Haematological trends and associated congenital anomalies in children with cleft lip and palate

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ABSTRACT

Introduction: Cleft lip and palate are prevalent congenital craniofacial anomalies affecting approximately 1 in 400 live births. These conditions result from incomplete fusion of embryonic facial processes and can lead to significant aesthetic, functional, and psychological challenges. Recent studies have suggested a possible link between cleft anomalies and haematological abnormalities. This study aimed to investigate the haematological parameters and associated anomalies in children with cleft lip and/or palate admitted for surgical repair at a tertiary care hospital.

Materials and Methods: We conducted a prospective observational study involving 100 children with cleft lip and/or palate admitted between January and December 2023. Demographic data, haematological parameters (including haemoglobin, white blood cell count, and platelet count), and associated anomalies were recorded and analysed using JAMOVI software.

Results: The mean haemoglobin levels were 10.2 g/dL in cleft lip, 11.3 g/dL in cleft lip and palate, and 9.98 g/dL in cleft palate alone. Anaemia was observed in 12 children with cleft lip alone, 1 with both cleft lip and palate, and 12 with cleft palate alone. Elevated total leucocyte counts were noted in children with cleft lip and palate. Associated anomalies included Pierre Robin sequence (3%), ventricular septal defect (4%), and renal anomalies (4%). Malnutrition was detected in five children.

Conclusion: Anaemia and leucocytosis are common in children with cleft lip and/or palate. Comprehensive nutritional support and regular monitoring of haematological parameters are crucial for improving surgical outcomes and overall health in these patients.

KEYWORDS:
Cleft lip, cleft palate, anemia, leucocytosis, associated anomalies, hematological parameters

INTRODUCTION

Cleft lip and palate occur due to non-fusion of the nasal process with the palatal process during embryonic development in utero. Cleft lip/palate represents one of the most common craniofacial congenital anomalies worldwide, affecting nearly 1 in 400 live births.[1] The root cause of Cleft lip and palate is complex, involving some genetic and environmental factors. Despite advancements in surgical techniques and interdisciplinary care, children with Cleft lip/palate often face a variety of challenges, including aesthetic, functional, and psychological issues.

The in-utero development of the human lip occurs during the 4th to 8th week of gestation, and the palatal process forms between the 6th and 9th weeks of gestation.[2] The cleft in lip occurs due to maldevelopment of the mesenchymal layer, in which non-fusion of medial nasal and maxillary processes is noted, while the cleft in palate is seen because of non-fusion of palatal processes. A cleft lip is noted to have different presentations varying from a small notch in the vermilion border to a complete separation involving skin, mucosa, tooth and bone (Figure I). It can be unilateral, common on the left side or bilateral, or may involve the alveolar ridge.[5] Sometimes it is seen in the midline affecting only the uvula in case of isolated cleft palate, or may deepen into or through the palate till the incisive foramen.[2] When cleft palate is associated with cleft lip, the defect is noted involving the midline of the soft palate, hard palate, one or both sides, leading to exposure of the nasal cavities.

In recent years, there has been growing interest in exploring the potential association between Cleft lip/ palate and haematological abnormalities. Several articles have proved arise in the incidence of haematological abnormalities in individuals with Cleft lip and palate compared to the general population. These abnormalities may include variations in red blood cell indices, such as haemoglobin levels and mean corpuscular volume, as well as alterations in white blood cell counts and platelet counts.[5]

Though cleft anomalies are being diagnosed through anomaly scan in the antenatal period, since isolated cleft lip or palate has a good prognosis, many parents continue pregnancy as isolated cleft lip or palate is a correctable defect and has a good prognosis.[8] Cleft lip/palate is associated with many syndromes like Van der Woude syndrome, Pierre Robin sequence, Velocardiofacial syndrome, Median facial dysplasia, Trisomy 13/18, etc.[3] After birth, babies have certain issues like difficulty in feeding, poor weight gain, nutritional anaemia, ear infections, upper respiratory tract infections, etc. Also, babies have other non-syndrome associated cardiac defects like Ventricular Septal Defect, Tetralogy of Fallot, transposition of the great vessels, hearing defects, and cataracts.[4] Hence, we wanted to study the blood parameters and congenital anomalies associated with cleft lip and palate admitted in our tertiary care hospital and assess their incidence rates along with complications.

