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Original Article

Low prevalence of anaemia among the wives of serving personnel in a military station: A community-based study

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ABSTRACT

Background: Various studies in India have reported the prevalence of anaemia to be more than 50% among women of the reproductive age group. A community-based study was done to find out the prevalence of anaemia in non-pregnant, non-lactating wives of serving soldiers in a military station.

Methods: It was a cross-sectional study. The sample size was 600. Venous blood was collected for haemoglobin and ferritin levels. Analysis was done by SPSS 20.

Results: The mean age at marriage was 19.8 years (SD + 2.76). The average age at first childbirth was 20.88 years. Major symptoms reported were weakness (24.34%), giddiness (23.47%), fatigue (20.17%) and heavy bleeding (3.13%). Prevalence of anaemia in our study was 13.9%, which is much below the national prevalence. Prevalence of iron-deficient status was reported in 153 (26%) individuals. Out of these, 81 subjects were non-anaemic (Hb > 12d/dL) but were iron deficient (ferritin < 15 µg/L). Sixty out of these 81 subjects reported presence of fatigue and 36 had weakness. Statistically significant associated observations of anaemia were low Body Mass Index, irregular menstrual pattern, shortened menstrual cycle and increased duration of bleeding ($p < 0.05$). Low ferritin levels were significantly associated with low BMI, not using Oral Contraceptive Pills and bleeding for more than 3 days during menstrual cycle ($p < 0.05$).

Conclusion: The scenario of low prevalence of anaemia in women under the cover of the Armed Forces Medical Services represents an 'island of excellence'.

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Introduction

Anaemia is a major public health challenge in the world, both in rich and poor countries.¹ This ubiquitous problem has major consequences for human health and thereby on social and economic development of a country. It is estimated that about 20% of maternal deaths are directly related to anaemia and another 50% of maternal deaths are associated with it.² WHO estimates the number of anaemic people worldwide to be a staggering two billion. Half of all anaemia cases can be attributed to iron deficiency.³ Approximately, 600 million people in South-East Asia suffer from iron deficiency anaemia (IDA), which predominantly affects adolescent girls, women of reproductive age and young children.⁴ Prevalence of anaemia in the region ranges from 13.4% in Thailand to 87% in India. About 74% of pregnant women in Bangladesh, 63% in Nepal, 58% in Sri Lanka and Myanmar and 51% in Indonesia suffer from anaemia.⁵

Over a third of the global burden of this menace occurs in India. Prevalence of anaemia among non-pregnant women in India is higher than that in Bangladesh, Nepal, Sri Lanka and Pakistan and other South-East Asian countries.³ Various studies in India have reported its occurrence in more than 50% of the women of the reproductive age group. Despite being the first country to launch the National Nutritional Anemia Prophylaxis Programme (NNAPP) in 1970, the problem of IDA remains widespread. Data from the latest National Family Health Survey (NFHS-3) estimate the prevalence of anaemia at 55.3% among women of reproductive age (and 53.2% in non-pregnant, non-lactating women).⁶ These values have worsened over the years as the prevalence in NFHS – 2 survey was 51.8%.⁷ Data from District Level Household Survey (DLHS) and surveys of the National Nutrition Monitoring Bureau (NNMB) and Indian Council of Medical Research (ICMR) have also shown consistently high prevalence of anaemia in preschool children, pregnant and lactating women and adolescent girls.^{8–10} These findings indicate that NNAPP has not yielded desired results. Hence, there is a need to find out the reasons as to why the strategies are not working.

A wide variation in prevalence rates of anaemia is reported from different parts of the country with the lowest burden of 32.8% being reported from Kerala to the highest of 69.5% in Jharkhand and Assam. In hill areas also low prevalence rates have been reported.¹¹

Pilot studies and routine testing have highlighted that the prevalence of anaemia in the armed forces is lower as compared to overall national levels.¹² In view of these findings, a research project was undertaken with an objective to estimate the prevalence of anaemia in married, non-pregnant wives of serving armed forces personnel and to compare it with prevalence elsewhere in India. The results are expected to give a lead in identifying the factors responsible for differential prevalence of anaemia in various settings. This will also help us in identifying the strategies that have worked so that the same can be replicated elsewhere.

