Evaluation of Prevalence and Knowledge about Anaemia and Their Determinants Among Adolescent Girls

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ABSTRACT

Purpose: Adolescence is the crucial period of growth and development between the ages of 10–19 years. This is a vulnerable period for the development of nutritional anaemia. Lack of knowledge concerning nutrition is one of the most significant reasons for nutritional problems and inappropriate nutritional practices can lead to numerous complications.

Methods: A school based cross sectional study was carried out in two social welfare residential schools situated in Hyderabad & Secunderabad. Total of 862 adolescent girls were screened from both the schools. Demographics, menstrual history, clinical history, KAP, anthropometry and haemoglobin were assessed.

Results: A total of 862 girls were screened of which 746 (86.5%) were anaemic and 116 (13.5%) were non-Anaemic. %). Mild anemia was seen in 22% (95% CI range: 20-25%), moderate anemia was seen in 55% (95% CI range: 51%-58%), severe anemia was seen in 10% (95% CI range: 7.9%-12%). Only 13% had no anemia (95% CI range: 11-16%). The prevalence of stunting & thinness was 21.2% & 10.1% among the girls. Age, nutritional status, knowledge and clinical history were important predictors of anaemia.

Conclusion: Anaemia was highly prevalent amongst the adolescent girls. There was poor knowledge about anaemia and its prevention. Personal Hygiene practice was found good among the girls. Focus should be on counselling adolescents to promote healthy eating habits and promotion of iron-rich foods.

Keywords: Anaemia, adolescent, prevalence, nutrition, Knowledge, Attitude, Personal hygiene. Morbidity, Stunting, thinness, Menarchal Status.

INTRODUCTION

Anaemia is the most prevalent nutritional problem worldwide. It is a condition when the number and size of red blood cells, or the haemoglobin concentration, falls below an established cut-off value, consequently impairing the capacity of the blood to transport oxygen around the body. The prevalence of iron deficiency and subsequent anemia increases at the start of adolescence. World Health Organization (WHO) identifies adolescence as life span between 10 to 19 years [1] Adolescents are at high risk of iron deficiency and anemia as Iron requirement in girls increases dramatically during adolescence as a result of expansion of the lean body mass, increase in total blood volume, and the onset of

menstruation; these changes make adolescent girls more vulnerable to anaemia. Inadequate dietary intake of nutrients (especially iron) or Dietary enhancers (such as vitamin C), dietary inhibitors (oxalates, phytates present in the diet lowers absorption and utilization of nutrients and other nutrient losses (through menstruation, infections, worm infestation), teenage pregnancy, chaotic eating patterns, do not follow dietary recommendations, Frequent dieting or restricted eating, skipping meals and vegetarian eating styles contribute to nutritional anaemia [2,3].

Anaemia can lead to the poor cognitive (mental fatigue) and physical development of adolescents, which is reflected in poor academic performance or physical performance (physical fatigue), reduced work productivity, and frequent infections [4]. The pre-pregnancy anaemic status of adolescent girls is crucial as it has long term intergenerational consequence (irregular menstruation and premature births Low birth weight infants, perinatal mortality). In addition to these direct causes, there are indirect socioeconomic factors such as illiteracy, poverty, gender discrimination and rural residence that affect anaemia [5,6]. WHO (2001) considers adolescent girls (12-18 yrs) having haemoglobin levels lower than 12 grams per decilitre (g / dL), as anaemic [7]. Adolescent anaemia is a long-standing public health problem in India. According to the WHO, anemia affects 24.8% of the world's population and affects 27% of adolescent females in impoverished countries and 6% of adolescent females in affluent nations (Sedlander et al 2020) [8]. As per NFHS -5 children (0-59 months) 53.4% and women (15-49yrs) 53.4% and adolescent girls(15-19yrs) 59.1% are anaemic. The CNNS (2016-2018) reported that 28% of adolescents aged 10–19 years had some degree of anaemia [9,10]

Adolescent girls represent a window of opportunities to provide health & nutrition education and therefore it is important to assess the KAP of adolescent girls and provide appropriate counselling. It is essential to identify the scope of micronutrient deficient disease by assessing the Knowledge, Attitude and Practice (KAP) of micronutrient, i.e., iron and then by educating the importance of adequate iron stores. KAP assessment is suitable to evaluate target group's current knowledge, attitude, and practice regarding a specific topic to detect their needs, problems and possible barriers. As magnitude of anaemia as a nutritional health problem is huge, can be tackled with regular nutritional education sessions to increase awareness, promotion of correct attitudes and practices in adolescent girls regarding anaemia. [11,12]. The aim of the paper is to understand the determinants in low socio-economic adolescent girls where KAP are assessed for incremental learning and counselling through health education and was part of intervention study.

