A Cross-Sectional study on prevalence of Anemia among Adolescent females from field practice areas of a Medical College of Mahbubnagar.

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ABSTRACT

Introduction: Adolescent age group is the window of opportunity to correct nutritional status of children. If we intervene correctly during this period we can prevent future consequences of nutritional deficiencies. Very few studies have been conducted in Mahbubnagar regarding adolescent anemia.

Aim: To estimate prevalence of anemia and its associated factors among adolescent females from field practice areas of a Government Medical college of Mahbubnagar, Telangana.

Materials and Methods: The community-based cross-sectional study was conducted in adolescent girls of rural and urban field practice area of Government Medical College, Mahbubnagar. From the computerized Health Management Information System data (HMIS), a random list of 306 adolescent girls was generated. A pre-designed and pre-tested proforma was used to obtain data regarding socio-demographic details and factors associated with anemia. Relevant clinical examination of participants were done. Blood samples were analyzed using an auto-analyser. Diagnosis of anaemia was established when hemoglobin was less than 12gm/dl.Hemoglobin level was measured for all the consented or assented participants using a digital hemoglobinometer (HemoCue201+ photometer, HemoCue AB, Angelholm, Sweden).Data analysis was done using SPSS 24.0. Association between Categorical variables were tested with Chi-square test and continuous variables independent t-test was used. The level of significance was fixed at p-value of < 0.05.

Results: The prevalence of anaemia was 21%.A total of 306 participants were enrolled in the study. Prevalence of anemia among adolescent girls who had attained menarche was observed to be 71.7% (95% CI:66.3 - 77.1) as per the WHO classification. Among the 195 anemic adolescent girls, severe, moderate, and mild anemia was observed in 4.8%, 41.2%, and 25.7%, respectively.

Majority of families belong to upper lower socio-economic status (48.4%) according to BG Prasad's classification. Age-wise prevalence of anaemia shows that prevalence of anemia was highest (62.5%) in 11-12 years age group and least (37.04%) in the age group of 10-11 years. Majority of subjects with anemia were having mild anemia (66.2%) followed by moderate anemia (23%) and severe anemia (10.8%) respectively.

Conclusion:

Prevalence of anaemia was 45.42% with majority of study subjects having mild to moderate anaemia.

KEYWORDS: prevalence, adolescent girls, anemia

INTRODUCTION

There are 253 million adolescents in India, and 72% of them reside in rural areas [1]. Anemia is seriouspublic health challenge in India, even among adolescents[2]. According to National Family Health Survey-4(2015-2016), the prevalence of anemia, i.e. hemoglobin level < 12gm/dL among adolescent girls (15-19years), was 54%[3].

The adolescence period especially in girls is vulnerable to anemia due to the increased demand during theperiod of a growth spurt, inadequate dietary intake, vulnerability for helminthic infestation, and increasedloss of iron during menstruation. Adolescent girls have a median iron loss of 12.5-15 mg per month duringmenstruation[4].

The nutritional concerns of adolescent girls, including anemia, are addressed by several flagship schemesand programs of the Government of India. These include the Integrated Child Development Services (ICDS)scheme, the Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG)-SABLA, and more recently, POSHAN Abhiyaan and Anemia Mukt Bharat [5-7]. Since there are multiple programs addressinganemia, many specifically focusing on adolescent girls, there is a need for monitoring the prevalence ofanemia for assessing the impact of such measures. Adolescent girls living in rural areas, especially those whohave attained menarche, constitute the most vulnerable subgroup.

Anemia causes easy fatigability, menstrual irregularities, and poor physical as well as mental health outcomes.Among adolescents in addition to this, there is a high chance of poor literacy outcomes. There is a paucity ofliterature about anemia among girls from Mahbubnagar. Against this background, this study aimedto estimate the prevalence of anemia and factors associated with it among adolescent girls (10-19 years) currently living in the field practice areas of Government medical college, Mahbubnagar.

