Introduction

WHO defines ‘Adolescents’ as individuals in the 10-19 years age group and ‘Youth’ as the 15-24 years age group. While ‘Young People’ covers the age range 10-24 years. Adolescents are the important age group of the society yet neglected in many ways. Adolescents are tomorrow’s future; they are important for the country’s progress. Therefore, their health is an important issue to deal with at present.

Anaemia is most common nutritional deficiency disorder in India and remains a formidable health challenge. It is a condition when haemoglobin (Hb) level goes <12 g/dl in women and <13 g/dl in men of age 15 years and above. The iron needs are high in adolescent girls because of the increased requirements for

Prevalence of anaemia among school going adolescent girls attending Test, Treat and Talk (T-3) camp under Anaemia Mukt Bharat in Delhi

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Abstract

Background: Adolescent period is signalized by marked physical activity and rapid growth spurt; therefore, they need additional nutritional supplements and are at utmost risk of developing nutritional anaemia. Anaemia play a major role in affecting the adolescents especially girls. On September 2019, Ministry of Health and Family welfare, Govt. of India directed to all state and district health authority to conduct Test, Treat and Talk (T-3) anaemia camps for celebration of nutrition month (Poshan Maah) in all government schools and colleges. The present study aimed to assess prevalence of anaemia and factors associated with it among school going adolescent girls attending T-3 camp in Delhi. Methods: A cross-sectional study was conducted among 203 adolescent girls in government girls’ school in central district of Delhi. Hb estimation was done by HemoCue 201 and data regarding socio-demographic details, deworming, dietary preferences were collected. Clinical examination and anthropometric measurements were done by resident doctors. Data was analysed using STATA vs. 13. Results: The prevalence of anaemia was found to be 59% with mean (±SD) Hb of 11.3 gm/dl (±1.55) among 203 participants. The majority (48%, n = 119) of anaemic girls had mild degree of anaemia. Among 203 girls, 65% participants were of age 14–15 years with mean (±SD) age of 14.6 years (±1.18). There was a significant relationship between anaemia and diet, deworming status, and BMI (P < 0.05). Conclusion: The study revealed that anaemia was highly prevalent among adolescent girls. Among anaemic girls, majority had mild anaemia. Factors like vegetarian diet, underweight, deworming and presence of pallor were found to be associated with anaemia. There is need to conduct T-3 camps at regular interval in all schools to curb the problem of adolescent anaemia.

Keywords: Adolescent girls, anaemia, Anaemia Mukt Bharat, Delhi, T-3 camp

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expansion of blood volume associated with the adolescent growth spurt and the onset of menstruation. Prevalence of anaemia among adolescent girls (Hb <12 gm/dL) is alarmingly high, as per National Family Health Survey 4 (NFHS-4), 54% of the adolescent girls are anaemic.\(^3\) Data shows that between NFHS 3 and 4 there was only 2% decline in the prevalence of anaemia among Adolescent girls. In India over 50% women in reproductive age are reported to be anaemic.\(^3\) Many a times in India girls get married and becomes pregnant in late adolescent period and increases the risk of Anaemia. Occurrence of pregnancy during adolescence with anaemia increases not only the maternal morbidity and mortality but also the incidence of poor birth outcomes such as stillbirth, low birth weight, and prematurity and also has negative impact on infant iron status.\(^4\) According to available literature inadequate nutrition, menstruation, socioeconomic status, personal hygiene and worm infestation are important risk factors which leads to anaemia.\(^5\) There are number of schemes directly/indirectly affecting the nutritional status of adolescents and pregnant women.\(^6\) In spite of these, level of malnutrition and related problems in the country is high. There is no dearth of schemes but lack of creating synergy and linking the schemes with each other to achieve common goal.

