Section: Pediatrics

Original Research Article

ETIOPATHOLOGICAL AND CLINICAL PROFILE OF PANCYTOPENIA IN INDIAN CHILD SUBJECTS AGED 1-18 YEARS

Shailesh Patel[1], Shivam Patel[2], Mukesh Kumar Patel[3], Ahilya Patel[4], Reena Patel[5]

[1]*Assistant professor, Department of Pediatrics, Shri Rawatpura Sarkar Institute of Medical Sciences and Research, Pacheda-2, Chhattisgarh, India.*
[2]*Assistant Professor, Department of Emergency Medicine, Pt. Jawaharlal Nehru Memorial Medical College, Raipur, Chhattisgarh, India.*
[3]*Assistant professor, Department of Emergency Medicine, Shri Balaji Institute of Medical Sciences Raipur, Chhattisgarh, India.*
[4]*Director, Shri Shakti Hospital, Raipur, Chhattisgarh, India.*
[5]*Senior Resident, Department of Transfusion Medicine, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India.*

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Corresponding Author:
Dr. Shivam Patel,
Assistant Professor, Department of Emergency Medicine, Pt. Jawaharlal Nehru Memorial Medical College, Raipur, Chhattisgarh, India.
Email: patelshivam999@gmail.com

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ABSTRACT

Background: Pancytopenia is a condition assessed by decreased all three blood components including anemia, thrombocytopenia, and leukopenia below the normal range. However, existing literature data is scarce concerning pancytopenia in Pediatric subjects. **Aim:** The present study aimed to assess the etiopathological and clinical profile of pancytopenia in Indian child subjects aged 1-18 years.

Material and Methods: The present study assessed 130 subjects in the age range of 1-18 years within the defined study period in the Pediatric Department of the Institute. After final inclusion, clinical and etiopathological characteristics were assessed in all the study subjects. Data gathered were analyzed statistically.

Results: The most common presenting complaints were fatigue and fever in 90% and 54% of subjects. The most common physical finding was pallor, splenomegaly, and pedal edema in 100%, 38%, and 18% of subjects respectively. Bone marrow cellularity showed hypocellular, hypercellular, and normocellular marrow in 62%, 31%, and 7% of subjects respectively. For etiology, megaloblastic anemia was reported in 30% of subjects followed by malignancies in 30% of subjects with sepsis, aplastic anemia, acute myeloid leukemia, acute lymphocytic leukemia, multiple myeloma, and myelodysplastic syndrome in 8%, 14%, 9%, 9%, 3%, and 9% subjects respectively. Rare causes of pancytopenia seen in study subjects were dengue, malaria, and disseminated tuberculosis reported in 3%, 9%, and 6% of study subjects respectively.

Conclusion: The present study concludes that the most common etiology of pancytopenia is nutritional, which is megaloblastic anemia, followed by malignancies and aplastic anemia.

Keywords: Bone marrow, Children, leukemia, Megaloblastic anemia, Pancytopenia.

INTRODUCTION

Pancytopenia is signified as a condition where ANC (absolute neutrophil count) is <1.5x109/L, the absolute platelet count is <100x109/L and the hemoglobin (Hb) level is <10g%. Pancytopenia is considered a severe condition when the hemoglobin of the subject is <7 g%, platelet count is 20x109/L, ANC is <0.5x109/L, and reticulocyte count is 1%. The frequency of the cause of pancytopenia is affected by demographic data, and hence, in developing nations, infectious and nutritional causes predominate, whereas, in developed nations, malignancies are presented as pancytopenia.[1]

Existing literature data from different geographical backgrounds in the Indian context depicted various

etiological factors being associated with pancytopenia where northern regions report megaloblastic anemia as a common etiological factor, whereas, in northeast India, most common cause of pancytopenia was aplastic anemia followed by megaloblastic anemia. Existing literature data also reported that in the Western region, the most common cause of pancytopenia was AML (acute myeloid leukemia) followed by myelodysplastic syndrome and the southern region showed normoblasts erythroid hyperplasia followed by megaloblastic anemia as etiology of pancytopenia.[2,3]

Existing literature data is scarce concerning assessing the etiopathological and clinical profile of pancytopenia in Indian subjects. Hence, it is vital to assess the frequency of causes in the Indian context for the effective and early management of treatable and reversible causes of pancytopenia which can help in decreasing associated mortality and morbidity.[4] Hence, the present study aimed to assess the etiopathological and clinical profile of pancytopenia in Indian child subjects aged 1-18 years.

MATERIALS AND METHODS

The present cross-sectional observational study was aimed to assess the etiopathological and clinical profile of pancytopenia in Indian child subjects aged 1-18 years. The study subjects were from the Department of Pediatrics of the Institute. Verbal and written informed consent were taken from all the subjects before study participation.