MATERIALS & METHODS

A community-based cross-sectional study was conducted in the Urban and Rural field practice area of Government medical college, Mahbubnagar from April to July 2022. Data were obtained from the well-established database, i.e., Health Management InformationSystem (HMIS). A computerized HMIS contained health and demographic data of all residents of these field practice areas. The inclusion criterion wasadolescent girls (10-19 years), who had been residing in the study area for at least 7 years. Adolescents that were pregnant, unable tocomprehend, or not contactable after three home visits were excluded. Assuming the prevalence of anemia(p) among adolescent girls as 59%[10], absolute precision of 6%, 95% confidence level, and 15% nonresponserate, the minimum required sample size was 300. The final required sample size thus

obtainedwas 306. There were 3524 adolescent girls in the HMIS database. A list of total adolescent girls (N = 3524)was generated from the HMIS database of the rural and urban field practice area, GMC, Mahbubnagar. Using this samplingframe, a simple random sample of 306 adolescent girls was drawn in the Microsoft (MS) Excel 2016(Microsoft® Corp., Redmond, WA) using =RAND () function, meaning random. This function was used togenerate a random list of adolescent girls from the sampling frame. Once the random list was made, girlswere sorted village-wise and were approached within the community with the help of a local village-level health worker for the interview.

Data collection

The study was conducted for two months by the trained investigator. A self-developed, pre-tested,semi-structured questionnaire that contained items relevant to study objectives viz. demographic details(Including socioeconomic status). Hemoglobin level was measured by a digitalhemoglobinometer by the study investigator. Hemoglobin estimation (gm/dl) was done by using the digital hemoglobinometer method, i.e., Hemocue201+(Hemocue AB, Angelhom, Sweden). This is a point of care diagnostic method utilized in field settings that are operated through the battery. It works on the principle of modified azide methemoglobin determination using a specially designed micro cuvette with dried reagents. The hemoglobin method is estimated usingabsorbance levels at two wavelengths of 570 nm and 880 nm for turbidity compensation in the bloodsample [11]. Using a sterilized gauge piece and lancet, the initial two drops of blood were discarded, and thethird drop of blood was placed in the HemoCue slide by the investigator (MS), and then in the digitalhemoglobinometer. It displayed hemoglobin levels immediately which was noted in the log sheet of thestudy participant and informed to the participant.

Anemic adolescents were prescribed tablet IFA (Iron Folic Acid). Those requiring further management werereferred to the nearest government health facility. The socio-economic status was assessed using the Modified B.G Prasad Scale updated for the year 2022. Participants in the random list were paid a home visit andscreened for eligibility criteria. The participants and available parents/guardians were explained about thestudy objective and procedure. The assent was taken from the participants if they were younger than 18years. Written informed consent was taken from the study participants aged 18 years or older and theparticipant's parents/guardians if the age of the participant was less than 18 years.The severity of anemia was classified as per the World Health Organization (WHO) recommendation. Inbrief, anemia was classified as mild if the hemoglobin level was 11.0-11.4 gm/dL for those aged 10 to 11years, and 11.0-11.9 gm/dL for those aged 12-19 years. Anemia was classified as moderate when thehemoglobin level was 8.0-10.9 gm/dL, and severe if the hemoglobin level was <8 gm/dL [2].

Institute Ethics Committee (IEC) approved the study protocol

Data Processing and Analysis.Data was checked, cleaned,coded, and entered using Microsoft excel and then exportedto SPSS version 20 statistical software for analysis.Descriptivestatistics such as frequencies, proportions, and standarddeviationweredone todescribedata. Association between the categorical variables were tested with Chi-square test and for continuous variables independent t-test was used. The level of significance was fixed at p-value of < 0.05.

