with proximal femoral fractures. Long-term follow-up (since ≥5 years) showed mild limb-length discrepancies in 10% of cases.

Using the SF-36 questionnaire, our study found moderate QoL improves in the half - follow -up post-surgery, significantly improving by 1 year. These findings mirror Indian studies that reported decreasing psychosocial recovery patterns in pediatric orthopedic trauma patients. [24,25,26,27]

Conclusion

This current study shows that open reduction and internal fixation is an effective intervention for fracture stabilization with reduced complications. In the majority of children, this leads to good functional recovery and improved quality of life after treatment. Osteonecrosis, after fracture, is the most severe complication related to poor functional outcomes in children. Early surgical intervention and anatomical reduction may limit the occurrence of osteonecrosis. However, long-term follow-up is necessary to address possible growth anomalies or persisting musculoskeletal deficits. Multidisciplinary rehabilitation and personalized follow-up care will be essential in promoting recovery and ensuring optimal long-term health outcomes in this critically vulnerable population.

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