

Impact of Residential Location on Knowledge and Awareness of Anemia: A Cross-Sectional Study in Mahesana District, Gujarat

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Abstract

Anemia is a longstanding health problem in India, affecting school-going adolescent girls, leading to profound physiological and cognitive vulnerabilities. The situation of anemic women in the district of Mehsana, Gujarat is vastly unequal in the different urban and rural parts of the district despite the various attempts at national level such as Anemia Mukh Bharat and Weekly Iron and Folic Acid Supplementation (WIFS). This comparative study assessed the behavioural and cognitive awareness of anemia in school going adolescent girls of Mehsana district and compared their clinical hemoglobin levels with the awareness. The data for the present study was gathered in 2025-2026 using a cross-sectional comparative field design with school-going girls from a balanced sample of 400 girls from rural areas and 400 girls from urban areas of the school. Health literacy was measured using a structured 45 item questionnaire, which contained 13 specific questions about anemia, graded out of a possible 39 points, in three domains: awareness, etiology and identification. Capillary hemoglobin was used to assess objective health status by immediate PoC test carried out with a calibrated digital hemoglobinometer and continuous data was analyzed using independent paired t-tests on Excel.

The independent paired t-test showed that there was no difference in the mean score of Variable 1 (33.08 \pm 3.90) and Variable 2 (32.98 \pm 3.83; $t(399) = 0.488$, two-tailed $p = 0.626$). On the other hand, clinical testing revealed a virtually universal health problem and more than 95% of all the participants had anemia. There was a mere 3.25% (26) of the rural participants and 1.25% (10) of the urban participants with healthy, normal hemoglobin levels (≥ 12.0 { g/dL}). The vast majority of girls presented with moderate anemia (8.0 - 10.9 { g/dL}), accounting for 35.5% (284) of the rural and 38.625% (309) of the urban sample. Significant finding, life-threatening severe anemia (< 8.0 { g/dL}) was more common in urban cohort (7%) as compared to rural cohort (5.125%). The results show a significant disconnect between the mind and the body as uniform health literacy is not enough to alleviate the dire clinical depletion. The urban cohort had a higher burden of moderate and severe anemia (45.625%), challenging the traditional infrastructure notions, which may be attributed to the trend of ultra-processed foods and low dietary diversity.

1. Introduction

Pathologically, anemia is a reduction in the number of circulating red blood cells or the number of circulating hemoglobin molecules below physiologic levels, compromising the ability of the blood to carry oxygen to the peripheral tissues. Anemia remains one of the most persistent public health challenges globally and in India, impacting millions of people. It is strongly linked to malnutrition, particularly

systemic iron deficiency, inadequate vitamin levels (B12 and folate) and infectious diseases in developing countries.

Although India has made a number of institutional efforts to reduce anaemia in women of reproductive age, notably the Weekly Iron and Folic Acid Supplementation (WIFS) programme and the comprehensive Anemia Mukt Bharat initiative, the country's functional status data, including that from the National Family Health Survey-5 (NFHS-5), show that more than half of women of reproductive age are still functionally anaemic, as are a large proportion of children.

The Mehsana district in North Gujarat provides an interesting region of study to examine these public health dynamics. It is defined by the juxtaposition of high density urban industrial belts and deeply traditional agrarian rural villages. This structural difference significantly affects social determinants of health such as physical access to health care facilities, access and diversity of food choices, education levels and general health literacy.

There is a huge gap between awareness and knowledge with respect to direct relation with real world and clinical level of hemoglobin in Mehsana. In filling this gap, this research has a rigorous study design that compares two balanced groups of 400 rural and 400 urban respondents.

Methodology

- **Study Design and Setting**

The study employed an experimental, cross sectional comparative and field design with a quantitative, socio-behavioral survey and objective clinical testing. Field investigations were carried out throughout the district of Mehsana in Gujarat during a specific timeframe of 2025-2026.

- **Size of the sample.**

A sample size of $N = 800$ was fixed to ensure a sufficient number of respondents in the final sample size. To achieve a clean comparative analysis, half of the sample school going girls were from rural areas and half from urban areas:

Rural ($n = 400$): Schools selected in selected villages across multiple talukas (blocks) in Mehsana.

Urban ($n = 400$): Sampled from different municipal schools located in Mehsana town and its surrounding areas.

- **Data Collection Tools**

The experimental setup adopted two different diagnostic pillars:

- **Structured Knowledge and Awareness Survey**

A comprehensive, 13 knowledge and awareness regarding question and total 45 question's questionnaire was designed and translated into the local language (Gujarati).

A 3 point mark was awarded to each correct answer and a 2 point mark was awarded for each incorrect answer and a 1 point mark awarded for each neutral answer, giving a maximum possible knowledge score of 39.

