

Original Research Article

Community-based baseline survey regarding prevalence of anemia among females of different age categories under Anemia Mukht Abhiyan in District Ambala, Haryana

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Received: 23 November 2022

Revised: 12 January 2023

Accepted: 13 January 2023

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ABSTRACT

Background: Anemia is the most common micronutrient deficiency. Despite repeated efforts taken under the national program, high prevalence of anemia still observed across various life stages of females in India over the past two decades.

Methods: This cross-sectional study aimed to discern the prevalence of anemia in the non-pregnant and non-lactating females of Ambala, Haryana, between the ages of 6 months to 49 years using the gold standard cyan-met-hemoglobin method.

Results: A total of 1, 21, 202 study subjects, with a mean age of 28.9 ± 19.3 years were tested for hemoglobin across 524 villages, out of which 97,305 (80.1%) females were found to be anemic with mean hemoglobin level of 10.8 ± 1.4 gm% with 53.2% of all females being moderately anemic.

Conclusions: This study reported that anemia is extremely prevalent in all walks of life of females. Multipronged strategy is to be followed to curb anemia from various age groups of females.

Keywords: Anemia, Anemia Mukht Haryana, Cyan-met-hemoglobin method, Females, India, Walks of life of females

INTRODUCTION

Anemia is a global public health problem affecting both developing and developed countries with major negative consequences on human health as well as socio-economic development. It occurs at all stages of the life cycle but is more prevalent in pregnant women and young children.¹ Anemia is one of the most common micronutrient deficiency disorders on this earth, ironically caused by the deficiency of the most abundant mineral on earth. It is a condition in which the number and size of red blood cells or the hemoglobin concentration falls below an established cut-off value, consequently impairing the

capacity of blood to transport oxygen.² Micronutrient deficiencies including folate and vitamin B₁₂ also contribute to anemia. However, recent evidence also pointing that anemia is also due to inflammation caused by parasitic infections including malaria and inherited disorders such as hemoglobinopathies also contribute to anemia.^{3,4}

As per the recorded data set two billion people are anemic worldwide, which includes 315 million in the South East Asia Region (SEAR). WHO estimates that 12.8% of maternal deaths in the Asia region could be related to anemia. In the SEAR, a total of 202.0 million women of

reproductive age (WRA) are anemic. The overall anemia prevalence among non-pregnant women is 41.5 % with 1.9% of women being severely anemic.^{5,6} National Family Health Survey-IV data revealed the prevalence of anemia among women of reproductive age group in India was 53% and in Haryana 62.7%.⁷ The NFHS-5 India and Haryana data revealed the prevalence of anemia amongst all the different age-groups in Haryana was still higher than the national prevalence.^{8,9}

Anemia also affects health, survival, productivity, income, and development.¹⁰ Iron deficiency with or without anemia impairs cognitive development, attention span, and memory capacity, resulting in poor classroom performance, high absenteeism, and early dropout rates among school children. Iron deficiency can cause up to a 30% impairment of physical work capacity and performance and losses of up to 8% of GDP. Anemia due to iron deficiency is among the top 10 leading causes of years lost to disability in low- and middle-income countries, while anemia is the 7th leading cause of years lost to disability in women.⁶

In the year 2012, The World Health Assembly Resolution with six Global Nutrition Targets for 2025 incorporated the second target to do a 50% reduction of anemia in women of reproductive age (WRA, 15-49 years).² Only a few countries have comprehensive programs which have achieved sufficient coverage and if the current status continues, the global nutrition target on anemia is unlikely to be achieved.¹¹ While improvements in the anemia status of women in South East Asia have occurred, many policy and programmatic gaps limit the effectiveness of current anemia interventions. A more aggressive strategy of testing, detecting, and treating anemia in all settings was adopted, and the program was renamed as National Anemia Control Program in 1991. In 2013, under the National Iron Plus Initiative, the strategy was modified wherein IFA supplementation throughout the life cycle was adopted.¹² The highest level of political commitment to control anemia was displayed in 2018 when the Government of India launched the Anemia Mukh Bharat (AMB) (Anemia Free India) program. Under this program, an ambitious target of annual reduction in the prevalence of anemia by 3% from the National Family Health Survey (NFHS-4) was set.⁷

Thus, despite repeated efforts taken under the national program, there has been no decline observed in the prevalence of anemia for various life stages of females in India over past two decades. The prevalence of anemia in women of reproductive age group in India is not only among the highest in the world but also the worst even when compared to the neighboring countries.¹³

METHODS

This community-based cross-sectional survey was conducted in the Ambala district of Haryana having a population of 1128350. Out of this female population

constitute 529647 (46.94%). Administratively, Ambala district has four sub-divisions, and this baseline survey was carried out in all four sub-divisions of Ambala. A total of 524 villages of all the 4 subdivisions of Ambala districts were covered for estimation of the prevalence of anemia in various age groups of females i.e. (0-59 months, 5 to 11 years, 12 to 14 years, and 15 years and more non-pregnant women of reproductive age group) in a study duration from 1st March 2021 to 30th November 2021.