Hence, the present study was conducted to assess the prevalence of anaemia among adolescent girls, their knowledge, towards anaemia & Personal hygiene and the determinants of anaemia.

METHODOLOGY

A cross sectional study was conducted in 2017-18 among adolescent girls of 7th to 9th Class aged (≥10 years and ≤16yrs) of two social welfare residential schools, TSWREI-Telangana Social Welfare Residential Education Institutes of Hyderabad and Secunderabad as these two were permitted randomly by the higher authority from the list of school available. The school caters to girls from a low socio-economic background.

Total of 894 adolescent girls were enrolled. Adolescent girls willing to participate in the study and who gave consent for the same were included while those adolescent girls who are not willing to participate or not giving consent were excluded from the study. Out of 894 adolescent girls (n=862) were selected for the study. The reason for non-participant of some girls was long absence from school. The Adolescent girls were screened for Haemoglobin,

Anthropometry (Height, weight), Clinical signs & symptoms for anaemia. Haemoglobin (HB) status was assessed by Cyanmethemoglobin method by using Photoelectric colorimeter 113(systronics). For this purpose, 20 µl of finger prick blood samples was collected by using glass haemoglobin pipette and transferred into a test tube containing 5ml of Drabkin's reagent. Anaemia is classified based on WHO classification, when HB level is <12 g/dl. Mild, moderate, and severe anaemia are when the HB levels are 11–11.9 g/dl, 8–10.9 g/dl, and <8 g/gl, respectively. Based on their initial haemoglobin levels, the adolescent girls were then classified as Normal, Mild, Moderate and Severely anaemic.

Stadiometer (True Sense Digital Stature Meter) was used to measure the height which was fixed vertically on the wall perpendicular to the ground. The adolescent girls were asked to stand erect with the shoulder, hips and heels touching the wall and with no footwear, heels together and looking straight ahead, the meter was pulled down onto the head of the girls to get the measurement. Weight was determined using a portable digital weighing machine (Samso Progress). The adolescent girls were asked to stand on the weighing machine bare feet and without leaning against or holding anything.

Dietary assessment was done for 50% of the adolescent girls by using institutional diet survey technique.

The investigator who measured the adolescent girls was previously worked for NNMB- NIN (National Nutrition Monitoring bureau) as Research assistant for two years where she was trained regularly and conducted large scale survey in the field. This experience helped in capturing high quality measurements and her guide trained her even during the study period as part of PhD curriculum.

A pretested structured questionnaire was used for data collection in a detailed way which included information on age, age at menarche, menstrual history, Knowledge about anaemia, personal hygiene practices, food habits (preference of GLV, Junk foods, skipping of meals, Fasting), Morbidity status, the girls were asked to report any ailment that they experienced three months prior to data collection. Utmost care was taken during data collection by the investigator. Interaction among adolescent girls themselves was restricted and data collection was done parallelly so that discussions could be avoided.

Ethical clearance was obtained from institutional ethical committee (NIN protocol no: 08/II/2017). Informed consent was obtained from Deputy Director, Social welfare department, Secretary, TSWREI, Head of the Institutions, participants and their caretakers.

STATISTICAL ANALYSIS

Mean and SD values were calculated for quantitative variables and prevalence's were calculated for categorical variables. Median with IQR values were calculated for non-normal variables like food and diet. Z scores were calculated and assess the nutritional status of adolescent children based on WHO growth standards using Anthroplus software. Chi square test was performed to study the associations between age, clinical signs and symptoms, nutritional status, morbidity and knowledge and anemia status. Multiple logistic regression was used to estimate risk factors (Odds ratio with 95% CI) for anemia. Level of significance was considered as 0.05. IBM SPSS version 24.0(SPSS Inc, Chicago, Illinois, USA) were used for all statistical analysis.

RESULTS

A Total of (n=862) adolescent girls of 7th to 9th from the two permitted schools were included for the study. The age range of the adolescent girls were ≥10 years and ≤16yrs old (mean =13 SD=1.16). The height in cm (mean=146.5 SD=6.87) and weight in kg (mean=38.4 SD=6.63) respectively (Because of small population involved aged, ≥10 years and ≤16yrs old and due to growth spurts in this age group the SD are high).

