

Original Research Article

Disability prevention with early screening and intervention among children with congenital clubfoot in India

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ABSTRACT

Background: Congenital clubfoot has an incidence of 1-9/1000 live births. Untreated clubfoot leads to physical, social, psychological, and financial burden on the family and society. Early intervention can prevent disability in the future. The aim of this study is to assess the effectiveness of an early intervention and conservative management to treat congenital clubfoot and prevent disability.

Methods: We conducted a retrospective analysis at an urban multispecialty hospital in North India among children with a diagnosis of congenital clubfoot managed with Ponseti technique (manipulation, casting, tenotomy and bracing). Descriptive statistics and chi-square test were used to measure association between variables.

Results: We had a total of 125 feet (41 bilateral, 43 unilateral). 78.5% (n=66) children were below 12 months of age with a mean age at diagnosis of 7.8 months. 70.2% (n=59) children were corrected with less than 5 casts to achieve complete correction. Tenotomy was required in 69% of children (n=58) and was statistically significant. A 100% success rate was achieved in our study.

Conclusions: Early intervention is essential to correct idiopathic/ congenital clubfoot, prevent disability and improve quality life in adulthood. National programs with a focus on prevention, surveillance, advocacy, and research are vital for universal health coverage.

Keywords: Children, Disability, Orthopaedics, Birth defect, Health policy

INTRODUCTION

National Health Mission (NHM) was initiated by the Government of India in 2013 with a goal to achieve universal access to equitable, affordable and quality health care services that are accountable and responsive to people's needs. To meet these goals, two divisions being the National Rural Health Mission (NRHM) and the National Urban Health Mission (NUHM) were set up. Several programs were launched under each division in the country with specific aims and targets depending on individual states' capacity, context, and epidemiological trends. Under the NRHM, Rashtriya Bal Swasthya

Karyakram (RBSK) was initiated in 2013, with an aim to screen and provide early intervention for children from birth to eighteen years of age to cover 4 D's which include Development delays including Disability, Defects at birth, Deficiencies, and Diseases. Significant improvement was made in reducing Infant Mortality Rate (IMR); however, healthy survival of children was lacking. This issue was addressed with this national program through early detection and intervention. District Early Intervention Centers (DEIC) were set up in hospitals to manage children below six years of age, and existing public health centers to manage children 6-18 years of age with DEIC as the referral center. Post diagnosis of any condition,

intervention or treatment is provided at no cost to these children.

Globally about 6% (7.9 million) of children are born annually with a serious birth defect of genetic or partially genetic origin. At least 42% (3.3 million) children under five years of age die from birth defects every year and another 41% (3.2 million) of those who survive may be disabled for life.¹ In India, 26 million babies are born annually, with about 6.5% (1.7 million) babies born with birth defects. Congenital talipes equinovarus (CTEV) or clubfoot (inward and downward rotation of the foot) is one of the most common pediatric foot deformity with an incidence in India at 0.9/1000 live births.² Clubfoot has four components i.e. talipes equius, midfoot cavus, forefoot adduction, and hindfoot varus. If left untreated, children develop callus formation, skin and bone infection, deformed bones, restricted movement, and permanent disability. DEICs provide screening at birth to identify neonates born with such defects and manage as early as possible. To the best of our knowledge, this is the first study to evaluate the performance of DEIC, and the success of RBSK to treat and prevent disability due to congenital clubfoot among children in an urban healthcare facility in India.

The aim of this study is to: evaluate the performance of a DEIC in an urban multispecialty healthcare facility in the District of Panchkula, Haryana, India, to manage congenital clubfoot, evaluate the effectiveness of Ponseti technique as a conservative method of treatment in the correction of congenital clubfoot and provide recommendations for improving facilities at DEIC and meet the goals set under RBSK.

METHODS

We conducted a retrospective analysis from January 2018 through December 2019 at an urban multispecialty healthcare facility in the district of Panchkula, Haryana, India. Eighty-four children with a diagnosis of congenital clubfoot were included. These included 41 children with bilateral clubfoot and 43 children with unilateral clubfoot giving a total of 125 feet. Children who might have developed clubfoot as a result of neurological defects, congenital spine and hip deformities, were excluded from the study. Conservative management with the Ponseti technique which includes serial casting and manipulation, tenotomy, maintenance of correction with brace and physiotherapy, was performed. Several variables were collected from medical records including demography, ante-natal history, and age at diagnosis, gender, and steps

of intervention / treatment. The outcome indicators include the number of casts needed for complete correction, requirement of tenotomy, duration of follow up, and level of correction achieved after completion of treatment.

