ORIGINAL ARTICLE

Anaemia and Iron studies among women of reproductive age group: A Cross-sectional survey of a Large Cantonment in Western Maharashtra

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Abstract

Background: Anaemia remains a major cause of concern among the women of reproductive age in our country. However, there is a wide variation amongst different socio-economic strata. **Aim & Objectives:** This study was conducted among women of reproductive age for prevalence of anaemia and its association with certain socio-clinical variables in cantonment. **Methods:** It was a cross-sectional study. The information regarding socio-demographic variables, anthropometric measurements and clinical parameters were taken. Hemogram and iron profile was done by collecting venous blood from the participants. **Results:** Data was analyzed for 722 participants. There were 140 (20.2% (95% CI: 17.2 – 23.3)) non-pregnant women of reproductive age-group having anemia. Out of these 140, mild, moderate and severe anaemia was seen in 57(40.7%), 77(55%), 06(4.3) respectively. The major factors associated with anaemia were heavy menstruation and higher parity. Amongst these 140, iron deficiency anaemia was diagnosed in 135 (96.7%). Among the 28 pregnant women, eight were anaemic (28.6: 95% CI 19.1-63.9). **Conclusion:** The results of our study showed lower prevalence of anaemia than national level and majority of these were iron deficiency anaemia, which is amenable to prevention and treatment.

Keywords

Reproductive Age; Menstruation; Cantonment; Iron Profile

Introduction

The global estimates of anaemia by WHO in 2021 observed that global anaemia prevalence was 29.9% amongst women of reproductive age-group for the year 2019. However, these figures vary widely across different WHO regions, with South-East Asia bearing most of the brunt (1). The women of reproductive age are more susceptible to anaemia because of regular blood loss during menstruation and increased demand as a result of pregnancy and lactation (2). As per National Family Health Survey (NFHS), prevalence of anaemia in women of reproductive age-group in India was 53% in 2015-16 (NFHS-4) and 57% in 2019-21 (NFHS-5) (3). The figure is even higher in adolescent girls (59%) because of blood loss during menstruation, rapid growth and poor diet (3,4).

Anaemia significantly affects the daily activities and leads to a huge capital and economic loss annually (5-8). The Anaemia Mukt Bharat-Intensified Iron Plus Initiative was launched by the Government of India for tackling the problem of anaemia (9). Though nation-wide survey for anaemia is conducted on a regular basis during NFHS, such large surveys have rarely been reported among women of reproductive age group in cantonments. Also, iron studies are not conducted routinely to find the cause of anaemia.

Aims & Objectives

To assess the burden of anaemia among the women of reproductive age in a large cantonment.

1. To estimate the prevalence of anaemia among the women of reproductive age group in a large cantonment in Western Maharashtra.

2. To study the distribution of selected socio-demographic-anthropometric-Gynae-obstetric variables among this population.
3. To conduct Iron studies for the anaemic patients to identify the cause of anaemia.
4. Raise the awareness level of the study population about causes, prevention and treatment of anaemia.

Material & Methods

Study type: It was a community based cross-sectional study.

Study population: The study population comprised of women of reproductive age.

Study area: The study was conducted in a large cantonment in Western Maharashtra.

Sample size & enrolment of participants: All women in the reproductive age-group in the cantonment were taken as a part of the study. Flow diagram of enrolment procedure is given in Figure 1.

Inclusion criteria: All women in reproductive age group in the study area.

Exclusion criteria: Women with chronic or acute illnesses at the time of data collection were excluded from the study.

Methodology: The medical teams comprising of a doctor, nurse, lab assistant and health assistant were given training and standardization of procedure was done. The information regarding socio-demographic details & obstetric history was collected using the data collection form. Clinical examination was done followed by anthropometric measurements.

Portable stadiometer was used for measuring height. Weight was measured using Rossmax WB 1010 weighing scale. Waist and hip circumference were measured with non-stretchable fibre measuring tape. Coded vacutainers were used for collection of venous blood under aseptic conditions. Blood samples were analyzed for hemoglobin, RBC count, Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC) using Beckman Coulter LH 750 and blood group at Blood Transfusion Centre of a tertiary care hospital.

