

Demographic Epidemiology of Idiopathic Clubfoot and Evaluation of its Treatment using the Ponseti Method in Nigeria; A Regional Approach



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Abstract

Introduction: Idiopathic clubfoot is the commonest musculoskeletal congenital anomaly. Estimates of its prevalence in low- and middle-income countries range from 0.5 to 2 per 1000 births. Available data suggests that 80% of infants with congenital clubfoot live in developing countries. There is currently sparse estimate of prevalence of clubfoot in Nigeria. Ponseti method of treatment is widely accepted. **Aims:** To assess the demographics of children presenting with clubfoot deformity from different regions of Nigeria and evaluate some indices for a successful outcome using the Ponseti method of treatment.

Methodology: A one-year retrospective study of demographic characteristics of children with idiopathic clubfoot less than 2 years. EMR data from Clubfoot Administration SysTem (CAST) was obtained from all the MiracleFeet- supported clinics in Nigeria that have completed one year of clubfoot treatment. Number of casts to completion of treatment, rates of tenotomy and brace dropout as performance indices were also analyzed using SPSS version 25 (August 2017).

Results: Between September 2023 and August 2024, a total of 1037 children with clubfoot were enrolled. Of these, 459 (44.3%) were children with isolated clubfoot. 578 (55.7%) were bilateral, while 206 (19.9%) involved the left foot and 253 (24.4%), the right. There was a male preponderance with a male to female ratio of 1.6:1. The mean age of the population was 41.25±26.73 weeks. There was an average of 4.8 casts to correct with a tenotomy and brace dropout rate of 85.9% and 13.9% respectively. Prevalence rate was 0.034 per 1,000 live births.

Conclusion: The prevalence of clubfoot in Nigeria is 0.034 per 1,000 live births. The treatment indices (number of casts to correction, tenotomy rates) fall within the globally accepted levels. Treatment access should be improved nationwide.

Keywords: Idiopathic Club Foot; Tenotomy; Congenital

Abbreviations: POP: Plasters of Paris; CAST: Club foot Administration SysTem

Introduction

Idiopathic club foot is one of the commonest complexes disabling musculoskeletal foot anomaly that a child is born with [1,2]. The deformed foot resembles the club of a golf stick

characterize by fore foot adduction, mid foot cavus, hind foot varus and ankle in equinus [1,3]. Its incidence varies between regions and has a global incidence of 0.5- 2 cases per 1,000 live births [1,4]. Over 80% of this prevalence is seen in middle- and

low-income countries [5]. It shows a male preponderance and both feet affectation is seen in 50% of cases [3,5-8]. Its cause is largely unknown, however genetic causes have been implicated [5]. Club foot deformity varies from a mild to a severely deformed foot [9].

The Pirani score system is one of the scoring systems employed to determine the severity of the foot deformity during assessment. It is also used in monitoring the progress of treatment and predicting the average number of casts required for deformity correction [3,6,9]. The Ponseti technique of non-operative treatment has revolutionized the treatment of club foot deformity because it has reduced surgical foot correction in 95% of cases [1,3,5,7,10]. Thus, complications such as scarring, pain and stiff foot associated with such extensive foot surgeries have been eliminated [1].

The Ponseti method of treatment involves a weekly serial foot manipulations and casting from toe to groin using plasters of Paris (POP) with knee held at 90 degrees of flexion to sequentially correct the foot deformity of cavus, fore foot adduction and hind foot varus. Percutaneous tenotomy corrects the equinus deformity and the last cast is left in place for 3 weeks to enhance Achilles tendon healing. The correction is then maintained in a foot brace up to the age of 4 years to ensure supple, pain free, plantigrade and shoe able foot [1-3,7,9,10]. There is sparse estimate of prevalence of clubfoot in Nigeria, thus the need to assess the demographics of children presenting with club foot deformity from miracle feet sponsored club foot clinics across Nigeria and some indices for a successful outcome using the Ponseti method of treatment.

Methodology

A one-year retrospective study of demographic characteristics of children with idiopathic club foot in children less than 2 years of age. This study was carried out across Miracle feet sponsored

club foot treatment centers in Nigeria between August 2023 and September 2024. Patients with idiopathic club foot, less than 2 years of age were included in the study from miracle feet sponsored club foot clinics that are up to one year since its establishment between August, 2023 and September 2024. Ethical clearance was sorted and consent obtained from parents.

