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Research Article

Association between skinfold thickness and neck circumference with anemia in rural school going adolescent girls

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ABSTRACT

Background: Anemia is one of the most common hematological abnormalities found in children and adolescents. Unfortunately assessment of nutritional status of adolescent girls has been the least explored area of research, particularly in rural India. There are studies which associated Body Mass Index and anemia in adolescent girls. But the validity of BMI across diverse samples of youth has not been evaluated. Objective of this study was to study association between skinfold thickness and neck circumference with anemia in rural school going adolescents.
Methods: A prospective study was carried out among 1200 rural adolescent girls of 10 randomly selected government schools (120 girls from each school and from each class 30 girls) between the age group of 12-16yrs. Skin fold thickness was measured by Herpenden's caliper. Neck circumference was measured. The hemoglobin levels were estimated by cyanmethemoglobin method by finger prick. The collected data was statistically analysed.
Results: The prevalence of anemia in rural school going adolescent girls was 54.2%. 91.3% adolescent girls had SFT <14.5mm, out of that 56.2% adolescent girls were significantly anemic. 25.1%, 30.3% and 0.7% suffered significant mild, moderate and severe anemia respectively. 84.4% adolescent girls had neck circumference <27cms, out of that 58.4% girls had significant anemia (24.2% mild, 33.4% moderate and 0.9% severe anemia).
Conclusions: The adolescent girls who had SFT <14.5mm and neck circumference <27cms suggesting undernutrition were significantly anemic. SFT and NC can be used as nutritional parameter in adolescent girls. The health and nutritional education should be advocated to rural adolescent girls.

Keywords: Adolescent girls, Anemia, Neck circumference, Skinfold thickness

INTRODUCTION

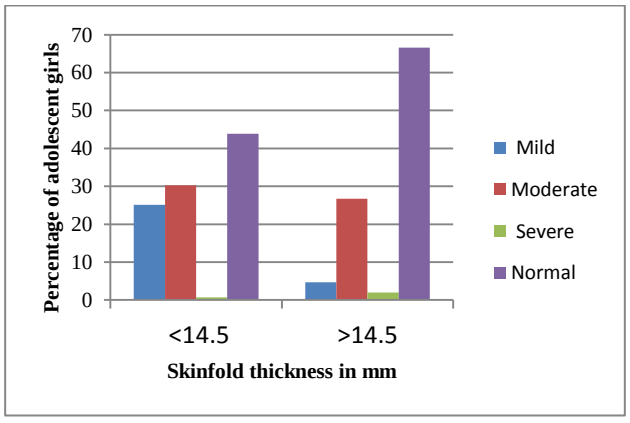
Anemia is one of the most common hematological abnormalities found in children and adolescents. It is defined as a low level of hemoglobin in the blood. It is one of the world's most widespread nutritional problem.[1] India has the world's highest prevalence of iron deficiency anemia among women with 60-70% of the adolescent girls being anemic.[2] Anemia in adolescent girls has far reaching implications. The anemic adolescent girls grow into adult women with compromised growth, both physical and mental. These women have low pre-pregnancy weight and are more likely to die during childbirth and deliver low birth weight babies.[3,4] Adolescent girls form a crucial segment of the population and constitute, as it were, the vital bridge between the present generation and the next. Unfortunately assessment of nutritional status of adolescent girls has been the least explored area of research, particularly in rural India. There are various studies, in which Body Mass Index was associated with anemia in adolescent girls.[5-8] However, the BMI has limitations; it tends to have high specificity, but low and variable sensitivity in children and adolescents. Further, the validity of BMI across diverse samples of youth has not been evaluated.[9] So we tried to associate other nutritional parameters like Skinfold thickness (SFT) and

Neck circumference (NC) with anemia in rural school going adolescent girls.

