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Original Research Article

Association of socio-demographic factors with undernutrition in children under five with cleft palate: a cross-sectional study in a South Indian tertiary hospital

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ABSTRACT

Background: Children with cleft palates face unique challenges that increase their risk of undernutrition. While feeding issues are well established, the role of sociodemographic factors in nutritional outcomes remains underexplored in low-resource settings. To estimate the prevalence of undernutrition and assess its association with sociodemographic factors in children with cleft palate.
Methods: A cross-sectional study was conducted at Sree Balaji Medical College and Hospital in Chennai over 19 months. A total of 218 children under five with cleft palates were enrolled. Nutritional status was assessed using the WHO anthropometric indicators. Associations between undernutrition and sociodemographic factors were analyzed using chi-square tests and odds ratios.
Results: Undernutrition was observed in 70.2% of the children. Most participants were below 3 years of age (and 54.5% were male. The majority belonged to lower-middle and middle-income socioeconomic classes. A higher proportion of undernourished children were born preterm (71.5%). Maternal education was low in a subset of mothers, with 5.5% being illiterate. Feeding difficulties such as nasal regurgitation were commonly reported.
Conclusions: Socioeconomic disadvantage and low maternal education significantly contribute to undernutrition in children with cleft palate. Early interventions targeting these factors are essential for improving nutritional outcomes.

Keywords: Cleft palate, Children, India, Maternal education, Socioeconomic status, Undernutrition

INTRODUCTION

Cleft palates, which are congenital splits in the roof of the mouth, present special complications for children, including feeding and nutrition issues. Undernutrition can negatively affect the growth, development and surgical outcomes of these children, which is a serious concern for the healthcare system. Designing successful interventions requires an understanding of the sociodemographic factors that lead to undernutrition in this population group. Compared to their classmates without cleft palates, children with cleft palates are at a significantly increased risk of malnutrition. The frequency of underweight status in children with cleft palate can be more than twice as high as that of children under five years of age in the general population, according to extensive investigations conducted in low- and middle-income countries (LMICs).[1] Sociodemographic characteristics, such as household income, geography and access to healthcare services, are strongly associated with this difference.

The median neighbourhood income (MNI) is a reliable sociodemographic indicator of undernutrition in children with cleft palate. Research indicates a high correlation between lower MNI and weight-for-age and height-for-age z-scores, which reflect acute and chronic malnutrition,

respectively.[2] This implies that children in underprivileged areas have more nutritional difficulties, most likely due to a lack of resources for proper feeding, access to healthcare and parental education regarding cleft palate-related eating issues.

Remarkably, in certain cohorts, race and insurance type did not independently predict malnutrition in these children, suggesting that environmental influences and economic position may be more important than ethnicity or healthcare coverage.[2] However, it has been demonstrated that, especially in LMICs, social variables such as religion and money have an impact on children with cleft palates' perceptions of the severity of their sickness as well as their health-related quality of life.[3] This emphasizes the complexity of sociodemographic influences, involving the intersection of economic considerations with cultural and societal circumstances.

Gender disparities in nutritional status have also been observed among children with cleft palates. For instance, girls and boys in Indonesia showed statistically significant variations in stunting and weight-for-age measurements at different age intervals, indicating that dietary treatments should consider potential gender-specific vulnerabilities.[4]

Undernutrition is directly caused by feeding issues inherent to cleft palate, such as difficulty in swallowing and sucking. In socioeconomically challenged environments, where early surgical repair and specialist feeding support may be unavailable or delayed, these difficulties are exacerbated.[5,6] For children who continue oral intake prior to surgery, the timing of the surgical procedure (palatoplasty) does not increase growth velocity, especially for those who are already malnourished.[7] According to this study, to enhance growth results, nutritional support needs to be maximized both before and after surgery.

Children with chronic malnutrition are more likely to experience postoperative complications, such as fistula formation, which makes their care and recuperation challenging.[8] This results in a vicious loop whereby sociodemographic characteristics that cause undernutrition also have an indirect impact on long-term health and surgical outcomes.

The lack of well-financed population-level research on feeding and nutrition in children with orofacial clefts is highlighted by studies conducted in African environments. Most of the evidence currently available comes from descriptive, hospital-based studies that highlight the effects of malnutrition and feeding issues but lack intervention-based research.[9] This disparity emphasizes the necessity of focused nutrition initiatives that consider the sociodemographic conditions of the local community.

Furthermore, parental attitudes toward feeding and therapy may be influenced by cultural myths and beliefs about cleft palates in some developing nations, which could affect nutritional results.[4] The prevalence of these misconceptions is frequently correlated with socioeconomic status, making efforts to offer appropriate care even more challenging.

