RESEARCH PAPER

Estimation of haemoglobin levels among nurses in a peripheral town- Kumbakonam Urban Rural Epidemiological Study – KURES 11

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ABSTRACT
Background: The health and well-being of nursing professionals are vital to the proper functioning of the healthcare system. Nurses face a stressful work environment, including rotating shifts, a heavy workload, and occupational stress, which may impair their nutritional status and health. Anemia, defined as a decrease in the concentration of hemoglobin in the blood, may cause weakness, fatigue, and decreased cognitive ability, which may impair work productivity.
Objective: The study aimed to evaluate the prevalence of anemia among nursing personnel in a peripheral town in India and assess the demographic and occupational correlates of their hemoglobin levels.
Methods: A cross-sectional study design was used to recruit 400 nursing personnel from various government and private healthcare institutions in the peripheral town. Ethical clearance was granted by the Institutional Ethics Committee (STH Ethics – IHEC 102-2023). A structured questionnaire was used to collect information on the demographic and work-related characteristics and the presence of comorbidities. Venous blood samples were collected and analyzed using an automated analyzer to measure the concentration of hemoglobin in the blood. Statistical analysis was performed using SPSS software version 21, and descriptive statistics and Pearson's correlation were used to assess the associations between the variables.
Results: The average age of participants was 30.4 years (SD: 9.8). The average hemoglobin level was recorded as 10.49 g/dL (SD: 1.75). Out of the total participants, 144 (36%) had hemoglobin levels below 10 g/dL. Moreover, 23 (5.8%) had severe anemia, i.e., below 8 g/dL. This shows a high incidence of anemia among nursing professionals. An independent t-test comparing hemoglobin levels between government and private nurses showed no significant difference ($p > 0.05$). Pearson correlation revealed a weak association between age and hemoglobin ($r \approx 0.03$, $p > 0.05$). A chi-square test assessing qualification and anemia prevalence was not significant ($p > 0.05$). Logistic regression also showed that age and workplace were not independent predictors of anemia in this cohort.
Conclusion: Anemia is still a major health issue among nursing professionals, which might be related to work stress and lifestyle. It is strongly recommended that interventions be implemented for the health and well-being of nursing professionals. This is the first study in South India in the recent years..
Keywords: nurses, hemoglobin, nutrition, anemia
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INTRODUCTION

The health of a robust healthcare system depends considerably on the well-being of nursing professionals. Nurses have to provide crucial services every minute of the day and, hence, have to maintain an alternate shift schedule, causing physical and mental fatigue at work. Such a routine is not only bad for their health but can affect the quality of care in return. Among the many health concerns that nurses face, anemia has emerged as one of the most important ones that require attention.

Anemia is a condition characterized by a decrease in hemoglobin levels, which can cause tiredness, weakness, and poor cognitive function. This is detrimental to the ability of a nurse to be effective in her or his work. Studies have revealed that the prevalence of anemia among healthcare workers, especially nurses, is extremely high, [1-2]which can undermine their health and that of their patients.

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In the small peripheral town of India, where the healthcare resources are often scarce and workload pressure is immense, it becomes important to understand the factors which contribute to anemia among nurses.

This study aims at assessing the prevalence of anemia among nurses in the specific locality, examining possible socio-demographic, occupational, and lifestyle factors related to its occurrence. We hope that by identifying the extent of this issue, we will be able to increase awareness and develop targeted interventions that promote the health and well-being of nurses. Ensuring the health of nursing staff is essential for enhancing the overall quality of care provided to patients, thereby reinforcing the integrity of the healthcare system in our community.

Methodology:

This study was undertaken to assess the prevalence of anemia among nurses in a small peripheral town in India, focusing on demographic and occupational factors that may influence hemoglobin levels. A total of 400 nurses, encompassing a diverse range of ages and sexes, were surveyed for this purpose. The selection criteria included nurses with varying educational backgrounds and work experience, employed in either private or government healthcare settings.

Ethical approval was sought from the Institutional Ethical Committee prior to the start of the study, to ensure compliance with ethical standards and participants' rights. (STH ethics – IHEC 102-2023 – dated 05-02-2023) Informed consent was taken from all participants, assuring them of the confidentiality and anonymity of their responses.

Data collection was done by using a structured questionnaire that captured the essential demographic information, including age, sex, educational qualifications, years of work experience, and type of employment, whether private or government. We also recorded any comorbidities that the participants may have had, such as chronic diseases that could influence hemoglobin levels.

