



## FREQUENCY OF APLASTIC ANEMIA IN CHILDREN WITH NEW ONSET PANCYTOPENIA ON PERIPHERAL SMEAR

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### ABSTRACT

**Objective:** Ascertain the frequency of aplastic anemia in children with pancytopenia with recent onset. Examine any socioeconomic or demographic connections. The objective is to offer guidance on the prompt identification and treatment of aplastic anemia in pediatric patients who exhibit pancytopenia.

**Study Design:** A cross-sectional study

**Duration and place of study:** The department of pediatrics Combined Military Hospital Rawalpindi from 6 July 2023- 6 Feb 2024

**Methods:** The study comprised 110 individuals with peripheral blood smears who had developed pancytopenia recently. To be eligible, volunteers had to be of either gender, at least 12 years old, and sign an informed consent form. Patients had physical tests as part of the study, as well as 15 to 45 minute interviews. Data from electronic health records was also obtained.

**Results:** The study group included 110 patients, of whom n-72 (65.2%) were male and n-38 (34.8%) were female. Of the patients, n-56 (50.4%) belonged to the middle class, n-33 (30.6%) to the lower class, and n-21 (19%) to the upper class. 36 individuals (32.4%) had a diagnosis of aplastic anemia.

**Conclusion:** It was discovered that 32.4% of children with new-onset pancytopenia had aplastic anemia. The prevalence of aplastic anemia did not significantly change according to age, gender, or socioeconomic level.

**Keywords:** Frequency, Aplastic Anemia, Pancytopenia, Peripheral Smear

### INTRODUCTION

Pancytopenia, described as a reduction in all three main blood cell types—erythrocytes, leukocytes, and platelets—is a hematological condition frequently encountered in pediatric patients [1,2,3]. It can happen as a number one disease or attributable to diverse underlying pathologies, including hematologic malignancies, bone marrow failure syndromes, infectious diseases, autoimmune

disorders, and nutritional deficiencies[4,5]. Among these etiologies, aplastic anemia represents a critical problem because of its potential for life-threatening complications if no longer directly recognized and managed [6].

Aplastic anemia is characterized by a marked reduction in the production of hematopoietic stem cells in the bone marrow, leading to peripheral blood cytopenias [7,8]. While it could occur at any age, pediatric instances pose specific demanding situations owing to the complexities of diagnosis and treatment in this susceptible population [9]. The clinical presentation of aplastic anemia regularly consists of symptoms associated with pancytopenia, including fatigue, pallor, bruising, bleeding, and extended susceptibility to infections [10]. However, these manifestations are nonspecific and may overlap with other hematologic disorders, necessitating a complete diagnostic technique [11].

The gold standard for diagnosing aplastic anemia includes bone marrow aspiration and biopsy, which monitor hypocellular marrow with reduced or absent hematopoietic elements [12]. Nevertheless, due to its invasive nature and the potential risks associated with the procedure, alternative diagnostic modalities were explored. Peripheral blood smear examination represents a readily accessible and cost-effective tool in the initial evaluation of patients presenting with pancytopenia. Abnormalities discovered on peripheral smear, which includes hypocellularity, dysplastic modifications, and the presence of atypical cells, can provide valuable clues suggestive of underlying bone marrow problems, such as aplastic anemia [13].

Despite the clinical significance of aplastic anemia in pediatric patients with new-onset pancytopenia, restrained records exist regarding its frequency and related demographic elements in this population, specially inside the context of a developing country like Pakistan [14]. Understanding the epidemiology of aplastic anemia in children is vital for timely recognition and intervention, thereby enhancing results and lowering morbidity and mortality [15]. Moreover, exploring capacity socioeconomic determinants may shed light on disparities in healthcare access and outcomes amongst different strata of society.

This study objectives to investigate the frequency of aplastic anemia in children presenting with latest-onset pancytopenia, using peripheral blood smear examination as a screening tool. Additionally, the study seeks to discover any potential associations between socioeconomic status, demographic variables, and the prevalence of aplastic anemia in this cohort. By elucidating the epidemiology of aplastic anemia in pediatric patients with pancytopenia, this research endeavors to make a contribution to the development of targeted strategies for early detection and control, thereby optimizing clinical care and improving affected patient outcomes.

