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Original Article

Prevalence and Pattern of Pediatric Musculoskeletal Deformities in a Tertiary Care Hospital

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Abstract

Background: Pediatric musculoskeletal deformities are an important cause of childhood disability, leading to impaired mobility, functional limitation, and reduced quality of life. Data on the pattern of these deformities in Bangladesh are limited. This study aimed to determine the prevalence and pattern of pediatric musculoskeletal deformities in a tertiary care hospital.

Methods: This cross-sectional study was conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2023 to June 2024. A total of 320 children aged 0–18 years with clinically diagnosed musculoskeletal deformities were enrolled using consecutive sampling. Data on socio-demographic characteristics, deformity pattern, anatomical distribution, severity, associated clinical conditions, and rehabilitation interventions were collected through clinical assessment and medical record review. Descriptive statistics and the Chi-square test were used for data analysis.

Results: The mean age of the participants was 8.6±4.1 years, and 59.4% were male. Cerebral palsy-related deformities (25.9%) were the most common condition, followed by clubfoot (21.3%), genu valgum (13.1%), and scoliosis (10.0%). Lower limb involvement was observed in 61.9% of children, while 52.5% had bilateral deformities. Moderate deformities accounted for 45.0% of cases. Developmental delay was the most common associated condition (20.0%). Physiotherapy (90.6%) and home exercise programmes (76.9%) were the most frequently recommended interventions. A significant association was found between deformity severity and developmental delay (χ^2=27.35, p<0.001).

Conclusion: Cerebral palsy-related deformities and clubfoot were the predominant pediatric musculoskeletal deformities in this tertiary rehabilitation center, with lower limb involvement being the most common presentation. Early diagnosis, multidisciplinary rehabilitation, and timely intervention are essential to improve functional outcomes in affected children.

Keywords: Pediatric musculoskeletal deformities; Prevalence, Cerebral palsy; Clubfoot; Developmental delay.

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Introduction

Pediatric musculoskeletal deformities comprise a wide range of congenital and acquired disorders affecting bones, joints, muscles, and connective tissues, and are

important causes of childhood disability worldwide[1]. These conditions can impair physical growth, mobility, and functional independence, thereby reducing the quality of life of affected children if left untreated[2].

Congenital musculoskeletal deformities, including clubfoot, limb reduction defects, polydactyly, syndactyly, and developmental dysplasia of the hip, represent a significant proportion of congenital anomalies encountered in pediatric orthopedic practice [3-5].Their occurrence is influenced by genetic, environmental, and maternal factors, while acquired deformities may result from trauma, infections, neuromuscular disorders, and metabolic bone diseases[2,3]. Early recognition and appropriate management are essential, as untreated musculoskeletal deformities may lead to permanent disability, chronic pain, psychological distress, and considerable socioeconomic burden for affected children and their families[2,6,7].

The prevalence and pattern of pediatric musculoskeletal deformities vary across regions due to differences in population characteristics, healthcare access, and referral practices [1,3]. Previous studies have reported that congenital musculoskeletal anomalies constitute a substantial proportion of pediatric orthopedic conditions, with lower limb deformities, particularly clubfoot, being the most common presentations[3-5,8].

In Bangladesh, information on pediatric musculoskeletal deformities is limited, as most published studies have focused on congenital birth defects in general rather than the specific spectrum of musculoskeletal disorders [9]. Consequently, evidence regarding the prevalence and clinical pattern of pediatric musculoskeletal deformities in tertiary care hospitals remains inadequate.

Understanding the prevalence and pattern of these deformities is essential for planning early diagnosis, timely intervention, and appropriate orthopedic services. Therefore, the present study aimed to determine the prevalence and pattern of pediatric musculoskeletal deformities in a tertiary care hospital, providing evidence to support clinical practice and healthcare planning in Bangladesh.

METHODOLOGY

This cross-sectional study was conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2023 to June 2024. The study included pediatric patients aged 0–18 years who attended the department with clinically diagnosed musculoskeletal deformities during the study period. A total of 320 participants were enrolled using a consecutive sampling technique. Children with congenital or acquired musculoskeletal deformities were included, while those with acute traumatic injuries without deformity, incomplete clinical records, or whose parents/guardians declined participation were excluded from the study.