The HB range was (mean=10.1 SD=1.71) g/dl. Assessment of nutritional status on the basis of Z score reveals 21.1% stunting & 10.1% thinness among the girls (Table 1).

Table 1: General characteristics of Study participants

Characteristics	N=862
Age group N (%)	
10-11	78(9)
12	228(26.5)
13	285(33.1)
14-16	271(31.4)
Age in years (Mean ±SD)	13.0±1.16
Height in cm (Mean ±SD)	146.5±6.87
Weight in kg (Mean ±SD)	38.4±6.63
Hb g/dl (Mean ±SD)	10.1 ±1.71
HAZ (Mean ±SD)	-1.252±0.999
BAZ (Mean ±SD)	-0.536±1.064
Stunting	182(21.2)
Thinness	87(10.1)

Figures in parenthesis () denotes percentage

Prevalence of anaemia was found to be 746 (86.5%). Mild anemia was seen in 22% (95% CI range: 20-25%), moderate anemia was seen in 55% (95% CI range: 51%-58%), severe anemia was seen in 10% (95% CI range: 7.9%-12%). Only 13% had no anemia (95% CI range: 11-16%). (fig1).
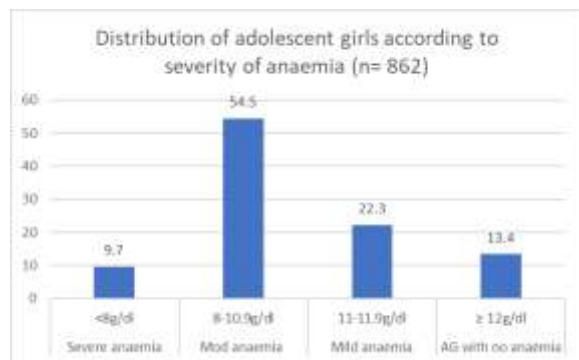
Fig 1: Prevalence of anaemia

The Adolescent girls who had attained menarche were 502(58.2%). The mean age of menarche was 11.9±0.93yrs. Menstrual history reveals, 218(43%) had 4 to 5 days duration of blood flow, 296(58.9%) had menstrual ±cycle of above 28 days, regular menstrual cycle was reported by 294(58.6%). Abdominal pain 314(69%) was one of the most common premenstrual symptoms experienced by the girls (Table 2).

Table 2: Menstrual History & Premenstrual symptoms of the adolescent girls

Attained menarche N (%)	
Yes	502(58.2)
No	360(41.7)
Mean Age of menarche	11.9±0.93
Duration of Blood flow	
2-3 days	76(15)
3-4 days	69(14)
4-5days	218(43)
>5days	139(28)
Duration of Menstrual cycle	
>28days	296(58.9)
<28days	206(41.1)
Menstrual cycle	
Regular	294(58.6)
Irregular	208(41.4)
Premenstrual symptoms*	
Vomiting	23(5)
Nausea	43(9.4)
Abdominal Pain	314(69)
Back ache	195(43)
Loss of Appetite	169(37)
Abdominal Discomfort	84(18.4)
Others	46(10)

* multiple response
Figures in parenthesis () denotes percentage

Personal hygiene practices followed by the AG reveals that 847(98.3%) washed hand before eating, 304(35.5%) bathed daily, 722(83.8%) changed their clothes daily. Brushing of teeth once daily 805(93.4%) and trimming of nails regularly 750(87%), walking barefoot 131(15.2%) was reported. AG 776(90%) preferred green leafy vegetables and 800(92.8%) junk foods (Table 3).

Table 3: Personal hygiene & food preferences of the adolescent girls

Do you Wash your Hands before eating N (%)	
Yes	847(98.3)
Do you wash hand with Soap after using Toilet	
Yes	674(78.2)
Taking Bath	
Daily	304(35.5)
Weekly Thrice	83(9.6)
Weekly Twice	289(33.5)
Weekly Once	186(21.6)
How frequently do you Wash Hair	
Daily	23(2.6)
Weekly Twice	103(11.9)
Weekly Once	736(85.4)
Do you Change Dresses daily	
Yes	722(83.8)

Table 3 To Be Continued…	
Do you Wash your Dresses daily	
Yes	341(39.6)
Brushing of Teeth	
Once	805(93.4)
Twice	57(6.6)
How often do you Comb Hair	
Once	340(39.4)
Twice	502(58.2)
Thrice	20(2.3)
Do you Cut your fingernails regularly	
Yes	750(87)
Do you Walk Barefoot outside	
Yes	131(15.2)
Washing fruits before consumption	
Yes	816(94.7)
Preference of junk foods	
Yes	800(92.8)
Preference of Green leafy vegetable	
Yes	776(90)

Figures in parenthesis () denotes percentage

Dietary assessment of the AG revealed intake of micronutrients especially iron (mean=13.6 SD=1.420) mg was less than 70% Compared to Estimated Average Requirement (EAR).

