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Research Article

TO ANALYSE THE CORRELATION AND PREVALENCE IN CHILDREN WITH CLUBFOOT WITH RESPECTIVE MATERNAL BLOOD SUGAR IN INDIAN SUBCONTINENT

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ABSTRACT

Background: Although clubfoot accounts for majority of common birth defects among the Congenital Musculoskeletal Anomalies with prevalence of approximately 1 per 1000 live births, the aetiology of clubfoot remains largely unknown. The purpose of this study was to analyse and establish relationship between clubfoot with respective Maternal Blood Sugar.

Methods: Mothers of the 222 clubfoot children visiting the outdoor Department were subjected to Random blood sugar analysis and interpreted. Prevalence was calculated by pooling the specific data. Conditional logistic regression was used to investigate the association between diabetes and club foot.

Results: The overall prevalence of club foot was found higher than compared to other musculoskeletal anomalies. There was only prevalence of 3.2% of Diabetes contrary to popular belief of a strong association between Diabetes and club foot in our Indian scenario.

Conclusion: We estimated the prevalence of clubfoot was more significant anomalies constituting majority of the cases prevailing among the congenital malformations in the child. Our findings underline the importance of establishing early surveillance and investigating risk factors among child born to suspected Diabetic mother.

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INTRODUCTION

Clubfoot is a major structural birth defect with a birth prevalence of approximately 1 per 1,000 live births among Asians and greatly varies among race and ethnicity across the globe [1, 2]. Affected children have abnormal bone structure in their ankle such that the affected feet are fixed in an extended, adducted position. Correction requires repeated medical treatment and quite often surgery [3]. Clubfoot affects about twice as many males as females [4, 5]. Clubfoot recurs within families but does not follow a strict Mendelian inheritance pattern [2]. It is sometimes accompanied by other structural anomalies, including neural tube defects and bilateral renal agenesis, but it most often occurs as an isolated congenital anomaly without any family history [1].

Clubfoot can be visualized by ultrasonography at 12 weeks' gestation and, thus, is considered to develop early in pregnancy, though its pathogenesis is not known. One hypothesis is vascular disruption, based on epidemiologic, radiological, surgical, and pathological observations [6-8].

Clubfoot might also be secondary to neurological or connective tissue maldevelopment [9]. Genetic factors involved in limb signalling pathways have also been implicated [10]. Known risk factors include maternal smoking during pregnancy and primiparity [11, 12]. Although various environmental exposures and medical conditions have been suggested in single studies [13], these have not been confirmed as risk factors. Some studies of specific medications in relation to a wide variety of birth defects have reported associations with clubfoot [14], but no definitive specific underlying causes have been identified.

METHODOLOGY

Within the study total 222 cases of clubfoot of both sex (male and female) children were enrolled. The whole of the study was conducted in department of Paediatric Orthopaedics, King George's Medical University, Lucknow, Uttar Pradesh. All the cases are taken into consideration that attended our outdoor facility as regular follow-ups. Exclusion criteria patients with

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no consent or non-willing patients were excluded from our study.

A detailed history of mother was taken in to account with stress on gestational diabetes after which mother was subjected to random blood glucose test. Blood was drawn by very simple prick to a finger after cleaning the part with alcohol based swab following the American Diabetes Association (ADA) guidelines and recorded [15]. Glucometer was used for measuring Random blood glucose test. A blood glucose level of 140 mg/dL or above was highly indicative of indicative of diabetes. Once random blood glucose test results were abnormal another diabetes was confirmed using Hgb1c test.

Statistical analysis

Continuous data were summarised as Mean ± SE (standard error of the mean) and discrete (categorical) in no. and percentage. Categorical groups were compared by chi-square (χ²) test. A two-tailed p<0.05 was considered statistically significant. Analysis was performed on SPSS software (windows version 21.0).

RESULTS

The present study evaluates association between diabetes mellitus (DM) and clubfoot and prevalence of DM in mothers with clubfoot. Total 222 clubfoot mothers were recruited.

The basic characteristics of mother is summarised in (Table 1). The age of mothers ranged between 20-32 yrs with mean (± SE) 27.54 ± 2.96 yrs and median 27 yrs. Among mothers, 167 (75.2%) had 1 child, 39 (17.6%) had 2 and 16 (7.2%) had 3 children. Further, 131 (59.0%) mother had B/L clubfoot, 45 (20.3%) had left and 46 (20.7%) had right.

Out of total clubfoot mothers, 7 had DM thus the prevalence of DM was 3.2% (Table 1 and Fig. 1).

Table 1 Basic characteristics of mothers

Characteristics	No. of patients (n=222) (%)
Age (yrs):	
Mean ± SE, Range, Median	27.54 ± 2.96
No. of children:	
1	167 (75.2)
2	39 (17.6)
3	16 (7.2)
CLUBFOOT:	
B/L	131 (59.0)
Left	45 (20.3)
Right	46 (20.7)
Diabetic mellitus:	
No	215 (96.8)
Yes	7 (3.2)

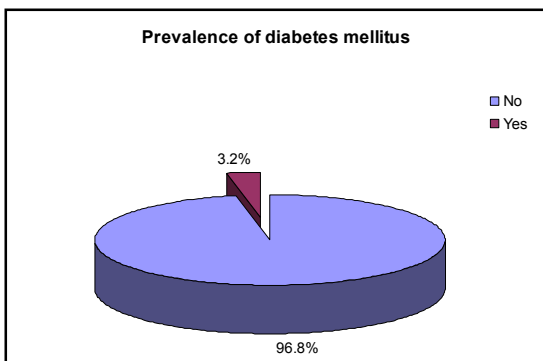


Fig 1 Prevalence of DM in Clubfoot mothers

Correlation

The correlation between DM and clubfoot is summarised in table 2 and also depicted in (Fig. 2). Out of total 222 clubfoot mothers, only 7 had DM, of which 4 (57.1%) with B/L clubfoot, 1 (14.3%) with left Clubfoot and 2 (28.6%) with right Clubfoot. On correlating DM and clubfoot, χ² test showed insignificant association between DM and clubfoot (χ²=0.35, p=0.841) suggesting that DM is not associated with clubfoot.

