

Frequency and Patterns of Congenital Talipes Equinovarus (Clubfoot) Deformity in Children

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ABSTRACT

Background: Clubfoot, also known as congenital talipes equinovarus (CTEV), is a structural deformity that appears early in pregnancy. **Objective:** To determine the frequency and patterns of congenital talipes equinovarus (clubfoot) deformity in children. **Study Design:** Cross sectional study. **Settings:** Department of Anatomy Dow International Medical College, DUHS Karachi Pakistan. **Duration:** October 2022 to March 2023. **Methods:** We initiated a prospective study that aimed to investigate congenital anomalies among neonates. We systematically documented the patterns of clubfoot concerning factors such as gender, the affected side, any coexisting congenital anomalies and maternal demographic details as part of our comprehensive analysis. **Results:** The number of children with clubfoot deformity recorded during the study period was 125 out of total number of all births at hospital during this period. This gave an estimated clubfoot incidence of 1 in 500 per number of births or 2 per 1000 births. Most patients were infants, with 50.4% aged less than 6 months, while 27.2% were between 6 months and 1 year old, and 22.4% were over 1 year old. Gender distribution showed that 56% were male, and 44% were female. Among the patients, 40% had CTEV on the right side, 20% on the left, and an equal number, 40%, had it bilaterally. The majority, 96%, had isolated CTEV, while a smaller percentage, 4%, had CTEV associated with other medical conditions. **Conclusion:** The occurrence of clubfoot is higher in males than in females. An equal number of cases presented with bilateral and unilateral clubfoot. Notably, the mode of delivery and a positive family history were found to have significant associations with clubfoot. These initial findings are expected to contribute to future studies in both central India and the broader Pakistani population that focus on similar issues.

Keywords: Frequency, Clubfoot, Neonates, Congenital, Talipes Equinovarus.

INTRODUCTION

Talipes equinovarus or clubfoot is a congenital condition that has a significant impact on a substantial number of individuals worldwide, resulting in diminished quality of life, impairment, and restrictions in movement.¹ Talipes equinovarus (TEV) is a condition that is distinguished by foot abnormalities, such as a high arch in the middle of the foot (cavus midfoot arch), inward deviation of the front part of the foot (forefoot adduction), inward deviation of the hindfoot (hindfoot varus), and limited upward movement of the foot (equinus).^{2,3} According to estimates, the overall incidence

of this condition is approximately 1-2 per 1000 live births. If left untreated, TEV has the potential to endure into adulthood, resulting in a decline in mobility and a reduction in overall quality of life.⁴

Although the exact cause remains a subject of continued debate, the prevailing perspective suggests the presence of numerous genetic and environmental factors that wield varying levels of impact on the clinical manifestation of this condition. Within this spectrum of factors, environmental elements such as maternal smoking and maternal diabetes demonstrate the strongest connections to clubfoot.⁵ There could also be a

potential association with maternal alcohol consumption. Furthermore, seasonal variations have been documented, with a hypothesis proposing a potential connection between embryonic development and fluctuations in maternal temperature. In utero positioning is another factor frequently cited in the literature.⁶ Genetics likely contributes to the condition, although the specific genetic alteration responsible remains elusive.⁷ The management of TEV encompasses both surgical and non-surgical modalities and has demonstrated efficacy during the early stages of childhood.⁸

Reconducting studies on this topic in Pakistan is crucial to validate existing findings, assess regional variations, and provide updated insights. It can enhance our understanding of the issue's local context, improve healthcare interventions, and contribute to global knowledge on the subject. By revisiting the research, we can ensure that the data and conclusions align with current circumstances and knowledge.

METHODS

The present cross-sectional investigation was carried out at a Department of Anatomy Dow International Medical College, DUHS Karachi from October 2022 to March 2023. The researchers gained ethical clearance from the Institutional Ethics Committee of the Hospital. The study included infants with idiopathic clubfoot deformity within the age range of birth to 12 months. Prior to their participation, informed written agreement was obtained from the parents of the infants. The study excluded children who were older than 12 months who had already undergone clubfoot surgery, as well as those with atypical or secondary clubfoot. A total of 20 infants diagnosed with untreated idiopathic clubfoot, encompassing a collective count of 31 affected feet, were chosen from the CTEV clinic based on predetermined inclusion and exclusion criteria. Photographs and radiographs were captured when deemed required in the given circumstances. Testing consists of Examine the foot closely for any congenital abnormalities, including a lack of lateral symmetry, an abnormal position of the sole, abnormal skin folds, and so on. The talus, calcaneum, malleoli, achilles tendon, and tibialis posterior tendon were all palpated to determine their relative positions. The question of whether or not the reduction is possible was tested for both active and passive motion.

