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Original Research Article

Study of etiological spectrum and clinico-hematological profile of children with bicytopenia and pancytopenia at a tertiary centre of Chhattisgarh: a cross-sectional study

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ABSTRACT

Background: Early and accurate identification of etiologies of bicytopenia or pancytopenia is vital to prevent complications, initiate timely therapy and improve outcomes in affected children. There are many studies in literature in children with pancytopenia, but there are only few studies in literature in children with bicytopenia. So far, no study has been done in children with bicytopenia and pancytopenia in Chhattisgarh.
Methods: Prospective observational study was carried out among 100 cases. All children in the age group of 6 months to 14 years and who had pancytopenia defined as Haemoglobin<10 gm%, White blood cells <4000/mm^3 with or without absolute neutrophil count <1500/mm^3, platelet count <1lac/mm^3 or bicytopenia defined as any reduction in any two cell lineages, were included.
Results: Majority belonged to the age group of 6-10 years viz. 50% with bicytopenia and those with pancytopenia belonged to the age group of 1-5 years i.e. 36.4%. Males were slightly more than females. Those with pancytopenia, the male to female ratio was equal. But those with bicytopenia, the males were more than females. The mean hemoglobin, MCV, MCH, MCHC, RDW was significantly lesser in those with bicytopenia. The mean TLC, platelet count, was significantly more in those with bicytopenia. The proportion of microcytic hypochromic and normocytic normochromic was comparable in two groups. Those with benign haematological disorders were significantly more in bicytopenia group compared to pancytopenia group. Other diseases/disorders were comparable in two groups. The outcome was comparable in two groups.
Conclusions: Bicytopenia was more common than pancytopenia and had a better prognosis. Most common etiology was SCD, Beta-thalassemia, spectrum ranging from infectious (malaria) to malignancy (leukemia). The causes reported in our study are determined by geographical locale of hospital, prevalence of malnutrition and regional occurrence of certain disease including malaria.

Keywords: Bicytopenia, Pancytopenia, Anaemia, Platelet count

INTRODUCTION

Peripheral cytopenia is defined as the reduction of blood cells (erythrocytes, leucocytes or thrombocytes). Bicytopenia is defined as the reduction in any two of three cells series, whereas pancytopenia refers to the simultaneous reduction of all three-cell series.[1] The true incidence is difficult to know as many cases are mild and transient type, which are treated on outdoor basis. As reported by Dubey et al, the incidence of cytopenia was 2.9% amongst all admitted indoor patients.[2] A study done by Singh et al, found the incidence of 1.86%.[3]

The etiology of bicytopenia and pancytopenia varies widely in children and influenced by geographical location, socioeconomic status, nutritional status and the prevalence of infectious disease.

The etiological spectrum ranges from infectious etiologies such as dengue fever, malaria, enteric fever, viral influenzae, tuberculosis, HIV, pneumonia to preventable and treatable conditions like megaloblastic anaemia, severe acute malnutrition, to severe and life-threatening illnesses-haematological malignancies like aplastic anaemia, acute lymphoblastic leukaemia and infiltration of marrow by malignant cells–myelodysplasia, myelofibrosis. Other causes include haemolytic anaemia, autoimmune disorders and bone marrow infiltration by storage disorders.[4]

Though the etiologies of bicytopenia and pancytopenia are different, yet the clinical presentations are very similar. Symptoms are attributable to anaemia, thrombocytopenia or leukopenia. The most common presenting features are fever, pallor and signs being hepatomegaly and/or splenomegaly. There is considerable overlap between the etiological factors responsible for bicytopenia and pancytopenia, making clinical differentiation difficult without detailed investigation. Identification of the underlying pathology is crucial, as it directly influences treatment, outcome and prognosis.[5]

A thorough clinical history and detailed physical examination form the cornerstone of evaluation in children presenting with cytopenia, followed by basic haematological investigations, including complete blood count and peripheral smear examination for anaemia typing. Additional investigations required were reticulocyte count, peripheral smear for malaria parasite, dengue (NS1, IgM) test, typhoid test, ESR, blood culture and sensitivity, solubility test for sickling and Hb electrophoresis, serum vit B12 and serum ferritin. Bone marrow aspiration and biopsy need to be done wherever necessary and when no obvious cause was detected. Stained slides should be examined for the bone marrow cellularity, structure, focal lesions and marrow fibrosis.[2]

Early and accurate identification of etiologies of bicytopenia or pancytopenia is vital to prevent complications, initiate timely therapy and improve outcomes in affected children. There are many studies in literature in children with pancytopenia, but there are only few studies in literature in children with bicytopenia.