Undernutrition in children with cleft palate is strongly associated with sociodemographic factors, especially neighbourhood income, which gauges economic status and, to a lesser extent, gender and cultural background. These factors affect nutritional access, feeding assistance and timely surgical care. To treat undernutrition in this vulnerable population, comprehensive strategies involving early feeding interventions, culturally sensitive education, socioeconomic support and coordinated surgical management are required.[4,8,10]

To address the gap in region-specific data, this study aimed to estimate the prevalence of undernutrition and evaluate the role of sociodemographic predictors, such as maternal education and socioeconomic status, in children under five years of age with cleft palate, using WHO anthropometric standards.

METHODS

This cross-sectional observational analysis was conducted at the Department of Pediatrics, Sree Balaji Medical College and Hospital, Chennai, over a period of 19 months (July 2022 to January 2024). The primary objective was to estimate the prevalence of undernutrition and evaluate its association with sociodemographic factors such as age, gender, maternal education and socioeconomic status.

A total of 218 children age<five with cleft palates were enrolled using purposive sampling. The exclusion criteria included prior surgical correction for cleft anomalies or comorbid conditions independently associated with severe malnutrition (e.g., cerebral palsy, hemolytic anemia, nephrotic syndrome and malignancies). Ethical clearance was obtained from the Institutional Human Ethics Committee of the Sree Balaji Medical College (Ref No: 002/SBMCH/IHEC/2023/1989).

The sample size was calculated using the formula $n=Z^2PQ/L^2$, where Z=1.96 for 95% confidence, P=28.6% (as per Barbara et al.), Q=71.4% and L=6%, yielding a final sample size of 218.

Data were collected using a semi-structured questionnaire that captured demographic details and maternal characteristics. Socioeconomic status was assessed using the Modified B.G. Prasad Classification (January 2022). Nutritional status was evaluated using the WHO anthropometric indicators of weight-for-age, height-for-age and weight-for-height using digital weighing scales and stadiometers.

Data analysis was conducted using SPSS v21. Descriptive statistics were used to summarize the demographic variables. Chi-square tests and odds ratios (OR) with 95%

confidence intervals (CI) were used to assess the associations. Statistical significance was set at p<0.05.

RESULTS

Among the 218 children assessed, 153 were undernourished, indicating a high prevalence rate of 70.2%, underscoring the importance of targeted public health and nutritional interventions (Table 1). Table 2 and Figure 1 summarizes the age distribution of 218 study participants. The largest age group was infants under 1 year, representing 48.6% (n=106) of the population. This was followed by children aged 1 to 3 years, comprising 40.3% (n=88). The smallest group included children aged 3 to 5 years, who made up 11.0% (n=24). Overall, the data shows that the sample is heavily skewed towards younger children, with nearly 89% being under the age of 3.

Table 1: Prevalence of undernutrition among children (n=218).

Category	Frequency (N)	%
Undernourished children	153	70.2
Not undernourished	65	29.8

Table 2: Association of age with undernutrition.

Age (in years)	Frequency (N)	%
<1	106	48.6
1–3	88	40.3
3–5	24	11.0

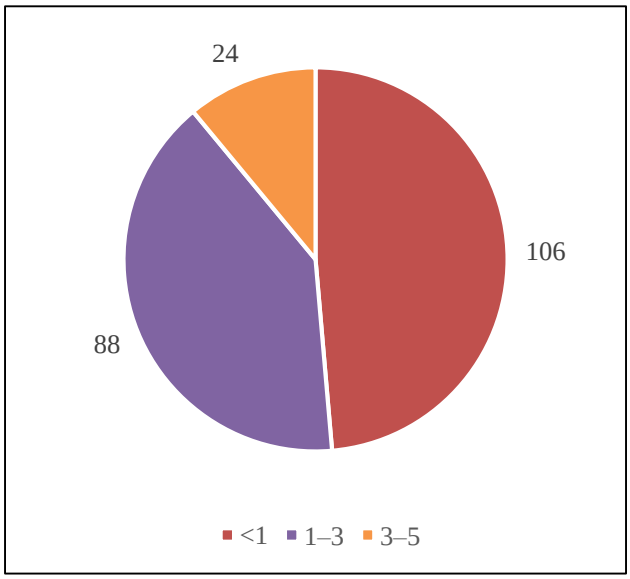

Figure 1: Association of age with undernutrition.

Table 3 and Figure 2 shows the gender distribution of the 218 participants included in the study. Males constituted the majority, accounting for 54.5% (n=119) of the total sample. Females made up 45.4% (n=99). The distribution is relatively balanced, with a slight predominance of male participants.

