

Frequency of Aplastic Anemia in Children (1-15 years) with New-Onset Pancytopenia

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ABSTRACT

Background: Pancytopenia is a medical disorder in which the usual quantities of red blood cells, white blood cells, and platelets are depleted. This condition can arise from various factors, including diminished production of hematopoietic cells, ineffective hematopoiesis, or the destruction of these cells in the peripheral blood. **Objective:** To determine the frequency of aplastic anemia in children (1-15 years) with new-onset pancytopenia presenting at Children Hospital Lahore. **Study Design:** Cross sectional study. **Settings:** Department of Pediatric Medicine, Children Hospital, Lahore Pakistan. **Duration:** From August 2022 January 2023. **Methods:** This research included 250 children, covering both genders, with ages ranging from 1 month to 15 years old. These children had all been diagnosed with pancytopenia within the past month. The primary focus of the study was to determine the prevalence of aplastic anemia within this group of children. This prevalence was then examined in relation to their age, gender, and socioeconomic backgrounds. **Results:** The patient group had a mean age of 6.74 years, primarily consisting of children aged 1-10 years (86.4%). Gender distribution was fairly balanced, with 55.2% males and 44.8% females. Most patients belonged to the middle class (48.8%), followed by the lower class (35.2%) and high class (16.0%). Pallor was the most common, with 86.36% of patients experiencing it. Fever and bruises/purpura were also frequent, affecting 64.55% and 59.55% of patients, respectively. Aplastic anemia was observed in 33.60% of the children, while 66.4% did not have this condition. **Conclusion:** In children who had recently developed pancytopenia, the incidence of aplastic anemia was determined to be 33.60%. Interestingly, no noteworthy disparities in the occurrence of aplastic anemia were observed with regard to age, gender, or socioeconomic status.

Keywords: Prevalence, Periodontology, Adult gingivitis, Gingivitis, Plaque.

INTRODUCTION

Pancytopenia is a condition in which there is an abnormally low count of all three types of blood cells (RBCs, WBCs, and thrombocytes). Infections, poisons, or malignant cell infiltration into the bone marrow can all lead to a reduction in the marrow's ability to create hematopoietic cells, which can contribute to pancytopenia.^{1,2} Pancytopenia can also result from impaired hematopoiesis, arrested maturation, or peripheral blood cell death. Due to the wide variety of probable reasons, a bone marrow examination is

commonly required in cases with pancytopenia (a deficit of all three blood cell types).^{3,4} Pancytopenia is a common side effect of systemic cancer treatments including chemotherapy and myeloablative radiation therapy.⁵ Diagnosing the reason of new-onset pancytopenia in patients outside of this setting, whether they are children or adults, can be difficult. Syndromes of congenital and acquired bone marrow failure, marrow-occupying lesions, the loss of blood-forming cells in the periphery, autoimmune diseases, infections, and inefficient marrow cell generation are all possible explanations.^{6,7}

Typically, investigating new-onset pancytopenia involves a thorough examination, including a detailed review of the patient's medical history, medications, recreational drug use, and environmental exposures.⁷ While bone marrow examination often uncovers the underlying cause of pancytopenia, it may not always provide a definitive diagnosis. Recognizing the diverse range of conditions that can trigger pancytopenia can guide clinicians in recommending additional tests and clinical assessments when the marrow analysis does not pinpoint a specific cause.⁸

Aplastic anemia (AA) characterizes pancytopenia accompanied by hypo-plastic marrow. Its incidence varies by region, being lower in Europe, North America, and Brazil, and higher in Asia. This condition can affect individuals of all ages, with genetic disorders or idiopathic factors contributing to its occurrence in children. Improved care and treatment methods have enhanced outcomes for AA patients in recent decades, with 28.3% of patients with pancytopenia found to have aplastic anemia.^{9,10}

In Pakistan, pancytopenia is frequently encountered among patients in emergency departments, prompting bone marrow examinations when necessary for a precise diagnosis. However, despite the prevalence of pancytopenia, there remains a limited body of research on the frequency of aplastic anemia, with existing studies highlighting it as a major contributor. Therefore, it is imperative to conduct population-specific studies to ascertain the percentage of individuals with aplastic anemia, ultimately facilitating better understanding, diagnosis, and management of this disease.