According to NFHS-4, anaemia prevalence varies from 30 percent to 69 percent across different age groups.\(^3\) POSHAN Abhiyan was launched in March 2018 with one of the objectives as reduction in anaemia.\(^8\) Anaemia Mukt Bharat strategy was set to achieve targets of POSHAN Abhiyan and National Nutrition Strategy set by NITI Aayog. It has been decided that prevalence of anaemia will reduce by three percentages per year across all age groups between year 2018 to 2022 through Anaemia Mukt Bharat strategy.\(^8\) All villages, blocks, and districts of all the States/UTs of India will be covered under POSHAN Abhiyan. On September 2019, Health ministry directed to all state and district health authority to conduct Nutrition Month (POSHAN Mah) Test, Treat and Talk (T-3) anaemia camps under Anaemia Mukt Bharat programme in all government schools, colleges, and institutions across India.

A typical T-3 Camp\(^9\) is a key strategy to generate demand and mobilise people on anaemia. And it works in three steps: Test: with the help of a digital haemoglobinometer. Treat: with iron-folic acid tablets (IFA) and referral Talk: counselling beneficiaries on healthy lifestyle measures, to increase iron levels in the body and on foods rich in iron, protein and vitamin C.

Integrated District Health Society (IDHS), Central District of Delhi in collaboration with Department of Community Medicine, North DMC Medical College & Hindu Rao Hospital, Delhi conducted T-3 camp in GSS Vivekanand Puri, Delhi on 11th October 2019.

Under T3 camp after taking written informed consent haemoglobin was tested using Hemocue 201 machine and general health check-up was done by resident doctors and interns. Hb testing was done by trained lab technician of IDHS, Central district of Delhi. Nutritional counselling was done on the one-to-one basis by interns.

Health talk on Menstrual Hygiene was also given.

Iron folic Acid tablets for one month were given if student found mild to moderate anaemic and severely anaemic students were referred to paediatric OPD of Urban Health Training Centre (UHTC), Vivekanand Puri for further investigation and management.

Material and Methods

Study setting

The present study was cross-sectional in nature and carried out in Delhi during October 2019. Delhi has population of 1.68 crores and is divided in 11 districts for administrative purpose. The present study was carried along with Test, Treat and Talk (T-3)\(^9\) anaemia camp in Government Girls Secondary School (GGSS) of Vivekanand Puri area of central Delhi district.

Study population

School going adolescent girls attending classes 9th, 10th, 11th and 12th standards of GGSS school were included in the study. Girls who did not give the consent and who were absent at the time of data collection were excluded from the study. In this study, data was collected from 203 adolescent girls who gave consent for the participation. Pre-tested, semi-structured questionnaire was used. It included information regarding socio demographic factors, dietary habits and deworming. General examination and anthropometric measurements were done by resident doctors.

Sampling strategy

Complete enumeration of all adolescent girls of class 9th to 12th of GGSS school was attempted.

Procedure

- In September 2019, Ministry of Health and Family Welfare (MoHFW), Govt. of India directed to all state and district health authority to conduct Nutrition Month (POSHAN Mah) Test, Treat and Talk (T-3) anaemia camps under Anaemia Mukt Bharat programme in all government schools, colleges, and institutions across India.
- A typical T-3 Camp\(^9\) is a key strategy to generate demand and mobilise people on anaemia. And it works in three steps: Test: with the help of a digital haemoglobinometer. Treat: with iron-folic acid tablets (IFA) and referral. Talk: counselling beneficiaries on healthy lifestyle measures, to increase iron levels in the body and on foods rich in iron, protein and vitamin C.
- Integrated District Health Society (IDHS), Central District of Delhi in collaboration with Department of Community Medicine, North DMC Medical College & Hindu Rao Hospital, Delhi conducted T-3 camp in GSS, Vivekanand Puri, Delhi on 11th October 2019.
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Definitions

Adolescents[10]

Individuals in the age group of 10-19 years is defined as adolescent. 10 years to 14 years age group considered as Early Adolescence and 15 years to 19 years age group considered as Late adolescence.

Anaemia among adolescent girls was classified according to WHO cut off values[2]

- Normal >12 gm/dl
- Mild anaemia >11 gm/dl and <11.9 gm/dl
- Moderate anaemia >8 gm/dl and <10.9 gm/dl
- Severe anaemia <8 gm/dl

Cut-offs for classifying underweight and overweight as per WHO growth reference for adolescents[11]

- According to WHO growth charts body mass index (BMI) less than 2 standard deviation (SD) below the WHO growth standard median was considered as underweight, BMI greater than 1 SD above the WHO growth standard median was considered as overweight.