METHODS

This prospective study was conducted in 10 government schools of rural Kolhapur, among 1200 adolescent girls. Schools were chosen randomly and from each school 120 adolescent girls and from each class 30 adolescent girls were selected randomly from attendance register. The girls between the age group 12-16yrs were selected for the study. The study was carried out after approval by Institutional ethical committee and permission from school principal/ headmaster. Informed consent from parents/ guardian was also taken. A specially designed data entry format was used to enter all adolescent girl's details like name, age, school, standard, skinfold thickness, neck circumference and haemoglobin level. Tricep skinfold thickness (SFT) was measured on right side with relaxed shoulder and arms hanging freely at the sides in standing position. Skin is pinched using both index finger and skinfold thickness was measured with herpendens caliper. Neck circumference (NC) was measured in the midway of the neck, between mid-cervical spine and mid anterior neck, to within 1 mm, using non stretchable plastic tape with the girls standing upright. Hemoglobin level was determined by cyanmet hemoglobin method by finger prick on the same day of sample collection.[10] As per WHO recommendations anaemia was diagnosed when Hb <12g/dL in 10-18 years girls.[11] The severity of anaemia was graded as mild (Hb >10g/dL), moderate (Hb 7-9.9 g/dL) and severe (Hb <7g/dL).[12] All observations were recorded, tabulated and subjected to statistical analysis by chisquare test in which P<0.05 was significant. P value was determined by using the primer of biostatistics and MS EXCEL 2007.

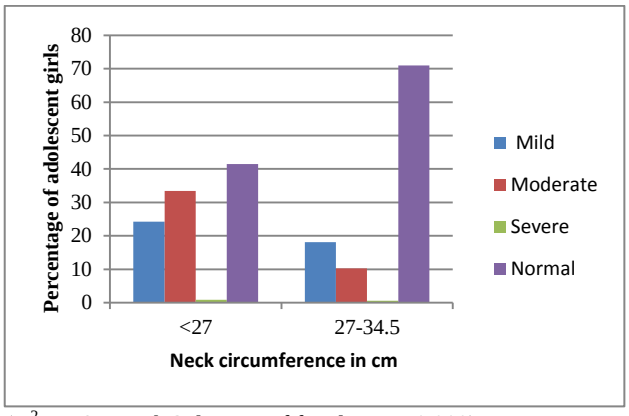
RESULTS



(X^2=29.917 with 3 degrees of freedom; P=0.000).

Figure 1: Association between skinfold thickness and severity of anemia.

The prevalence of anemia in rural school going adolescent girls was 54.2% (Table 1). 23.4%, 30% and 0.8% adolescent girls suffered from mild, moderate and severe anemia (Table 2).91.3% rural adolescent girls had skin fold thickness < 14.5 mm and 8.7% had > 14.5 mm.56.2% adolescent girls who had skin fold thickness <14.5 mm were significantly anemic compared to 33.4% in whom skin fold thickness >14.5mm (Table 3). The adolescent girls who had skin fold thickness <14.5mm suffered significantly 25.1% mild, 30.3% moderate and 0.7% severe anemia (Figure 1).



(X^2=57.951 with 3 degrees of freedom; P=0.000).

Figure 2: Association between neck circumference and severity of anemia.

Table 1: Prevalence of anemia in rural adolescent girls.

Age in years	Adolescent girls					
	Anemic		Non anemic		Total	
	No	%	No	%	No	%
12-13	138	46	162	54	300	100
13-14	190	63.3	110	36.7	300	100
14-15	172	57.4	128	42.6	300	100
15-16	150	50	150	50	300	100
Total	650	54.2	550	45.8	1200	100

Table 2: Severity of anemia in rural adolescent girls.

Hemoglobin (g/dl)	No. of cases	Percentage%
>12 Normal	550	45.8
10-12 Mild anemia	280	23.4
7-10 Moderate anemia	370	30.0
Below 7 severe anemia	10	0.8
Total	1200	100

84.4% adolescent girls had neck circumference < 27 cms, out of that 58.4% girls had significant anemia as compared to girls whose neck circumference was 27-34.5 cms (Table 4).