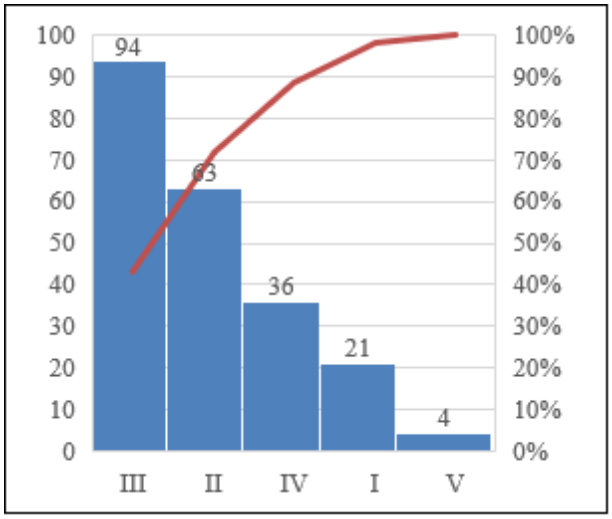

Figure 2: Association of socioeconomic status with undernutrition.

Table 3: Association of gender with undernutrition.

Gender	Frequency (N)	%
Male	119	54.5
Female	99	45.4

Table 4: Association of socioeconomic status with undernutrition.

Socioeconomic status	Frequency (N)	%
I	21	9.6
II	63	28.8
III	94	43.1
IV	36	16.5
V	4	1.8

Table 4 presents the socioeconomic classification of 218 participants. The majority belonged to Class III, representing 43.1% (n=94) of the total sample. This was followed by Class II with 28.8% (n=63) and Class IV with 16.5% (n=36). Smaller proportions were found in Class I (9.6%, n=21) and Class V (1.8%, n=4). The data suggests that most individuals came from middle-income backgrounds (Class II and III), while a very small percentage were from the lowest socioeconomic group.

Table 5: Association of maternal education with undernutrition.

Mother's education	Frequency (N)	%
Illiterate	12	5.5
School	128	58.7
Graduate and above	78	35.7

Table 5 and Figure 3 outlines the educational status of the mothers of 218 study participants. A majority, 58.7% (n=128), had completed school-level education. 35.7% (n=78) were graduates or held higher qualifications, while

only 5.5% (n=12) were illiterate. These figures indicate that a significant proportion of the mothers had at least a basic level of education, with over one-third achieving a graduate-level or higher education. Table 6 displays the distribution of gestational age among 218 study participants. A significant majority, 71.5% (n=156), were preterm births, while only 28.5% (n=62) were born at term. This highlights a high prevalence of preterm births within the study population, which may have implications for neonatal outcomes, developmental risks and healthcare needs.

Table 6: Association of gestational age with undernutrition.

Gestational age	Frequency (N)	%
Preterm	156	71.5
Term	62	28.5

DISCUSSION

This study examined the relationship between undernutrition and sociodemographic characteristics in children with cleft palates mal five who were receiving treatment at a South Indian tertiary care hospital. Children with cleft palates suffer from undernutrition due to a variety of factors, including intricate relationships between environmental factors, social determinants and biological vulnerabilities.

Due to inherent feeding challenges such nasal regurgitation, decreased oral suction and an inability to generate sufficient intraoral pressure during nursing or bottle feeding, children with cleft palates are known to be at a markedly elevated risk for undernutrition.[11] According to Miller et al, these feeding difficulties frequently cause delays in the commencement and successful weaning onto complementary foods, which results in insufficient nutrient intake and stunted growth.[12]

Prior epidemiological research has shown that children with clefts have greater prevalence rates of stunting and underweight than their counterparts without clefts. A study from Bengaluru reported undernutrition in 75% of affected children, with maternal nutrition knowledge significantly influencing feeding practices (p=0.006). Nutrition knowledge was further shaped by cleft-related information (p=0.045) and surgical details (p=0.09), underscoring the importance of caregiver education in improving nutritional outcomes in this vulnerable population.[13] 48.6% of the children in our cohort were younger than one year old, followed by 40.3% who were between one and three years old and just 11% who were between three and five years old. According to Murray et al, this age distribution is in line with the natural history of cleft feeding difficulties, which are most noticeable during the fast-growing and nutritionally demanding years of infancy and early toddlerhood.[14] Because of their poor oral coordination and nasal regurgitation, infants with cleft palates often have trouble breastfeeding. This can result in inadequate calorie intake and growth stalling at important developmental windows Miller 2011.[12]