The study assessed subjects admitted to the Institute with the diagnosis of pancytopenia in child subjects. The study assessed 130 subjects from both genders within the age range of 1-18 years. The inclusion criteria for the study were subjects in the age range of 1-18 years, guardians willing to participate in the study, a history of recurrent blood transfusion not within the last month, and subjects with symptoms and signs of pancytopenia. Exclusion criteria for the study were subjects not willing to participate in the study, recent surgery history, known hemoglobinopathies cases inconclusive bone marrow reports, hemodilution bone marrow aspiration smears, known cases of malignancies on radiotherapy/chemotherapy, and recent blood transfusion history.

After final inclusion of the study subjects, detailed history was recorded along with demographics including ascites, altered sensorium, bleeding manifestations (bleeding from any site, petechial rash purpura, epistasis, and gum bleed), pedal edema, lymphadenopathy, splenomegaly, hepatomegaly, bony tenderness, bone pain, signs of vitamin deficiencies, skin pigmentation, icterus, and pallor like physical findings along with radiation exposure, drug intake history, family history, treatment history, and presentation age. This was followed by a comprehensive clinical examination to make the diagnosis.

Investigations were carried out in all the subjects at admission time including the assessment of blood culture, typhi dot, MP smear, folic acid levels, vitamin B12, serum ferritin, serum iron, reticulocyte counts, peripheral blood smear, platelet counts, mean corpuscular hemoglobin concentration, mean corpuscular hemoglobin, mean corpuscular volume among red blood indices, and differential and total leukocyte counts. Serological tests were also done to exclude the diagnosis of typhoid and hepatitis, neuroimaging, ultrasonography, and X-ray along with bone marrow examination to reach the diagnosis.

The data gathered were analyzed statistically using SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk. NY, USA) for assessment of descriptive measures, Students t-test, Mann-Whitney U test, Z-scores, and Spearman correlation coefficient. The results were expressed as mean and standard deviation and frequency and percentages. The p-value of <0.05 was considered statistically significant.

RESULTS

The present study aimed to assess the etiopathological and clinical profile of pancytopenia in Indian child subjects aged 1-18 years. The present study assessed 130 subjects in the age range of 1-18 years within the defined study period in the Pediatric Department of the Institute. There were 68% (n=88) males and 32% (n=42) females in the present study. There were 55% (n=72) subjects from 1-6, 29% (n=38) subjects from 7-12, and 16% (n=20) subjects from 13-18 years respectively. There were 40% (n=52) and 60% (n=80) subjects respectively from urban and rural residences. [Table 1]

On assessing the symptoms of pancytopenia in study subjects, it was seen that palpitation, giddiness, fever, easy fatigue, breathlessness, cough, lower limb edema, bleeding tendencies, loose stool, bony pain, and decreased appetite was seen in 38% (n=50), 40% (n=52), 54% (n=70), 90% (n=116), 16% (n=22), 18% (n=24), 19% (n=26), 24% (n=30), 8% (n=12), 14% (n=18), and 16% (n=22) study subjects respectively. For physical findings, purpuric spots, knuckle hyperpigmentation, glossitis, icterus, hepatomegaly, ascites, lymphadenopathy, pedal edema, splenomegaly, and pallor were seen in 6% (n=8), 10% (n=14), 12% (n=16), 14% (n=18), 18% (n=24), 18% (n=24), 18% (n=24), 18% (n=24), 18% (n=24), 38% (n=50), and 100% (n=130) study subjects respectively. [Table 2]

It was seen that for the distribution of study subjects based on bone marrow cellularity and peripheral smear, hypocellular/acellular, hypercellular, and normocellular bone marrow was seen in 62% (n=80), 31% (n=40), and 7% (n=10) subjects

respectively. In peripheral smear, normocytic hypochromic, dimorphic picture, macrocytic hypochromic, and normocytic normochromic state was seen in 8% (n=10), 28% (n=36), 30% (n=20), and 34% (n=44) subjects respectively. [Table 3]

The study results showed that for etiological diagnosis in the study subjects, disease etiology was dengue, sepsis, multiple myeloma, myelodysplastic syndrome, malaria, megaloblastic anemia, hypersplenism, disseminated tuberculosis, acute myeloid leukemia, acute leukemia, and aplastic anemia was seen in 3% (n=4), 8% (n=10), 3% (n=4), 9% (n=12), 3% (n=4), 30% (n=38), 6% (n=8), 6% (n=8), 9% (n=12), 9% (n=12), and 14% (n=18) study subjects respectively. [Table 4]

Table 1: Demographic and disease data in study subjects

S. No	Characteristics	Number (n)	Percentage (%)
1.	**Gender**		
a)	Males	88	68
b)	Females	42	32
2.	**Age range (years)**		
a)	1-6	72	55
b)	7-12	38	29
c)	13-18	20	16
3.	**Residence**		
a)	Urban	52	40
b)	Rural	78	60