## **Methods**

A total of 110 pediatric patients with peripheral blood smears demonstrating pancytopenia and recent onset were protected in the study. Inclusion criteria encompassed patients of either sex, aged 12 years and above, who provided informed consent for participation. Pancytopenia changed into defined as simultaneous reduction in red blood cells, white blood cells, and platelets below normal reference ranges. Patients meeting the inclusion criteria underwent thorough physical examinations and established interviews lasting between 15 to 45 minutes to gather demographic records, scientific history, and presenting symptoms. Additionally, relevant statistics from electronic health records, such as laboratory consequences and diagnostic evaluations, were extracted for evaluation. The diagnosis of aplastic anemia was established based totally on clinical evaluation, peripheral blood smear exam, and bone marrow aspiration and biopsy findings, as in step with general diagnostic recommendations. Peripheral blood smears Were examined for morphological functions suggestive bone marrow failure, such as hypocellularity, dysplastic modifications, and the absence of abnormal cells.

## **Statistical Analysis**

The incidence of aplastic anemia in the sample population was determined by the use of suitable statistical techniques for data analysis with SPSS 28.0 Additionally, possible connections with demographic characteristics and socioeconomic status were assessed. Categorical variables were

summarized using descriptive statistics, such as frequencies and percentages. Inferential statistics, such as chi-square tests or logistic regression, were used to investigate correlations between variables. A significance level of  $p < 0.05$  was established.

### Ethical Considerations

The research followed the ethical guidelines specified in the Declaration of Helsinki and received approval from the institutional review board of Combined Military Hospital Rawalpindi. Prior to registration, all participants or their legal guardians provided informed permission, assuring that their participation was voluntary and that their personal information would be kept secure.

### Results

The study included 110 patients with a mean age  $12.04 \pm 2.02$ . The majority of patients were male (65.5%) and from middle-class families (50.9%). The most common clinical presentation of pancytopenia changed into fatigue (89.1%), followed by pallor (77.3%) and bruising (65.5%). A smaller percent of participants reported bleeding (36.4%) and infections (57.3%). Of the total sample size of 110 patients, 36 were identified as having aplastic anemia. The diagnostic method that was frequently used was bone marrow aspiration, accounting for 94.4% of cases. This was followed by bone marrow biopsy at 88.9% and peripheral blood smear at 72.2%. A significant proportion of individuals diagnosed with aplastic anemia had excellent outcomes across all three diagnostic modalities. No statistically significant correlation was found between socioeconomic position and the occurrence of aplastic anemia among the participants. In contrast, the prevalence of aplastic anemia was found to be significantly greater among those belonging to middle-class households (44.4%) as compared to those from upper-class (19.4%) and lower-class (36.1%) families. Furthermore, there was no notable correlation seen between gender and the occurrence of aplastic anemia. The prevalence of aplastic anemia was found to be slightly higher among male patients (66.7%) in comparison to female patients (33.3%). In general, the results of the study indicate that aplastic anemia is a prevalent phenomenon leading to pancytopenia among individuals in the teenage and early adult age group. Fatigue is the prevailing clinical manifestation, whereas bone marrow aspiration is the most dependable diagnostic method. The occurrence of aplastic anemia does not exhibit a statistically significant correlation with socioeconomic position or gender. Additional investigation is required to examine alternative risk factors associated with aplastic anemia within this particular demographic.

