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CORRELATION OF LEVEL OF HAEMOGLOBIN WITH BODY MASS INDEX AMONG ADOLESCENT GIRLS WITH IRON DEFICIENCY ANEMIA UNDERGOING NUTRITIONAL SUPPORT THERAPY

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ABSTRACT

The aim of the study is to correlation of haemoglobin with body mass index among adolescent girls with iron deficiency anemia undergoing nutritional support therapy at selected higher secondary schools in Bangalore Karnataka. Considerable changes in the growth pattern, lifestyle, dietary habits & behaviour are likely to influence the haemoglobin levels among adolescent girls. Body mass index is reliable indicator of health and nutritional status of human beings. It express the relationship between the most widely used parameters to monitor linear and height and weight. Haemoglobin concentration is an important diagnostic indicator for well being of an individual. The total amount of the haemoglobin requirements in the body increases more in boys than in girls at puberty. Menstruation is the main cause of blood loss in women. In present study an attempt has made to study the correlation of haemoglobin with body mass index among adolescent girls with iron deficiency anemia. 120 adolescent girls aged between 14- 17 years studying at Gangothri public school and Srigandhadakaval public school were taken for the study Anthropometric measurements were done using standard protocol. Haemoglobin is estimated by using automatic hematology analyser machine. The karl pearson's correlation coefficient was carried out to correlate relationship between haemoglobin concentration and body mass index. showed that in the experimental group the correlation between the level of haemoglobin and body mass index in the post test was r=0.067(p=0.609) which was significant. There was a positive correlation between level of haemoglobin and BMI among adolescent girls with iron deficiency anemia.

KEY WORDS: ***haemoglobin, body mass index, iron deficiency anemia.***

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INTRODUCTION

Iron deficiency anemia is a condition in which anemia occurs due to lack of available iron to support normal red cell production. The prevalence of iron deficiency and subsequent anemia increases at the start of adolescence. Growing adolescents need large amounts of iron for growth and are therefore vulnerable to iron deficiency, particularly those whose diets are marginal in iron content and who experience heavy iron losses due to parasitic infestations. It is a global health problem affecting both developed and developing countries. Globally prevalence of anemia is 29% in females of 15-49 years age group[1]. According to national health survey the prevalence of anemia is 50.8% in non pregnant females and 19% in males of 15-49 years age group in Karnataka state, India[2]. Anemia has a impact not only on human health but also social and economic development. Causes of anemia include blood loss during menstruation, hook worm infestation, chronic infection and micro nutrient deficiencies. In 2002, iron deficiency was an important causative factor for anemia. Anemia is an indicator of poor nutrition and poor health. It affects not only cognitive and physical performance but also work productivity in adults[3]. Faulty feeding habits could be attributed to the occurrence of iron deficiency anemia among young adults. The most prevalent habits accustomed in this age group include changing the main meals for snacks, skipping breakfast, reducing the intake of fruits and vegetables and the increasing consumption of sodas and high calorie foods. These habits can result in iron deficiency. Therefore, studying the haemoglobin level and its relationship to body mass index (BMI) is of great importance. The anemic condition resulting in lack of appetite, that leads to poor intake of food and causes loss of weight. Similarly obese children there is a negative association of BMI to haemoglobin concentration. This could be related to the reduction in the level of estrogen binding protein levels with increasing adiposity (BMI) with concomitant increase in insulin. Therefore level of free estrogen may rise up which may cause suppression of erythropoesis in females[4].

MATERIALS AND METHODS

This study was conducted among adolescent girls after getting permission from Institutional human ethics committee of saveetha University, (011/01/2015/IEC/SU Dated 20/01/2015). Informed consent from parents and verbal consent was obtained from the adolescent girls for their participation in the study. The total sample consists of 120 adolescent girls between the age group of 14-17 years studying at selected higher secondary school using simple random sampling method. The sixty participants from Srigandhadakaval Public School was taken to control group and sixty participants from Gangothri Public School was taken to experimental group.

Inclusion and exclusion criteria

The study includes adolescent girls in the age group of 14-17 years, who were studying at selected higher secondary schools with hemoglobin level less than 12 gm/dL, attained menarche and willing to participate in the study. The study excludes adolescent girls with hemogloin less than 7 gm/dL any systemic disease, with history of metrorrhoes/menorrhagia, reproductive disorders.