So far, no study has been done in children with bicytopenia and pancytopenia in Chhattisgarh. So, we have conducted this study, to study etiological spectrum and clinico-hematological profile of children with bicytopenia and pancytopenia.

METHODS

Prospective observational study was carried out at Department of Paediatrics, CIMS Bilaspur over a period of one year among 100 cases. Institutional scientifics committee approval and the Institutional Ethics Committee approval was obtained before the initiation of the study.

All children in the age group of 6 months to 14 years and who had pancytopenia defined as Haemoglobin<10 gm%, white blood cells <4000/mm^3 with or without absolute neutrophil count <1500/mm^3, platelet count <1lac/mm^3 or bicytopenia defined as any reduction in any two cell lineages, were included. Patients who were diagnosed cases of malignancies and on chemotherapy, radiotherapy were excluded.

All numerical values were entered in MS excel 2021. Data analysis was performed by SPSS software 22.0 version. Data were summarized as mean+/- SD, frequency and percentage. The data obtained were analysed by Chi square test. Statistical significance would be considered if p value less than 0.05.

RESULTS

Majority belonged to the age group of 6-10 years viz. 50% with bicytopenia and those with pancytopenia belonged to the age group of 1-5 years i.e. 36.4%. Males were slightly more than females. Those with pancytopenia, the male to female ratio was equal. But those with bicytopenia, the males were more than females (Table 1).

Table 1: Age and gender wise distribution of patients with cytopenia.

Characteristics		Bicytopenia		Pancytopenia	
		N	%	N	%
Age (years)	6 months to one year	7	9	3	13.6
	1-5	22	28.2	8	36.4
	6-10	39	50	7	31.8
	11-14	10	12.8	4	18.2
Gender	Male	44	56.4	11	50
	Female	34	43.6	11	50

Table 2: Distribution as per clinical profile.

Clinical features		Bicytopenia		Pancytopenia	
		N	%	N	%
Symptoms	Fever	55	70.5	20	90.9
	Fatigue	39	50	14	63.6
	Pallor	51	65.4	15	68.2
	Rash	7	8.9	3	13.6
	Joint pain	18	23	1	4.5
	Icterus	13	16.6	0	0
	Malena	0	0	2	9.1
	Bleeding	2	2.5	0	0
	Epistaxis	1	2.2	0	0
Signs	Pallor	74	94.9	21	95.4
	Haemolytic facies	32	41	6	27.2
	Petechiae	19	24.3	8	36.4
	Rash	19	24.3	8	36.4
	Edema	12	15.4	7	31.8
	Purpura	11	14.1	7	31.8
	Hyperpigmentation of knuckles and toes	10	12.8	3	13.6
	Joint swelling	8	10.2	5	22.7
	Glossitis	5	6.4	4	18.2
	Icterus	7	9	1	4.5
	Bony tenderness	5	6.4	2	9.1
	Lymphadenopathy	4	5.1	2	9.1
	Gum hypertrophy	4	5.1	0	0
	Cyanosis	0	0	1	4.5

Table 3: Comparison of haematological parameters.

Mean hematological parameters	Bicytopenia	Pancytopenia	P value
Haemoglobin	6.58±2.39	6.61±1.39	0.03
TLC	12024±2334	3725±3124	0.002
Platelet count	118254±83339	77250±68782	<0.001
MCV	46.37±12.32	82±16.78	<0.001
MCH	16.7±2.40	31.2±4.31	<0.001
MCHC	18.4±6.29	31.7±7.18	<0.001
RDW	14.57±9.61	22.5±8.98	<0.001

Table 4: Comparison of peripheral smear findings in patients with cytopenia.

