

Original Research Article

Prevalence of anemia among school going adolescents in Thiruvallur district, Tamil Nadu

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ABSTRACT

Background: Nutritional anemia, with iron-deficiency anemia as the most prevalent type, is a pressing global health concern, impacting two billion people worldwide. Among vulnerable groups, school-going adolescents aged 10 to 17 years require special attention due to the critical phase of growth and development during this period. This study aims to assess the prevalence of anemia and its association with sociodemographic factors among adolescents in Thiruvallur district, Tamil Nadu.

Methods: A cross-sectional study was conducted among 900 adolescent girls, utilizing a multistage sampling technique. Hemoglobin levels were measured using one-touch blood sampling, and physical examinations were performed by trained healthcare professionals. A structured questionnaire collected sociodemographic information, dietary habits, and lifestyle factors.

Results: The study revealed a concerning prevalence of anemia, with 60% of the participants affected. Among these, 41.3% experienced moderate anemia, while 18.4% had mild anemia, and 0.4% had severe anemia. A significant correlation was observed between anemia prevalence and low socio-economic status among the participants.

Conclusions: The high prevalence of anemia among adolescent girls in Thiruvallur district underscores the urgency of targeted interventions and public health initiatives to address this critical health issue. Improving nutrition, healthcare access, and socio-economic conditions are crucial steps in combating anemia's impact on school-going adolescents. Collaborative efforts from policymakers, healthcare providers, and community organizations are essential in eradicating nutritional anemia and enhancing the health and prospects of adolescents in the studied region.

Keywords: Adolescent girls, Iron-deficiency anemia, Nutritional anemia, Prevalence, Sociodemographic factors, Thiruvallur district, Tamil Nadu

INTRODUCTION

Nutritional anemia remains a pressing global health concern, affecting individuals across various age groups and socioeconomic backgrounds.¹ Among the different types of nutritional anemias, iron-deficiency anemia stands out as the most prevalent, impacting a staggering two billion people worldwide.² Despite advancements in healthcare, anemia continues to be one of the most

common hematological abnormalities observed among children, particularly in developing countries.³

In recent years, there has been a growing recognition of the importance of studying anemia prevalence in specific population subsets.¹⁻³ One such critical group is school-going adolescents, aged between 10 and 17 years. Adolescence is a crucial phase of growth, bridging the transition from childhood to adulthood, and it requires

special attention to ensure optimal health and development.¹⁻³

In this context, our study, aims to address the prevailing issue of anemia within this age group and assess its correlation with sociodemographic factors. By focusing on this specific age range and geographical region, we hope to contribute valuable insights into the extent of anemia's impact on the health of adolescents in the Thiruvallur district.

The primary objectives of this study are twofold: first, to determine the prevalence of anemia among adolescents aged 10 to 17 years in Thiruvallur district; and second, to explore potential associations between anemia and sociodemographic factors in this population. By elucidating the prevalence and possible determinants of anemia in this specific group, our findings may inform targeted interventions and public health initiatives to address this critical health issue effectively.

To achieve our objectives, we have conducted a rigorous and systematic survey among school-going adolescents in Thiruvallur district. This research involved comprehensive data collection and analysis, ensuring that our findings are representative and reliable. We anticipate that the results of our study will shed light on the current status of anemia in this vulnerable population and lay the groundwork for evidence-based strategies to combat and prevent anemia among school-going adolescents. Furthermore, the implications of our findings may extend beyond Thiruvallur district, serving as a reference point for similar studies in other regions and contributing to the global efforts in eradicating nutritional anemia.

METHODS

Study design

This research employs a cross-sectional study design to assess the prevalence of anemia among school-going adolescents in Thiruvallur district, Tamil Nadu. The study was conducted during the period of January 2023-March 2023. The cross-sectional approach allows for data collection at a specific point in time, providing a snapshot of the prevalence of anemia in the targeted population. Ethical approval and informed consent were obtained before data collection.

Sample size

The sample size for this study is determined to be 870 participants. The prevalence of anemia in the population is estimated to be around 30%. With a desired confidence level of 95% and a confidence limit of 3%, the sample size has been calculated to ensure sufficient statistical power and precision in the findings.

Sampling technique

A multistage sampling technique will be employed to select the study participants. In the first stage, clusters of schools within Thiruvallur district will be randomly selected. In the second stage, classrooms from each selected school will be randomly chosen. Finally, all eligible students within the selected classrooms will be invited to participate in the study.

Inclusion criteria

All students who are in the adolescent age group and present to the school on the day of health check-up and are willing to participate in the study.

Exclusion criteria

Students who are absent in the day of health check-up and are not willing to participate in the study are excluded.