The patient's biodata, clinical history, clinical assessment using the Pirani score was obtained and recorded. Each child had foot manipulated for 2 minutes. With the foot held in the corrected position, a toe to below knee POP cast was applied and subsequently extended to the groin with the knee in 90 degrees of flexion. Each of the foot deformities was corrected serially with manipulations and POP casting done weekly and sequentially in the sequence of CAV. The equinus is corrected when the Pirani mid foot score is zero, heel varus is neutral or in valgus position and the fore foot has attained 50 -70 degrees of abduction.

The equinus is corrected using Percutaneous tenotomy aseptically using a size 15 surgical blade or a large gauge needle [7,11,12]. The last cast is applied toe to groin in the manipulated position with the foot in 50 -70 degrees of fore foot abduction, 10-15 degrees of Dorsiflexion with knee in 90 degrees of flexion. The patient demographic information, clinical information, treatment and follow up data collected into the EMR Club foot Administration SysTem (CAST) was retrieved and analyzed using SPSS version 25.

Results

Socio-demographic data of patients

A total of 1037 children (58 feet) were included in the study over a period of 12 months (September 2023 to August 2024). There were 637 males and 400 females with a male to female ratio of 1.6:1. The mean age of all children was 41.25 weeks (± 26.73). Mean age patients by regions are represented on Tables 1 & 2 Figures 1-3.

Table 1: Statistical summary of age of children.

Age	Valid N	Mean \pm SD	Minimum	Maximum
North Central	252	46.01 \pm 25.80	1	104
North East	94	46.51 \pm 23.04	8	104
North West	78	43.09 \pm 24.82	4	104
South East	391	32.53 \pm 25.27	1	104
South South	135	47.27 \pm 30.25	1	104
South West	87	49.94 \pm 30.25	8	104
Total	1037	41.25 \pm 26.73	1	104

Table 2: Gender distribution of children.

Gender	Number	Percent
Male	637	61.4
Female	400	38.6
Total	1037	100

Table 3: Foot affection.

Affected side	Valid number		Frequency	Percent
Unilateral	459	Left	206	19.9
		Right	253	24.4
Bilateral	578		578	55.7
Total	1037		1037	100

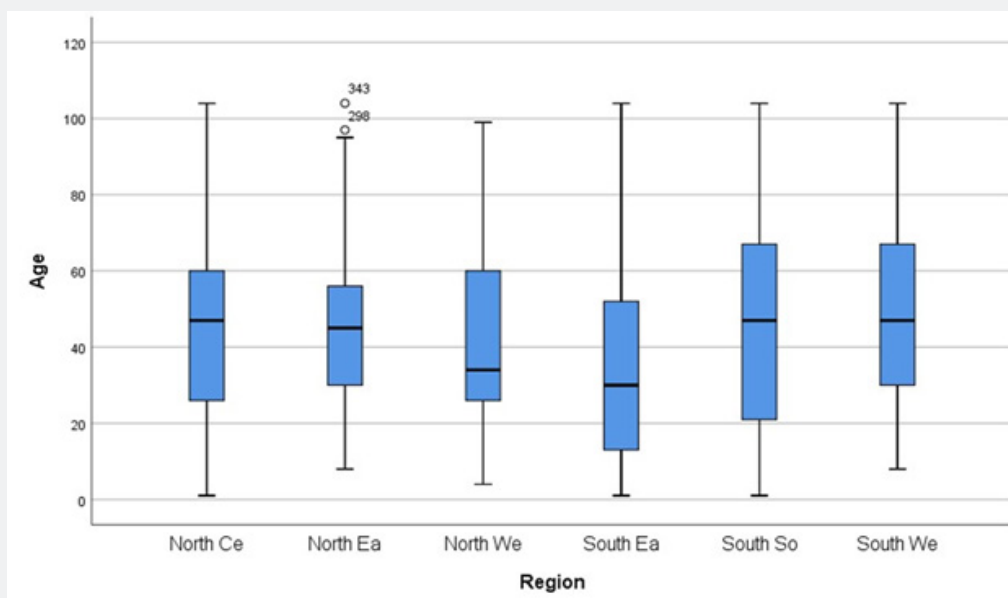


Figure 1: Region.