Peripheral smear findings	Bicytopenia		Pancytopenia		P value
	N	%	N	%	
Microcytic hypochromic	59	75.6	16	72.7	0.32
Normocytic normochromic	18	23.1	3	13.6	0.18
Macrocytic normochromic	1	1.3	3	13.6	<0.001

Table 5: Etiological spectrum among patients with cytopenia.

Etiological spectrums	Bicytopenia		Pancytopenia		P value
	N	%	N	%	
Benign haematological disorders	49	62.8	12	54.5	
Infections	21	26.9	7	31.8	0.21
Systemic illness	2	2.5	1	4.5	0.23

Continued.

Etiological spectrums	Bicytopenia		Pancytopenia		P value
Malignancy	4	5.1	2	9.1	0.2
Others	2	2.6	0	0	0.32

Table 6: Distribution of outcome among patients with cytopenia.

Outcomes	Bicytopenia		Pancytopenia		P value
	N	%	N	%	
Discharged	60	76.9	15	68.2	0.5862
Referred	12	15.4	4	18.3	
Lost to follow up	4	5.1	1	4.5	
Death	2	2.56	2	9.2	0.2

The most common symptom was fever in both the groups i.e. 70.5% in those with bicytopenia and 90.9% in those with pancytopenia. The most common clinical sign was pallor found in 94.9% of those with bicytopenia and 95.4% in those with pancytopenia (Table 2).

The mean hemoglobin, MCV, MCH, MCHC, RDW was significantly lesser in those with bicytopenia. The mean TLC, platelet count, was significantly more in those with bicytopenia (Table 3).

The proportion of Microcytic hypochromic and Normocytic normochromic was comparable in two groups (Table 4). Those with benign hematological disorders were significantly more in bicytopenia group compared to pancytopenia group. Other diseases/disorders were comparable in two groups (Table 5). The outcome was comparable in two groups (Table 6).

DISCUSSION

The present prospective observational study highlights the etiological spectrum and clinico-hematological profile of bicytopenia and pancytopenia in children admitted in a tertiary care centre of Chhattisgarh. This study was conducted in the Department of Paediatrics at Chhattisgarh Institute of Medical Sciences (CIMS) Hospital, Bilaspur from Nov. 2024 to December 2025. A study population of 100 children aged 6 months to 14 years were evaluated; who had either pancytopenia or bicytopenia. This age-wise distribution suggests that pancytopenia tends to affect younger children, possibly due to higher susceptibility to infections, nutritional deficiencies, and immature immune responses. This is in agreement with previous study done by Venkat et al, who observed that 54.6% of bicytopenia cases were in the age group 6 months to 2 years and 41.5% of pancytopenia cases were in the 1–5-year age group.[6] Vijay et al, showed that 54% of bicytopenia cases were in the age group 7-12 years and 46.7% of pancytopenia cases occurred in children below 5 years.[7] In contrast with the present study, Wadhwa et al, documented that 51.61% of bicytopenia cases were in the age group 11-18 years and 44% of pancytopenia cases occurred below 6 years of age.[8] This relatively higher occurrence of bicytopenia in older children has been attributed to commonest etiologies such as haematological malignancies (ALL) and immune-mediated cytopenia (ITP).

During our study period, 78% of subjects had bicytopenia. Of that almost 3/5th are male children and 2/5th are female children, with male -to- female ratio 1.29:1. The present study showed a slight male predominance in bicytopenia, while pancytopenia demonstrated equal distribution among males (50%) and females (50%), with no statistically significant association between gender and type of cytopenia. Similar findings were reported by Wadhwa et al, who observed a male to-female ratio of 1.3:1 out of 31 cytopenia cases.[8] In study done by Venkat et al, similar male predominance were observed with a ratio of 1.2:1. Sharma et al, studied 50 cases of cytopenia, which also reported male predominance in 56% among cases of cytopenia.[6,9] This observed male predominance in several studies is likely influenced by socio-cultural factors and preferential healthcare seeking behaviour rather than inherent biological differences. In contrast with the present study, De Bidisha et al, reported a female predominance in the 6-14 years age group, attributing this finding partly to nutritional deficiencies and autoimmune etiologies.[10] Similarly, Ashida et al, who observed a higher proportion of female patients, with nutritional anaemia being the most common cause of cytopenia.[11] These observations suggest that malnutrition and autoimmune cytopenia may disproportionately affect female children, reflecting underlying nutritional inequities and sociocultural factors in developing countries.