RESULTS

Socio-demographic profile

Table-1 (n=306)

Variable		Frequency	Percentage
Age (Yrs)	10-11	27	8.82
	12-13	16	5.23
	14-15	63	20.59
	16-17	38	12.42
	18-19	162	52.94
Religion	Hindu	233	74.14
	Christian	37	12.1
	Muslim	36	11.76
Diet	Veg	72	23.53
	Mixed	234	76.47
Mother's Education	Literate	276	90.2
	Illiterate	30	9.8
Mothers Occupation	Professional	142	46.41
	Un skilled	6	1.96
	Home maker	158	51.63
Place of stay	Rural	116	37.91
	Urban	80	26.14
	Hostel	110	35.95
S.E. S	Upper class	76	24.84
	Upper middle	26	8.49
	Lower middle	43	14.1
	Upper lower	12	3.92

	Lower	147	48.04
Blood Group	A+	50	16.34
	A-	1	0.33
	B+	115	37.58
	B-	8	2.61
	AB+	17	5.56
	AB-	2	0.65
	O+	109	35.62
	O-	4	1.31
Co-Morbidities	Menorrhagia	30	9.8
	DM	1	0.33
	Hypothyroid	9	2.94
	TB	21	6.86
	Leprosy	1	0.33
	None	244	79.74
Pallor	Yes	80	26.14
	No	226	73.86

Table 1 describes the study subjects according to age, socio-economic status, mothers' education and occupation, place of stay, type of diet taken regularly. Majority belongs to 18-19yrs age group (52.94%), followed by 14-15yrs age group. Most of them were Hindus (74.14%), 90.2% of mothers of participants were literate, 76.47% were taking mixed diet regularly, 51.63% of participants mothers were home makers. Majority of families belong to upper lower socio-economic status (48.4%) according to BG Prasad's classification. Most of the families (37.91%) were residing in rural areas, followed by 35.95% participants staying at hostels. Most of the families were nuclear family (76.0%).

Table-2 Distribution of anemia according to severity (n=139).

Grading of anemia	**Frequency**	**Percentage (%)**
Mild (10-11.99 gm%)	92	66.2
Moderate (8-9.99 gm%)	32	23
Severe (<8 gm%)	15	10.8
Total	139	100

37.68% were of B+ve, followed by 35.62% participants were O+ve blood group, 9.8% had menorrhagia followed by TB as co-morbidities. Only 26.14% had visible pallor.It was found that out of 306 adolescent girls, majority (45.42%) were anemic (Hb < 12 gm/dl). The mean (±SD)Hb of the participants was 11.73 gm/dl (±1.76). Among 139anemic girls, majority (66.2%) were mild

anemic followed bymoderately anemic (23%). Only fifteen participants had severeanemia (Hb <8 gm/dl). [Figures 1 and Table 2].

Table-3 Age-wise distribution of prevalence of anemia.

Age (years)	Anemia Yes	No	Total	Prevalence (%)
10-11	10	17	27	37.04
12-13	10	6	16	62.5
14-15	26	37	63	41.27
16-17	18	20	38	47.37
18-19	75	87	162	46.3
Total	139	167	306	100

Table 3 depicts the Age-wise distribution of prevalence of anemia. Prevalence of anemia in our study was found to be 45.42 %. Age-wise prevalence of anemia shows that prevalence of Anemia was highest (62.5%) in 12-13 years age group and least (37.04%) in the age group of 10-11 years. The difference in prevalence of anemia between different adolescent age group was found to be statistically significant.

Table 4: Peripheral smear examination

Red cell morphology	Subjects with anemia (n = 139)	Subjects without anemia (n =167)
Normocytic normochromic	44	157
Normocytic hypochromic	25	8
Microcytic hypochromic	66	1
Dimorphic	4	1

Blood indices	Hemoglobin status	Frequency	Mean	Std. Error Mean	t value	p-value
PCV*	Anemia	139	34.08	0.34	15.13	<0.001
	Normal	167	40.06	0.19		
MCV†	Anemia	139	74.59	0.82	11.07	<0.001
	Normal	167	84.9	0.44		
MCH‡	Anemia	139	22.75	0.41	10.41	<0.001
	Normal	167	27.77	0.25		
MCHC§	Anemia	139	30.15	0.17	11.60	<0.001
	Normal	167	32.49	0.11		

It was found that 17.98% of subjects had early stages of iron deficiency reflected by normocytic hypochromicpicture. A total of 45.42% subjects had iron deficiencyanemia while 2.87% of subjects had dimorphic anemia[Table 4].