Quantitative data analysis was performed using SPSS. Descriptive statistics were performed for all variables and the chi-square test was used to find an association between laterality and number of casts needed for complete correction. A p value of 0.05 was accepted as the level of statistical significance at a 95% confidence interval.

RESULTS

Hundred percent success rate was observed in achieving complete correction with early intervention/ treatment at DEIC in the District of Panchkula, among the 84 children (125 feet) who were screened and diagnosed with congenital clubfoot. 75% (n=63) of the children were males with 57% (n=36) below 3 months of age (Table 1). The mean age of children at diagnosis was 7.8 months with a range from 3 days to 36 months. The mean age at the last follow-up was 12.9 months with a range from 1 month-48 month. 58.3% (n=49) children were below 3 months of age, and 51% (n=25) of these had bilateral clubfoot (Table 2). The mean number of casts applied to achieve complete correction was 4.9 with a range from 1 to 22. 70.2% (n=59) of all children achieved complete correction with less than five casts. There was a statistically significant association between laterality and the number of casts applied during the entire treatment (p value of 0.05). Tenotomy was not performed on 30.9% (n=26) children and they were managed with serial casting, manipulation, and maintenance with brace and physiotherapy. There was a statistically significant association between laterality and the number of casts applied during the entire treatment (p value of <0.001).

Table 1: Age distribution of patients.

Age at admission (in months)	Gender		Total
	Male	Female	
0-3	13	36	49
3-6	3	9	12
6-9	1	36	5
9-12	1	9	9
12-18	0	4	1
18-24	2	8	3
≥24	1	1	5
Total	21	1	84

Table 2: Distribution of cases as per the laterality

Age at admission (month)	Laterality		Total	P value
	Unilateral (%)	Bilateral (%)		
0-3	24 (49)	25 (51)	49 (100)	0.325
3-6	5 (41.7)	7 (58.3)	12 (100)	
6-9	3 (60)	2 (40)	5 (100)	

Continued.

Age at admission (month)	Laterality		Total	P value
	Unilateral (%)	Unilateral (%)		
9-12	5 (55.6)	4 (44.4)	9 (100)	0.325
12-18	0 (0)	1 (100)	1 (100)	
18-24	1 (33.3)	2 (66.7)	3 (100)	
≥24	5 (100)	0 (0)	5 (100)	
Gender				
Female	10 (47.6)	11 (52.4)	21 (100)	0.705
Male	33 (52.4)	30 (47.6)	63 (100)	
Number of casts				
0-5	35 (59.3)	24 (40.7)	59 (100)	0.056
6-10	8 (44.4)	10 (55.6)	18 (100)	
11-15	0 (0)	3 (100)	3 (100)	
16-20	0 (0)	3 (100)	3 (100)	
≥21	0 (0)	1 (100)	1 (100)	
Tenotomy				
Not performed	18 (69.2)	8 (30.8)	26 (100)	< 0.001*
Unilateral	25 (78.1)	7 (21.9)	32 (100)	
Bilateral	0 (0)	26 (100)	26 (100)	

* P values of <0.05 were considered significant.

DISCUSSION

The Government of India, under the RBSK program, provides free treatment for congenital clubfoot irrespective of socio-economic status. The national program aimed for timely intervention to prevent deterioration of the condition and reducing the out-of-pocket (OOP) expenditure for the vulnerable population in the country. The teams working towards this goal at DEIC include a pediatrician, medical officer, nurses, and paramedics. The purpose of the program was to provide referral support to children primarily up to 6 years of age and diagnosed with any anomaly during health screening.

