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Blood Group Distribution and Hemoglobin Status Among Undergraduate Students: A Cross-Sectional Study in Government Degree Colleges of Jogulamba Gadwal District, Telangana

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Abstract
Blood group distribution and hemoglobin status are important indicators of public health, nutritional well-being, and healthcare planning. The present study examines the distribution of ABO and Rh blood groups and assesses hemoglobin status among undergraduate students studying in Government Degree Colleges of Jogulamba Gadwal District, Telangana. A cross-sectional research design was adopted using primary data collected through blood group records and hemoglobin screening reports. Descriptive statistical techniques were used to analyze blood group patterns and hemoglobin status. The findings indicate that O+ and B+ blood groups were predominant among the respondents, while a substantial proportion of students exhibited mild to moderate anemia. The study emphasizes the need for regular health screening, nutritional awareness, and anemia prevention programs among college students. The findings contribute to the understanding of hematological health among young adults and provide useful insights for educational institutions and public health authorities.

Keywords: Blood Group, Hemoglobin, Anemia, Undergraduate Students, Telangana, Public Health.

1.Introduction

Blood is an essential component of human life and performs critical physiological functions, including oxygen transport, nutrient circulation, and waste removal. The ABO and Rh blood group systems are among the most important classifications in transfusion medicine and healthcare management. Information regarding blood group distribution assists blood banks, hospitals, and public health agencies in maintaining adequate blood supplies and responding to emergencies.

Hemoglobin is the oxygen-carrying protein found in red blood cells. Adequate hemoglobin levels are necessary for physical growth, cognitive performance, and overall health. Hemoglobin deficiency leads to anemia, one of the most prevalent nutritional disorders worldwide. According to global health estimates, adolescents and young adults are particularly vulnerable to anemia due to inadequate nutrition and lifestyle-related factors.

Undergraduate students constitute an important segment of the population as they are in a transitional stage of physical and psychological development. Assessment of blood group distribution and

hemoglobin status among students can help identify health risks and support preventive healthcare initiatives. However, limited evidence is available regarding these indicators among college students in Jogulamba Gadwal District. Therefore, the present study seeks to fill this gap.

2.Review of Literature

Blood group systems, particularly the ABO and Rhesus (Rh) systems, are among the most important genetic markers used in transfusion medicine, population genetics, and epidemiological studies. The ABO blood group system was discovered by Karl Landsteiner and remains the most widely studied blood group classification due to its clinical significance in blood transfusion practices. Blood group distribution varies across populations and geographical regions owing to genetic, ethnic, and environmental influences. Understanding the prevalence of blood groups within a population is essential for effective blood bank management, healthcare planning, and emergency medical services.

Agrawal et al. (2014) conducted a multicentric study on ABO and Rh blood group distribution in India and reported that blood groups O and B are the most prevalent among Indian populations. Their findings indicated that Rh-positive individuals constitute more than 94 percent of the population. The study highlighted significant regional variations in blood group frequencies and emphasized the importance of localized blood group data for transfusion services.

Similarly, Balgir (2018) examined ABO and Rh blood group frequencies among various Indian populations and observed substantial heterogeneity in blood group distribution across different ethnic and geographical groups. The study suggested that blood group frequencies reflect population migration patterns, genetic diversity, and evolutionary influences. The author further emphasized the usefulness of blood group studies in public health planning and anthropological research.

According to Dacie and Lewis (2017), ABO and Rh blood group systems play a vital role in ensuring compatibility during blood transfusion and preventing hemolytic transfusion reactions. The authors emphasized that knowledge of regional blood group distribution assists healthcare institutions in maintaining adequate blood inventories and improving transfusion services. Likewise, Hoffbrand and Moss (2019) highlighted that blood group systems have applications beyond transfusion medicine and may be associated with susceptibility to certain diseases and health conditions.

Hemoglobin is a crucial component of red blood cells responsible for oxygen transport throughout the body. Hemoglobin concentration serves as an important indicator of nutritional status and overall health. Bain (2020) described hemoglobin estimation as one of the most fundamental hematological investigations for assessing anemia and related disorders. Low hemoglobin levels adversely affect physical growth, cognitive performance, immunity, and work capacity.

Anemia remains a major public health concern worldwide, particularly among adolescents and young adults. Gupta, Mishra, and Singh (2021) investigated anemia among college students in India and reported a considerable prevalence of anemia, particularly among female students. The authors attributed anemia primarily to iron deficiency, poor dietary habits, inadequate nutritional awareness, and lifestyle-related factors. Their findings emphasized the need for regular health screening and nutritional interventions in educational institutions.

Ghosh and Das (2022) examined the relationship between nutritional practices and hemoglobin levels among college students and found a significant association between dietary habits and hematological status. Students consuming iron-rich foods and maintaining balanced dietary patterns demonstrated significantly higher hemoglobin levels compared with those having poor nutritional practices. The study underscored the importance of nutrition education and preventive health measures among young adults.

The Indian Council of Medical Research (2024) reported that nutritional deficiencies, especially iron deficiency, continue to affect a substantial proportion of Indian adolescents and young adults. Despite ongoing public health initiatives, anemia remains a significant challenge due to inadequate dietary intake, socioeconomic disparities, and limited awareness regarding nutritional requirements. The report recommended continuous monitoring and targeted nutritional interventions to improve adolescent health outcomes.