Table 2: Symptoms and physical findings in study subjects

S. No	Variables	Number (n)	Percentage (%)
1.	**Symptoms**		
a)	Palpitation	50	38
b)	Giddiness	52	40
c)	Fever	70	54
d)	Easy fatigue	116	90
e)	Breathlessness	22	16
f)	Cough	24	18
g)	Lower limb edema	26	19
h)	Bleeding tendencies	30	24
i)	Loose stool	12	8
j)	Bony pain	18	14
k)	Decreased appetite	22	16
2.	**Physical findings**		
3.	Purpuric spots	8	6
4.	Knuckle hyperpigmentation	14	10
5.	Glossitis	16	12
6.	Icterus	18	14
7.	Hepatomegaly	24	18
8.	Ascites	24	18
9.	Lymphadenopathy	24	18
10.	Pedal edema	24	18
11.	Splenomegaly	50	38
12.	Pallor	130	100

Table 3: Study subjects distribution based on bone marrow cellularity and peripheral smear

S. No	Bone marrow cellularity	Number (n)	Percentage (%)
1.	**Peripheral smears**		
a)	Normocytic hypochromic	10	8
b)	Dimorphic picture	36	28
c)	Macrocytic hypochromic	20	30
d)	Normocytic normochromic	44	34
2.	**Normocellular**	10	7
3.	**Hypercellular**	40	31
4.	**Hypocellular/ acellular**	80	62

Table 4: Etiological diagnosis in the study subjects

S. No	Etiology	Number (n)	Percentage (%)
1.	**Dengue**	4	3
2.	**Sepsis**	10	8
3.	**Multiple myeloma**	4	3
4.	**Myelodysplastic syndrome**	12	9
5.	**Malaria**	4	3
6.	**Megaloblastic anemia**	38	30
7.	**Hypersplenism**	8	6
8.	**Disseminated tuberculosis**	8	6

9.	**Acute myeloid leukemia**	12	9
10.	**Acute leukemia**	12	9
11.	**Aplastic anemia**	18	14

DISCUSSION

The present study assessed 130 subjects in the age range of 1-18 years within the defined study period in the Pediatric Department of the Institute. There were 68% (n=88) males and 32% (n=42) females in the present study. There were 55% (n=72) subjects from 1-6, 29% (n=38) subjects from 7-12, and 16% (n=20) subjects from 13-18 years respectively. There were 40% (n=52) and 60% (n=80) subjects respectively from urban and rural residences. These data were comparable to the previous studies of Khunger JM et al,[5] in 2002 and Reddy GP et al,[6] in 2016 where authors assessed subjects with demographic data comparable to the present study and subjects with pancytopenia.

The study results showed that on assessing the symptoms of pancytopenia in study subjects, it was seen that palpitation, giddiness, fever, easy fatigue, breathlessness, cough, lower limb edema, bleeding tendencies, loose stool, bony pain, and decreased appetite was seen in 38% (n=50), 40% (n=52), 54% (n=70), 90% (n=116), 16% (n=22), 18% (n=24), 19% (n=26), 24% (n=30), 8% (n=12), 14% (n=18), and 16% (n=22) study subjects respectively. For physical findings, purpuric spots, knuckle hyperpigmentation, glossitis, icterus, hepatomegaly, ascites, lymphadenopathy, pedal edema, splenomegaly, and pallor were seen in 6% (n=8), 10% (n=14), 12% (n=16), 14% (n=18), 18% (n=24), 18% (n=24), 18% (n=24), 18% (n=24), 38% (n=50), and 100% (n=130) study subjects respectively. These results were consistent with the findings of Santra G et al,[7] in 2010 and Chouthai AC et al,[8] in 2020 where symptoms and physical findings of pancytopenia similar to the present study were reported by the authors in their respective studies.

Concerning the distribution of study subjects based on bone marrow cellularity and peripheral smear, hypocellular/acellular, hypercellular, and normocellular bone marrow was seen in 62% (n=80), 31% (n=40), and 7% (n=10) subjects respectively. In peripheral smear, normocytic hypochromic, dimorphic picture, macrocytic hypochromic, and normocytic normochromic state was seen in 8% (n=10), 28% (n=36), 30% (n=20), and 34% (n=44) subjects respectively. These findings were in agreement with the results of Pathak R et al,[9] in 2012 and Rathod GB et al,[10] in 2015 where the distribution of study subjects based on bone marrow cellularity and peripheral smear reported by the authors in their studies was similar to the present study.

It was seen that for etiological diagnosis in the study subjects, disease etiology was dengue, sepsis, multiple myeloma, myelodysplastic syndrome, malaria, megaloblastic anemia, hypersplenism, disseminated tuberculosis, acute myeloid leukemia, acute leukemia, and aplastic anemia was seen in 3% (n=4), 8% (n=10), 3% (n=4), 9% (n=12), 3% (n=4), 30% (n=38), 6% (n=8), 6% (n=8), 9% (n=12), 9% (n=12), and 14% (n=18) study subjects respectively. These results correlated with the findings of Gupta V et al,[11] in 2008 and Singh G et al,[12] in 2016 where etiological diagnosis in the study subjects of the present study was comparable to the etiology reported by the authors in their respective studies.

CONCLUSION

Within its limitations, the present study concludes that the most common etiology of pancytopenia is the nutritional causes which is megaloblastic anemia followed by malignancies and aplastic. However, further longitudinal studies in the future are warranted with larger subjects size residing in different geographical regions to reach definitive conclusion.

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