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**Original article**

# PREVALENCE OF IRON DEFICIENCY ANEMIA IN CHILDREN WITH CLEFT LIP AND CLEFT PALATE- A RETROSPECTIVE STUDY.

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## Abstract

**Background:**

Cleft lip and/or cleft palate are the most prevalent craniofacial anomalies visible to the naked eye. Variations in haematological parameters can be used to determine if the immune system of these patients has been altered as a result of nutrition difficulties and recurrent infections. This study sought to determine the prevalence of malnutrition, including deficiencies in major micronutrients such as iron, folate, and vitamin B12, among children with cleft lip and/or palate, and to determine which nutritional interventions can improve the situation for these children.

**Methods :**

All infants with cleft lip and/or cleft palate younger than 5 years who attended our institute were included. On their initial visit, the following were documented: demographic information, an assessment of malnutrition, and investigations including a complete blood count and peripheral blood film examination, as well as serum levels of albumin, ferritin, iron, folate, and vitamin B12.

**Results :**

The study included 115 patients, 26 (52%) of whom were male and 24 (48%) of whom were female. 19 (38%) had a cleft lip, 10 (20%) had only a cleft palate, and 21 (42%) had both clefts.

**Conclusion :**

Iron deficiency is almost universally present in children with cleft lip and palate, according to a study. Therefore, iron and folic acid supplements should be administered upon initial contact to enhance iron reserve and haematological parameters for optimal and safe surgical outcomes.

***Keywords:*** Anemia, Cleft lip, Cleft palate, Iron deficiency, Submitted: 2023-06-22 Accepted: 2023-06-26

## 1. Introduction:

Cleft lip and/or palate is a prevalent congenital malformation globally, characterized by a separation or gap in the upper lip and/or roof of the mouth. The global prevalence of orofacial clefts, encompassing cleft lip and/or palate, is estimated to be 1 in 600 live births [1]. Despite the establishment of the Birth Defects Registry of India in 2001, there remains a paucity of data regarding the incidence of clefts in the Indian population, as reported in the literature [2, 3, 4]. Notwithstanding, an estimated annual incidence of 28,000 to 35,000 cases of clefts is reported among neonates in India. The statement suggests that the prevalence of cleft lip and/or palate among live births is approximately 1 in 500 to 800 individuals [3,

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5]. These are intricate congenital malformations that affect the nasal cavity, labial region, alveolar ridge, or palatal structures and result in respiratory difficulties, aesthetic concerns, dental abnormalities, occlusal discrepancies, craniofacial dysmorphisms, speech impairments, and auditory impairments.

Paediatric patients may experience malnourishment as a result of postnatal feeding challenges. The aetiology of feeding difficulties is attributed to neonatal oral incompetence and upper respiratory tract infections or otitis media, leading to insufficient nutrient intake during the early months of life [6, 7]. Therefore, these paediatric individuals are at a heightened risk for insufficiencies in essential vitamins and minerals. The malnourished state and low body mass index of the child create a detrimental cycle that impedes the feasibility of the corrective surgical intervention. In the absence of such intervention, the child's weight gain is compromised [8].

The ontogeny of the lip takes place during the embryonic period, specifically from the 4th to the 7th gestational week. Conversely, the formation of the palate occurs during the same period, but from the 6th to the 9th week of intrauterine life [9]. A cleft lip is a congenital anomaly that arises from inadequate development of the mesenchymal layer, resulting in the inability of the medial nasal and maxillary processes to coalesce. Conversely, a cleft palate is caused by the incomplete fusion of the palatal shelves during embryonic development. A cleft lip is a congenital anomaly that exhibits a spectrum of phenotypic expressions ranging from a minor indentation in the vermilion border to a comprehensive discontinuity affecting the integumentary, mucosal, dental, and osseous structures [10]. The lesions may exhibit unilateral manifestation, with a higher incidence on the left side, or bilateral presentation, and may affect the alveolar ridge. A midline isolated cleft palate may manifest as uvular involvement or extend through the palates to the incisive foramen. This is according to the literature [11]. In the context of a cleft lip, the anomaly may encompass the median region of the velum molle and extend into the osseous palate on one or both sides, resulting in the unilateral or bilateral presentation of the cleft palate, which exposes one or both of the nasal fossae [12].