Knowledge pertaining to anaemia was assessed by a set of pre tested questionnaire. Information regarding minerals, its importance, deficiency disorder symptoms was very poor which was statistically significant (p<0.005). About HB 500(58%) knew, 239(28%) had knew their HB level 170(19.7%) had knowledge about normal HB level which was significant (p<0.005) (Table 4).

Table 4: Knowledge about anaemia in relation to HB status among adolescent girls (n=862):

Variables		<8g/dl	8-11g/dl	11-12g/dl	>=12g/dl	P value
Minerals necessary for body functions	Know	21(5.5)	219(57.6)	90(23.7)	50(13.2)	0.003
	Do not know	63(13.1)	251(52.1)	102(21.2)	66(13.7)	
Do you about mineral Iron	Know	10(2.7)	203(54.7)	102(27.5)	56(15.1)	0.000
	Do not know	74(15.1)	267(54.3)	90(18.4)	60(12.2)	
Do you know the Importance of mineral iron	Know	6(2.4)	149(60.1)	63(25.4)	30(12.1)	0.000
	Do not know	78(12.7)	321(52.3)	129(21)	85(14)	
Do you know about the deficiency disorder of mineral iron	Know	6(3.5)	98(56.6)	50(28.9)	19(11)	0.003
	Do not know	78(11.3)	372(54)	142(20.6)	97(14.1)	
Do you know about B complex Vitamin	Know	72(9.8)	390(53.4)	172(23.5)	97(13.3)	0.084
	Do not know	12(9)	80(61.5)	20(15)	19(14.5)	
Do you know what anaemia is	Know	9(4.9)	108(59.3)	45(24.7)	20(11)	0.361
	Do not know	75(11.1)	362(53.2)	147(21.7)	96(14.2)	
Do you know about Haemoglobin	Know	38(7.6)	302(60.4)	109(21.8)	51(10.2)	0.000
	Do not know	46(12.7)	168(46.4)	83(22.9)	65(18)	
Do you Know your Haemoglobin level	Know	22(9.2)	153(64)	47(19.7)	17(7.1)	0.001
	Do not know	62(10)	317(50.9)	145(23.3)	99(15.9)	
Do you know what Normal Haemoglobin level is	Know	16(9.4)	95(55.9)	42(24.7)	17(10)	0.468
	Do not know	68(9.8)	375(54.2)	150(21.7)	9.9(14.3)	
Do you know deficiency of Iron leads to anaemia	Know	5(4.8)	58(55.8)	26(25)	15(14.4)	0.325
	Do not know	79(10.4)	412(54.4)	166(21.9)	101(13.3)	
Do you know causes of Anaemia	Know	2(3.1)	38(58.5)	15(23.1)	10(15.4)	0.305
	Do not know	82(10.3)	432(54.2)	177(22.2)	106(13.3)	
Do you Know about Hookworm	Know	76(10.9)	370(53.1)	157(22.5)	94(13.5)	0.089
	Do not know	8(4.81)	100(60.6)	35(21.2)	22(13.3)	
Do you know that parasitic infection causes anaemia	Know	4(11.1)	20(55.6)	5(13.9)	7(19.4)	0.519
	Do not know	80(9.7)	450(54.5)	187(22.6)	109(13.2)	
Do you know Symptoms of anaemia	Know	0	10(50)	10(50)	0	0.000
	Do not know	84(10)	460(54.6)	182(21.6)	116(13.7)	
Are you aware of Deworming Tablets	Know	80(10.7)	427(57.2)	154(20.6)	86(11.5)	0.000
	Do not know	4(3.5)	43(37.4)	38(33)	30(26.1)	
Are you aware of IFA tablets	Know	79(11.8)	381(56.7)	128(19)	84(12.5)	0.000
	Do not know	5(2.6)	89(46.8)	64(33.7)	32(16.8)	
Are you given health & Personal Hygiene Education	YES	84	457(54.1)	188(22.3)	115(13.6)	0.296
	NO	0	13(72.2)	4(22.2)	1(5.6)	
Total		(n=84)	(n=470)	(n=192)	(n=116)	