Data were collected using a structured data collection form through clinical assessment and review of medical records. Information regarding socio-demographic characteristics, type and anatomical distribution of deformities, laterality, severity, associated clinical conditions, and recommended rehabilitation interventions was recorded. Deformities were categorized according to clinical diagnosis, and severity was classified as mild, moderate, or severe based on clinical assessment and functional limitations documented by the treating physicians. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Descriptive statistics were used to summarize the findings, with continuous variables expressed as mean ± standard deviation and categorical variables presented as frequencies and percentages. The association between severity of deformity and developmental delay was assessed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Review Board of BSMMU, and written informed consent was obtained from the parents or legal guardians of all participants.

RESULTS

A total of 320 pediatric patients with musculoskeletal deformities attending the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, during the study period were included in the study.

Socio-demographic Characteristics

Table 1 presents the socio-demographic characteristics of the study participants. The mean age of the children was 8.6±4.1 years. The highest proportion of participants belonged to the 5–9 years age group (35.3%), followed by the 10–14 years age group (30.6%). Children aged below 5 years constituted 21.9% of the study population, while 12.2% were aged 15–18 years. Male participants predominated, accounting for 59.4% of the sample, whereas females comprised 40.6%. More than half of the participants (56.9%) were from urban areas, while 43.1% resided in rural areas (Table 1).

Table 1. Socio-demographic characteristics of the study participants (n=320)

Variable	Frequency	Percentage (%)
Age group (years)		
<5	70	21.9
5–9	113	35.3
10–14	98	30.6
15–18	39	12.2
Mean age ± SD	8.6 ± 4.1 years	
Sex		
Male	190	59.4
Female	130	40.6
Residence		
Urban	182	56.9
Rural	138	43.1

Pattern of Pediatric Musculoskeletal Deformities

The distribution of musculoskeletal deformities among the study participants is shown in Table 2. Cerebral palsy-related deformities were the most common condition, affecting 25.9% of the children. Clubfoot (CTEV) was the second most prevalent deformity, accounting for 21.3% of cases. Other common deformities included genu valgum (13.1%), scoliosis (10.0%), and genu varum (8.8%). Developmental dysplasia of the hip (5.6%), limb length discrepancy (5.0%), pes planus (4.4%), and congenital upper limb deformities (2.8%) were less frequently observed. Miscellaneous deformities accounted for 3.1% of cases (Table 2).

Table 2. Distribution of musculoskeletal deformities among study participants (n=320)

Type of deformity	Frequency	Percentage (%)
Cerebral palsy-related deformity	83	25.9
Clubfoot (CTEV)	68	21.3
Genu valgum	42	13.1
Scoliosis	32	10.0
Genu varum	28	8.8
Developmental dysplasia of hip (DDH)	18	5.6
Limb length discrepancy	16	5.0
Pes planus	14	4.4
Congenital upper limb deformity	9	2.8
Others	10	3.1

Anatomical Distribution of Deformities

Table 3 illustrates the anatomical distribution of musculoskeletal deformities. The lower limb was the most commonly affected region, involving 61.9% of participants. Spinal deformities were observed in 15.0% of children, while upper limb deformities accounted for 11.3% of cases. Hip and pelvic involvement was present in 7.5% of participants, and 4.3% had deformities affecting multiple anatomical sites (Table 3).

Table 3. Anatomical distribution of deformities (n=320)

Anatomical site	Frequency	Percentage (%)
Lower limb	198	61.9
Spine	48	15.0
Upper limb	36	11.3
Hip/Pelvis	24	7.5
Multiple sites	14	4.3

Laterality of Deformities

The laterality of musculoskeletal deformities is presented in Table 4. More than half of the deformities were bilateral (52.5%). Right-sided deformities were identified in 25.6% of participants, whereas left-sided deformities accounted for 21.9% of cases (Table 4).

Table 4. Laterality of deformities (n=320)

Laterality	Frequency	Percentage (%)
Bilateral	168	52.5
Right-sided	82	25.6
Left-sided	70	21.9

Severity of Deformities

As shown in Table 5, moderate deformities constituted the largest proportion of cases (45.0%). Mild deformities were observed in 31.3% of participants, while severe deformities accounted for 23.7% of the study population (Table 5).

Table 5. Severity of deformities (n=320)

Severity	Frequency	Percentage (%)
Mild	100	31.3
Moderate	144	45.0
Severe	76	23.7

Associated Clinical Conditions

Table 6 shows the associated clinical conditions among the study participants. Developmental delay was the most common associated condition, affecting 20.0% of children. Epilepsy and intellectual disability were present in 11.3% and 10.0% of participants, respectively. Visual impairment was identified in 5.6% of cases, while hearing impairment was reported in 3.1%. Half of the participants (50.0%) had no documented associated clinical condition (Table 6).