Working definition: The WHO classification of anaemia for pregnant and non-pregnant women was followed. As per this classification the cut-off for non-pregnant women 15 years and above is 12 gm/dl and for pregnant women it is 11 gm/dl. The mild anaemia is 11 – 11.9 and 10 -10.9 in nonpregnant and pregnant women. The moderate and severe anaemia is from 8-10.9, less than 8 and 7 to 9.9, less than 7 among non pregnant and pregnant women(10). Classification of Iron-deficiency anaemia was done using Harrison's Principles of Internal Medicine and Rodak's Hematology. The blood sample with hemoglobin levels less than 12g/dl and 11g/dl in non-pregnant and pregnant women respectively were further subjected to hemoglobin electrophoresis. Serum Ferritin was analyzed by ELISA method using Robonik Analyzer and Seimen's instrument was used for Serum Iron and (Total Iron Binding Capacity) TIBC.

Ethical approval: The study was given ethical clearance by institutional ethics committee. Informed consent was taken from the participants.

Data analysis: Data was collated on MS Excel. Continuous variables were described as mean and SD. Categorical variables were described as numbers and percentages. Contingency tables were made. Appropriate statistical tests were used. Data was analyzed using Stata Corp 2019. Stata Statistical Software: Release 16 College Station, TX: Stata Corp LLC. P value of less than 0.05 was taken as significant.(Figure 1)

Results

A total of 859 eligible women were approached. The data was collected from 740 (86.1%) of the study participants who consented for participating in the study. Finally, analysis was done for 722 (97.6%) participants, as data for 18 (2.4%) participants was incomplete. The mean (SD) for age was 32.1 (6.6) years. The socio-clinical characteristics and anthropometric measurements are given in Table-1.

Anaemia was present in 140 (20.1% (95% CI: 17.2 – 23.3)) of non-pregnant women of reproductive age group. Out of these 140 women, 57 (40.7%), 77 (55%), 06 (4.3) had mild, moderate and severe anaemia respectively. The hemogram investigations are given in Table 2. There was a statistically significant decrease in MCV and MCHC among anaemic patients (88.6(15.5) vs 78.7(11.1) for MCV; p value<0.001 and 30.1(2.8) vs 28.3(2.3) for MCHC; p value<0.001). The RDW was statistically increased among anaemic patients (16.6(2.3) vs 14.9(1.4); p value < 0.001).

Among 140 anaemic subjects, 126(90%) had decreased serum ferritin (<15 ug/L), 106(75.7%) had reduced serum iron(<60ug/dl) and total iron binding capacity was increased (>450 ug/dl) in 97(69.3%) subjects. Out of 140 subjects, 135(96.4%) were diagnosed with iron deficiency anemia, four subjects were diagnosed with beta thalassemia trait and one subject with homozygous HBE. The difference in hemogram studies among those with iron deficiency anaemia and beta thalassemia was not statistically significant.

Among the 28 pregnant women, eight were anaemic (28.6: 95% CI 19.1-63.9). There was reduced serum ferritin and serum iron in all of the anaemic patients and were diagnosed as iron deficiency anaemia as compared to non-anaemic pregnant ladies. Special investigations in pregnant and non-pregnant anaemic women is shown in Table 3. The factors found to be associated with anaemia by logistic regression were heavy blood flow during menstruation and higher parity Table 4. The anthropometric measurements (height, weight, BMI, waist circumference and hip circumference), age, socio-economic status and education showed no significant association with anaemia.