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Table I: Mean and standard deviation of haematological parameters

	CLEFT lip/palate	HB	TLC	RBC	PLT
N	lip	49	49	49	49
	lip/palate	7	7	7	7
	palate	44	44	44	44
Mean	lip	10.2	11207	4.71	3.43
	lip/palate	11.3	14049	4.94	4.37
	palate	9.98	11252	4.65	3.64
Median	lip	10.6	10380	4.80	3.50
	lip/palate	11.0	14650	4.81	4.48
	palate	10.5	10972	4.80	3.50
Standard deviation	lip	2.00	3424	0.662	0.737
	lip/palate	1.60	2989	0.254	0.720
	palate	1.92	3297	0.722	0.719

Note: HB-Haemoglobin, TLC- Total Leucocyte Counts, RBC-Red Blood Cells, PLT-Platelates

Table II: Associated anomalies/conditions with cleft lip/palate children

Associated anomalies/conditions	No. of children affected
Pierre robin sequence	3 (3%)
Dysmorphic facies	2 (2%)
Ventricular septal defect	4 (4%)
Severe acute malnutrition	3 (3%)
Moderate acute malnutrition	2 (2%)
Hearing defect	2 (2%)
Eye defects (cataract)	1 (1%)
Renal anomalies (PUV/VUR/HUN)	4 (4%)

MATERIALS AND METHODS

All children with cleft lip and palate admitted to the Paediatric ward under plastic surgery for surgical repair through the Smile Train programme in our hospital are enrolled in our study. A prospective observational study involving 100 children was conducted during the period from January 2023 to December 2023, and the data collected were tabulated in an Excel data sheet. After obtaining informed consent from parents, children with cleft lip/palate were enrolled, necessary history was collected, general and systemic examination was done, baseline blood investigations were sent as part of the Smile Train programme, cardiac evaluation involving ECG and echocardiogram was done along with cardiologist opinion and fitness for surgical repair. Meanwhile, specific issues like URTI, fever, aspiration, etc, are addressed and treated accordingly. All primary data, including antenatal history, delivery details, postnatal issues, anthropometry details, weight gain, associated anomalies, feeding difficulties and current complications, are collected and tabulated. Based on the data collected, a prospective observational study was done.

Inclusion criteria - Those children affected with cleft lip or palate admitted to our hospital during the study period.

Exclusion criteria - Those children whose parents are not willing to participate in study.

Statistical analysis

All Data were collected in an Excel sheet, formulated and tabulated. Data collected were analysed using JAMOVI software, the latest version 2.3.

RESULTS

In our study, we collected demographic and haematological data, analysed using JAMOVI software. In our study population, we had 50 female children (cleft lip, n=26, cleft palate, n=21, both cleft lip and palate, n=3) and 50 male children (23 had cleft lip, 23 had cleft palate, four had both). Mean birth weight was 2.74±0.35kg (Figure II). Mean birth weight was the same among the study population, and it does not show any significance related to mean haemoglobin and total counts. In our study group, 22 children were born out of consanguineous marriages, while 78 were born to non-consanguineous couples. While assessing the classification of cleft lip and palate, we found that 21 children had bilateral cleft lip, 35 children had unilateral cleft lip, 29 children had complete cleft palate, and 22 had incomplete cleft palate.

Haematological parameters (Table I) were analysed, which showed mean haemoglobin (in g%) of 10.2±2.0 (cleft lip)(Figure III), 11.3±1.60 (cleft lip and palate), 9.98±1.92 (cleft palate). Mean total leucocyte counts (Figure IV) (counts/mm3) of 11,207±3,424 (cleft lip), 14,049±2,989 (cleft lip and palate), 10,972±3,297 (cleft palate). Children had mean RBC counts (mill/mm3) of 4.71±0.66 (cleft lip), 4.94±0.25 (cleft lip and palate), and 4.65±0.72 (cleft palate). Mean platelet counts (lakhs/mm3) were noted as 3.43±0.73 (cleft lip), 4.37±0.72 (cleft lip and palate), and 3.64±0.71 (cleft palate). Mean haemoglobin among children born to consanguineous marriage is 10.4±2.65g% and 10.1±1.72g% among children born to non-consanguineous marriage. No significant difference in mean total counts among children of consanguineous and non-consanguineous marriages. (T-test applied, p-value <0.05).