Table 5: Distribution of anemia according to various blood indices (N=306)

*Packed cell volume, † Mean Corpuscular Volume, ‡ Mean Corpuscular Hemoglobin, § Mean Corpuscular Hemoglobin Concentration

The mean Packed Cell Volume(PCV), Mean Corpuscular Volume(MCV), Mean Corpuscular Hemoglobin(MCH) and Mean Corpuscular Hemoglobin Concentration(MCHC) were significantly lower among anemic subjects compared to normal subjects [Table-5].

DISCUSSION

Table 2 shows grades of anemia in our study. Majority of subjects with anaemia were having mild anemia (66.2%) followed by moderate anaemia (23%) and severe anaemia (10.8%) respectively.

Our study findings are comparable with Vitull et al and Sanjeev et al where prevalence of anaemia was found to be 67.1% and 69.2% respectively.6,11 However, Rawat et al, Kaur et al and Siddharam et al have reported low prevalence of mild anaemia with figures of 55.2%, 38.4% and 40.14% respectively.[12,17,19]A study by Siddharam et al on adolescent girls in rural area has found that mild anaemia, moderate anaemia and severe anaemia was seen in 40.14%, 54.92% and 4.92% of cases respectively.[19] Another study by Sanjeev et al revealed that 69.2% of cases had mild anaemia and 30.8% of cases had moderate anemia and no subject had severe anaemia.[20]Vitull et al has found in their study in rural Punjab on adolescent girls that 67.1% had mild anaemia, 19.0% had moderate anaemia and 0.9% had severe anaemia among anemic subjects in 10 to 19 years age group.[14]
In a study by Rawat et al in rural Meerut the proportion of subjects with mild, moderate and severe anaemia were 55.2%, 40.8% and 4.0% respectively.[16]Kaur et al in their study on adolescent girls of rural Wardha have found that the proportion of subjects with mild, moderate and severe anaemia were 38.4%, 20.8% and 0.6% respectively.[12]

Table 3 depicts age wise prevalence of anemia. Prevalence of anaemia in our study was found to be 45.42%.
Age-wise prevalence of anaemia shows that prevalence of Anemia was highest (62.5%) in 12-13 years age group and least (37.04%) in the age group of 10-11 years. The difference in prevalence of anaemia between different adolescent age group was not found to be statistically significant. Our study findings regarding prevalence of anaemia among adolescent girls was consistent with studies done by Kaur et aland Binay et al where they have observed prevalence of anaemia found to be 59.8% and 68.8% respectively.[12,13]Binay et al reported maximum prevalence in the age group 11 to 12 years and least prevalence in the age group 14 to 16 years.
However, Vitull et al, Meenal et al and Sharda et al have reported higher prevalence of anaemia with figures of 87%, 90.1% and 70.57% respectively in 15 to 16 years .[14,15] Rawat et al and Rajaratnam et al have observed low prevalence of anaemia with figures 34.5% and 40.7% respectively.[16,17]

The majority of subjects with anemia in the present study (17.98%) had a microcytic hypochromic picture in theperipheral smear suggestive of iron deficiency anemia, while 2.87% of subjects had a dimorphic picture. Khanduri*et al.*(21)) found peak incidences of megaloblastic anemia in the age group of 10.30 year olds (48%) with femalepreponderance (71%) in India. (Table-4)

Even though most of the study subjects have normocytic normochromic anaemia, the mean values of PCV, MCV, MCH and MCHC were significantly lower among anaemic subjects compared to normal subjects. This finding is agreement with study conducted by Dr. Manjula et al., [22]. As iron deficiency progress the cells become more microcytic with marked fall in MCV, MCH and MCHC.[22]**[Table-5]**

CONCLUSION

The present study revealed higher prevalence of anemia among school going adolescent girls of Mahbubnagar. The prevalence of mild and moderate anemia was higher compared to severe anaemia.There is urgent need for review of various Iron and Folicacid supplementation programmes for school going adolescentpopulation in addition to regular T- 3 camps in all schools. Specialpackage of policies and interventions under Anaemia MuktBharat (Anaemia Free India) programme Thus,school-based Iron folic acid supplementation and regular nutritional screening and deworming program should be implemented to help adolescent girls who are at risk of anemia.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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None

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