Figures in parenthesis () denotes percentage

The data in (Table 5) indicate severely anaemic 32(14%) were mostly in the 12yrs age group lowest were in <11 age group 3(3.8%). Age wise variation in anaemia prevalence was found statistically significant (p value 0.004). Clinical signs, paleness of (eyes, lips, tongue, skin, nails), gums were mostly observed in severely anaemic girls. (p<0.005). Symptoms (breathlessness, giddiness, fatigue, loss of appetite, frequent headache, pica) was mostly observed in moderately anaemic (p<0.005). This is important finding as a regular clinical history elicitation is a simple tool to assess anaemia.

Table 5: Known determinants of anaemia among adolescent girls (n=862)

Variables		<8g/dl	8-11 g/dl	11-12g/dl	>=12g/dl	P value
Age group	10-11	3(3.8)	39(50)	20(25.6)	16(20.5)	0.004
	11-12	32(14)	103(45.2)	60(26.3)	33(14.5)	
	12-13	31(10.9)	165(57.9)	53(18.6)	36(12.6)	
	14-15	18(6.6)	163(60.1)	59(21.8)	31(11.4)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Eyes(pale conjunctiva)	Normal	6(0.8)	435(58.2)	190(25.4)	116(15.5)	0.000
	Abnormal	78(67.8)	35(30.4)	2(1.7)	0	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Lips(pale)	Normal	22(2.9)	436(57.1)	190(24.9)	115(15.1)	0.000
	Abnormal	62(62.6)	34(34.3)	2(2)	1(1)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Tongue(pale)	Normal	6(0.9)	393(55.7)	190(27)	116(16.5)	0.000
	Abnormal	78(49.7)	77(49)	2(1.3)	0	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Skin(pale)	Normal	4(0.8)	204(40.8)	179(35.9)	113(22.6)	0.000
	Abnormal	80(22)	266(73.5)	13(3.6)	3(0.8)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Nails(pale)	Normal	24(28.6)	433(56.9)	189(24.8)	116(15.2)	0.000
	Abnormal	60(60)	37(37)	3(3)	0	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Teeth	Normal	80(10.2)	427(54.2)	176(22.3)	106(13.4)	0.620
	Abnormal	4(5.4)	43(58.1)	16(21.6)	10(13.7)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Gums	Normal	80(9.6)	451(53.9)	190(22.8)	116(13.9)	0.029
	Abnormal	4(16)	19(76)	2(8)	0	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Symptoms*	Normal	11(2.5)	142(32.3)	171(39)	115(26.2)	0.000
	symptoms	73(17.3)	328(77.5)	21(5)	1(0.2)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
HAZ	Normal	58(8.5)	373(54.9)	152(22.4)	97(14.3)	0.089
	Stunted	26(14.3)	97(53.3)	40(22)	19(10.4)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
BAZ	Normal	73(9.4)	438(56.5)	168(21.7)	96(12.4)	0.003
	Thinness	11(12.6)	32(36.8)	24(27.6)	20(23)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Attained menarche	Yes	44(8.8)	288(57.4)	110(21.9)	60(12)	0.167
	No	40(11.1)	182(50.6)	82(22.8)	56(15.6)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Fever	Normal	60(9)	362(54.3)	157(23.5)	88(13.2)	0.261
	Abnormal	24(12.3)	108(55.4)	35(17.9)	28(14.4)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Cold	Normal	44(8.8)	267(53.3)	122(24.4)	68(13.6)	0.284
	Abnormal	40(11.1)	203(56.2)	70(19.4)	48(13.3)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Cough	Normal	61(9.2)	363(55)	154(23.3)	82(12.4)	0.212
	Abnormal	23(11.4)	107(53)	38(18.8)	34(16.8)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Drinking water	Municipality + mineral water	60(9.5)	354(55.9)	129(20.4)	90(14.2)	
	RO	24(10.5)	116(50.7)	63(27.5)	26(11.4)	0.117
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Washing hand before eating	Yes	82(9.7)	463(54.7)	189(22.3)	113(13.3)	
	No	2(13.3)	7(46.7)	3(20)	3(20)	0.826
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Using soap after visiting toilet	Yes	70(10.4)	366(54.3)	141(20.9)	97(14.4)	
	No	14(7.4)	104(55.3)	51(27.1)	19(10.1)	0.118
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	