A total of 121202 female populations of various age groups were approached through a purposive sampling technique using a camp-based approach. Village-wise roster was prepared and information regarding this aspect. A total of 20 teams were constituted each having a lab technician, a camp manager (assistant medical officer, AMO), youths Nehru yuva kendra NYK and national cadet corps (NCC) to fill responses digitally in Google forms, and a ward servant for the help of lab technicians. For community participation, ASHA (accredited social health activist) workers had distributed pamphlets before one day of activity and prior information was given to PRI members, and school teachers of that village. ASHA workers helped in social mobilization during the day of activity. Panchayati raj institution members likewise block development panchayat officer, sarpanch, members provided the suitable site with the provision of electricity for the camp. District level supervisors supervised the team activity during the Anaemia Mukh Ambala campaign. After Hemoglobin estimation, nutritional advice was given, and IFA tablets were distributed to the anemic females.

Inclusion criteria

All the females of various age groups (6 months to 59 months, 5 to 11 years, 12 to 14 years, and non-pregnant females' age group 15 years and more).

Exclusion criteria

Females after calling/ contacting three times did not report for examination on the designated day and not given consent for Hb estimation. Females found to be pregnant during the study period were excluded from the study due to different cut-off values of hemoglobin for detecting anemia among pregnant females.

Selection of the participants

The participants were informed about the study and informed consent was obtained. Responses were filled in Google forms digitally by volunteers from Nehru yuva kendra (NYK) and national cadet corps (NCC).

Data collection

A brief, relevant clinical examination was also done of the study participants. Test principle (blood test for

anemia): the International Committee for Standardization in Hematology (ICSH) recommends the cyan-met-hemoglobin (CMG) method as a standard method for estimation of hemoglobin. This method is simple, rapid, and reliable and measures all types of hemoglobin except sulfhemoglobin.¹⁴ The cyan-met-hemoglobin standard complies with the specification defined by ICHS which is based on the molecular weight of Hb (64,458 Daltons) and a millimolar extinction coefficient of 44. Cyan-met-hemoglobin standard is used for direct comparison with blood. Drabkin's solution on mixing with whole blood converts hemoglobin to cyan-met-hemoglobin is proportional to the hemoglobin concentration.^{15,16} Collection of the blood samples: 0.02 ml of capillary blood was drawn by puncture in a micropipette under aseptic precautions and collected in a dry test tube containing Drabkin's solution (5.0 ml). The collected blood sample was mixed well and kept for 5 minutes and analyzed by expert laboratory technicians. Analysis of the blood samples: The samples were analyzed by using a photoelectric colorimeter (digital).

Hemoglobin levels to diagnose anemia (g/dl): to diagnose the hemoglobin levels among different age categories, 'WHO Nutritional Anemia: tools for effective prevention and control, 2017' was used.¹⁷

Data analysis

The entire collected data was cleaned by removing incomplete responses and any other non-sampling errors. Codes were prepared for the options and the master chart was prepared by using the Excel 2010 software. Data analysis was done using percentages, proportions, and chi-square test with the IBM SPSS software version 23.0. P value <0.05 was taken as statistically significant.

RESULTS

The present baseline community-based survey was done in all 4 administrative subdivisions of Ambala district. A total of 121202 females of varying age groups; 6 months to 59 months (4599), 5 to 11 years (12622), 12 to 14 years age group (8142), and age group 15 years and more women of reproductive age group were examined for hemoglobin estimation. Almost 25% of the sample size was taken from each administrative subdivision. A total of 97,305 (80.1%) study participants were found to be anemic. In the present study, the age ranges from 6 months to non-pregnant females of reproductive age groups (up to 49 years) with a mean of 28.9±19.3 years. The mean hemoglobin level was recorded as 10.8±1.4 gm%.

Table 1: Distribution of varying degrees of severity of anemia among study participants according to their age groups(n=121202).

Attribute	No anemia	Mild anemia	Moderate anemia	Severe anemia	Total
6-59 months	1288 (5.3)	1327 (4.5)	1927 (3)	57 (1.8)	4599 (3.8)
5-11 years	2221 (9.2)	1669 (5.6)	8361 (13)	371 (12)	12622 (10.4)
12-14 years	1603 (6.6)	1731 (5.9)	4627 (7.2)	181 (5.8)	8142 (6.7)
Non-pregnant >15 years	19055 (78.9)	24751 (84)	49563 (76.8)	2470 (80.2)	95839 (79.1)
Total	24167 (100.0)	29478 (100.0)	64478 (100.0)	3079 (100.0)	121202 (100)

Numbers in parentheses indicate percentages (p value < 0.05).