Table 2 Correlation between diabetes mellitus and clubfoot (n=222)

Clubfoot	Diabetes mellitus		χ ² value	p value
	No (n=215) (%)	Yes (n=7) (%)		
B/L	127 (59.1)	4 (57.1)	0.35	0.841
Left	44 (22.5)	1 (14.3)		
Right	44 (22.5)	2 (28.6)		

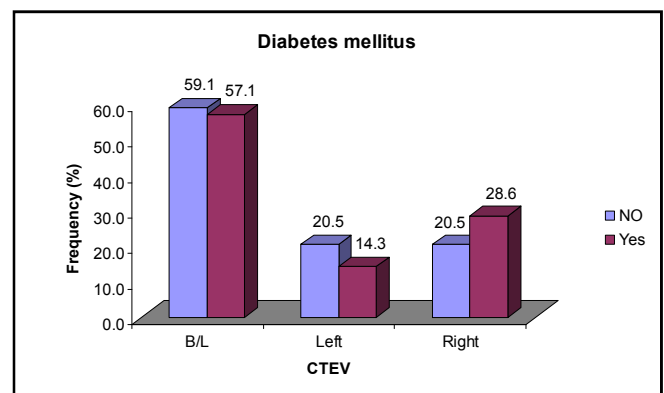


Fig 2 Correlation Between DM And Clubfoot

DISCUSSION

To our knowledge, this is the first large-scale study examining the association between clubfoot and maternal blood sugar in our Indian subcontinent. Our investigation revealed 3 important findings. First, clubfoot were the most frequently occurring anomalies among all the congenital musculoskeletal anomalies constituting highest percentage of cases. This is in accordance with the study by OA Adewole et. al. (2009) [16] which reported clubfoot as the commonest congenital musculoskeletal abnormality among the children visiting their teaching hospital in Lagos, Nigeria.

This finding was supported by study from another African teaching hospital by Omololu B et. al. (2005) [17] from University of Ibadan who reported that among 284 patients visiting them from January 1995 to December 2003 ,clubfoot accounted for 52.8% of all the malformations and was the most common congenital orthopaedic malformation.

Secondly we couldn't establish any significant relationship between clubfoot children and their respective maternal blood sugar as contrary to popular belief of strong association between maternal blood sugar with clubfoot which in our study was found only 3.2% prevalence. Third, there was no apparent increased risk for a specific type of anomaly with increasing maternal blood glucose, but there was an increased risk of anomalies affecting more than one body part of the body. Evidence also points out to fact that majority of clubfoot cases

were conservatively managed with full correction rarely requiring surgical intervention. Also isolated clubfoot cases fared much better in terms of treatment outcome in comparison to those patients who had clubfoot with other associated with other musculoskeletal anomalies affecting other parts of the body. Also on elaborate history taking there was strong genetic association of clubfoot running in to the family and in one particular cases extending up to 4 generations. Also we had siblings being affected by clubfoot in 4 cases.

Our study is limited in that we do not have information about the exact maternal blood sugar status and exact follow up of the long duration. This observation shows that Out of total clubfoot mothers only 7 (32%) had DM, along with our current findings suggesting that there is not much significant association between child born with clubfoot with increased maternal blood sugar as vast significant data had normal sugar levels below 140 mg/dL.

In a study by Schaefer-Graf et. al. [18], they found that the initial fasting serum glucose and glycosylated haemoglobin levels were significantly higher in pregnancies with anomalies and genetic syndromes compared with pregnancies with no anomalies, but talipes equinovarus (clubfoot) was found in 10 infants with initial fasting serum glucose levels of <120 mg/dL. In our study also similar result was found.

Another prospective Study by Lynn L. Moore et. al. (2000) [19] showed that prevalence of clubfoot was found higher in both diabetic non obese as well as obese non diabetic mothers among other musculoskeletal defects from 22,950 pregnant women enrolled in a progressive cohort study.

Our findings were contrary to western study by Dickinson et. al. (2008) [20] and Werler MM et. al. (2015) [21] of association between smoking and drinking habits with clubfoot. None of the clubfoot mothers in our study were either smoker or drinker which is something rarely seen among the women of our Indian subcontinent and is considered a great taboo owing to the family, cultural and social values and norms of the society.

Study by James L. Mills (2010) [22] summarised that multiple malformations are common in infants of diabetic mothers. Our study is supported by findings published by World Health Organization, 2013 [23] which clearly stated that musculoskeletal system accounts for 51.12 per 10,000 prevalence every year among which clubfoot at 18.60 rate per 10,000 and 50220 total births per annum in India accounts for second largest cause of malformations following anencephaly.

CONCLUSION AND FUTURE IMPLICATIONS

The study is not only for our knowledge enrichment about correlation of clubfoot with respective maternal blood sugar but also fill the gap of related information; it will reshape our knowledge towards the management of clubfoot. As well as we may be able to discover the new possible risk factors of these diseases. We estimated the prevalence of clubfoot was more significant anomalies constituting majority of the cases prevailing among the congenital musculoskeletal malformations in the child. Our findings underline the importance of establishing early surveillance and investigating risk factors among child born to suspected Diabetic mother.

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