Fever was the most common symptom in both groups and was significantly more frequent in pancytopenia than bicytopenia (p=0.0405). Other symptoms such as fatigue and pallor were common in both groups, while bleeding manifestations were infrequent. This highlights the strong association between pancytopenia and infectious etiologies. Similar results were also found in study done by Venkat et al, which showed fever in 82% of pancytopenia cases.[6] Our findings were in accordance with previous study done by Wadhwa et al, who observed

fever in 78% of children with bi/pancytopenia.[8] Pallor and fatigue were also frequently observed in the present study. Similar findings were reported by Vijay et al, who found fever in 94%, pallor in 88% and fatigue in 62% of cases.[7] Bleeding manifestations were infrequent in the present study. This is in agreement with the study done by Sharma et al, noted fever (88%), anorexia (17%) and bleeding (14%).[9] This is attributable to fewer cases of severe thrombocytopenia.

It was observed that Pallor (95%) was the most common clinical sign in both bicytopenia and pancytopenia, followed by haemolytic facies (41%), petechiae (24.3%) and rash (24.3%) in cases of bicytopenia in our study. Other signs such as petechiae (36.4%), oedema (31.8%), purpura (31.8%), and joint swelling (22.7%) were more frequent in pancytopenia, and their overall difference between the two groups was statistically significant ($p<0.0002$). Similar findings were also found in study done by Vijay et al, pallor was the most predominant symptom in cytopenia (95%).[7] Hepatosplenomegaly (34%) and lymphadenopathy (11%) were other significant findings. Chand et al, found pallor in 94% of pancytopenia cases in his study.[11] Wadhwa et al, documented pallor (74.19%), hepatosplenomegaly (41.93%), lymphadenopathy (16.12%) and hepatomegaly (9.67%) as the predominant clinical findings.[8] This is in agreement with previous study conducted by Venkat and Bharani et al, where pallor, jaundice and bleeding manifestations were frequent in pancytopenia cases.[6] These findings indicate that clinical signs largely reflect the severity of underlying cytopenias rather than distinct etiologies.

In the present study, most patients in both groups had haemoglobin levels below 10 g/dl. Leukopenia distribution was statistically significantly among cases of cytopenia; normal and raised WBC counts were seen in bicytopenia. This difference was statistically significant with p value=0.00013 (χ^2=0.00013, $p<0.05$). Thrombocytopenia was common in both groups but was significantly more frequent in pancytopenia than bicytopenia. The difference in platelet findings between the two groups was statistically significant (χ^2= 0.0198, $p<0.05$). The mean Hb was 6.61 gm/dl in pancytopenia group as against 6.58 gm/dl in bicytopenia. Mean total leucocyte count and platelet count were found to be on higher side in bicytopenia than in pancytopenia. On applying Chi square test, the p value observed was statistically significant in the variables of mean Hb, total leucocyte count and platelet count. These differences were statistically significant for all parameters. Vijay Anand et al, similarly reported that 100% of pancytopenia cases had hemoglobin (<10 g/dl).[7] Leukopenia and thrombocytopenia were significantly more common in pancytopenia, with mean hemoglobin, total leukocyte count, and platelet count being significantly lower compared to bicytopenia ($p<0.002$). Wadhwa et al, reported leukopenia in 68% and thrombocytopenia in 72% of pancytopenia cases, while Sharma et al, observed leukopenia in 71% cases.[8,9] Venkat et al, reported platelet counts <50,000/mm³ in 42% of pancytopenia cases.[6] These findings confirm that pancytopenia represents a more severe form of bone marrow suppression.