According to the three grades of anemia, the prevalence of mild anemia was found to be highest in the 6 to 59 months age group females (29%), followed by non-pregnant females above 15 years of age (26%), 12-14 years (21.2%), and 5-11 years of age (13.2%) (Table 1).

The prevalence of moderate anemia was observed to be highest among the age group 5-11 years (66.2%), followed by 12-14 years of age (57%), non-pregnant females above 15 years of age (52%), and among age group 6 months to 59 months (42%). The prevalence of severe anemia was found to be highest among non-pregnant females >15 years and age group 5-11 years which was recorded as 3%, followed by 12-14 years (2.2%), and 6 to 59 months female children (1.2%) (Figure 1). This distribution of varying degrees of anemia with age group was found to be statistically significant (p value <0.05).

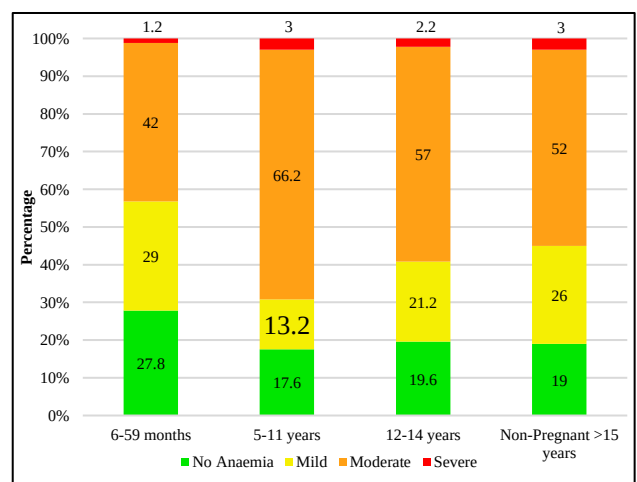


Figure 1: Prevalence of varying degrees of anemia among various age groups under study.

DISCUSSION

In this baseline cross-sectional community-based survey, the overall prevalence of anemia was reported among 97305 (80.1%) study participants. A similar study on this aspect conducted in Uttarakhand by Surekha et al showed that a total of 54.6% of women across different age groups were found anemic.¹⁸ Various studies on anemia prevalence from various parts of India indicate values ranging from 41-66%.¹⁸⁻²⁰ The present study's findings are higher than the reporting done under NFHS-5.^{8,9} The higher prevalence in our study might be due to the fact that it represented the ground reality by considering all the subdivisions of a district which are having different demographic attributes. Also, hemoglobin estimation was done by the cyan-met-hemoglobin method while in all other studies different methods (Sahli's/hemocue).

The study recorded the distribution of varying degrees of severity of anemia among study participants with respect to their various age groups likewise 6 to 59 months, 5 to 11 years, 12-14 years, and non-pregnant females of reproductive age group. It was found that no anemia showed decreasing trend while the overall prevalence of anemia was observed to be increased. And this distribution of varying degrees of anemia in various age groups of females was found to be statistically significant (p value <0.05).

Furthermore, the age group of 6-59 months showed the prevalence of anemia among 4599 (72%) of study participants. This finding was comparable to the prevalence of anemia reported i.e., 70.4% as per the NFHS-5 report related to Haryana. A similar slight discrepancy was noticed with the district-wise NFHS-5 report that states a lower prevalence of anemia (64.2%).⁹ Additionally, another study conducted through the Indian National Fertility and Health Survey by Onyeneho et al among children less than 5 years of age observed a prevalence of anemia among 53% of study participants.²¹ The reason for the high prevalence of anemia in the younger female population of Ambala, Haryana might be due to inadequacy in nutrition among children. This inference is supported by the NFHS-5 Haryana report; that only 11.8% of children between the age group of 6-23 months received an adequate diet.⁹ The same report also reflected that in less than 5 years old children, 27.5% were stunted, 11.5% were wasted, and 21.5% were underweight which in turn might be due to inadequate complementary feeding practices. One more important fact is that Haryana is one of the largest producers and consumers of milk.²² It might be used as a major source for meeting caloric demands among children; and it can be stated that the increased reliance on milk which in turn is deficient in iron; can be a strong risk factor for anemia.²³

Another reason for such a high prevalence of anemia in this demographic can be the high prevalence of anemia in pregnant females (56.5%), which in turn leads to more

premature deliveries, low birth weight of babies, and a strong risk factor for childhood anemia.^{9,24}

Besides, it was noted that the severity of anemia progressed with the progression of the child's age. The ratio of moderate to mild anemia cases was 1.44 increasing to 5.01, respectively, in the under 5-year-old and 5-11-year age group. Another observation from this study stated that the number of anemic children increased with the age progression, with 72% of anemic children under 5 years of age, increasing to 82.4% of anemic children in the 5-11 years of age group. As mentioned above, this increase in the severity of anemia in the 5-11-year age group can be because of inadequate diet compounded by increasing physiological demands of the body as the child enters adolescence. This finding brings forward major concerns as this age is vital for a child's growth and anemia at this age can lead to unrecoverable damage for the rest of the women's life.