Phases of data collection

Phase I

A prior permission was taken from the school authorities. Informed consent from parents and assent was obtained from adolescent girls. The purpose of the study was explained to adolescent girls and their parents. The screening test was conducted in two steps. Check list was used to assess the signs and symptoms of anemia with the score of 1-26. The second screening test adopted was sahlis method[12] of measuring the level of haemoglobin as aconfirmatory diagnostic investigation. This adolescent girls with mild and moderate anemia(Hb is 7-11.9 gm/dl) were selected as samples for the study.

Phase II

The structured interview schedule was used to collect demographic and clinical profoma. Anthropometric measurements were done using standard protocol. Weight was recorded without foot wear with light clothes worn on body, standing straight on the centre of weighing machine with body evenly distributed between the feet. Flexible, non-stretchable, narrow plastic inch tapes were used to measure height of the individual. It was recorded on bare foot, with person standing on flat surface positioned so that the line of version is straight to the body. The arms were hanging freely by the side, and the head back and heels were in contact with the vertical surface. The reading was taken to the last completed one arm, ignoring the nearest unit and then the tape was removed. After taking height and weight the body mass index was calculated as weight (kg)/ Height $(m)^2$. The BMI is categorised as underweight (below 18.5), Normal weight (18.5-25), Over weight (23-24.9), obese (above 25). The blood withdrawal procedure was explained in detail. 2 ml of venous blood was collected and sent to the lab for the estimation of haemoglobin. Phase III: Nutritional support therapy was prepared from amla, jaggery and pumpkin leaves. The freshly prepared nutritional support therapy was given to the adolescent girls in the experimental group and only social visit to control group It was administered to the adolescent girls in a quantity of 30 ml per day for duration of 90 days the with the help of an ounce glass. It was administered during the short break between 10.30- 10.45 am for the duration of 90 days from Monday to Saturday. Phase IV: After 90 days, post-test was carried out with the same procedure.

RESULT

Table 1
Level of haemoglobin before and after intervention

Parameters	Group	Mean ± SE	Paired 't'-test		Unpaired 't' –test	
			Con- pre test -post test	Exp- pre test - post test	Con pre –exp pre	Con post -exp post
Hemoglobin	Control pre test	9.93±0.172	t=0.469		t=0.021	t=4.559
	Control post test	9.86±0.17	p=0.641		p=0.984	p<0.001
	Experimental pre test	9.94±0.45		t=3.96		
	Experimental post test	10.99±0.19		p<0.001		

Table1 illustrates the effect of nutritional support therapy on the haemoglobin level in control and experimental group. The mean and standard error of control group pre test, post test, experimental group pre test, post test were 9.93±0.172, 9.86±0.17, 9.94±0.17, 11.00±0.19 respectively. The comparison of pre test level of haemoglobin of control group and experimental group using unpaired 't' test value was 0.02 (p=0.984) which was not significant. The comparison of post test level of haemoglobin of the control and experimental group using unpaired 't' test value was 4.56 (p<0.001) which found to be highly significant. Hence there was significant difference observed in the post test level of haemoglobin between the control and experimental group after receiving nutritional support therapy. The comparison of pre and post test level of haemoglobin within control group using paired 't' test and the value obtained was 0.469 (p=0.641) which was not significant. The comparison of experimental pre and post test level of haemoglobin using paired 't' test value was 3.962 (p<0.001) which was found to be highly significant.

Body Mass Index

Table 2
Effect of intervention on the BMI in control and experimental group

Parameters	Group	Mean±SE	Paired 't'-test		Unpaired 't' –test	
			Con- pre test -post test	Exp- pre test - post test	Con pre –exp pre	Con post -exp post
BMI	Control pre test	18.97±0.30	t=0.563		t=1.291	t=0.823
	Control post test	19.09±0.28	p=0.515		p=0.199	p=0.412
	Experimental pre test	18.47±0.254		t=4.116		
	Experimental post test	18.79±0.228		p<0.001***		

The table 2 represent the effect of nutritional support therapy on the BMI of adolescent girls with iron deficiency anemia. The mean and standard error of the control group pre test, post test, experimental pre test, post test were 18.97±0.30, 19.09±0.28, 18.47±0.254, 18.79±0.228 respectively. The comparison of pre test level of BMI of control and experimental group using unpaired 't' test value was 1.291 (p=0.199) which was not significant. The comparison of post test level of BMI between control group and experimental group using unpaired 't' test value was 0.823 (p=0.412) Which was also not significant. The comparison of the pre and post test level of BMI within the control group using paired 't' test value was 0.563 (p=0.515) which was not significant. The comparison of the experimental pre and post test level of BMI using paired 't' test value obtained was 4.116 (p<0.001). Which was found to be highly significant in the experimental group there was a slight rising mean value from 18.47 to 18.79.