Table 5 To Be Continued…						
Skipping of meals	Yes	64(10.6)	324(53.8)	124(20.6)	90(15)	0.055
	No	20(7.7)	146(56.2)	68(26.2)	26(10)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	
Fasting	Yes	49(10.4)	250(53.1)	97(20.6)	75(15.9)	0.076
	No	35(9)	220(56.3)	95(24.3)	41(10.5)	
	Total	84(9.7)	470(54.5)	192(22.3)	116(13.5)	

Figures in parenthesis () denotes percentage
*Symptoms of anaemia (breathlessness, giddiness, fatigue, loss of appetite, frequent headache, pica)

Nutrition Status was assessed by WHO recommended BMI-for-age Z-score (WHO,2006 standard). Stunting, 8.5% of the normal & 14.3% of the stunted girls were severely anaemic. Thinness(wasting), 9.4% of the normal & 12.6% of the thinness girls were severely anaemic. The overall stunting was prevalent in 21.2% & thinness in 10.1% of the adolescent girls. HAZ was not significant but there was trend(p=0.089). BMI, there was a significant association with anaemia prevalence (p<0.005).

Majority 442(88%) of anaemic girls had attained menarche. Menarchal status was not significantly associated with prevalence of anaemia(p=0.167).

The common ailments like Fever, cold, cough was seasonal. 195 (22%) girls suffered from fever. 361(42%) suffered from cold & 202(23.4%) suffered from cough. There was no significant association between anaemia & morbidity status, fever (p value 0.261), Cold (p value 0.284), Cough (p value 0.212).

Source of Drinking water (Municipality and mineral water & RO water) statistically it was not significantly associated with prevalence of anaemia (p value 0.117). 98.3% washed hands before eating & 78.2% washed hands with soap after visiting toilet. Washing hands before eating & using soap after visiting toilet was also not significantly associated with prevalence of anaemia (p value 0.118). Skipping of meals by 602 (69.8%) of the girls, breakfast was most skipped (80.4%) of the girls. Practice of fasting was reported by 471(54.6%). Skipping of meals & fasting was not significantly associated (p value 0.055) & (p value 0.076) with prevalence of anaemia but there was trend. Multiple regression analysis showed that the determinants Symptoms of anaemia was found to be important predictor of anaemia with odds ratio of 44.5(95%CI 5.8-33.81) and p value of 0.000. Pale skin was another predictor of anaemia with OR of 3.6(95%CI 1.0-12.3) and p value of 0.046.(Because of only few cells in one of the categories the odds ratios are large).

Table 6: Risk Estimates of Anaemia with other variables with stepwise logistic regression

Variables	Category	Risk estimation (OR)	95%CI lower	upper	p value
Symptoms*	No	1			0.000
	Yes	44.5	5.8	33.81	
Pale Skin	No	1			0.046
	Yes	3.6	1	12.3	

*Symptoms of anaemia ((breathlessness, giddiness, fatigue, loss of appetite, frequent headache, pica)

DISCUSSION

Adolescents are the future generation of any country and their nutritional needs are critical for the wellbeing of the society and nation. The objective of this study was to determine the prevalence and predictors of anemia in adolescent girls, as well as to assess adolescent girls' knowledge about anemia. Among the 862 adolescent girls screened, 22.3% were mildly anaemic, 54.5 % were moderate and 9.7% were severely anaemic. The prevalence of anaemia was found to be 86.5% which is of high magnitude as per WHO guidelines & a major public health problem. Similar studies of prevalence of anaemia ranging from 87%

to 89.1% was reported by various authors [13 to 15]

NFHS-5 survey in Telangana showed a high prevalence (64.7%) of anaemia among 15-19yrs and CNNS survey, prevalence of anaemia in Telangana to be (37.8%) among 10-14 yrs. girls & (55.2%) among 15-19yrs. [16,17].

The mean±SD HB levels of the girls were found to be 10.1±1.71g/dl and was similar to the other studies in India in this age group [15,18]. Clinical signs, paleness of (eyes, lips, tongue, skin, nails, gums) reported among AG were statistically significant (p<0.005) to the prevalence of anaemia. Studies by some authors reported 28.12% of conjunctival pallor among adolescent girls [19], 16% pale skin and 5.7 % pigmentation of nails [18], 52.3% pallor of conjunctiva, tongue and nail bed [20] among the adolescent girls.