Material and methods

It was a cross-sectional community-based point prevalence study. The unit of study was a non-pregnant, non-lactating wife of serving armed forces personnel in the age group of 15–49 years. The total sample size (using single proportion formula and 95% CI) was 594 females. Multistage sampling was done. In the first stage, number of families from each zone of station was calculated using Probability Proportion to Size (PPS) method (Table 1). Line listing of families was done in these zones and subjects were selected randomly using random number table method. Informed consent was obtained from the participants. An interviewer administered closed-ended pretested schedule to assess various determinants of anaemia. A physical examination was carried out that included measurement of height, weight and waist circumference. Venous blood was collected for all females under aseptic precautions in EDTA vacutainers. Slide for peripheral blood smear was made at the time of sample collection and labelled. Separate blood samples were collected for serum ferritin. Blood sample was analyzed using automated cell counter for detection of haemoglobin levels. Serum test was separated on the same day and kept in a refrigerator at 2–8 °C. Serum ferritin levels were estimated by Enzyme Linked Immunosorbent Assay (ELISA). Slides were stained with Leishmann stain to study staining characteristics and morphological abnormalities of RBCs. All the females were educated in small groups (5 each) about prevention and control of anaemia with special emphasis on iron rich foods. **Inclusion criteria:** All married females of serving personnel in the age group of 15–49 years were included in the study. **Exclusion criteria:** All females who were pregnant or had delivered in the last six months, all females who were staying in Separated Family (SF) quarters and females who had consumed iron tablets in the past 3 months were excluded from the study. Statistical Analysis was conducted using SPSS 20 software. Cut-off values for anaemia, which are haemoglobin level of 12 g/L in non-pregnant females and serum ferritin levels less than 15 µg/L, were taken from WHO guidelines.^{3,13}

Results

A total of 600 subjects staying with their husbands in an Army Cantonment participated in the study. Samples of 25 females were spoilt before reaching the lab. Hence, data were analyzed for 575 females. Fertility parameters of the subjects are given in Table 2. The mean age at marriage of the wives of serving

Table 1 – Sampling of subjects in the station.

S.No	Location	Approximate number of families staying	Number of subjects selected
1	A	600	228
2	B	350	133
3	C	500	190
4	D	130	49
Total		1538	600

Table 2 – Fertility parameters of study subjects.

Covariate	Number (%)
Age at marriage (years)	
<15	11 (01.91)
16	28 (04.86)
17	23 (04.00)
18	93 (16.17)
19	92 (16.00)
20	96 (16.69)
>21	232 (40.34)
Number of children	
Nil	059 (10.26)
One	182 (31.65)
Two	266 (46.26)
Three	053 (09.21)
Four	014 (02.43)
Five	001 (0.19)
Age at first child birth (years) ^a	
<21	245 (47.48)
>21	271 (52.52)
Birth interval (years) ^b	
<1	171 (51.50)
1–2	031 (09.33)
2–3	076 (22.89)
3–4	039 (11.75)
4–5	010 (03.02)
>5	005 (01.51)

^a 59 subjects with no child are excluded.

^b 59 subjects with no child and 182 subjects with one child are excluded: 2.

soldiers was 19.8 years (SD + 2.76). This is in contrast to NFHS 3 finding according to which more than half of the women are married before the legal minimum age of 18 years. The average age at first childbirth was 20.88 years, as majority of them conceive within one year of marriage. Most (90%) adopted a small family norm though majority (60%) had a birth interval of less than two years. The literacy rate in our subjects was 80%. Nearly half (49%) of the subjects in the study were overweight. The mean Body Mass Index (BMI) was 25.97 kg/m².