Data collection

A total of 900 school going adolescents' children both male and female were included for the study. The data collection process will include the following components:

Hemoglobin (Hb) measurement

One-touch blood sampling will be used to assess the hemoglobin levels of the participants. This non-invasive method ensures quick and convenient Hb measurement, allowing for efficient data collection.

Physical examination

Apart from Hb measurement, a physical examination will be conducted to assess any signs of nutritional deficiencies or health issues that may be associated with anemia. This examination will be performed by trained professionals to ensure accuracy and reliability.

Structured questionnaire

A structured questionnaire is given to each participant to gather relevant sociodemographic information, dietary habits, and lifestyle factors. The questionnaire is designed carefully to capture comprehensive data related to anemia risk factors and potential determinants.

Data analysis

The collected data will undergo rigorous statistical analysis. The prevalence of anemia among school-going adolescents in Thiruvallur district is calculated based on the Hb levels measured during the study. Additionally, associations between anemia prevalence and sociodemographic factors are explored using appropriate statistical tests.

RESULTS

In the present study, a total of 900 adolescent girls were included as participants. The distribution of these participants across different age groups was as follows: 147 (16.3%) belonged to the 10-11 years age group, 330 (36.6%) belonged to the 12-13 years age group, 259 (29%) belonged to the 14-15 years age group, and 164 (18.2%) belonged to the 16-17 years age group (Table 1).

Table 1: Age-sex wise distribution of cases in study group.

Age (years)	No. of cases	No. of male	No. of female
10-11 years	147	35	112
12-13 years	330	77	253
14-15 years	259	65	194
16-17 years	164	28	136
Total	900	205	695

To assess the prevalence of anemia among these adolescent girls, the World Health Organization (WHO) criteria for diagnosis and classification of anemia were applied.^{1,2,5} Based on the hemoglobin (Hb) levels, the following results were obtained; 417 (46.3%) of the subjects were classified as normal, with Hb levels equal to or greater than 12 g/dL. This indicates that nearly half of the adolescent girls in the study had adequate hemoglobin levels.

Mild anemia was observed in 180 (20%) subjects, with Hb levels falling between 10 and 11.9 g/dL. Mild anemia signifies a slight decrease in the oxygen-carrying capacity of red blood cells but is generally considered to be a less severe form of anemia (Table 2).

Table 2: Hemoglobin-wise distribution of cases in study group.

Hb (gm %)	No. of boys (%)	No. of girls (%)	No. of cases
Normal (≥ 12)	136 (66.3)	281 (40.4)	417
Mild (10-11.9)	40 (19.5)	140 (20.1)	180
Moderate (7-9.9)	29 (14.1)	271 (38.9)	300
Severe (< 7)	0	3 (0.4)	3
Total	205	695	900

A total of 300 (33.3%) subjects were found to have moderate anemia, characterized by Hb levels ranging from 7 to 9.9 g/dL. Moderate anemia indicates a more significant reduction in the red cell mass and oxygen-carrying capacity, which can lead to noticeable symptoms and health implications. Only 3 (0.3%) subjects were identified as having severe anemia, with Hb levels below 7 g/dL. Severe anemia is a critical health condition that requires immediate medical attention, as it can lead to life-threatening complications. The findings from this study demonstrate a notable prevalence of anemia among the adolescent girl population. It is evident that a substantial proportion of the participants experienced varying degrees of anemia, with the majority falling into the categories of mild and moderate anemia.

The study revealed a clear and significant association between socioeconomic class and anaemia prevalence. The data indicated that the maximum occurrence of anaemia was observed in individuals belonging to socioeconomic class IV and V, with percentages of 71.7% and 71.1% respectively. These findings suggest that anaemia is more prevalent in lower socioeconomic classes compared to higher classes, indicating a potential link between economic status and health outcomes (Table 3).

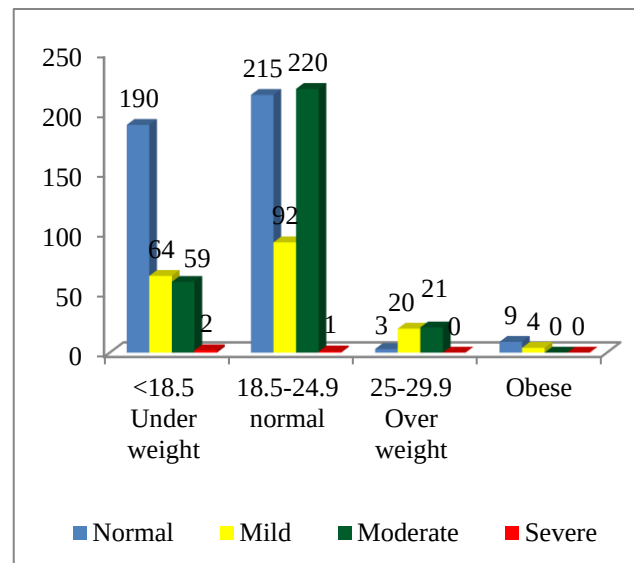


Figure 1: Association between body mass index and hemoglobin in study group.