We computed numbers and frequencies to characterize various study variables, including personal information, family history, the clinico-epidemiological pattern of CTEV, and factors linked to CTEV. Mean and standard deviation (SD) were employed for numerical data that displayed a normal distribution. To assess significance, we utilized Pearson's chi-square test. All statistical analyses were carried out using Statistical Package for the

Social Sciences (SPSS) version 21, ensuring precise and dependable data analysis. We adopted a significance level (alpha coefficient) of 0.05 for our statistical evaluations.

Figure 1: Clinical photograph of boy who has bilateral CTEV Radiograph of bilateral clubfoot



RESULTS

The number of children with clubfoot deformity recorded during the study period was 125 out of total number of all births at hospital during this period. This gave an estimated clubfoot incidence of 1 in 500 per number of births or 2 per 1000 births. Most patients were infants, with 50.4% aged less than 6 months, while 27.2% were between 6 months and 1 year old, and 22.4% were over 1 year old. Gender distribution showed that 56% were male, and 44% were female. Regarding family history of clubfoot, only 3.2% had a positive history, whereas the majority, 96.8%, did not have a family history of clubfoot. These findings indicate that the majority of patients were infants under 1 year old, with a slight male predominance, and a low percentage had a family history of the condition.

Table 1: Demographics of children having congenital talipes equinovarus (CTEV)

Variables	Category	Number	Percentage
Age	<6 months	63	50.4%
	6 months to 1 year	34	27.2%
	>1 year	28	22.4%
Gender	Male	70	56%
	Female	55	44%
Family history of clubfoot	Yes	4	3.2%
	No	121	96.8%

Among the patients, 40% had CTEV on the right side, 20% on the left, and an equal number, 40%, had it bilaterally. The majority, 96%, had isolated CTEV, while a smaller percentage, 4%, had CTEV associated with other medical conditions. Furthermore, 84% of the children did not have any associated medical conditions, whereas 16% had additional medical conditions alongside CTEV as shown in table 2.

Arthrogyriposis followed at 14.4%, while multiple congenital anomalies constituted 24% of cases. Gastrochiasis and longitudinal lower limb deficiencies

(Tibia Agenesis) were each seen in 9.6% of patients. Down Syndrome, Anophthalmia, and Cleft Palate were less frequent, each comprising 4.8% of diagnoses as shown in table 3.

Table 2: Distribution of clinical features of children presenting with congenital talipes equinovarus

Variables	Category	Number	Percentage
Side of CTEV	Right	50	40%
	Left	25	20%
	Bilateral	50	40%
CTEV Association	Isolated	120	96%
	Not isolated	5	4%
Associated with other Medical Conditions	No	105	84%
	Yes	20	16%

Table 3: Pattern of congenital talipes equinovarus

Diagnosis	Frequency	Percentage
Neurotube Defects (Spina Bifida, Anencephaly)	40	32%
Arthrogryposis	18	14.4%
Multiple Congenital Anomalies	30	24%
Gastrochiasis	12	9.6%
Longitudinal Lower Limb Deficiencies (Tibia Agenesis)	12	9.6%
Down Syndrome	6	4.8%
Anophthalmia	6	4.8%
Cleft Palate	6	4.8%

The risk factors of congenital talipes equinovarus (CTEV) in the enrolled patients were examined. Consanguinity among parents was reported in 40% of cases, while 60% had non-consanguineous parents. The majority of patients were born full-term (97.6%), with only a small proportion having an unknown gestational age (2.4%). Normal Vaginal Delivery (NVD) was the primary mode of delivery for 92% of patients, while 8% were delivered via Caesarean Section (CS). Additionally, the majority of patients were from singleton pregnancies (97.6%), while a few (2.4%) came from pregnancies with more than one gestation as given in table 4.