Early dietary management is necessary because the first year is the time when low weight gain is most likely to occur, according to Miller et al in 2011.[12] This susceptible age range was highlighted by McKinney et al, who found that more than 50% of undernourished cleft patients were poorly the age of two.[15] The lower percentage of older children (3-5 years) in our study might be due to referral bias or to effective nutritional recovery following surgery, even though stunting and delayed cognitive development are two irreversible consequences of early undernutrition by Victora et al.[16] This serves as more evidence of the necessity of prompt interdisciplinary intervention and early nutritional evaluation in cleft treatment. A slight male predominance (54.5%) was seen in our analysis, which is in line with global epidemiological trends of cleft prevalence by Mossey et al. We did not, however, find a statistically significant difference in undernutrition rates by gender. In line with this, Vyas et al found that among cleft children in an Indian cohort, gender was not a reliable indicator of nutritional status.[13] According to Gallego et al, sociocultural factors pertaining to gender bias in healthcare access and eating practices, especially in South Asia, may have an impact on long-term results even if there are no noticeable nutritional differences right away.[17] More longitudinal research is necessary to clarify any potential indirect impacts on nutrition and growth caused by gender differences in health-seeking behaviour and care delivery.

Nutritional outcomes have been found to be significantly influenced by socioeconomic level (SES). The majority of the children in our sample came from middle-class (Class II) and lower-middle-class (Class III) families and the rates of moderate to severe undernutrition were significantly higher among those from lower SES backgrounds. According to Zeraati et al, children with cleft palates have restricted access to energy-dense foods, nutritional supplements and specialist feeding support due to a lack of financial means.[18]

This finding supports their findings. Long-term feeding issues are further worse by postponed surgical procedures because of financial constraints. Undernutrition risk among underprivileged people is further exacerbated by maternal malnutrition, poor household hygiene and feeding misunderstandings.[19] To improve nutritional outcomes in this population, interventions that target socioeconomic constraints are also essential. The nutritional status of children was greatly impacted by maternal education, which is in line with the large body of research worldwide that links mother literacy to the health of children by Glewwe, et al and Desai et al.[20,21]

Undernutrition was more common in children of illiterate mothers in our study than in children of mothers with formal education. According to Smith et al, mothers who possess education are more likely to follow medical and

surgical care recommendations, identify early indicators of malnutrition and implement the best nursing and supplemental feeding methods.[22] mother education has a well-established protective effect in cleft populations; Victora et al, showed that mother education about nutritional supplementation and feeding practices greatly enhanced growth indices in cleft infants. To improve dietary support and compliance, parental education should be incorporated into cleft treatment procedures.[16]

The prevalence of preterm births in our sample was 71.5%, which is significantly higher than India's national preterm birth rates, which are approximately 13% Chawanpaiboon et al.[23] According to Lawn et al, preterm new-borns with cleft palate are at a heightened risk because of their immature feeding reflexes, elevated metabolic demands and weakened immune systems.[24] Our data support the notion that these factors work in concert to promote vulnerability to undernutrition, particularly underweight and obesity. According to Lawn et al, early-life growth failure is disproportionately more likely to occur in preterm new-borns with congenital abnormalities, necessitating special dietary guidelines and careful observation.[24]

Our results highlight the vital necessity of incorporating sociodemographic risk assessments into standard care routes for clefts. The identification of individuals at risk for growth faltering requires early nutritional evaluation, especially in new-borns and toddlers. Important elements include economical support, feeding aids and nutritional guidance based on the educational attainment of the mother. Additionally, focusing multidisciplinary feeding therapies in conjunction with prompt surgical correction may help to enhance long-term developmental outcomes and minimize protracted undernutrition. Future studies should examine how sociodemographic characteristics affect growth trajectories over time after surgery and assess how well focused dietary interventions work in environments with limited resources.

CONCLUSION

The study revealed a high prevalence of undernutrition in children with cleft palate in a South Indian tertiary care setting. Socioeconomic disadvantage and lower maternal education were significantly associated with poor nutritional outcomes, underscoring the influence of modifiable social determinants. Biological parameters such as age, gender and gestational maturity were not significant predictors. The findings suggest the need for early, community-level, multidisciplinary nutritional interventions, especially in resource-constrained settings.

However, the study's limitations include its cross-sectional design, data collection from a single tertiary care centre and insufficient exploration of the interaction with modifiable behaviours such as diet and health-seeking patterns. Future research should adopt longitudinal or multi-centre designs and integrate qualitative approaches to understand how social dynamics and maternal knowledge translate into nutritional risk. This study emphasizes the need for multisectoral interventions in the care continuum for children with cleft palates.

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