Table 3: Association between socio economic (SE) status and hemoglobin in study group.

SE status	Mild Hb gms %	Moderate Hb gms %	Severe Hb gms %	Normal Hb gms %	Total
I	22	18	0	32	72
II	52	90	0	180	322
III	70	150	1	170	391
IV	36	42	2	35	115
Total	180	300	3	417	900

The results of the association between body mass index (BMI) and hemoglobin levels in the study group are presented in Figure 1. The table displays the number of participants in each BMI category and their

DISCUSSION

The present study revealed a concerning prevalence of anemia among adolescent girls, with 60% of the participants being affected. This high incidence of anemia is consistent with findings from other studies conducted in similar populations. For instance, Kaur et al reported a prevalence of 59.8% among adolescent girls in rural Wardha, while Rana et al and Sheshadri et al, reported similar prevalence rates of 60% and 63%, respectively.⁶⁻⁸ These collective findings underscore the urgency of addressing anemia in this vulnerable population group.

Regarding the severity of anemia, most subjects in the present study (41.3%) were found to suffer from moderate anemia, which indicates a significant decrease in red blood cell mass and oxygen-carrying capacity. Additionally, 18.4% of participants had mild anemia, while 0.4% had severe anemia. These results are in line with the observations made by Rawat et al, and Verma et al, who also noted a high incidence of mild to moderate anemia in their respective studies.^{9,10} Such prevalence of moderate anemia demands immediate attention and intervention to prevent further health complications in affected individuals.

Socio-economic and demographic factors have been recognized as crucial determinants of anemia prevalence. In this study, a substantial percentage of adolescent girls from low socio-economic backgrounds were found to suffer from anemia. These findings resonate with the study conducted by Gawarika et al, where a prevalence rate of 96.5% was observed in the weaker income group and 65.18% in the middle or higher middle-income group.¹¹ Kapoor et al also reported anemia rates of 56% in the lower middle-income group and 46% in the high socio-economic group.¹² The correlation between anemia prevalence and low socio-economic status highlights the role of poverty and limited access to nutritious food in contributing to anemia among adolescent girls.

The findings from this study indicate that a significant number of girls from the lower socio-economic strata were anemic, with 2 out of 30 girls experiencing mild anemia and 28 girls suffering from moderate anemia. These results reinforce the urgent need for targeted interventions and support systems to address the higher prevalence of anemia in poor populations. Improving access to nutritious food, promoting awareness about balanced diets, and implementing school-based health and nutrition programs are potential strategies to combat anemia in this context.¹³

The study's limitations should be considered when interpreting the results. The cross-sectional design

corresponding hemoglobin levels classified as "NORMAL," "MILD," "MODERATE," and "SEVERE." Figure 1 shows the association between body mass index and hemoglobin in study population.

provides a snapshot of anemia prevalence at a specific point in time, but it does not allow for determining causal relationships between anemia and potential contributing factors. Additionally, the study's sample size and geographical focus may limit the generalizability of the findings to other populations or regions.

The present study highlights the substantial burden of anemia among adolescent girls, with most of them suffering from moderate anemia. Low socio-economic status emerged as a significant risk factor for anemia in this population. These results underscore the importance of implementing targeted interventions and public health initiatives to address anemia and its contributing factors among adolescent girls. Efforts to improve nutrition, access to healthcare, and socio-economic conditions are crucial to enhance the overall health and well-being of this vulnerable group. Collaborative efforts from various stakeholders, including policymakers, healthcare providers, and community organizations, are essential to effectively combat anemia and improve the prospects of adolescent girls in the studied region.

As with any research, this study may have certain limitations. The cross-sectional design allows for the assessment of prevalence at a specific time point but does not establish causality. Furthermore, self-reporting bias or errors in Hb measurement could potentially influence the findings. The prevalence of anemia in the research sample may not be fully representative of the entire adolescent girl population in the region. Additionally, the cross-sectional design of the study does not allow for causal relationships to be established between anemia and other potential contributing factors.

Further research and comprehensive approaches are warranted to effectively address anemia among adolescent girls and promote their overall health during this critical stage of development.

CONCLUSION

In conclusion, addressing anemia among school-going adolescents is a critical step towards ensuring their overall well-being and prospects. Through our research, we strive to make a meaningful contribution to the field of public health and bring about positive changes in the lives of adolescents in Thiruvallur district, Tamil Nadu, and beyond.

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