Venous blood samples were taken from all participants and analyzed using a standard automated hematology analyzer to ensure accuracy and reliability in assessing the hemoglobin levels. Hemoglobin concentration was measured in grams per deciliter (g/dL), and the values were interpreted according to established clinical guidelines for diagnosing anemia.

The collected data were, therefore, analyzed with the assistance of descriptive statistical tools like SPSS software (version 21). The main aim was to provide in-depth information regarding the population's demographic and clinical details. To study the correlations between age and type of employment (private and governmental), correlation analyses were, therefore, carried out by calculating Pearson's correlation coefficient to determine the directionality and strength of association with these variables.

This methodology will enable the comprehensive assessment of the prevalence of anemia among nurses, considering important sociodemographic and occupational factors that may influence hemoglobin levels. The results of this study will contribute to the understanding of the health status of nursing professionals and inform strategies to enhance their well-being and, therefore, the quality of healthcare delivery

The sample size was estimated using the prevalence formula:

$$n = \frac{Z^2 pq}{d^2}$$

where **Z = 1.96** (95% confidence), **p = 0.5** (assumed anemia prevalence due to lack of prior local data), **q = 1 − p = 0.5**, and **d = 0.05** (precision). The calculated sample size is **384**, which was rounded up to **400** to improve statistical reliability and account for potential data loss

Results

Among 400 nurses, the mean age was 30.4 years (SD 9.8; IQR 9.5). The sex ratio was 20:379 (male:female). Qualifications included 129 diploma holders and 270 with BSc or above. Workplaces included 64 government and 335 private employees. Mean hemoglobin was 10.49 g/dL (SD 1.75; IQR 2.40). There are **23 nurses with hemoglobin < 8 g/dL** Among the 400 nurses, 144 participants had hemoglobin < 10 g/dL. Within this subgroup, the mean hemoglobin was 8.73 g/dL (SD 0.99; IQR 1.10)((figures 1 and 2) .An independent **t-test** comparing hemoglobin levels between government and private nurses showed no significant difference ($p > 0.05$). **Pearson correlation** revealed a weak association between age and hemoglobin ($r \approx 0.03$, $p > 0.05$). A **chi-square test** assessing qualification and anemia prevalence was not significant ($p > 0.05$). Logistic regression also showed that age and workplace were **not independent predictors of anemia** in this cohort.

Figure 1. Box plot showing the distribution of hemoglobin levels among nurses (n = 400). The central line represents the median hemoglobin concentration, the box indicates the interquartile range (IQR), and the whiskers represent the overall distribution of values.

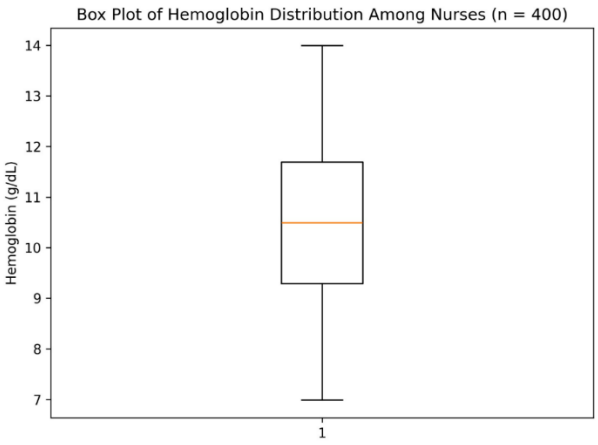
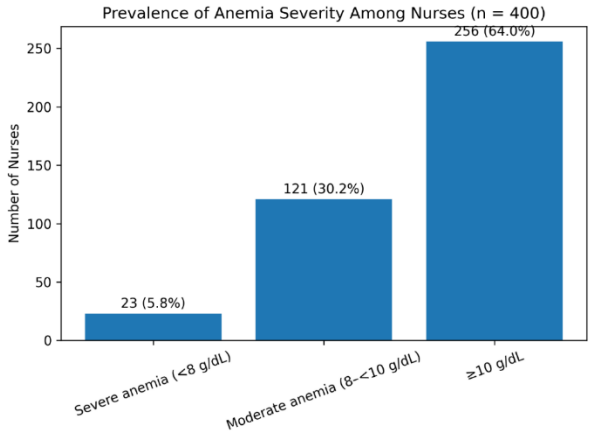


Figure 2. Prevalence of anemia severity among nurses (n = 400). Severe anemia (<8 g/dL) was observed in 23 participants (5.8%), while 121 nurses (30.3%) had hemoglobin levels between 8–<10 g/dL. Overall, 144 nurses (36%) had hemoglobin levels below 10 g/dL.