This area of concern indicates that although the antenatal, peripartum, and postpartum services are working to an extent to fight anemia, there is a dire and immediate need for continuing the support as the children's age progresses. This will contribute majorly to saving the younger population of India from falling anemic. Also, this is apropos as the anemic population never recovers to the values of their younger selves. The same is interpreted through the study the population becomes less anemic with the age progression in non-pregnant females above 15 years of age, following the ratio of moderate to mild anemia dropping to 2.

Since Haryana is one of the largest producers and consumers of wheat which has high phytate content that hampers iron absorption, in addition, since Haryana is among the top in tea consumption which is high in tannins and has shown to decrease iron absorption, it can be inferred that a generally increased prevalence across all age groups might be due to poor nutrition and poor dietary habits.²⁵ Both the above-mentioned factors are compounded even further when taken together, which, in the case of Haryana is applicable as it is very common to drink tea alongside meals. Also, Haryana has the highest incidence of vegetarianism where more than 80% of the population is vegetarian, which adds up to the risk of iron deficiency.^{26,27}

A high prevalence of *H. pylori* infection can be seen in around 80% population of rural India, which can also be a leading cause of anemia as it has been observed that *H. pylori* infection causes iron deficiency.^{28,29} Another probable risk factor for anemia can be worm infestation and poor water sanitation. However, these factors are ruled out circumstantially as the worm infestation rates were found to be low in Ambala.³⁰ On a parallel level, this showcases the successful implementation of sanitation programs, also reflected in the NFHS-5 Haryana report.⁹ Overall, in the present study across all age groups, a total of 53% of patients fell in the moderate

anemia category with average hemoglobin of 10.8 gm%. This could likely be due to the large difference in the cut-off ranges set by WHO for anemia, with the moderate category range being 3-6 times larger than that of the mild anemia category.² It is also pertinent to note that these cut-offs are unchanged since 1968 and they might require a revision as they paint a grimmer picture of the condition than it actually is.

To sum up, support staff like ASHA should be continuously strengthened and intense surveillance is required towards the younger and more sensitive population. Also, intense interventions are required in the younger population to prevent them from falling deeper into anemia. It would be easier to treat them when they are mildly anemic than when they have moderate anemia.

Strengths

All 4 subdivisions were taken for baseline survey for further interventional study to be carried out. 121202 study participants i.e., 20% of the study population covered, having representation across all age groups and the gold standard method was used for hemoglobin estimation which has given the ground reality of such a grievous situation at present in Haryana.

This study has few imitations also. Firstly, this was a cross-sectional study, it could not accurately determine the causation for the high prevalence of anemia but can only make informed assumptions through associations present in the literature on this topic. Focused studies are required in the future to hone down on the most relevant of all the aforementioned factors affecting hemoglobin levels. Secondly, in this study, only the hemoglobin estimation was done but the determinants were not looked at in the female population.

CONCLUSION

Anemia is extremely prevalent in all walks of life particularly affecting a larger section of the female populations of various age groups. Such a representative community-based survey is also indicative of an awareness generation campaign which itself is a major step in the direction to curb anemia among the female populations of various age groups. A combined effort from all the facets of the government is required to break the loops and to fetch the population out of the strong grasp of anemia. The findings and outcomes of this study may be used as a reference for the estimation of anemia and further interventional study to eradicate anemia under Anemia Mukta Ambala Abhiyan.

ACKNOWLEDGEMENTS

The authors are thankful to Kuldeep Singh and the district health authorities of Ambala for giving permission to conduct this study, the study participants who had given their valuable time to this study, Sh. Rajesh Tyagi and the

staff involved in conducting the survey, NYK and national cadet corps who helped in the data collection process on such a large scale and Vaibhavi for swiftly editing and error-correcting the document.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Singhal J, Kharb M, Karol S, Abhishek, Hari S. Community-based baseline survey regarding prevalence of anemia among females of different age categories under Anemia Mukht Abhiyan in District Ambala, Haryana. Int J Community Med Public Health 2023;10:708-13.