Discussion

Among the South-East Asian nations, India has the highest prevalence of anaemia. Multiple nationwide surveys over a period of time have shown a lack of evidence in the reduction of prevalence of anaemia in India (11). As per the National Family Health Survey 5 (NFHS-5, 2019-21), prevalence of anemia in reproductive age group in India has increased to 57.2% from 53.2% in NFHS-4 (12), whereas in our study the prevalence of anaemia was found to be 20.1% in non-pregnant women and 28.6% in pregnant women, which is at a much lower level. Another study in Mumbai among slum dwellers showed the prevalence of anaemia as high as 90% (13). The low prevalence of anaemia in our study population can be attributed to their higher socio-economic status alongwith other factors such as better comprehensive health-care facilities, regular screening campaigns and health education activities being conducted in this population. These results are consistent with studies conducted in populations similar to ours. A pilot study conducted on 14,273 wives of serving personnel of Indian Armed Forces showed anaemia of 21.54% (14). Another study conducted among 600 non-pregnant and non-lactating women of military station showed prevalence of 13.9% (15).

In our study, mild to moderate anaemia constitutes 95.7% of all anaemia cases. Though NFHS-4 & NFHS-5 does not provide data on severity of anemia, similar findings were observed in NFHS 2 and NFHS 3 data. Other studies showed that majority of anaemia may be of mild to moderate (15,16).

In the present study, significant association was observed between heavy menstrual bleeding and anaemia (p=0.01) in non-pregnant women of reproductive age. Similar findings have been observed in other studies as well (13,15). Progress to reduce anaemia has been slow despite substantial economic growth and 50 years of programmatic efforts (17). NFHS-5 data shows higher prevalence of anaemia in non-pregnant women (57.2%) as compared to pregnant women (52.2%) (3), whereas our study showed a higher prevalence among pregnant women (28.6%). We further conducted iron diagnostic study on all anaemic patients and observed decreased serum ferritin and iron levels and increased total iron binding capacity. Most of these patients had Iron deficiency anaemia, the major cause of which in developing countries is poor bioavailability of iron in the diet (18). Iron deficiency as a cause of anaemia is both preventable and treatable (19). Iron deficiency anaemia can lead to a constellation of symptoms and has intergenerational effect (20). Hence it is important to diagnose these cases and treat them. Community based screening is an efficient way to identify these cases and administer treatment.

Conclusion

This study was conducted among women of reproductive age-group in a large cantonment area. The prevalence of anaemia in this study was much lower than national levels. However, one-fifth of the study population was anaemic which is likely due to incorrect dietary habits, poor iron bioavailability in diet and low awareness about this condition as it has non-specific symptoms. Community based approaches such as regular health education and screening campaigns can raise the awareness level of the study population about causes, prevention and treatment of anaemia and bring about a further reduction in prevalence of anaemia in our population.

Recommendation

The present study found low prevalence of anaemia as compared to national levels, which can be attributed to higher socio-economic status of the population, better comprehensive health-care facilities, regular screening campaigns and health education activities being conducted in this population. Further research can be planned to determine the factors responsible for development of anaemia in this population. Health education and prophylactic treatment can be given to women reporting heavy menstrual flow and pregnant ladies. All cases detected to have anaemia in our study were further referred for treatment and follow-up in health care facilities.

Limitation of the study

A limitation of our study was that due to constraints of resources we did not conduct iron studies in non anaemic participants. So, it is likely that we may have missed early cases of anaemia, as haemoglobin levels are the last to decrease and maybe normal though ferritin levels maybe decreased.

Relevance of the study

The problem of anaemia amongst the women of reproductive age-group in India is a burning topic in today's scenario. However, the low prevalence of anaemia in our study population brings out the important fact that better socio-economic status, availability of efficient comprehensive health-care facilities, regular screening campaigns and health education can reduce the anaemia prevalence among the women of reproductive age group.

Authors Contribution

All authors contributed equally in conceptualizing the study design, collecting data, analyzing the data and finally drafting and authoring the article.

References

1. Anaemia [Internet]. [cited 2022 Sep 20]. Available from: https://www.who.int/westernpacific/health-topics/anaemia
2. Gernand AD, Schulze KJ, Stewart CP, West KP, Christian P. Micronutrient deficiencies in pregnancy worldwide: health effects and prevention. Nat Rev Endocrinol. 2016;12(5):274–89.