Clefts are commonly observed in conjunction with diverse syndromes and other congenital anomalies of the body. Common comorbidities noted in afflicted patients comprise dysphagia and recurrent infections such as otitis media, cholesteatoma, maxillary sinusitis, and bronchopneumonia [6-8]. The act of breastfeeding a child can present a formidable challenge, with multiple factors potentially contributing to the difficulty. These may include the inability to generate negative intraoral pressure, as well as occasional instances of familial neglect in providing adequate nourishment to the infant [13, 14]. Therefore, these paediatric individuals are not solely lacking in the nutritional advantages provided by human milk, but also experiencing modifications in their immune systems, which may result in the development of diverse infections.

The current investigation was carried out within our academic institution to ascertain the prevalence of malnourishment, encompassing the insufficiency of significant micronutrients, among paediatric patients diagnosed with cleft lip and/or palate. The objective is to propose supplementary dietary measures beyond the current national guidelines to enhance the health status of these minors.

The investigation aimed to evaluate the prevalence of malnourishment and micronutrient inadequacy among paediatric patients under the age of 5 with primary cleft lip and/or palate who received care at our institution. The study aimed to achieve the following specific objectives:

(1) to evaluate the malnutrition status of the subjects using anthropometric measurements,

(2) to evaluate the levels of iron, ferritin, folate, and vitamin B12, and determine the prevalence of iron deficiency anaemia in children with cleft lip and/or palate, and

(3) to establish a correlation between the presence of nutritional deficiencies and the type of deformity observed in the subjects.

## 2. Material and methods:

This retrospective analytical study was carried out at Saveetha Medical College and Hospital, a tertiary care center located in Chennai, India, over a period of two years from October 2020 to October 2022. The research comprised a sample size of 50 patients. The research conducted was a cross-sectional study that was approved by the institutional ethics committee. The study enrolled paediatric patients under the age of 5 who presented with primary cleft lip and/or palate. Paediatric patients diagnosed with syndromes or presenting with secondary deformities were excluded from the study. During the initial consultation, pertinent demographic information such as age, gender, body weight, height, breastfeeding history, and socioeconomic status were documented. Anthropometric measurements of height and weight were recorded and subsequently plotted on the World Health Organisation (WHO) Z score charts for further analysis. The patient underwent a comprehensive diagnostic workup, including a complete blood count, examination of a blood smear, and measurement of serum levels of albumin, iron, ferritin, folate, and vitamin B12.

### *2.1. Inclusion criteria:*

- Patients below 5 years of age.
- Patients who are clinically diagnosed with cleft lip and cleft palate

### *2.2. Exclusion criteria:*

- Patients already had a history of blood transfusion.
- Patients with known cases of iron deficiency anemia and taking iron supplements
- Surgery-completed patients are excluded

The patients were scheduled to undergo corrective surgery between 3 and 6 months for cleft lip and 6 to 9 months for cleft palate. Patients who presented late underwent corrective surgery as quickly as possible. Eighty-one patients had complete data recorded. An automated haematology analyzer (Sysmex XN-1000; Kobe, Japan) performed a full hemogram. The levels of serum ferritin, vitamin B12, and folate were measured via chemiluminescence assay. Mild anaemia was categorized as 10.0–10.9 g/dL, moderate anaemia as 7.0–9.9 g/dL, and severe anaemia as 7.0 g/dL [4]. Serum ferritin concentrations below 12 ng/ml were categorized as low [5].

### *2.3. Data collection and analysis:*

The collected information was then tabulated and examined. 50 patients from the same age cohort who presented for reconstructive surgery served as controls. SPSS version 20 (IBM Corp., Armonk, NY, USA) was utilised for statistical analysis. Mean standard deviation was used to represent demographic data such as age, sex, etc. Student's t-test was performed to compare the levels of haemoglobin, serum ferritin, vitamin B12, and folate.

## 3. Results:

A total of 50 patients were included in the study, of which 26 (52%) were males and 24 (48%) were females (Table 1).

Based on the primary diagnosis, 19 (38%) had a cleft lip, 10 (20%) had a cleft palate and 21 (42%) had both cleft lip and palate. The combination of cleft lip and cleft palate was more common in males (Table 2).

## 4. Discussion:

Cleft lip and/or palate is a prevalent congenital malformation that has a considerable impact on the physical appearance of children [11]. Paediatric patients diagnosed with cleft lip and/or palate exhibit a higher susceptibility to malnutrition in comparison to their age-matched peers. This type of malnutrition arises from postnatal feeding difficulties, which are caused by the deformity that inhibits the child's ability to generate adequate intraoral suction pressure or from recurrent respiratory and otic infections [13]. The literature reports a variable prevalence of malnutrition ranging from 30% to 50% among infants diagnosed with cleft lip and/or palate. This is per previous academic research [15, 16]. However, there is a paucity of data regarding the prevalence of malnutrition among neonates in India.