Table 4: Risk factors of congenital talipes equinovarus in enrolled patients

Variables	Factors	Number	Percentage
Parents' Consanguinity	Yes	50	40%
	No	75	60%
Gestational Age	Full Term	122	97.6%
	Unknown	3	2.4%
Mode of Delivery	NVD (Normal Vaginal Delivery)	115	92%
	CS (Caesarean Section)	10	8%
Number of Gestations	One	122	97.6%
	More than one	3	2.4%

DISCUSSION

Research findings indicate that there is a notable global incidence of roughly 250,000 infants annually who are born with foot problems. The majority of these cases, namely 80%, are recorded in underdeveloped nations.¹⁰ However, accessing medical treatment for parents in remote locations poses challenges due to the limited availability of orthopedic surgeons and the considerable distance to tertiary facilities. To date, no existing study has addressed the topic of clubfeet in children specifically within the context of Pakistan.¹¹

In our study 50.4% children aged less than 6 months, while 27.2% were between 6 months and 1 year old, and 22.4% were over 1 year old. Gender distribution showed that 56% were male, and 44% were female. Ahmad *et al.* (2020) studied patients aged between 2 and 11 months, with a mean age of 3.2 months, the majority of the children in the sample were male, accounting for 68.9%, while females constituted 31% which was similar to findings of our study. Various studies have consistently revealed a higher prevalence of clubfoot in males. Similarly, Ahirwar *et al.* (2021) research in India also indicated a higher occurrence in males, with a ratio of 2.2:1. Our own study aligns closely with these findings, showing a male-to-female ratio of 2.2:1.¹³

In our research, only 3.2% had a positive history, whereas the majority, 96.8%, did not have a family history of clubfoot. Likewise, Sami A.L.'s study noted a positive family history in 11% of their patients.¹⁴ In contrast, Hussain SA's study from Pakistan reported a significantly higher proportion, with 57.14% of patients having a positive family history.¹⁵ Our research confirms the importance of delivery mode in the etiology of clubfoot by comparing it to those of previous studies. Among 104 patients with Talipes Equinovarus, Sami A.L. described the route of delivery, finding that 73 presented via SVD, 14 required caesarean section, and 17 required episiotomy.¹⁵ Talipes Equinovarus has the potential to manifest either unilaterally or bilaterally. Various studies have had varying outcomes. Hussain SA conducted a study on a sample of 70 patients diagnosed with Talipes Equinovarus from the Khyber Pakhtunkhwa province. Among these patients, 23 individuals (32.8%) presented with bilateral clubfoot, whereas 47 individuals (67.2%) exhibited unilateral clubfoot.¹⁵ Ahmad *et al.* (2020) stated that among a cohort of 58 individuals diagnosed with TEV, there was a nearly similar distribution of unilateral and bilateral clubfoot cases, namely 28(48.27%) and 30(51.72%), respectively.¹² In our study, the incidence of clubfoot was determined to be 1 per 1000 live births. This finding is consistent with Pavone *et al.*'s research, which reported an incidence of 1.03 per 1000 live births.¹⁶ However, Shylaja *et al.* found a slightly higher incidence of 1.9 per 1000 births in Karnataka, India.¹⁷

Pavone *et al.* concluded that risk factors associated with clubfoot include a positive family history of the condition, gender, and maternal smoking.¹⁶ McConnell *et al.* also conducted a study and found a significant link between clubfoot and caesarean section deliveries.¹⁸ Additionally, Gulati *et al.* in 2011 noted a higher prevalence of consanguineous marriages in rural areas compared to urban areas, which is associated with an increased incidence of autosomal recessive disorders.¹⁹ In a 2016 study by Kulkarni *et al.*, they discovered that 34.4% of patients had parents with consanguineous marriages.²⁰ These findings collectively indicate a notable presence of consanguinity among clubfoot patients, emphasizing the importance of educating communities where interrelated marriages are common about the potential adverse effects of inbreeding.²¹

CONCLUSION

The occurrence of clubfoot is higher in males than in females. An equal number of cases presented with bilateral and unilateral clubfoot. Notably, the mode of delivery and a positive family history were found to have significant associations with clubfoot. These initial findings are expected to contribute to future studies in both central India and the broader Pakistani population that focus on similar issues.

LIMITATIONS

This retrospective hospital-based study relied on incomplete data for conducting risk factor analysis. Furthermore, our study is limited by a relatively small sample size.

SUGGESTIONS / RECOMMENDATIONS

It is important to recognize the value of future research on this subject.

CONFLICT OF INTEREST / DISCLOSURE

None.