3. India - National Family Health Survey 2019-2021 [Internet]. [cited 12/09/2022]. Available from: https://main.mohfw.gov.in/sites/default/files/NFHS-5_Phase-II_0.pdf
4. Bharati S, Pal M, Som S, Bharati P. Temporal trend of anemia among reproductive-aged women in India. Asia Pac J Public Health. 2015;27(2):NP1193-1207.
5. Onyeneho NG, Ozumba BC, Subramanian SV. Determinants of childhood anemia in India. Scientific reports. 2019;9(1):1-7.
6. Nutritional anaemias: tools for effective prevention and control. Geneva: World Health Organization; 2017.
7. Lopez A, Cacoub P, Macdougall IC, Peyrin-Biroulet L. Iron deficiency anaemia. Lancet. 2016;387(10021):907–16.
8. Marzban M, Nabipour I, Farhadi A, Ostovar A, Larijani B, Darabi AH, Shabankari E, Gholizade M. Association between anemia, physical performance and cognitive function in Iranian elderly people: evidence from Bushehr Elderly Health (BEH) program. BMC geriatrics. 2021;21(1):1-7
9. BhatiaV, SahooDP, ParidaSP.India steps ahead to curb anemia: Anemia Mukt Bharat Indian J Comm Health. 2018; 30, 4: 312-316.
10. Addo OY, Emma XY, Williams AM, Young MF, Sharma AJ, Mei Z, Kassebaum NJ, Jefferds ME, Suchdev PS. Evaluation of hemoglobin cutoff levels to define anemia among healthy individuals. JAMA Network Open. 2021;4(8):e2119123-.
11. Pasricha SR, Armitage AE, Prentice AM, Drakesmith H. Reducing anaemia in low income countries: control of infection is essential. BMJ. 2018;362.
12. Activities Undertaken for Anaemia Mukt Bharat [Internet]. [cited 2022 Sep 12]. Available from: https://pib.gov.in/pib.gov.in/Pressreleaseshare.aspx?PRID=1696431
13. Kumar SS, Valavan R, Manoharan R, Sabarirajan S, Sitharthan R. High Prevalence of Anemia in Children in Dharavi Locality of Mumbai: Possible Role of Homeopathy. Advancements in Homeopathic Research. 2022;7(2):19-24.
14. Srivastava R, Dudeja P, Bhide GD, Pant MR. Demystifying prevalence of anemia in female spouses of army personnel in an Army's Corps zone: A multicentric cross-sectional study.
15. Anaemia in women [Internet]. Available from: https://pib.gov.in/pib.gov.in/Pressreleaseshare.aspx?PRID=1575151
16. Goyal P, Talwar I. Assessment of Nutritional status and its correlates among adolescent girls of Haryana, India. Annals of pediatrics and Child health. 2020;8(10).
17. Nguyen PH, Scott S, Avula R, Tran LM, Menon P. Trends and drivers of change in the prevalence of anaemia among 1 million women and children in India, 2006 to 2016. BMJ global health. 2018;3(5):e001010.
18. Dudeja P, Tewari R, Singh A, Roy SD. Low prevalence of anaemia among the wives of serving personnel in a military station: A community-based study. Med J Armed Forces India. 2016;72(4):356–61.
19. Thakur M, Narang A, Muzammil S, Mahabole KG, Aggarwal M, Gupta M, et al. Swasth Mahila Swasth Pariwar: A Screening Program for Women to Detect Common Health Problems in Cost Effective Manner. International Journal of Applied Sciences and Biotechnology. 2017;5(1):86–90.
20. Zhang YX, Chen J, Liu XH. Profiles of anemia among school-aged children categorized by body mass index and waist circumference in Shandong, China. Pediatrics & Neonatology. 2021;62(2):165-71.