Prevalence of anaemia in our study was 13.9% (80 females had Hb < 12 g% out of 575). Out of these, 22(03.82%) had mild, 45(07.82%) had moderate and 13(2.26%) had severe anaemia. Main symptoms reported were weakness (24.34%), giddiness (23.47%) and fatigue (20.17%) (Table 3). Statistically significant associated observations of anaemia were low BMI, irregular menstrual pattern, shortened menstrual cycle, increased duration of bleeding and dietary pattern (vegetarian diet) (Table 4).

Prevalence of iron-deficient status (low ferritin levels) was 28%. Out of these, 14% were those females who were non-anaemic (with normal haemoglobin levels) but had serum

Table 3 – Symptoms of anaemia in study subjects.

Symptom	Yes Number (%)	No Number (%)
Weakness	140 (24.34)	435 (75.66)
Giddiness	135 (23.47)	440 (76.53)
Fatigue	116 (20.17)	459 (79.83)
Heavy bleeding	018 (03.13)	557 (96.87)

Table 4 – Covariates of anaemia in study participants.

Covariate	Number (%)	Anaemia Number (%)	p value
BMI			
<25	292 (50.78)	67 (83.75)	0.000
>25	283 (49.22)	13 (16.25)	
Current OCP use			
Yes	152 (26.43)	28 (35.00)	0.108
No	423 (73.57)	52 (65.00)	
Menstrual pattern			
Extremely regular	217 (37.74)	20 (25.00)	0.000
Very regular	164 (28.52)	42 (22.50)	
Regular	161 (28.00)	10 (20.00)	
Usually irregular	024 (04.17)	02 (15.00)	
Always irregular	009 (01.57)	06 (17.5)	
Length of period (days)			
<21	006 (01.04)	02 (02.50)	0.000
21–25	131 (22.78)	20 (25.00)	
26–31	364 (63.30)	22 (27.50)	
32–39	065 (11.31)	14 (17.50)	
40–50	005 (00.87)	3 (03.75)	
>51	004 (00.70)	1 (01.25)	
Bleeding days			
≤3	077 (13.36)	09 (11.25)	0.01
4–5	411 (71.49)	45 (56.25)	
6–7	087 (15.15)	26 (32.50)	
Dietary pattern			
Egg veg	024 (04.17)	20 (10.00)	0.00
Non-veg	291 (50.60)	26 (57.50)	
Veg	260 (45.21)	34 (32.50)	

ferritin levels of less than 15 µg/L (Table 5). 60 out of 81 (75%) subjects who were non-anaemic but had low serum ferritin levels complained of general fatigue and 36 (45%) of them had weakness (Table 6). Low ferritin levels were significantly associated with low BMI, not using Oral Contraceptive Pills (OCPs) and bleeding for more than 3 days during menstrual cycle ($p < 0.05$) (Table 7).

Discussion

Health promotion is a distinctive part of public health that plays a significant role in improving the health and well being of individuals. WHO has recognized the Settings Based Approach (SBA) to health promotion as an effective method for targeted health promotion. One such example is the settings in the Indian Armed Forces (IAF). The family of IAF includes serving personnel and their dependents. The administration and practice of health care for military service members and their dependents consist of a medical system paralleling all the medical specialties and sub-specialties that exist in the civilian sector through the Armed Forces Medical Services (AFMS).

According to the Ottawa Charter (1986), health is created and lived by people within the settings of their everyday life, where they learn, work, play and love.¹⁴ The armed forces can also be considered as a setting where health of the troops and their families is an important agenda of policy makers and strong practices are put in place for their implementation. As our results show, mean age at marriage of the women was 19.8 years (SD + 2.76). The average age at first childbirth was

Table 5 – Anaemic status of study subjects.