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REFERENCES

- O'Shea RM, Sabatini CS. What is new in idiopathic clubfoot?. *Current reviews in musculoskeletal medicine.* 2016;9:470-7.
- Wijayasinghe SR, Abeysekera WYM, Dharmaratne TSS. Descriptive epidemiology of congenital clubfoot deformity in Sri Lanka. *J Coll Physicians Surg Pak.* 2018;28(2):166-168.
- Mustari MN, Faruk M, Bausat A, Fikry A. Congenital talipes equinovarus: A literature review. *Annals of Medicine and Surgery.* 2022 Aug 18:104394.
- Pavone V, Chisari E, Vescio A, Lucenti L, Sessa G, Testa G. The etiology of idiopathic congenital talipes equinovarus: a systematic review. *Journal of orthopaedic surgery and research.* 2018 Dec;13(1):1-1.
- Bina S, Pacey V, Barnes EH, Burns J, Gray K. Interventions for congenital talipes equinovarus (clubfoot). *Cochrane Database of Systematic Reviews.* 2020(5):CD008602.
- Gelfer Y, Leo DG, Russell A, Bridgens A, Perry DC, Eastwood DM. The outcomes of idiopathic congenital talipes equinovarus: a core outcome set for research and treatment. *Bone & joint open.* 2022 Jan 27;3(1):98-106.
- Pavone V, Chisari E, Vescio A, Lucenti L, Sessa G, Testa G. The etiology of idiopathic congenital talipes equinovarus: a systematic review. *Journal of orthopaedic surgery and research.* 2018 Dec;13(1):1-1.
- Hosseinzadeh P, Kelly DM, Zionts LE. Management of the relapsed clubfoot following treatment using the Ponseti method. *J Am Acad Orthop Surg.* 2017;25(3):195-203.
- Murtaza K, Saleem Z, Malik S. Talipes equinovarus or Clubfoot: A review of study approaches, management and trends in Pakistan. *Pakistan Journal of Medical Sciences.* 2020 Sep;36(6):1414.
- Jamil M, Siddiqui AA, Khan KM, Kumar J, Katto MS, Ahmed MW, Pirwani MA. Ponseti Technique in Neglected Club Foot Children with Age between 3 and 11 Years. *Journal of Liaquat University of Medical & Health Sciences.* 2019 Apr 11;18(01):17-21.
- Yaqeen A, Sidra H, Ijaz MA, Ijaz MM. Comparison of outcome of Ponseti method with traditional clubfoot treatment in children up to five years of age at tertiary care hospital. *Pakistan Journal of Medical Sciences.* 2022 Jul;38(6):1680.
- Ahmad I, Mehmood AU, Ali KW, Jameel HU. Cross Sectional Study of Clinical Profile and Treatment of Clubfoot by Ponseti Method among Infants at a Tertiary Care Hospital. *Health Sci J.* 2020 May 21;14(4):726-32.
- Ahirwar R, Upadhyay S, Varma HS. Demographic study of congenital talipes equinovarus deformity in central India. *Int J Res Med Sci* 2021;9:1313-7.
- Sami AL, Hanif A, Masood F, Awais SM. Cross sectional study of club foot at tertiary care hospital. *Annals of King Edward Medical University.* 2010;16(1):20-25.
- Hussain SA, Khan MS, Ali MA. Modified Turco's postero-medial release for congenital talipes equino-varus. *Journal of Ayub Medical College, Abbottabad: JAMC.* 2008;20(3):78-80.
- Pavone V, Bianca S, Grosso G, Pavone P, Mistretta A, Longo M R et al. Congenital talipes equinovarus: an epidemiological study in Sicily. *Acta Orthop.* 2012;83(3):294-8.
- Shylaja DK, Menasinkai SB, Ramesh BR. Study of congenital clubfoot in newborns. *Int J Anat Res.* 2016;4(4):3072-8.
- McConnell L, Cosma D, Vasilescu D, Morcuende J. Descriptive epidemiology of clubfoot in Romania: a clinic-based study. *Eur Review Med Pharmacol Sci.* 2016;20:220-4.
- Gulati R. Consanguineous marriages still high in Puducherry. *The Hindu.* 2011.
- Kulkarni SM, Malve S, Negandhi R, Prevalence and Degree of consanguinity in idiopathic clubfoot in India. *Int j paediatr orthop.* 2016;2(1):33-4.
- Shylaja D K, Sharada B Menasinkai, B R Ramesh. Study of congenital clubfoot in newborns. *Int J Anat Res* 2016;4(4):3072-3078.