METHODS

The study was conducted at the Department of Pediatric Medicine, Children Hospital, Lahore, spanning from August 2022 to January 2023. A sample size of 250 cases was determined, considering a 95% confidence level, a 5% margin of error, and an anticipated percentage of aplastic anemia at 28.3% in patients with newly diagnosed pancytopenia. Patient selection was performed using a Non-Probability, Consecutive Sampling method. The study included children of both genders, ranging in age from 1 month to fifteen years, who presented with new-onset pancytopenia. Exclusions encompassed patients with hepatosplenomegaly or lymphadenopathy detected through abdominal ultrasound, as well as those with a history of transfusions within the past year. A total of 220 patients who met the inclusion and exclusion criteria were enrolled in the study. Their complete blood count (CBC) reports, which had already been conducted upon admission, were tracked and recorded using a predefined proforma (see Annexure I). Subsequently, bone marrow

aspiration biopsies were performed in the hematology ward, overseen by trained hematologists.

Aplastic anemia was recorded whether it was present or absent. All the data was entered and analyzed thoroughly in SPSS version 17. Mean and standard deviation (SD) were used to describe numerical variables. The frequency and percentage distributions of the categorized variables were presented. In order to take into account potential effect modifiers, the data was further divided by age, gender, and socioeconomic position. After stratification, chi-square tests were performed at the p 0.05 level of significance.

RESULTS

The patient group had a mean age of 6.74 years, primarily consisting of children aged 1-10 years (86.4%). Gender distribution was fairly balanced, with 55.2% males and 44.8% females. Most patients belonged to the middle class (48.8%), followed by the lower class (35.2%) and high class (16.0%) as shown in table 1.

Table 1: Age distribution of patients

Variable	Values	Number (Percentage)
Age	Mean Age	6.74 ± 3.69 years
Age Classification	1-5 years	106 (42.4%)
	6-10 years	110 (44.0%)
	11-15 years	34 (13.6%)
Gender	Male	138 (55.2%)
	Female	112 (44.8%)
Socioeconomic Status	Lower Class	88 (35.2%)
	Middle Class	122 (48.8%)
	High Class	40 (16.0%)

The table 2 illustrates the prevalence of clinical features in the patient group. Pallor was the most common, with 86.36% of patients experiencing it. Fever and bruises/purpura were also frequent, affecting 64.55% and 59.55% of patients, respectively.

Table 2: Symptoms and characteristics observed in cases of pancytopenia upon initial presentation

No. of Cases	Percentage
Pallor	190 (86.36%)
Fever	142 (64.55%)
Bruises/Purpura	131 (59.55%)
Petechial Hemorrhages	47 (21.36%)
Melena	36 (16.36%)
Hematemesis	38 (17.27%)
Joint/Leg Pain	38 (17.27%)
Bleeding from Gums	47 (21.36%)
Epistaxis	56 (25.45%)
Hematuria	28 (12.73%)

The table 3 displays the frequency of aplastic anemia among the enrolled children (n=250). Aplastic anemia was observed in 33.60% of the children, while 66.4% did not have this condition. The total sample size was 250 children.

Table 3: The Frequency of Aplastic anemia in enrolled children (n=250)

Frequency (n)	Percent (%)
Present	84 (33.60%)
Not Present	166 (66.4%)
Total	250 (100%)

Table 4 showed aplastic anemia had a similar occurrence across different age groups (1-5 years: 33.3%, 6-10 years: 33.0%, 11-15 years: 33.7%), with no statistically significant differences observed ($p=0.368$). Gender did not significantly influence the frequency of aplastic anemia, as it was fairly balanced between males (32.8%) and females (33.3%) with no significant p-value difference ($p=0.453$). The incidence of aplastic anemia didn't exhibit significant disparities among different socioeconomic classes, with percentages of 34.6% in the lower class, 32.7% in the middle class, and 31.4% in the high class. The p-value for socioeconomic status was also not significant ($p=0.546$).