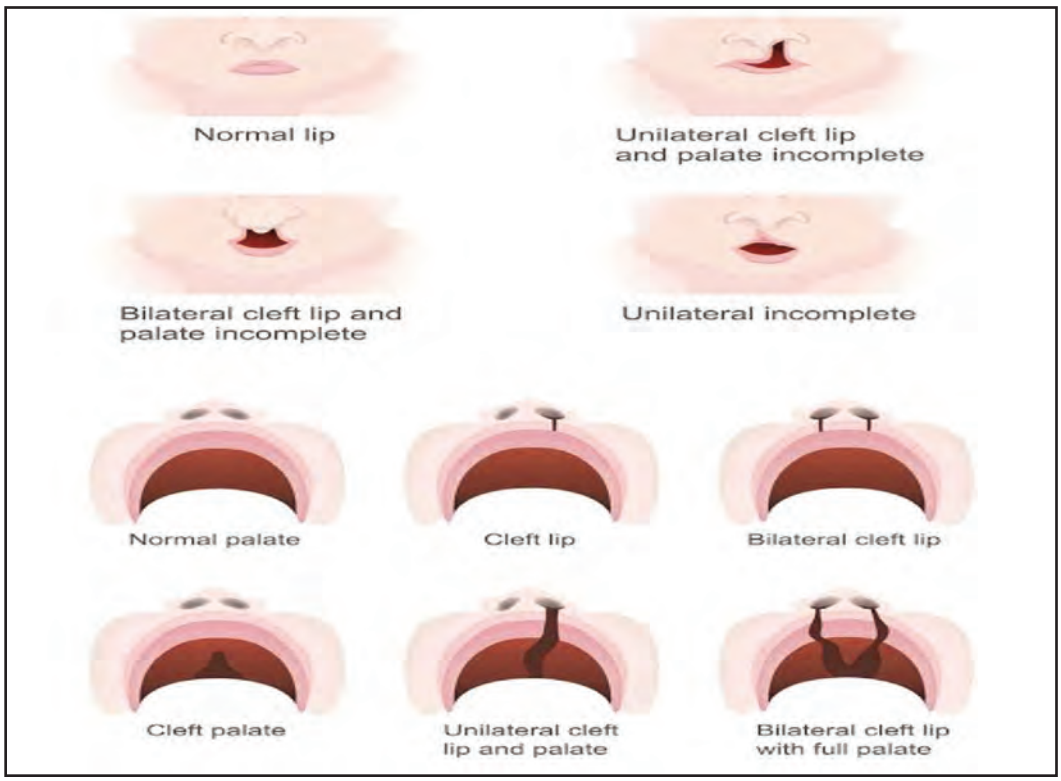

Fig. 1: Topographical classification of cleft lip and palate

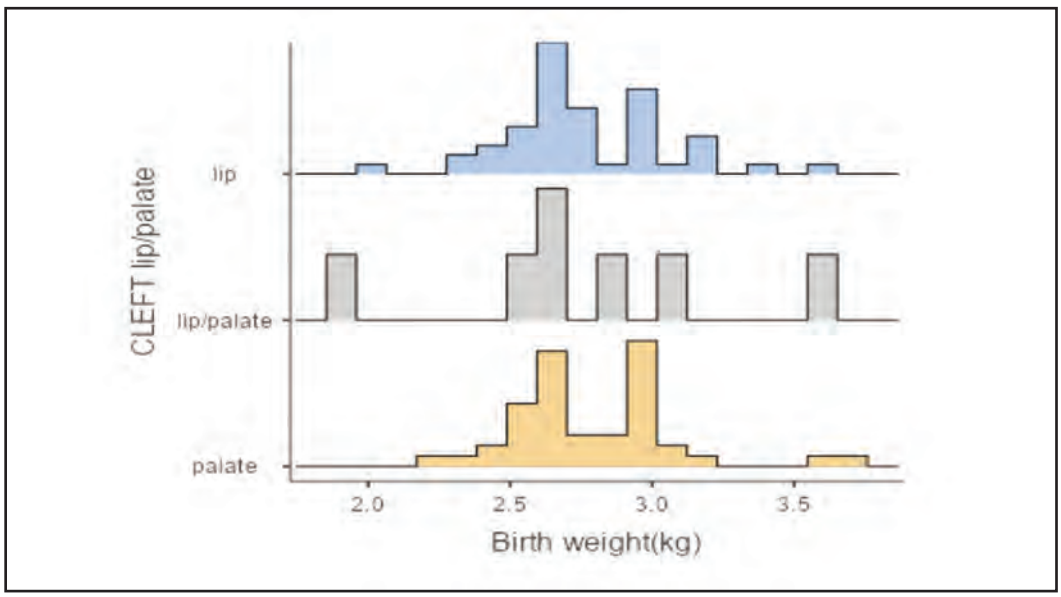

Fig. 2: Depiction of birth weight distribution among study population

We could not detect any significant difference (using ANOVA test) in blood parameters among children with cleft lip alone, cleft lip and palate, and Cleft palate alone ($p<0.05$). But anaemia was noted in 12 children with cleft lip alone, one child with both cleft lip and palate, and 12 children with cleft palate alone. There were also higher values of total leucocyte counts noted in children affected with both cleft lip and palate.

Apart from haematological parameters, three children had Pierre Robin sequence, four children had a ventricular septal defect, two children had Dysmorphic facies, two children had hearing defects, one child had congenital cataract, and four children had renal anomalies. Five children are malnourished (three with Severe acute malnutrition and two with Moderate acute malnutrition) based on anthropometry data. A total of 12 children were syndromic in our study population, of which 9 (75%) were anaemic and 11(87%) had elevated total counts.