Tables

TABLE 1: SOCIO-CLINICAL CHARACTERISTICS OF THE STUDY PARTICIPANTS (N=722)

S. No		Characteristics	N (%)
1.	**Education**	Upto class tenth Higher secondary Graduate and above	177(24.5) 263(36.4) 282(39.1)
2.	**Socio-economic status**	Upper Upper Middle Lower Middle	20(2.8) 150(20.8) 552(76.4)
3.	**Parity**	0 1 2 3 or more	177(24.5) 116(16.1) 265(36.7) 164(22.7)
4.	**Abortion**	0 1 2 or more	517(71.6) 153(21.2) 52(7.2)
5.	**Menstrual Flow**	Heavy Light Medium	56 (7.8) 105 (14.5) 561(77.7)
6.	**Blood Group**	A AB B O	216(29.9) 86(11.9) 244(33.8) 176(24.4)
7.	**Status**	Non-pregnant non-lactating Pregnant Lactating	623(86.3) 28(3.9) 71(9.8)
8.	**Anthropometric measurements**	 Height (cm) Weight (Kg) BMI (Kg/m^2) Waist circumference(cm) Hip circumference (cm)	**Mean (SD)** 155 (6.7) 62.1(11.6) 25.7(4.6) 85.9(10.9) 100.6(10.1)

TABLE 2: HAEMOGRAM VALUES FOR NON-PREGNANT AND PREGNANT WOMEN (N=722)

S. No	Haemogram	Non-pregnant (N=694)	Pregnant (N=28)	Total (N=722)
1	Hemoglobin	12.1(1.4)	11.1(1.1)	12.02(1.4)
2	RBC Count	4.6(0.8)	4.6(2.1)	4.6(0.9)
3	MCV	86.6(15.2)	80 (16.9)	86 (9.3)
4	MCHC	29.7(2.8)	29.6(1.6)	29.7 (2)
5	RDW-CV	15.2(1.8)	16.7(3.7)	15.3(1.9)

TABLE 3: SPECIAL INVESTIGATIONS OF THE ANEMIC SUBJECTS IN NON-PREGNANT AND PREGNANT WOMEN (N=148)

Hematological parameters	Non-pregnant subjects, (n= 140) (Mean ± SD)	Pregnant subjects (n= 8) (Mean ± SD)
Hb (g/dl)	9.9 ± 1.3	9.8 ± 0.5
MCV (fl/cell)	78.9 ± 10.9	79.0 ± 8.9
MCHC (g/dl)	28.3 ± 2.4	28.5 ±1.1
Ferritin (ng/ml)	9.9± 11.7	11.3±12.6
Serum Iron (mcg/dl)	49.7± 21.2	63.3 ± 30.5
TIBC (mcg/dl)	437.5±94.1	514.3 ± 52.2

TABLE 4: ASSOCIATION OF ANAEMIA WITH SOCIO-CLINICAL VARIABLES IN NON-PREGNANT WOMEN IN REPRODUCTIVE AGE-GROUP

Characteristic	Number	Unadjusted Odd ratio with 95% CI	P value	Adjusted odd ration with 95% CI	P value
Age	694	1.003(0.9-1.03)	0.8	1.006(0.9-1.04)	0.7
Socio-economic status (SES)					
Upper	20	Reference		Reference	
Upper Middle	147	1.3(0.3-4.7)	0.7	1.5(0.4-5.9)	0.5
Lower Middle	527	1.5(0.4-5.2)	0.5	2.1(0.6-7.7)	0.3
Education					
Upto X class	175	Reference		Reference	
XI-XII Class	252	0.8(0.5-1.2)	0.2	0.8(0.5-1.3)	0.5
Graduate and above	267	0.9(0.5-1.4)	0.5	0.9(0.6-1.6)	0.6
Menstrual Flow					
Light	102	Reference		Reference	
Medium	536	0.9(0.5-1.5)	0.8	1.02(0.6-1.8)	0.9
Heavy	56	2.5(1.2-5.1)	0.01	2.4(1.2-5.1)	0.02
Parity					
0	176	References		References	
1	105	0.4(0.2-0.8)	0.006	0.4(0.2-0.9)	0.008
2	256	0.7(0.5-1.1)	0.5	0.7(0.4-1.1)	0.6
3 or more	157	0.6(0.3-0.9)	0.04	0.6(0.3-1)	0.05

Figures

FIGURE 1 FLOW DIAGRAM