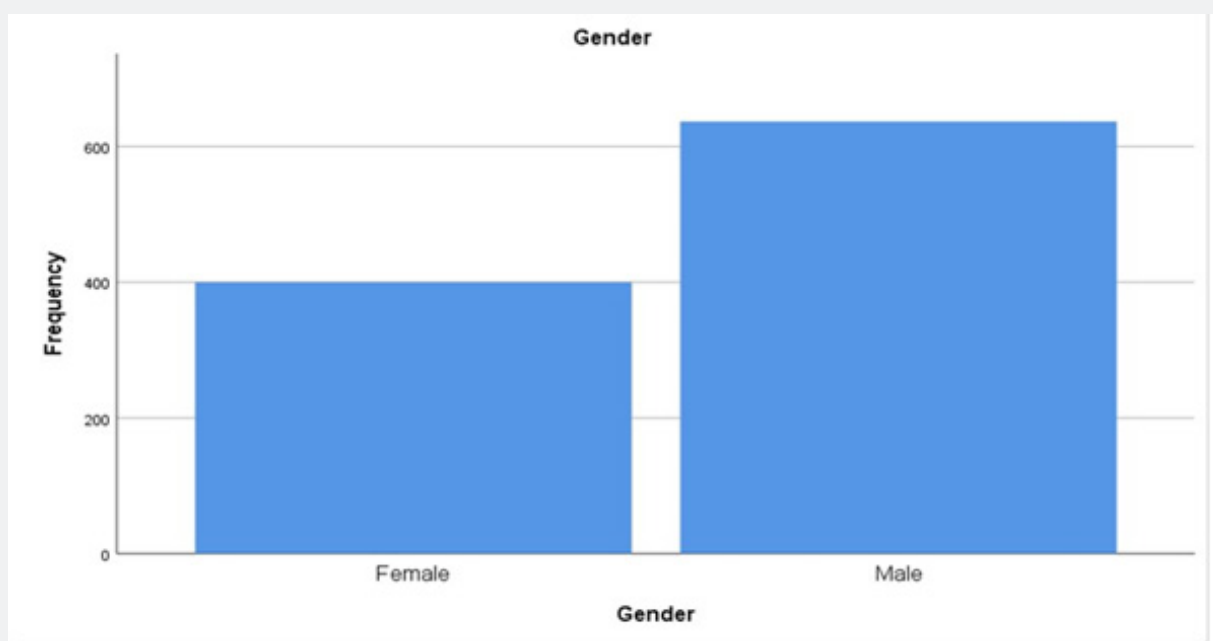


Figure 2: Gender distribution of children.