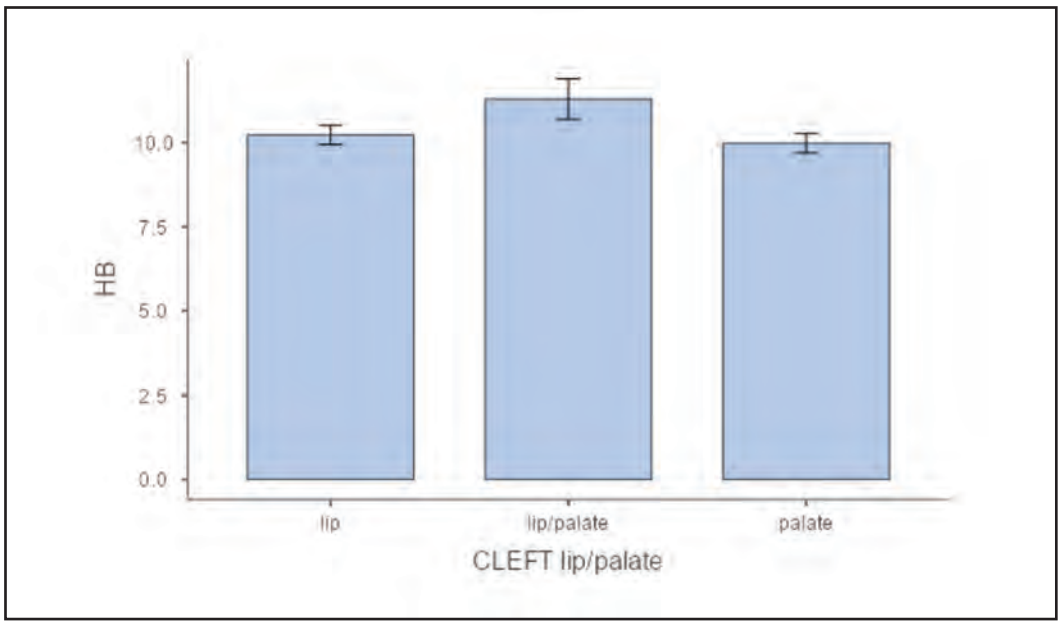

Fig. 3: Mean haemoglobin among the study population

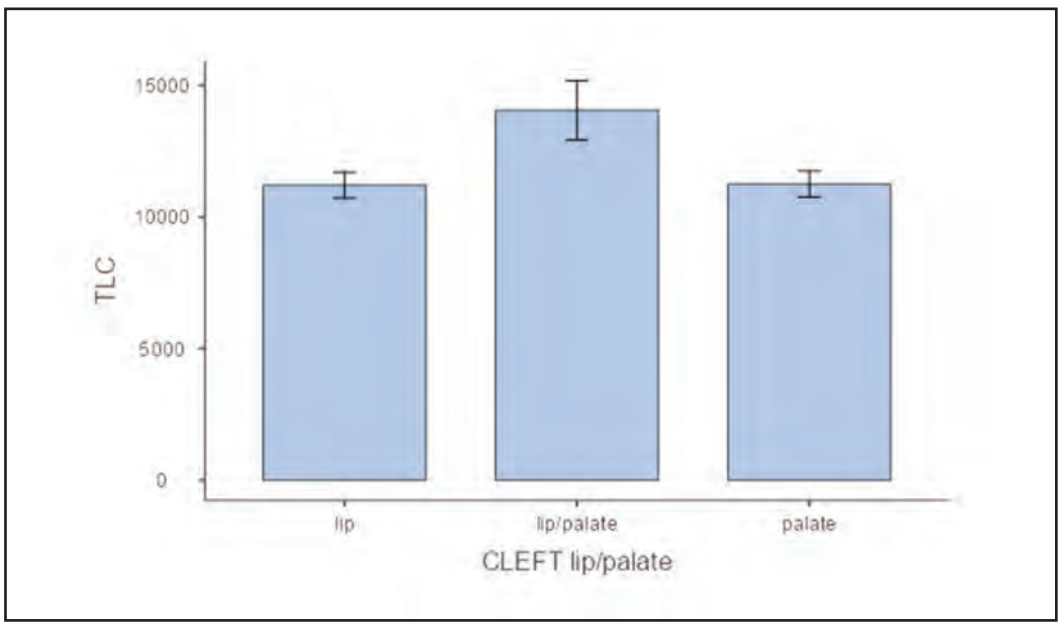

Fig. 4: Mean TLC values among the study population

DISCUSSION

Since we have a good number of children admitted for cleft lip and palate repair, we want to study the haematological trends and other associated anomalies among them. Since many studies have been done so far in various centres, we want to explore the characteristics of cleft lip/ palate children being operated on in our health centre. Previous similar studies have reported the incidence of anaemia as a major concern in children affected with cleft lip and palate.[3] Similarly, about 25% of our study group had anaemia, which poses a serious problem because cleft lip has been operated on at 3-5 months of age. Anaemia becomes a major threat to fitness for surgery. Both anaemia of infancy and nutritional anaemia (due to poor feeding tolerance in cleft lip/palate) hit these children at the same time.[6]

In a study done by Lin et al, stated that thrombocytosis and leucocytosis were typically noted in the majority of children with cleft lip and palate with both cleft lip and palate.[1] Similarly, our study results show that leucocytosis occurs in a portion of the population, particularly in children with both cleft lip and palate. It is believed to be due to micro aspiration via cleft defect into the airway while feeding the babies. These prolonged microaspirations can lead to activation of the immune system by a rise in TLC and platelets. But in our study, we did not notice any thrombocytosis in children. In a study by Singhal et al, it was concluded that the majority of their study population with cleft defect had eosinophilia in blood, but the possible reason was mentioned to be allergic response in their dwelling place –Uttarakhand.[2,11] In our study, none of the children had eosinophilia. Also, certain

studies have shown some syndromes like Downs, Robert syndrome, and Pierre Robin syndrome are commonly associated with cleft defects in children.[5] In our study, three children had Pierre Robin sequence, two children had Dysmorphic facies and four children had renal anomalies. Further Syndromic association needs a large sample size and extensive research in children with cleft defects. Hence, early anticipation, cause for such anomalies, and adequate counselling of parents can be done for a better outcome of the child in future.

CONCLUSION

From our study, we conclude that anaemia and Leucocytosis are common haematological findings noted in children with cleft lip/palate. Certain anomalies like retrognathia (Pierre Robin sequence), renal anomalies and dysmorphic facies are noted among them. We also encountered malnutrition in our study population. Since our entire study population belongs to the lower socio-economic class, it may be a confounding factor for anaemia and malnutrition. We strongly suggest that adequate antenatal counselling, proper nutritious diet, proper feeding solutions in cleft defective children and regular blood workup before surgical correction of cleft defect are essential for all children affected with cleft lip/palate. In case of the above factors being rectified, post-surgical correction, almost all children affected with cleft lip/palate can lead a near-normal life.

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