**Table 1:** Demographic Characteristics of Study Participants

Characteristic	Number of Participants (n=110)	Percentage (%)
Age (years) Mean $\pm$ SD	12.04 $\pm$ 2.02	
Range	02-12	
Gender		
Male	72	65.5%
Female	38	34.5%
Socioeconomic Status		
Upper Class	21	19.1%
Middle Class	56	50.9%
Lower Class	33	30.0%

**Table 2:** Clinical Presentation of Participants with Pancytopenia

Clinical Presentation	Number of Participants (n=110)	Percentage (%)
Fatigue	98	(89.1%)
Pallor	85	(77.3%)
Bruising	72	(65.5%)
Bleeding	40	(36.4%)
Infections	63	(57.3%)

**Table 3: Diagnostic Findings of Aplastic Anemia in Study Participants**

Diagnostic Modality	Number of Participants with Aplastic Anemia (n=36)	Percentage (%)
Peripheral Blood Smear	26	72.2%
Bone Marrow Aspiration	34	94.4%
Bone Marrow Biopsy	32	88.9%

**Table 4: Association Between Aplastic Anemia and Socioeconomic Status**

Socioeconomic Status	Aplastic Anemia (n=36)	No Aplastic Anemia (n=74)
Upper Class	7 (19.4%)	14 (19.0%)
Middle Class	16 (44.4%)	40 (54.1%)
Lower Class	13 (36.1%)	20 (27.0%)

**Table 5: Association Between Aplastic Anemia and Gender**

Gender	Aplastic Anemia (n=36)	No Aplastic Anemia (n=74)
Male	24 (66.7%)	48 (64.9%)
Female	12 (33.3%)	26 (35.1%)

## Discussion

The findings of this study align with prior research published on aplastic anemia among young adults and adolescents. The average age of the participants in this study (12.2 years) is consistent with the established age range for aplastic anemia, a condition that is frequently identified in adults aged 02-12 years [16]. The findings of this study indicate a higher proportion of males (65.5%) compared to earlier research, which has shown a male to female ratio of 1.5:1 [17]. Fatigue was the predominant clinical manifestation of pancytopenia in our investigation, accounting for 89.1% of cases. our finding aligns with earlier research [18]. Subsequently, pallor (77.3%) and bruising (65.5%) are often observed signs in individuals with aplastic anemia. Nevertheless, the prevalence of bleeding (36.4%) and infections (57.3%) among the participants in this study is comparatively lower than the findings reported in prior investigations [19]. This may be attributed to the study's exclusive inclusion of young adults and adolescents, who may have a less severe symptom of the disease in comparison to older individuals. The diagnostic results obtained in this study align with other research, as bone marrow aspiration emerged as the predominant method employed (94.4%) [20]. However, the proportion of participants who obtained a favorable outcome on all three diagnostic methods (72.2%) surpasses the findings published in previous studies [21]. This phenomenon may be attributed to the inclusion of a greater percentage of patients in this study who had received a verified diagnosis of aplastic anemia, in contrast to prior studies that may have contained a diverse range of anemia types.

The findings of this study align with other research, as they indicate a lack of substantial correlation between socioeconomic status and the occurrence of aplastic anemia [22]. However, the significant difference in the prevalence of aplastic anemia among participants from middle-class families (44.4%), compared to those from upper-class (19.4%) and lower-class (36.1%) families, is significant and underlines the need for additional research. The development of aplastic anemia may be influenced by environmental variables or lifestyle patterns commonly associated with the middle-class population.

The absence of a substantial correlation between gender and the occurrence of aplastic anemia in our study aligns with other research findings [23]. However, it is important to conduct additional research on the slightly higher proportion of male participants (66.7%) diagnosed with aplastic anemia in comparison to female participants (33.3%). The potential influence of hormonal disparities between males and females on the development of aplastic anemia requires consideration.

## Conclusion

Aplastic anemia was found to be present in 32.4% of children diagnosed with new-onset pancytopenia. There was no substantial variation observed in the prevalence of aplastic anemia based on age, gender, or socioeconomic status. Fatigue is the prevailing clinical manifestation, while bone marrow aspiration is the most dependable diagnostic method. Additional investigation is required to

examine alternative risk factors associated with aplastic anemia within this particular demographic. Prompt identification and timely intervention play a pivotal role in enhancing prognoses among persons diagnosed with aplastic anemia. It is imperative for healthcare professionals to possess knowledge regarding the clinical signs and symptoms and diagnostic approaches associated with aplastic anemia in adolescents and young adults, in order to facilitate prompt identification and treatment.

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