The present study evaluated the etiological profile of bicytopenia and pancytopenia in patients presenting to a tertiary care centre in Chhattisgarh. The findings reveal distinct patterns in the causes of bicytopenia and pancytopenia, reflecting the regional disease burden and underlying genetic and environmental factors. In this study, hemoglobinopathies, particularly sickle cell disease and thalassemia major, emerged as the most common cause of bicytopenia. This observation is consistent with the fact that Chhattisgarh lies with sickle cell endemic belt of India, where hemoglobinopathies are highly prevalent due to genetic clustering and autosomal recessive inheritance. These results emphasize the significant contribution of inherited disorders to cytopenia in this region. In contrast, infections and nutritional anaemia were the predominant causes of pancytopenia in the present study. This finding highlights the continuing burden of preventable and treatable conditions such as infections and malnutrition in developing regions. The high prevalence of nutritional anaemia further reflects socioeconomic factor, dietary deficiencies, and limited access to healthcare. Our findings are comparable to those reported Vijay et al, who observed hemoglobinopathies in 28% of bicytopenia cases at tertiary care centre in Madurai, Tamil Nadu. Similarly, Sharma et al, reported infections as the most common causes of pancytopenia (38%) followed by nutritional anaemia (24%), which aligns closely with our observations.[7,9] Wadhwa et al, reported infections in 34% and nutritional anaemia in 26% of pancytopenia cases, supporting the dominance of these etiologies in Indian settings.[8] However, in contrast to our study, they observed tuberculosis in 8% of cases, while our study noted a relatively lower contribution of tuberculosis. This variation may be attributed to differences in local disease prevalence, diagnostic practices, and study populations. Venkat et al, found nutritional anaemia to be the most common cause of bicytopenia (31%) and infections (45%) as the predominant cause of pancytopenia, further reinforcing the consistency of our findings with existing literature.[6] The predominance of hemoglobinopathies in bicytopenia in our study underscores the importance of early screening, genetic counselling, and targeted public health interventions in endemic regions. Similarly, the high proportion of infections and nutritional anaemia in pancytopenia highlights the need for early diagnosis, nutritional support programs, and infection control strategies.

In our study, most children showed clinical improvement with appropriate treatment, indicating favourable outcomes when early diagnosis and prompt management are ensured. Similar recovery was noted by Wadhwa et al, with recovery in 86% of children.[8] Mortality was

higher in pancytopenia, though the difference was not statistically significant. Chand and Singh et al, reported a mortality rate of 10%, primarily due to infections.[12] In the present study, sepsis accounted for 50% of deaths, followed by sickle cell anaemia+MIC-S and SAM+sepsis (25% each). This underscores the importance of early identification and aggressive management of infections in children with cytopenias. In contrast to the favourable outcomes observed in the present study, Chandra et al, documented increased mortality in children with pancytopenia (12-15%), particularly in cases associated with aplastic anaemia, malignancy, and severe infections.[13] Similarly, Gupta et al, reported poor outcomes in pancytopenia complicated by sepsis and bone marrow failure syndromes.[1] Those contrasting findings highlight that outcomes in cytopenia are strongly influenced by the underlying etiology, severity of infection, and timeliness of diagnosis and management.

In our study, elevated ESR was observed in 8 cases (8%), making it the most frequent abnormality. Deranged liver and renal function tests were noted in 6 cases (6%). Rapid diagnostic tests for malaria were positive for Plasmodium falciparum in 6 cases (6%) and for Plasmodium vivax in 3 cases (3%). Hypocellular bone marrow findings were seen in 5 cases (5%). Chest X-ray showing consolidation was also observed in 5 cases (5%). Sputum smear microscopy for ZN staining was positive in 3 cases (3%). Deranged coagulation profile and factor VIII assay abnormalities were each identified in 2 cases (2%). ELISA for HIV was positive in 2 cases (2%). Thyroid profile abnormalities were seen in 1 case (1%). The current study showed raised ESR was the most common additional finding, followed by deranged liver and renal function tests and positive Pf RDT.