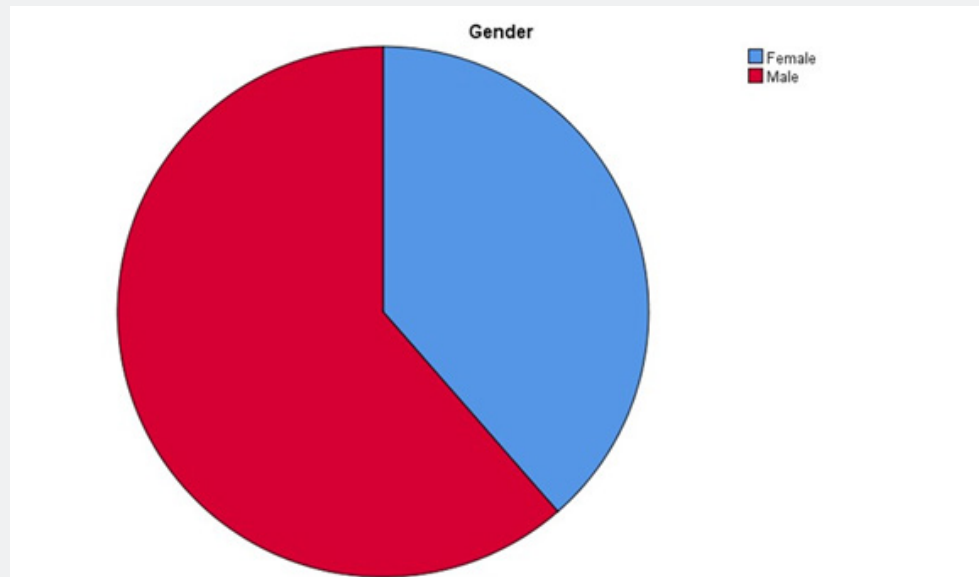


Figure 3

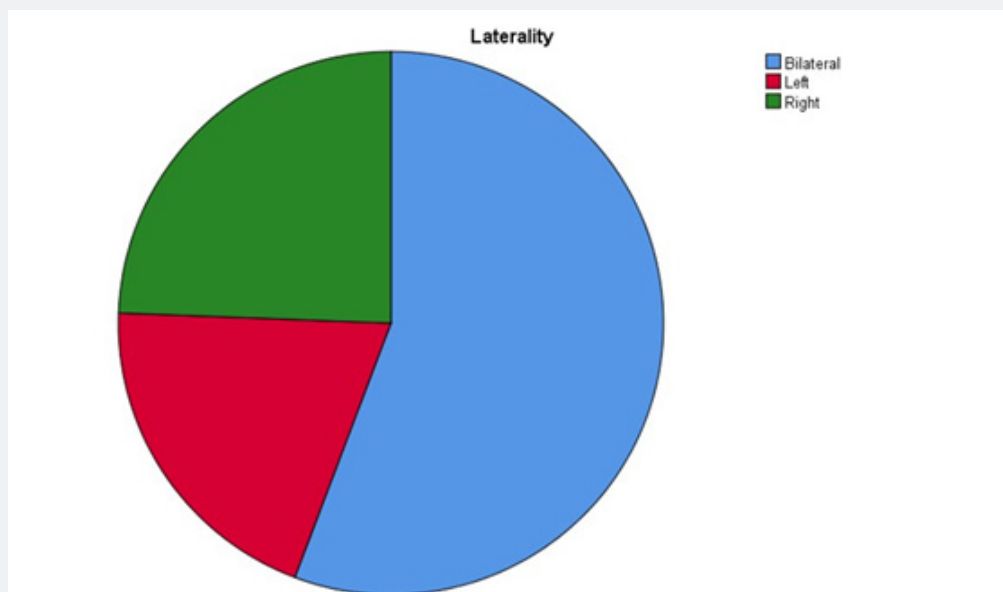


Figure 4: Pie chart representation of foot affection.

Foot Affection

In this study, 459 (44.3%) patients had unilateral involvement and 578 (55.7%) had bilateral involvement. Of the unilateral

cases, right sided clubfoot was slightly commoner (253 children) than the left sided clubfoot (206 children) as seen in table 3 and figure 4 below.

Table 4: Performance indices for Ponsetti method of treatment.

Variable	Tenotomy Rate (%)	Cast Dropout (%)	Average Cast	Brace Dropout (%)
Mean	85.94	8.09	4.82	13.87
Std Deviation	13.61	13.42	1.11	16.69
Minimum	40.0	0	2.7	-0
Maximum	100.0	66.0	7.5	50.0

Estimate Prevalence of Idiopathic Clubfoot

Over the period from 2023 to 2024 a total of 1037 cases of clubfoot were recorded, accounting for a prevalence rate of 0.034/1,000 births using the estimate birth rate of Nigeria [13].

Discussion

From our findings the mean age in our series is 41.25 weeks (+_26.73). This study reveals a male predilection with bilaterality involvement in 55.7%. This is like other series [3-8,10]. Unilateral affection accounted for 44.3% with predilection of the right foot as seen in other series [5,6]. The reason for this is largely unknown. The prevalence of club foot in Nigeria from this study is 0.03 per 1000 live birth. This is lower than other series which may be due to small sample size and low case identification.

This study demonstrates a good outcome of club foot management using the Ponseti method. The average number of cast needed to achieve full correction stood at 4.8% which is well within the range of other series [4,7,8,10]. The tenotomy rate for this study is 85.9% which is within the range of other series to achieve the final correction of equinus deformity [1]. The cast and brace dropout are 8.1% and 13.9% respectively and are like other case series [4,5].

Conclusion

The prevalence of clubfoot in Nigeria stood at 0.03 per 1000 livebirths. Use of Ponseti method for treatment of club foot demonstrates a good clinical outcome and a valuable treatment option for idiopathic club foot.

Limitation

Small sample size and the need to involve more centers treating clubfoot across Nigeria. Short duration of follow up and the need to for a longer duration of study and follow up.

Conflict of Interest

Nil

Funding

Miracle feet

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