DISCUSSION:

The present study evaluated the prevalence of anemia among 400 nurses working in a peripheral town in India and demonstrated a considerable burden of reduced hemoglobin levels. The mean hemoglobin level in our cohort was 10.49 g/dL, and 36% of nurses had hemoglobin values below 10 g/dL, with 5.8% presenting severe anemia (<8 g/dL). Anemia continues to exist as a major health issue which affects nurses in their work environment[3]. Our study results show both matching elements and distinct differences when we compare them to earlier research. Yortanlı et al. [4]reported a relatively lower prevalence among nursing students, with iron deficiency observed in 22.2% and iron deficiency anemia in only 4% of participants. The higher proportion of anemia observed in our study may be explained by the inclusion of working nurses who are exposed to demanding schedules, shift duties, and occupational stress, which leads to nutritional imbalance and fatigue. Channar et al.[5]found that 53.2% of female nursing students had anemia and they showed that breakfast skipping was a major dietary behavior which increased their risk of developing anemia. The development of anemia among healthcare trainees and professionals is significantly influenced by their lifestyle choices and irregular eating habits and their work responsibilities.

The authors found that nursing students had a 42% rate of iron deficiency anemia which they possibly linked to inadequate food consumption and irregular breakfast consumption which were not studies but assumed due to irregular duty shifts. The results of this study demonstrate that dietary patterns have a major impact on the hemoglobin levels of young healthcare professionals. The research results show that nurses who work in the field experience the same level of work burden as our study group. Medeni et al. established that 10.7% of hospital nurses had iron deficiency anemia together with various iron parameter abnormalities which indicated hidden deficiencies in people who did not show clinical signs of anemia. Devi et al. established that anemia affected 50.1% of nurses at a tertiary care center and that your study found nutritional deficiencies of folate and vitamin B12 and iron as main factors. The study results show our research found a moderate rate of anemia which we consider clinically significant. Nurses need routine screening together with nutritional counselling and workplace health programs.[6-8] Healthcare workers need anemia treatment because it helps them recover better and supports excellent patient care and efficient operation of healthcare systems.

Limitations:

The study includes multiple constraints which restrict its findings. The study restricted itself to one peripheral town which had nurses working in two specific healthcare facilities thus making it difficult to apply its results to other areas. Anemia assessment used hemoglobin levels only because the testing excluded additional parameters which included serum ferritin, vitamin B12, folate, and iron indices. The authors did not conduct systematic analysis of three key aspects which included dietary habits and menstrual history and factors related to workload. The research design prevents researchers from establishing causal links between different work conditions and anemia. Multicenter research projects which include complete nutritional and biochemical testing need to take place in order to achieve better understanding. This study is just an awareness study among health professionals as such simple studies are rare to find.

CONCLUSION:

This study shows that a big percentage of nursing personnel had lower hemoglobin levels, indicating that anemia is still a major health concern. This burden may be exacerbated by rigorous work schedules, occupational stress, and potential dietary deficits. To safeguard nurses' health and continue providing efficient patient care, early detection and routine screening are crucial. Reducing the prevalence of anemia and enhancing the general health and productivity of nursing staff can be achieved by the implementation of workplace health programs, dietary advice, and preventive measures, ultimately leading on to better patient care.

Declarations:

Ethical Approval and Participant Consent

The study protocol was reviewed and approved by the Institutional Ethics Committee (STH Ethics – IHEC 102-2023 dated 05-02-2023). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrollment in the study. Participants were informed about the purpose of the research, and confidentiality and anonymity of the collected data were ensured. Participation in the study was voluntary and participants had the right to withdraw at any stage.

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study. The authors have no financial or personal relationships that could have influenced the work reported in this manuscript.

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Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions

S. Parthasarathy conceived and designed the study, supervised the research process, and critically revised the manuscript.

P. Kadaksha was involved in data collection, statistical analysis, preparation of figures, and drafting of the manuscript. The study findings were presented at an international scientific conference (**International Conference on Health and Disease Management (ICHDM 2026)** | 26-27 Feb, 2026.) by P. Kadaksha.

M. R. Suchitra contributed to methodological guidance, biochemical interpretation, literature review, and manuscript editing.

All authors have read and approved the final version of the manuscript and agree to be accountable for the integrity of the work..

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