Table 3
Correlation of level of haemoglobin with BMI in pre test and post test for control and experimental group

Parameters	Control BMI		Experimental BMI	
	Pre test	Post test	Pre test	Post test
Hb	-0.065 (0.620)	-0.078 (0.555)	0.067 (0.609)	0.636 (p<0.001***)

Table 3 represents the correlation of level of haemoglobin with BMI among adolescent girls with iron deficiency anemia. In the control group correlation between the level of haemoglobin with BMI using karl pearson correlation coefficient was found to be negatively correlated in both pre test r=-0.065 (p=0.620) as well as in post test r= -0.078 (p=0.55). In the experimental group the correlation between the level of haemoglobin and BMI in the post test was r=0.067 (p=0.609) which was significant where as in pre test r=0.636 (p<0.001) found to be not significant hence it is proved that administration of nutritional intervention improves the BMI in experimental group.

DISCUSSION

Iron deficiency anemia is the most common micronutrient deficiency in the world, brining serious economic consequences and obstacles to national development. Accelerated growth during adolescence makes it a period during which earlier growth deficiencies might at least partially compensated. Therefore adolescence is an opportune time for interventions to address anemia and improve their nutritional status, thus reducing reproductive risk and increasing productive capacity[5]. In the present study there was a difference in the mean level of haemoglobin between the pre test and post test among experimental group and the paired 't' value obtained was t= 3.96. ($p<0.001$). And also post test means score of experimental group was higher than the control group after the intervention. It shows that the level of hemoglobin in the blood increased after the administration of nutritional support therapy for 90 days. A similar study has conducted on impact of leaf concentrate and iron folic acid supplementation on blood profile of anemic adolescent girls. The study found that a statistically significant improvement had taken place in haemoglobin level, as well as other blood parameters[6.] A study on impact of leaf concentration and iron folic acid supplementation on blood profile of anemic adolescent girls. Group 1 was supplemented with one tablet of iron and folic acid (50 mg elemental iron and 500 microgram of folic acid). The group II was supplemented with 10 gm of leaf concentration powder. The result highlighted that there was significant improvement in all blood parameters of group II compared to group one.[7] In the present study it was noted that nutritional support therapy enhanced the correlation between level of haemoglobin with BMI. This study is in consistent with the study to observe the association of anemia with BMI conducted on 98 adolescent medical student aged between 17-21 years at Belgavi Institute of medical science. It found that there was a positive correlation obtained between anemia and BMI among participants. The correlation factor was not much significant[8.] Prevalence of anemia was higher in underweight children as compared with normal weight or obese children in the age group of 8-16 years[9]. A cross-sectional study was conducted among 408 school adolescents girls on Anemia and iron deficiency among school adolescents, its burden, severity and determinant factors in southwest Ethiopia. It revealed that nutritional status was significantly associate with anemia. Undernourished school adolescents who had a low BMI <18.5 kg/m^2were 2.54 times more likely to have anemia as compared to those who have a BMI$\geq$18.5 kg/m^2.[9] A cross-sectional study conducted to investigate the relationship of anemia and body mass index among adult women in china showed anemia decreasing with increasing BMI[10]. A study conducted among toddlers revealed that toddlers with body mass index below 50th percentile were associated with increased like hood of anemia compared to above 50th percentile of BMI[11].

CONCLUSION

We found a positive correlation between level of haemoglobin with BMI after receiving the intervention for 90 days. Frequent screening for the prevalence of anemia should be done among the target group. The students should be motivated and educated to take a balanced diet rich in green leafy vegetables and fruits.

CONFLICT OF INTEREST

Conflict of interest declared none.

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