Congenital clubfoot is a common and complex congenital defect. Early diagnosis and treatment are essential to prevent deformity and disability. The treatment options have matured over the years, with the conservative treatment in the form of corrective casting evolving as the initial choice of treatment. Ponseti proposed a technique to correct this deformity, which is now the cornerstone in the early management of clubfoot globally.³ This method has specifically been adopted widely in rural and underdeveloped areas that lack advanced healthcare facilities. The effectiveness of the Ponseti method in the correction of clubfoot has been demonstrated by several studies over the years.⁴⁻⁶ Also, the results of our study are comparable to other studies done about this technique.^{7,8}

The mean age of children at diagnosis was 7.8 months with a range from 3 days to 36 months. 72.6% (n=61) children were below six months of age, and 52.5% (n=32) of these had bilateral clubfoot. 35.7% (n=30) and 13.1% (n=11) male and female children had bilateral deformity respectively. The mean number of casts applied to achieve complete correction was 4.9 with a range from 1-22.

70.2% (n=59) of all children achieved complete correction with less than five casts. 57.6% (n=34) of these were below 3 months of age. Among the children with unilateral clubfoot, 81.4% (n=35) were treated with less than five casts, and among those with bilateral deformity, 82.9% (n=34) were treated with less than ten casts. There was a statistically significant association between laterality and the number of casts applied during the entire treatment. Tenotomy was not required in 30.9% (n=26) children and was managed with serial casting, manipulation, and maintenance with brace and physiotherapy. Figure 1 shows one of the cases from our study with congenital clubfoot, managed with serial casting, manipulation, and brace until complete correction as achieved.

Through RBSK, the Government of India has taken a giant step for screening and early intervention for childhood defects, diseases, deficiencies, and disabilities. Birth defects are an unnoticed public health concern in India, warranting immediate attention. Healthcare services still lack in rural areas for the vulnerable population including those from lower socio-economic strata (21.1% of Indian population is below poverty line).⁹ Research on the epidemiology of birth defects is the need of the hour to address this issue in India. DEIC provides an opportunity for diagnosis and care for affected children (both rural and urban), but a national-level dialogue is needed to ensure practical changes. Potential challenges to implementing RBSK at the national level include the implementation of DEIC, training DEIC staff, collecting and monitoring data, etc. It is therefore imperative for the success of the program to focus on recruiting resources and work on capacity building, education, and communication to increase awareness and initiate conversation.

The Ponseti technique of correcting clubfoot being cost-effective is vital for developing nations, where medical/surgical facilities are deficient. Some programs have been launched in other developing nations as well such as Bangladesh and Uganda. Bangladesh is one of the most populous countries in the world, with a population of 160 million where 1/3 exist below the poverty line.¹⁰ With an incidence of 1:900 live births, the country has about 5000 cases of idiopathic clubfoot every year. Bangladesh's sustainable clubfoot program, Walk for Life (WFL), was launched in 2009 to address this issue. The government helped integrate the program in the public healthcare facilities, using the Ponseti method for management of cases. Similarly, the Uganda Sustainable Clubfoot Care Project (USCCP) is a Canadian International Development Agency (CIDA) funded University Partnerships in Cooperation and Development (UPCD).¹¹⁻¹³ The six-year program was initiated to grow the Ugandan healthcare

system's capacity to treat children using the Ponseti method and evaluate its effectiveness.

National programs with a focus on prevention, surveillance, advocacy, and research are vital for universal health coverage. Research and training are essential to help move the program in the right direction based on the needs of the population. Congenital anomalies can be prevented by implementing genetic counseling as a protocol in all healthcare facilities. In a society like ours, disability is the prime reason for poor health and poverty. The disabled population are socio-economically disadvantaged and have limited opportunities for education and employment. Targeted interventions based on valid data from research will help create a blueprint for health care policies and programs in the nation. With the advent of DEIC's providing quality care that is affordable and accessible, RBSK is proving to be the right step towards 'Health for All'.



Figure 1: (a) Pre-treatment- case with bilateral congenital clubfoot, (b) Legs placed in a cast as a part of management with Ponseti technique and (c) Post-treatment- complete correction achieved.

CONCLUSION

Early intervention is essential to correct idiopathic/congenital clubfoot, prevent disability and improve quality life in adulthood. National programs with a focus on prevention, surveillance, advocacy, and research are vital for universal health coverage. The Rashtriya Bal Swasthya Karyakram (RBSK) successfully screened and provided early intervention for children from birth to eighteen years of age to manage congenital clubfoot.

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