Ethical issues

Ethical clearance was obtained from institutional ethics committee of North DMC Medical College, Delhi (F.No. 199/IEC/NDMC/2019 dated 5th October, 2019). The research was conducted in complete accordance with the principles of the World Medical Association Declaration of Helsinki. Study purpose was explained to school principal and written informed consent was obtained for participation of minor students (<18 years). Written consent for participant of age >18 years and assent for participants of age <18 years were obtained from each participant after explaining them the purpose of the study. Data was used for research purpose only and all personal information revealing details were kept confidential.

Data analysis

MS-Excel and STATA version 13 software were used for data entry and analysis. Data were presented in the form of frequencies and percentages. Significant association was established by using Chi-square tests and Fisher exact tests considering P < 0.05 as statistically significant.

Results

In this study, 203 (84.6%) out of 240 adolescent girls of class 9th to 12th participated in T-3 camp. Majority (65%) participants were of age 14-15 years with mean (±SD) age of 14.6 years (±1.18). Most of them (96%) were Hindu and nearly half (51%) were vegetarian by diet. Majority of participants (73.9%) were underweight as per BMI-for age for girls [Table 1].

It was found that out of 203 adolescent girls, more than half (59%) were anaemic (Hb < 12 gm/dl). The mean (±SD) Hb of the participants was 11.3 gm/dl (±1.55). Among 119 anaemic girls, majority (48%) were mild anaemic followed by moderately anaemic (45%). Only nine participants had severe anaemia (Hb < 7 gm/dl) [Figures 1 and Table 2].

In the present study, it was found that the prevalence of 61.7% in early and mid-adolescent age group (<15 years) as compared to 46.3% in late adolescent age group (>15 years), but difference was not statistically significant (p = 0.74). Anaemia among adolescent girls who took albendazole tablet for deworming on national deworming day was significantly lower than who did not undergo deworming (p < 0.001).

It was found that adolescent girls who were underweight had higher prevalence of anaemia than adolescent girls having normal BMI and this difference was statistically significant (p < 0.001). It was found that school girls who were vegetarian by diet were more anaemic than girls consuming mixed diet (p < 0.001). Factors like religion, number of siblings and occupation of mother did not find to be associated with anaemia (P > 0.05) [Table 3].
In the present study prevalence of mild, moderate and severe anaemia was 48%, 45% and 7% respectively which was similar to one reported by Chandrakumari AS et al.[10] in Tamilnadu and Habib N et al.[23] in Pakistan. DLHS-4[22] report of Haryana revealed that prevalence of mild and moderate anaemia was 57.9% and severe anaemia was 6.3% among adolescent girls which was supporting our finding. However, in our study prevalence of mild, moderate and severe anaemia was higher compared to various studies by Premlatha T et al.[20] in Chennai, Siva PM et al.[9] in central Kerala, Kumar A et al.[22] in Jorhat, Agrawal A et al.[10] in Udupi and Patil N et al.[21] in North Karnataka. This difference in findings may be due to different cut-off used to classify anaemia in different studies. We observed that early adolescent age group girls were more anaemic than late adolescent (84% vs 16%). Whereas other studies reported higher prevalence of anaemia among late adolescent than early adolescent.[12,13,15,16,19] The high prevalence of anaemia among early adolescent age group in our study may be due to the small sample size of our study and low number of participants in late adolescent age group.

The mean (±SD) Hb of 203 adolescent girls who participated in the study was 11.3 gm/dl (±1.55) which was similar to one reported by Rakesh Kumar et al.[12] and Kaur S et al.[13] In the present study, the prevalence of anaemia among adolescent girls found to be 59% which was similar to that reported by NFHS-4[11] (54%), DLHS-3[10] (57.9%), Kaur S et al.[13] in Wardha (59.8%) and Kishore S et al.[22] in Uttrakhand (57.1%). Various studies on prevalence of anaemia among adolescent girls reported prevalence ranging from 39% to 90% in different parts of India.[12,13,20] This vast range of prevalence of anaemia may be due to different methods of haemoglobin estimation, different study settings and different study periods. Few studies had adopted standard method for haemoglobin estimation, thus calling for a uniform prospective study of adolescent population using digital haemoglobinometer with high precision.