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Table 1: **Age and Gender distribution**

| **Age** | **Frequency** | **Percentage** |
|---|---|---|
| 1-6 months | 22 | 44% |
| 6-12 months | 6 | 12% |
| 1-2.5 years | 18 | 36% |
| 2.5-5 years | 4 | 8% |
| **Gender** | **Frequency** | **Percentage** |
| Male | 26 | 52% |
| Female | 24 | 48% |

Table 2: **Cleft lip and Cleft palate distribution**

| **Cleft lip and palate** | **Number of patients** | **Percentage** |
|---|---|---|
| Cleft lip | 19 | 38% |
| Cleft palate | 10 | 20% |
| Combined cleft lip and palate | 21 | 42% |

Table 3: **Distribution of pallor, breastfeeding and paladai**

| **Pallor** | **No. of patients** | **Percentage** |
|---|---|---|
| Yes | 30 | 60% |
| No | 20 | 40% |
| **Breastfeeding** | **No. of patients** | **Percentage** |
| Yes | 48 | 96% |
| No | 2 | 4% |
| **Paladai/spoon** | **No. of patients** | **Percentage** |
| Yes | 19 | 38% |
| No | 31 | 62% |

In the current investigation, out of a cohort of 50 individuals diagnosed with cleft lip and palate, 26 were identified as male (52%) and 24 as female (48%). Nineteen individuals were clinically determined to have isolated cleft lips, representing 38% of the sample population. Ten individuals were diagnosed with isolated cleft palate, accounting for 20% of the sample population. Additionally, 21 individuals were diagnosed with combined cleft lip and cleft palate, representing 42% of the sample population. The patients were stratified based on their age group. The cohort consisted of 10 male and 12 female patients aged between 1-6 months, 3 male and 3 female patients aged between 6-12 months, 11 male and 7 female patients aged between 1-2.5 years, and 2 male and 2 female patients aged between 2.5-5 years.

Anaemia is a medical condition that affects the normal growth and development of an individual. Iron deficiency, with or without anaemia, during the initial half-year of life may result in the impaired physical and cognitive development of a child. The paediatric patient in question is prone to sustained susceptibility to pathogenic microor-

ganisms and exhibits decreased immunological resistance [17, 18]. Anaemia exerts a negative impact on the process of wound healing.

Among the cohort of patients, an examination of the peripheral blood smear revealed that 31 individuals exhibited microcytic hypochromic anaemia, accounting for 62% of the total population. Additionally, 17 patients presented with normocytic normochromic anaemia, representing 34% of the sample. The remaining 4% of patients (n=2) were diagnosed with macrocytic normochromic anaemia. A study was conducted on haemoglobin levels in a sample of 50 patients. The results showed that 10 patients had haemoglobin levels ranging from 7-9 Mg/dl, 33 patients had levels ranging from 10-12 Mg/dl, 5 patients had levels ranging from 13-15 Mg/dl, and 2 patients had levels ranging from 16-18 Mg/dl.

The study involved the examination of pallor among a cohort of 50 patients (Table 3). Out of the total sample, 30 patients exhibited pallor, representing a prevalence rate of 60%. Conversely, 20 patients did not present with pallor, accounting for 40% of the sample. Based on milk consumption, a cohort of 48 subjects were observed to have received milk through lactation (96%), while a minority of 2 subjects were unable to consume milk through this method (4%). Nineteen patients are utilizing a combination of breastfeeding and paladai/spoon to administer expressed breast milk, while 31 patients have opted not to use paladai/spoon.

## 5. Limitation:

The limitation of this investigation was that only data regarding cleft lip and palate were included.

## 6. Recommendation:

When medical personnel first come into touch with a kid who has a cleft lip and/or palate, we recommend that iron supplementation be started. This straightforward action can make a significant difference in the children's nutritional deficiencies, infection management, and haematological parameters for the face- and life-changing surgery.

## 7. Conclusion:

The prevalence of iron deficiency anaemia among individuals with cleft lip and cleft palate is nearly universal. To prevent iron deficiency anaemia, iron supplements should be started early and continued for three months before and after surgery. Folate and vitamin B12 deficiency are more prevalent in infants with both cleft lip and palate than in those with only one deformity. For optimal and safe surgery, iron and folic acid supplements should be administered immediately to enhance iron reserve and haematological parameters.

## 8. Acknowledgment:

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## 9. List of abbreviations:

WHO- World Health Organisation

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None declared

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