The girls in whom neck circumference was <27 cms suffered significantly 24.2% mild, 33.4% moderate and 0.9% severe anemia (Figure 2).

Table 3: Association between skinfold thickness and anemia.

	Skin fold thickness (mm)			
	<14.5		>14.5	
	no	%	no	%
anemic	615	56.2	35	33.4
non anemic	480	43.8	70	66.6
total	1095	91.3	105	8.7

(X^2 =19.208 with 1 degree of freedom; P = 0.000).

Table 4: Association between neck circumference and anemia.

	Neck circumference in cm			
	<27		27-34.5	
	no	%	no	%
anemic	599	58.4	51	29
non anemic	425	41.6	125	71
total	1024	85.4	176	14.6

(X^2 = 51.530 with 1 degree of freedom; P = 0.000).

DISCUSSION

In our study the overall prevalence of anemia in rural school going adolescent girls was reported to be 54.2%. Chitra B et al, Peter etal and Rawat et al observed prevalence of anemia as 81.7%, 77.9% and 40.8% respectively in rural adolescent girls.[13-15] National Family health Survey (NFHS) New Delhi observed 56% of adolescent girls were anemic and stated that adolescence in India goes hand in hand with iron deficiency anemia. Agarwal etal observed 77.2% adolescent girls were anemic out of that 45.5%, 28.2% and 3.5% suffered mild, moderate and severe anemia respectively.[16,17] According to WHO if the prevalence of anemia at community is more than 40%, it is considered as a problem of high magnitude.[18]

Deshpande et al studied SFT and NC as nutritional parameter in adolescent girls, and observed 95% and 81.7% adolescent girls had SFT<14.5mm and NC<27cm respectively which was the sign of under nutrition.[19] 62.8% and 63.6% adolescent girls were anemic whose SFT<14.5mm and NC<27cm respectively. 6.1% and 42.4% adolescent girls were anemic whose SFT>14.5mm and NC>27cm respectively. These results are comparable to our study results. Reilly et al used SFT as a parameter to measure body composition in pre pubertal children. Patnaik et al used NC as one of the nutritional parameter in overweight adolescents.[20,21] In adults, SFT had been shown to be as valid as any other method for the measurement of absolute fat mass and fat free mass.[22] SFT was widely used in children for clinical research and epidemiological purpose, but there are doubts about its validity in infancy.[23] BMI is a measure of excess weight relative to height rather than excess body fat, may be less sensitive indicator of fatness among children.[24] SFT and NC measurements are simple, reasonably precise and attractive methods, they can be used to assess nutritional status in adolescents.

Adolescence is a period of growth spurt and there is an increased demand for energy, protein, minerals and vitamins. Iron deficiency anemia constitutes the major anemia during adolescents and it may affect growth and skeletal development. This is due to rapid pubertal growth with sharp increase in lean body mass, blood volume and red cell mass which increases iron requirements for myoglobin in muscles and hemoglobin in the blood.[25] The adverse impact gets especially aggravated, if both undernutrition and anemia are present in adolescents.

The rural adolescent girls should be regularly taught about nutritive value of common food items, so that they can cope up with protein, calorie and iron requirements. Key dietary behaviour messages for girls include: eating more than 3 meals a day, eating with family members so as to eat enough, eating green leafy vegetables daily and eating lemon or amla with meals. Iron supplementation programmes need to include nutrition education programmes to be effective. School based nutrition intervention will also work to prevent under nutrition and anemia effectively and efficiently. There should be regular health check up to diagnose and treat undernutrition and anemia early. The government also should establish effective strategies to improve adolescent girls health.

CONCLUSION

The adolescent girls who had SFT <14.5mm and neck circumference <27cms suggesting under nutrition were significantly anemic. SFT and NC can be used as nutritional parameter in adolescent girls. The health and nutritional education should be advocated to rural adolescent girls.

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