Iron deficiency ANEMIA (Hb < 12 g/dL; ferritin < 15 µg/L)	72 (12.52%)
ANEMIA not due to iron deficiency (Hb < 12 g/dL; ferritin > 15 µg/L)	08 (01.39%)
Non-anaemic with normal ferritin (Hb > 12 g/dL; ferritin > 15 µg/L)	414 (72.00%)
Non-anaemic with iron deficiency (Hb > 12 g/dL; ferritin < 15 µg/L)	81 (14.09%)
Total	575 (100%)

20.88 years, as majority of them conceive within one year of marriage. This is in contrast to NFHS-3 finding, according to which more than half of women are married before the legal minimum age of 18 years. This has a definite major impact on women's health. It is well known that early marriage exposes women to early child bearing and attendant risks of maternal mortality as well as morbidity, especially anaemia. Moreover, most (90%) of our respondents adopted a small family norm even though majority (60%) had a birth interval of less than two years. OCP use of 26% in our subjects is much more than the national average of 3.1%.¹⁵ OCPs are reported to have an iron sparing beneficial side effect. This progressive attitude towards family planning also has a major bearing on better haemoglobin levels in army wives. Literacy rate in our subjects was 80%, which makes them amenable to better understand all health promotional activities conducted for them.

Nearly half (49%) of the subjects in the study were overweight. The mean BMI was 25.97 kg/m². This also indicates that the subjects were well nourished. Their overall nutrition was certainly good. This in turned helped in preventing anaemia in them. The prevalence of anaemia in our study was (13.9%), which is much lower than the national average. Rather these figures are close to prevalence in developed countries.¹⁶ It is imperative that we should try to explain such low prevalence of anaemia. These results need special attention of the health care planners. Does this scenario represent an 'island of excellence' as far as anaemia situation in women is concerned? If so, then we need to know the factors for this low prevalence?

Our study population comprised of wives of serving personnel. Majority of them came from a rural background where the NNAPP is in place. Under this programme, iron and folic acid tablets are distributed to pregnant, lactating mothers and preschool children. A study by ICMR task force has documented national wide failure of this programme in achieving the stated objectives.¹⁶ Taking cognizance of the situation, the government recently launched iron plus initiative with scientific evidence and revised the protocols for iron folic acid supplementation across the life cycle (preventive strategy).^{17,18} However, this is not just about an intervention in the form of a magic tablet to solve the problem of anaemia. This is rather an oversimplification. This medicinal approach

Table 7 – Distribution of mean serum ferritin (µg/L) by covariate categories.

Covariate	Number (%)	Mean ferritin	SD	p value
BMI				
<25	292 (50.78)	21.1	2.1	<0.05
>25	283 (49.22)	26.4	2.3	
Current OCP use				
Yes	152 (26.43)	22.7	2.8	<0.05
No	423 (73.57)	17.1	1.9	
Menstrual pattern				
Extremely regular	217 (37.74)	22.8	4.5	>0.05
Very regular	164 (28.52)	21.9	5.9	
Regular	161 (28.00)	21.7	6.1	
Usually irregular	024 (04.17)	22.6	7.3	
Always irregular	009 (01.57)	21.4	7.6	
Length of period (days)				
<21	006 (01.04)	21.8	7.5	>0.05
21–25	131 (22.78)	21.0	6.9	
26–31	364 (63.30)	21.7	2.1	
32–39	065 (11.31)	22.1	5.3	
40–50	005 (00.87)	21.4	7.6	
>51	004 (00.70)	21.1	7.9	
Bleeding days				
≤3	077 (13.36)	23.3	1.2	<0.05
4–5	411 (71.49)	21.8	0.7	
6–7	087 (15.15)	19.1	3.8	

assumes that distribution of these tablets will solve the problem of anaemia. This sadly has not happened. In reality, this requires looking at the health of the women holistically as is being done in the Army. Prevention and control of anaemia in India is not just about medical interventions, but, to a great extent, also about changing behaviour (both in terms of dietary habits and compliance), and promotion of health in general through communication campaigns.