Table 4: Distribution of Aplastic Anemia by Age, Income, and Gender

Parameters	Variables	Frequency (n)	Percent (%)	p-value
Age Groups	1-5 years	73	33.3%	0.368
	6-10 years	73	33.0%	
	11-15 years	74	33.7%	
Gender	Male	73	32.8%	0.453
	Female	74	33.3%	
Socioeconomic Status	Lower class	73	34.6%	0.546
	Middle class	73	32.7%	
	High Class	74	31.4%	

DISCUSSION

The assessment of pancytopenia greatly benefits from a thorough examination of the bone marrow.¹¹ Aplastic anemia (AA) is the term used to describe a specific form of pancytopenia characterized by a hypo-plastic or underdeveloped bone marrow. It's worth noting that the incidence of aplastic anemia varies geographically. Reports suggest that it tends to be less common in regions like Europe, North America, and Brazil, while showing a higher prevalence in parts of Asia.¹²

In our current research, we found that the average age of the patients was 6.74 years, with a standard deviation of

3.69 years. A significant portion of the patients, specifically 42.3% individuals, fell within the 1-5 years age group. Additionally, 40.0% patients were aged between 6-10 years, followed by 17.7% patients who were in the 11-15 years age category. It's interesting to note that a comparable distribution of patients across the 1-5 years (42.0%), 6-10 years (40.0%), and 11-15 years (18.0%) age groups was also reported by Khan *et al.* in 2012, in their study of children presenting with pancytopenia.¹³

In terms of gender distribution, our study included 122 male patients (55.5%) and 98 female patients (44.5%), resulting in a male-to-female ratio of 1.2:1. This male predominance aligns with the findings of Ishtiaq *et al.* in 2004 at Holy Family Hospital, Rawalpindi, where a similar male-to-female ratio of 1.2:1 was observed.¹⁴ Similarly, Makheja *et al.* reported a male-to-female ratio of 1.3:1 among pancytopenic patients presenting at Jinnah Postgraduate Medical Centre in Karachi.¹⁵ This trend of male predominance in pancytopenic patients has also been documented previously by Gayathri *et al.* in 2011 (1.2:1) and Khunger *et al.* in 2002 (1.2:1) within the Indian population.^{16,17}

Our study showed that the most common, with 86.36% of patients experiencing it. Fever and bruises/purpura were also frequent, affecting 64.55% and 59.55% of patients, respectively. The table 3 displays the frequency of aplastic anemia among the enrolled children (n=250). Aplastic anemia was observed in 33.60% of the children, while 66.4% did not have this condition. The total sample size was 250 children. A study conducted by Memon *et al.* (2008) prevailed the initial symptom was pallor, observed in 200 cases (87%), while fever lasting beyond two weeks was prevalent in 150 cases (65%) these finding are similar to our study.¹⁸

Aplastic anemia was diagnosed in 84 (33.60%) patients. Aplastic anemia incidence did not differ significantly by age, gender, or socioeconomic level ($P>0.05$). A similar frequency of aplastic anemia among pancytopenic patients has been reported by Aziz *et al.* in 2010 (31.90%)¹⁹ in local population and Dasgupta *et al.* in 2015 (33.50%) in Indian²⁰, Jalaeikhoo *et al.* in 2017 and (29.50%) in Iranian.²¹

Understanding the prevalence of common contributing factors could assist in the identification of children at higher risk. Therefore, we strongly recommend that future research should prioritize conducting such studies to address this important aspect.

CONCLUSION

In children who had recently developed pancytopenia, the incidence of aplastic anemia was determined to be 33.60%. Interestingly, no noteworthy disparities in the occurrence of aplastic anemia were observed with regard to age, gender, or socioeconomic status.

LIMITATIONS

A significant limitation of our current study was the lack of investigation into the contributing factors responsible for aplastic anemia in these children.

SUGGESTIONS / RECOMMENDATIONS

Future research endeavors in this field deserve recognition.

CONFLICT OF INTEREST / DISCLOSURE

None.

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