In this study, problem of anaemia was more prevalent among underweight girls than normal girls (p < 0.001). This result is consistent with studies conducted by Kaur S et al.[13] in Wardha, Kumar A et al.[12] in Jorhat, Basu S et al.[24] in Chandigarh, Mengistu G et al.[4] in North West Ethiopia, Tura MR et al.[23] in West Shewa, Ethiopia and Fentie K et al.[20] in Southwest Ethiopia. We found that adolescent girls who were vegetarian by diet had statistically significant proportion of anaemia than girls taking mixed diet (p < 0.001). Similar finding was reported by Kumar A et al.[12] and Agrawal A et al.[10] among adolescent girls of Jorhat and Udupi respectively. Kaur S et al.[13] in their study conducted in Wardha found that vegetarian adolescent girls had higher odds of becoming anaemic than adolescent girls.

### Discussion

Nutritional anaemia among adolescent girls is a key health concern and remains persistently high despite of various national programmes like national nutritional anaemia prophylaxis programme, national iron plus initiative, WIFS, etc., The present study highlights the magnitude of anaemia among school going girls of Delhi attending T-3 camp under Anaemia Mukt Bharat.
who consume non-vegetarian diet (OR: 8.5, 95% C.I: 5.7, 12.8). This can be explained by fact that meat products, poultry and fish have haem iron which is superior to non-haem iron found in rice, cereals etc., in terms of absorption and bioavailability. In the present study, adolescent girls who undergone the deworming had lower prevalence of anaemia than girls who did not undergo deworming during national deworming days (p < 0.001). Kaur S et al., Siva PM and Mengistu G et al. in their study found that history of worm infestation was strong predictor of anaemia. This draws attention toward more effective implementation of national deworming days in schools to prevent surge of anaemia among adolescents. It was also found that adolescent girls who were having pallor on examination had high chance of anaemia (P < 0.05). This may be due to depleted iron stores along with low haemoglobin level among anaemic girls. In our study, factors like occupation of mother, age, religion and number of siblings were not associated with anaemia.

The strength of our study was use of standardised digital hemoglobinometer (HemoCue 201) for Hb estimation and use of WHO growth reference for BMI calculation. This study also gives an important insight into effectiveness of current anaemia prophylaxis programmes for adolescent age group. Limitation of our study was sample size was not calculated for this study as it was part of T-3 camp, so results of this study cannot be generalized. Recall bias may be possible. Few important factors associated with anaemia such as menstrual history, hand hygiene, socio-economic status, history of chronic disease were not included in the study.

Conclusion

The present study revealed higher prevalence of anaemia among school going adolescent girls of Delhi. The prevalence of mild and moderate anaemia was higher compared to severe anaemia. Factors like diet, deworming, BMI and presence of pallor found to be associated with anaemia among adolescent girls. There is urgent need for review of various Iron and Folic acid supplementation programmes for school going adolescent population in addition to regular T-3 camps in all schools. Special package of policies and interventions under Anaemia Mukt Bharat (Anaemia Free India) programme could help to curb the problem of anaemia among adolescent.

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Conflicts of interest

There are no conflicts of interest.

Key points:

1. It was found that out of 203 adolescent girls, more than half (59%) were anaemic (Hb < 12 gm/dl). The mean (±SD) Hb of the participants was 11.3 gm/dl (±1.55).
2. Among 119 anaemic girls, majority (48%) were mild anaemic followed by moderately anaemic (45%). Only nine participants had severe anaemia (Hb < 7 gm/dl).
3. It was also found that prevalence of anaemia was high among adolescent girls who were vegetarian by diet, underweight and did not take albendazole tablet on national deworming days.

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