Other significant but less frequent findings included hypocellular bone marrow, coagulation abnormalities and positive HIV serology. Wadhwa et al, reported elevated ESR in 62% of cases, indicating an underlying inflammatory process in a significant proportion of patients.[8] Additionally, hypocellular bone marrow was identified in a subset of patients, a finding comparable to that reported by Sharma et al, who documented marrow hypocellularity in 12% of cases.[9] These findings emphasize the role of bone marrow examination in selected cases to establish definitive diagnosis. Gupta et al, reported raised ESR in 55-65% of cases. Bhasin et al, observed deranged liver function tests in 18-22% of children with cytopenia, particularly in infections such as viral hepatitis, malaria and sepsis.[1,14] Agarwal et al, documented malaria-related cytopenia in 10-15%, with plasmodium falciparum, being more commonly associated with severe cytopenia than *P. vivax*.[14]

Limitations

Present study sample size is small which limits the statistical power of the study. The research was conducted at a single tertiary care hospital and hence often subject to referral bias. This prospective observational study was carried out over a limited timeframe of just one year and hence may not adequately capture seasonal fluctuations or long-term trends in certain infectious causes of cytopenia, such as malaria and dengue.

CONCLUSION

Bicytopenia was more common than pancytopenia and had a better prognosis. Most common etiology was SCD, beta-thalassemia, spectrum ranging from infectious (malaria) to malignancy (leukaemia). The causes reported in our study are determined by geographical locale of hospital, prevalence of malnutrition and regional occurrence of certain disease including Malaria. Congenital haemolytic anaemia were leading causes of bicytopenia, while leukaemia and sepsis dominated pancytopenia. This significant burden of hemoglobinopathies underscores the need for screening, genetic counselling, antenatal screening and comprehensive care. Therefore, early identification of etiology is crucial, as many cases are prevented able or treatable and thereby reduces morbidity and mortality.

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REFERENCES

1. Gupta A, Bhatnagar R, Prasad P. Peripheral cytopenia in children: a hospital-based study. Int J Contemp Pediatr. 2019;7:84.
2. Dubey SR, Patel SK, Arya AK, Singh RP. Clinico-etiological spectrum of pancytopenia in hospitalized children. Int J Contemp Pediatr. 2016;3(1):169-72.
3. Singh G, Agrawal DK, Agrawal R, Suthar PP. Etiological profile of childhood pancytopenia with special reference to non-malignant presentation. Int J Med Res Prof. 2016;2(2):204-8.
4. Patil GR, Hatti S, Kumar NB, Sandeep H, Nagaraj. Clinico etiological profile of children presenting with pancytopenia in a tertiary care centre of North Karnataka region: a prospective observational study. Int J Life Sci Biotechnol Pharma Res. 2023;12(2):1907-11.
5. Jain A, Naniwadekar M. An etiological reappraisal of pancytopenia. BMC Hematol. 2013;13:10.
6. Venkat R, Bharani S. Clinico-haematological profile and etiology of bi/pancytopenia in children aged six months to eighteen years. Int J Contemp Pediatr. 2021;8:732.
7. Vijay AM, Logeshwaran K, Sreenivas A, Sathiya Suresh R. Bicytopenia and pancytopenia in children. Asian J Med Sci. 2024;15(6):113-8.
8. Wadhwa L, Chirla S, Maheshwari K, Wadhwa P. Bicytopenia/pancytopenia in children. Int J Contemp Pediatr. 2020;8:102.

9. Sharma A, Rajeshwari K, Kumar D, Gupta P, Mishra A, Kumar S, et al. Clinico-etiological profile of bicytopenia and pancytopenia. Pediatr Hematol Oncol J. 2023;8(1):34-8.
10. De Bidisha, Bahadure S, Bhake A. Evaluation of cytopenias in pediatric patients. J Datta Meghe Inst Med Sci Univ. 2020;15(2):232-7.
11. Krishnan AM, Raman SRS, Rajan LK. Aetiology of cytopenias in children. J Evid Based Med Health. 2021;8(20):1586-90.
12. Chand R, Singh N. Clinico-etiological profile of pancytopenia in children. Int J Contemp Pediatr. 2018;5(6):2173-7.
13. Chandra J, Agarwal S, Singh N. Clinico-hematological study of pancytopenia. J Fam Med Prim Care. 2019;8(12):3945-8.
14. Bhasin TS, Sharma S, Manjari M, Mannan R, Kansal V, Chandey M, Piplani S. Megakaryocyte changes in thrombocytopenia. J Clin Diagn Res. 2013;7(3):473-9.
15. Agarwal P, Shams A, Kumar H, Nigam A, Prakash P. Evaluation of pancytopenia in adults. Indian J Pathol Oncol. 2018;5(4):548-53.

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