The main causes of iron deficiency anaemia in our country have been poor nutritional intake and infections like malaria and hookworm.⁴ The armed forces have taken a lead in combating this problem by following a holistic approach for the health of women. A comprehensive strategy including good nutrition, control of infections and parasitic diseases, antenatal care and safe motherhood, family planning and reproductive health, HIV/AIDS prevention and control and environmental health have been the milestones on the road to success. The health care system in the armed forces has been successful in providing comprehensive care. Apart from this, health promotional activities in the form of awareness lectures and medical camps improve the level of awareness regarding prevention of diseases and promotion of health.

The finding that needs the attention of the clinicians is that some of our subjects, 81(14%), were non-anaemic (Hb > 12 g%) but had low serum ferritin levels (<15 µg/L) and complained of general fatigue and had weakness. In a study by Vaucher et al., the authors have documented that iron supplementation

Table 6 – Symptoms of anaemia and ferritin status in study participants.

Ferritin status	Number	Presence of fatigue	Presence of weakness
Non-anaemic with iron deficiency (Hb > 12 g/dL; ferritin < 15 µg/L)	81	60 (75%)	36 (45%)

should be considered for women with unexplained fatigue who have ferritin levels below 15 µg/L.¹⁹ Verdon et al. also documented that there was significant improvement in fatigue following iron supplementation in non-anaemic women with unexplained fatigue.²⁰ Hence, iron supplementation may be considered in family OPDs/MI Rooms of Military hospitals for women with unexplained fatigue who have normal haemoglobin levels but have underlying low ferritin levels.

We found a significant association between anaemia and low BMI, irregular menstrual pattern, shortened menstrual cycle, increased duration of bleeding and dietary pattern (vegetarian diet). These correlates have been documented by other studies also.^{21–23} Our study also acknowledged that low serum ferritin levels were significantly associated with low BMI, not using OCPs and bleeding for more than 3 days during menstrual cycle ($p < 0.05$). Asres et al. in their study have also highlighted that undernourished women with low BMI are more likely to have anaemia as it is the most common nutritional deficiency disorder.^{24–26}

It is often reported theoretically that comprehensive strategy with a holistic approach is needed for improving the health of women especially with respect to anaemia prevention. The health care system in the armed forces has been successful in providing such comprehensive care to the wives of serving soldiers. The armed forces as a setting provide an ideal backdrop for implementing health promotion and preventive health activities to improve the overall health status of the troops and families. Thus, our results indicate the major role played by welfare measures taken by the Army in the form of rations, stable salary, good clean living conditions and dedicated medical care (AFMS). This package of primary health care offered by dedicated Regimental Medical Officers contributes a lot to the overall welfare of the clientele. This is in contrast with civilian health care services, where health workers, Medical Officers at Primary Health Centers (PHC) and Auxillary Nurse Midwife (ANMs) are overstretched by multiple tasks under various national health programmes. When the same women are living in rural areas, most of them suffer from anaemia. However, in the armed forces, there is an ownership of the welfare of the troops and their families in a true sense. The employer's role in the care of the troops and their families is displayed in true spirit. This is reflected in the caring attitude of the authorities for their troops and their dependents.

As per the 'Health field theory', health status is affected by interplay of four key influences: genetic factors, the environment, lifestyle and hospital services.²⁷ The family stations/SF stations where these women reside have provision of a hospital with availability of a gynaecologist most of the times. Availability and accessibility of specialist services in these stations go a long way in solving their reproductive health problems. The dictum 'Behind every fighting fit soldier there is a fit family' is strictly adhered to.

Conclusion

Prevalence of anaemia in wives of serving army personnel is 13.9%, which is much lower as compared to the national prevalence. Our study documented presence of weakness and

fatigue in females with normal haemoglobin levels but low ferritin levels. Our results demonstrate how public health practice can successfully augment the curative services provided by the hospitals as far as anaemia status in families is concerned.

Conflict of interest

The authors have none to declare.

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