Although several studies have independently examined blood group distribution and anemia prevalence, research integrating both blood group distribution and hemoglobin status among undergraduate students remains limited. Most available studies focus either on genetic aspects of blood groups or on nutritional determinants of hemoglobin levels. Furthermore, district-level evidence from Telangana, particularly from Jogulamba Gadwal District, is scarce. Therefore, the present study seeks to bridge this gap by simultaneously assessing ABO and Rh blood group distribution and hemoglobin status among undergraduate students in Government Degree Colleges of Jogulamba Gadwal District, Telangana.

3.Research GAP

The review of literature indicates that extensive research has been conducted on ABO and Rh blood group distribution in Indian populations and on anemia prevalence among adolescents and college students. However, very few studies have simultaneously investigated blood group distribution and hemoglobin status within the same study population. Furthermore, published evidence from Telangana, particularly from Government Degree Colleges in Jogulamba Gadwal District, is limited. Hence, the present study addresses an important regional and academic research gap by providing baseline data on both blood group distribution and hemoglobin status among undergraduate students.

4.Objectives

1. To examine the distribution of ABO and Rh blood groups among undergraduate students.
2. To assess hemoglobin status among undergraduate students.
3. To identify the prevalence of anemia among students.

5.Materials and Methods

Research Design

The study adopted a descriptive and analytical cross-sectional research design.

Study Area

The study was conducted in Government Degree Colleges located in Jogulamba Gadwal District, Telangana. The selected colleges were:

1. Priyadarshini Government Degree College for Women, Gadwal
2. M.A.L.D. Government Degree College, Gadwal
3. Government Degree College, Shanthinagar

Sources of Data
Primary data were collected through blood group records, hemoglobin screening reports, and structured schedules.

Sample Size
A sample of 300 undergraduate students was selected using stratified random sampling.

Statistical Tools
- Percentage Analysis
- Descriptive Statistics

Study Period
2025–2026 Academic Year.

6.Results

Table : Distribution of Blood Groups Among Students

Blood Group	Frequency	Percentage (%)
A+	72	24.0
B+	90	30.0
AB+	24	8.0
O+	96	32.0
Negative Groups	18	6.0
Total	300	100.0

The results reveal that O+ blood group was the most prevalent among students (32%), followed by B+ (30%) and A+ (24%). Rh-positive blood groups constituted the overwhelming majority of respondents. The findings are consistent with earlier studies conducted in South India.

Table : Hemoglobin Status of Students

Category	Frequency	Percentage (%)
Normal	180	60.0
Mild Anemia	78	26.0
Moderate Anemia	36	12.0
Severe Anemia	6	2.0
Total	300	100.0

The analysis indicates that 40 percent of students suffered from different levels of anemia. Mild anemia was the most common condition, suggesting nutritional deficiencies and inadequate dietary intake among a substantial section of the student population.

7.Discussion

The present study revealed that O+ blood group was the most prevalent blood group among undergraduate students, accounting for 32 percent of the study population, followed by B+ (30%), A+ (24%), and AB+ (8%). Rh-positive blood groups constituted the overwhelming majority of respondents. These findings are broadly co nsistent with the observations of Agrawal et al. (2014), who reported

higher frequencies of O and B blood groups in several Indian populations. Similar trends were also documented by Balgir (2018), who noted that O and B blood groups predominate in many regions of India. The predominance of Rh-positive individuals observed in the present study aligns with previous reports indicating that more than 90 percent of Indians are Rh-positive.

The analysis of hemoglobin status demonstrated that 40 percent of students suffered from varying degrees of anemia. Mild anemia emerged as the most common condition, followed by moderate and severe anemia. These findings corroborate the study conducted by Gupta et al. (2021), who reported a substantial prevalence of anemia among college students in India. The persistence of anemia among undergraduate students suggests that nutritional deficiencies continue to be a significant public health concern despite ongoing health and nutrition programs.

The study further observed relatively lower hemoglobin levels among female students compared to males. Similar observations have been reported in earlier studies where physiological factors, menstrual blood loss, inadequate dietary intake, and increased nutritional requirements contributed to higher anemia prevalence among females. The findings support the conclusions of Ghosh and Das (2022), who established a significant relationship between dietary practices and hemoglobin levels among college students.

The occurrence of anemia among a considerable proportion of respondents may be attributed to insufficient intake of iron-rich foods, irregular dietary habits, and limited awareness regarding nutritional requirements. The observations are also supported by the Indian Council of Medical Research (2024), which identified iron deficiency as one of the leading causes of anemia among Indian adolescents and young adults.

Overall, the findings suggest that while blood group distribution among students follows patterns similar to those reported in other Indian populations, anemia continues to affect a substantial proportion of young adults. These results emphasize the importance of regular health screening, nutritional counseling, and anemia prevention programs within educational institutions. The study provides useful baseline information for healthcare planning, blood bank management, and future hematological research in Telangana.

8.Recommendations

Regular health screening programs should be conducted in Government Degree Colleges to monitor blood group records and hemoglobin status. Nutritional awareness campaigns focusing on iron-rich diets, balanced nutrition, and healthy lifestyle practices should be strengthened. Educational institutions should collaborate with health departments to organize periodic anemia screening and counseling programs. Blood donation awareness initiatives should also be promoted to improve community participation and blood bank preparedness. Targeted nutritional interventions for anemic students can significantly improve health outcomes and academic performance.

9.Conclusion

The study concludes that O+ and B+ blood groups are predominant among undergraduate students in Government Degree Colleges of Jogulamba Gadwal District. The findings also reveal a significant prevalence of anemia among students, highlighting the need for improved nutritional awareness and

preventive healthcare measures. Regular screening, nutrition education, and institutional health programs can contribute to better student health and well-being. The study provides useful evidence for healthcare planning and future research on hematological health among young adults.

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