- **Clinical Hemoglobin (Hb) Verification**

This process involves verifying the clinical hemoglobin (Hb) results. Immediately after the survey, we carried out clinical hemoglobin screenings. Blood samples were taken from fingers by using aseptic practices in a capillary manner. Hemoglobin estimation was done on a calibrated digital hemoglobinometer (HemoCue Hb 201+ system) based on the principle of standard photometric methods. Severity of anemia was classified based on World Health Organization (WHO) diagnostic criteria:

Classification

- Hemoglobin Range (Adult Females)
- Normal 12.0 { g/dL}
- Mild Anemia 11.0 - 11.9 { g/dL}
- Moderate Anemia 8.0 - 10.9 { g/dL}
- Severe Anemia < 8.0 { g/dL}

- **Data Analysis**

The collected data were compiled and analyzed using excel. Independent t-tests were used to analyze continuous variables (e.g., knowledge scores, exact hemoglobin levels).

t-Test: Paired Two Sample for Means		
	<i>Variable 1</i>	<i>Variable 2</i>
Mean	33.0775	32.9825
Variance	15.18947	14.69393
Observations	400	400
Pearson Correlation	0.492465	
Hypothesized Mean Difference	0	
df	399	
t Stat	0.487839	
P(T<=t) one-tail	0.312966	
t Critical one-tail	1.648682	
P(T<=t) two-tail	0.625932	
t Critical two-tail	1.965927	

- **Anemia Classification**

Sr. No.	Haemoglobin level	rural		urban	
		F	%	F	%
1.	Normal 12.0 {g/dL}	26	3.25	10	1.25
2.	Mild Anemia 11.0 - 11.9 {g/dL}	49	6.125	25	3.125
3.	Moderate Anemia 8.0 - 10.9 {g/dL}	284	35.5	309	38.625
4.	Severe Anemia < 8.0 {g/dL}	41	5.125	56	7
Total		400	50	400	50
Source: Primary data					

Statistically, we conclude that the difference between the two groups is not significant.

Result and discussion

• Results

Evaluation of physiological data and anemia awareness throughout the Mehsana district showed that anemia awareness is statistically uniform but clinical hemoglobin (Hb) measurement shows a serious and nearly universal anemia situation in the public health sector. A structured questionnaire consisting of 13 specific items of anemia knowledge was used on a rubric of a maximum of 3 points: correct, incorrect or neutral answers. An independent two-tailed paired t-test indicated that there was no significant difference between the mean knowledge score for Variable 1 (33.08 \pm 3.90) and Variable 2 (32.98 \pm 3.83), with an absolute raw mean difference of 0.095 ($t(399) = 0.488$, $p = 0.626$). On the other hand, a digital hemoglobinometer is used to do point of care capillary hemoglobin screenings, and well over 95% of each of the 800 school-going girls is found to be suffering from anemia. Only 3.25% (26) of the rural participants and 1.25% (10) of the urban participants had healthy, normal hemoglobin levels (≥ 12.0 { g/dL}). The majority were in the Moderate Anemia category (8.0 - 10.9 { g/dL}) of 35.5% (284) of the rural sample and 38.625% (309) of the urban sample, while the number of Severe Anemia (< 8.0 { g/dL}) was noticeably higher in the urban sample at 7% (56) than in the rural sample at 5.125% (41).

• Discussion

These results reveal an unmet need for increased cognitive knowledge and understanding of the physiological health, thus showing that health literacy alone, as a uniform approach, is quite inadequate in countering the high levels of micronutrient deficiencies in North Gujarat. These findings lend support to the notion that urban areas do not predict better health outcomes because they have significantly better infrastructure as the urban cohort had a greater and more pronounced move towards moderate and severe clinical depletion (45.625 % combined) compared to the rural cohort. Urban vulnerability could be linked to changes in food consumption patterns, in favor of unhealthy, nutritionally deficient and processed food, and a decline in the consumption of traditional food diversity. Although there are a number of comprehensive schemes on the national level such as Anemia Mukht Bharat and Weekly Iron and Folic Acid Supplementation (WIFS) programme, severe iron deficiency is a major threat to the school going adolescent girls of both the geographical sectors. The findings show that while distributing knowledge in schools can be effective, it is not enough to improve behavior or reinforce compliance, and call for a shift from passive to active public health strategies such as compulsory food fortification and systematic clinical surveillance at the field level.

References

1. Frontiers in Global Women's Health. (2026). Factors associated with anemia among adolescent girls in Western India: insights from a multi-centric cross-sectional study.
2. Indian Journal of Community Medicine. (2026). Anaemia Prevalence and Its Determinants Among Adolescent Girls in Gujarat, India: A Cross-Sectional Study.
3. ResearchGate. (2026). Prevalence of Anemia among Adolescent Girls in Rural Vs. Urban Areas of Gujarat, India: A Cross-Sectional Study.
4. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. (2025). Awareness and preventive practices for anaemia among urban school going adolescent girls.
5. PubMed. (2000). Adolescent girls' Anaemia Control Programme, Gujarat, India. Indian Journal of Medical Research.

6. International Journal of Nursing Education and Research. (2020). A Study to Assess the Effectiveness of Structured Teaching Programme on Knowledge regarding Prevention of Iron deficiency Anemia in Mehsana.
7. Journal of Education and Trust for Research (JETIR). (2024). A study to assess the effectiveness of structured teaching program on knowledge regarding iron deficiency anemia among girls of Mehsana district.
8. WHO Guidelines on Nutritional Anaemia assessment and geographical mapping parameters.
9. Data source: Primary data from survey for study of Nutritional Status among School Girls of Mehsana district