Symptoms such as (breathlessness, giddiness, fatigue, loss of appetite, frequent headache, pica) was mostly observed in moderately anaemic followed by severely anaemic girls which is statistically significant. (p<0.005). A Study reported, 28.6% fatigue and feeling of weakness, while dizziness and giddiness 11.9% among adolescent [21]. Symptoms and Pale skin were found to be important predictor (Risk estimates) of anaemia which coincided with study [22].

BMI for age <2SD, is a significant risk factor of anaemia among adolescent girls [23]. The prevalence of Stunting & Thinness was found to be 21.2% & 10.1%. Similar prevalence of stunting & thinness was reported [24]. HAZ was not significant but there was trend(p=0.089). BMI, there was a significant association with anaemia prevalence (p<0.005) which coincided with the study [15].

88% of anaemic girls had attained menarche. Similar findings were reported by Tesfaye et al [25]. Premenstrual symptoms like abdominal pain, backache, loss of appetite, abdominal discomfort nausea vomiting headache, body pains, tiredness, discomfort was experienced by the girls.

Menarchal status was not significantly associated with prevalence of anaemia(p=0.167) which corroborated with other studies [26,27]. Morbidity status was not significantly associated with anaemia. Similar findings were reported by Johnson et al [28].

Personal hygiene practices such as washing of hands before eating & usage of soaps after visiting toilets was found to be good in our study. Similar findings were reported by these studies [29,20]. Higher prevalence of anaemia was found among the students who were not maintaining regular hand washing [20,30].

Skipping of meals and fasting was observed among girls Breakfast was the most skipped meal followed by dinner as was reported by other studies. [31,23]. Skipping of meals & fasting was not significantly associated with prevalence of anaemia but there was trend which coincided with the study done by Johnson et al [28].

Girls usually also pay attention to body shape, thereby limiting their food consumption and abstaining from large meals [32]. The mean intake of macro nutrients was adequate but of micronutrients especially iron (13.6±1.420 mg) was less than 70% compared to EAR among the Adolescent girls. Bodat et al in their study reported mean iron intake of 6.3 ±2.2mg/dl which was not even 25% of RDA (mg/day) [15].

Regarding knowledge towards anaemia, only 21% knew about anaemia & 7.5% knew about causes of anaemia. Chaluvaraj & Satyanarayana (2018) reported poor nutrition knowledge and ignorance about micronutrients, poor dietary management among adolescent girls in their study [11]. Poor knowledge & awareness regarding anaemia was significantly (p<0.005) associated with high prevalence of anaemia which corroborated with studies reported by Dhivakar, et al (2020) [31] Shanti & Ambujam (2021) [32], Patimah et al (2016) [33] in their study. Poor Knowledge about anaemia and skipping of meals could be a contributing factor for high prevalence of

anaemia among adolescent girls in our study.

Strengths and Limitation

Biomarker Ferritin was not carried out as resource & time constrains however, we have done detailed analysis of causes of anaemia as 50% of anaemia are of Iron deficiency and globally accepted. However, we have done a comprehensive analysis of determinants and their knowledge on anaemia, which is the strength of the study. The risk factors identified helped plan interventions in other part of our study

CONCLUSION

A high prevalence of anaemia, 86.5% was found in our study which is of high magnitude according to WHO. Most of the girls were moderately anaemic. High Anaemia prevalence was increasing with age, may be due to food faddism. Personal Hygiene practices was found to be good. Knowledge of anaemia among the adolescent girls was poor. Ignorance regarding food choices, skipping of meals was observed. Hence focus should be on counselling adolescents to promote healthy eating habits and promotion of iron-rich foods, iron absorption enhancers like haem iron and vitamin C rich foods and reducing ingestion of inhibitors (phytates, tannins and oxalates).

Abbreviations: HB-Haemoglobin**,** HAZ-Height for Age Z; BMI Z-Body Mass Index for Age
ICMR-Indian Council of Medical Research; WHO-World Health Organization; RDA-Required Dietary Allowance, CNNS-Comprehensive National Nutrition Survey, NHFS- National Health & Family Survey, TSWREI- Telangana Social Welfare Residential Education Institutes, MoHFW-Ministry of Health and Family Welfare. KAP- Knowledge Attitude & Practice, EAR- Estimated Average Requirement.

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