Table 6. Associated clinical conditions among study participants (n=320)

Associated condition	Frequency	Percentage (%)
Developmental delay	64	20.0
Epilepsy	36	11.3
Intellectual disability	32	10.0
Visual impairment	18	5.6
Hearing impairment	10	3.1
No associated condition	160	50.0

Rehabilitation and Management Requirements

The rehabilitation and management interventions recommended for the participants are summarized in Table 7. Physiotherapy was the most frequently prescribed

intervention, recommended for 90.6% of children. Home exercise programmes were advised for 76.9% of participants, while regular rehabilitation follow-up was recommended for 74.4%. More than half of the children (55.0%) required orthotic or brace prescription. Corrective surgery referral was indicated for 23.1% of cases, and serial casting was recommended for 13.1% of participants (Table 7).

Table 7. Recommended rehabilitation and management interventions (n=320)

Intervention	Frequency	Percentage (%)
Physiotherapy	290	90.6
Home exercise programme	246	76.9
Orthotic/Brace prescription	176	55.0
Regular rehabilitation follow-up	238	74.4
Corrective surgery referral	74	23.1
Serial casting	42	13.1

Association between severity of deformity and developmental delay

Table 8 shows a statistically significant association between the severity of musculoskeletal deformity and the presence of developmental delay (χ^2=27.35, p<0.001). The proportion of developmental delay increased progressively with increasing severity of deformity, from 10.0% among children with mild deformities to 39.5% among those with severe deformities. Children with severe deformities were more likely to have developmental delay compared with those having mild or moderate deformities (Table 8).

Table 8. Association between severity of deformity and developmental delay among study participants (n=320)

Severity of deformity	**Developmental delay Present n (%)**	**Developmental delay Absent n (%)**	χ^2	**p-value**
Mild (n=100)	10 (10.0)	90 (90.0)	27.35	<0.001
Moderate (n=144)	24 (16.7)	120 (83.3)		
Severe (n=76)	30 (39.5)	46 (60.5)		

Chi-square test was applied.A p-value <0.05 was considered statistically significant

DISCUSSION

The present study found that cerebral palsy-related deformities (25.9%) were the most common pediatric musculoskeletal deformities, followed by clubfoot (21.3%), genu valgum (13.1%), and scoliosis (10.0%). These findings differ from previous hospital-based studies, in which congenital musculoskeletal anomalies, particularly clubfoot and limb deformities, were the predominant conditions[10,11]. The higher proportion of cerebral palsy-related deformities in the present study may be explained by the study setting, as it was conducted in a tertiary rehabilitation center that receives a large number of referrals for children with neurological disabilities. This observation is supported by previous evidence showing that neurological disorders constitute a major component of pediatric musculoskeletal admissions in tertiary hospitals[12].Clubfoot was the second most common deformity in the present study, which is comparable to previous studies where clubfoot was reported as one of the most frequent congenital musculoskeletal anomalies[12,13]. Early diagnosis and conservative treatment of clubfoot have been shown to improve functional outcomes and reduce long-term disability, emphasizing the importance of timely referral and intervention[13].

The lower limb was the most frequently affected anatomical site (61.9%), followed by the spine and upper limb. Similar findings have been reported in previous studies, where lower limb deformities represented the largest proportion of pediatric musculoskeletal abnormalities[10,11]. The predominance of lower limb involvement may be attributed to the high frequency of clubfoot, genu valgum, genu varum, and cerebral palsy-related lower limb deformities, all of which substantially affect gait and mobility[14].

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Regarding management, physiotherapy was the most frequently recommended intervention, followed by home exercise programmes and orthotic prescription. These findings are consistent with current rehabilitation recommendations, which emphasize physiotherapy and structured home exercise programmes as the cornerstone of pediatric musculoskeletal management[18]. Nearly one-quarter of the participants required referral for corrective surgery, indicating that multidisciplinary management combining rehabilitation and orthopedic intervention remains essential for children with severe deformities[19].

CONCLUSION

Pediatric musculoskeletal deformities are common among children attending tertiary rehabilitation services, with cerebral palsy-related deformities and clubfoot being the predominant conditions. Lower limb involvement was the most frequent presentation, and developmental delay was the most common associated clinical condition. The

significant association between developmental delay and deformity severity highlights the importance of early diagnosis, comprehensive assessment, and multidisciplinary rehabilitation to improve functional outcomes in affected children.

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