

Impact of Knowledge, Attitude and Practice on Iron Deficiency Anaemia Status Among Females of Reproductive Age Group (20-21-year-old) Studying in Government Home Economics College Lahore, Pakistan

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ABSTRACT

Background: Iron deficiency anemia has emerged as a major public health issue in developed and developing countries. According to WHO 29% of all women of reproductive age group are diagnosed to have anemia. **Objectives:** 1) to determine Hemoglobin (Hb) levels among girls 20-21-year-old by Sahli's method 2) to identify correlation between Hb levels and KAP scores among girls 20-21-year-old. **Methods** cross sectional study design applied with convenient sampling technique; and sample of 150 girls 20-21 year old was taken. Standardized KAP questionnaire was developed from FAO Guidelines upon iron deficiency anemia, and administered. Hb levels were determined in laboratory by Sahli's method and classification of anemia was made according to WHO guidelines 2011. Frequency trend of anemia was noted, and Pearson product correlation was applied to Hb levels and KAP scores for risk analysis. **Results** 19.3% had mild, 51.3% had moderate, and 13.3% had severe anemia. Only 16% girls had normal Hb levels. 54% had good knowledge about anemia with Pearson correlation (r) = 0.092, $P=0.263$. 79% had positive attitude towards self-awareness of anemia as a disease but correlation (r) was found to be in inverse relation (-0.005), $P= 0.95$. Highly significant positive correlation was found between dietary practices and Hb levels; where 53% had shown desired dietary practices with $r= 0.174$, $P= 0.033$. **Conclusions:** increasing trend of iron deficiency anemia among young girls of reproductive age group was seen; mostly related to life style and behavior towards importance of taking balanced diet. Representative sample study is strongly suggested.

Key words: females, reproductive age group, nutrition, iron deficiency anemia, KAP study

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INTRODUCTION

Anemia is a global public health problem affecting developed as well as developing countries with serious consequences upon human health, social and economic development. It is found at all stages in a life cycle, more prevalent among females of reproductive age group (15-49

year) and young children.^[1] Anemia is considered to be the most common nutritional deficiency worldwide and in 95% of the cases it is associated with poor diet intake; despite the fact that iron is the second most abundant metal in the earth's

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crust. Anemia is more common in infants, children 3-6 year of age and adolescents 11-17 year of age living in developing countries; constituting a serious public health issue.^[2] WHO has defined anemia as: hemoglobin (Hb) concentration below 12 g/dl in women.

According to WHO, over 30% of the world's population are anemic; thus, focusing upon the importance of anemia as public health issue in developed and developing countries. 4.3-20% of the population in developed world where and 30-48% in developing countries are affected by iron deficiency anemia. According to a WHO report, globally it is estimated that roughly 43% of children, 38% of pregnant females, 29% non-pregnant women, and 29% of all women of reproductive age are diagnosed to have anemia.^[3] In Pakistan 51% of non-pregnant women are hemoglobin deficient and 20% is suffering from iron deficiency anemia.^[4] Mild to moderate iron deficiency has adverse functional consequences upon health of an individual; impaired cognitive functions, behavior and physical growth among infants to school age children, physical capacity, work performance and immunity of all age groups is significantly affected by low levels of iron.^[5] The period of adolescence and adulthood in the life cycle is a period of intense growth, second only to infancy; thus overall nutrient need is high in order to support optimum growth and development, and iron is the particular nutrient which is in high demand. Body needs more iron during rapid growth phase or when frequent blood losses are there (menstruation); thus adolescent girls and young adult women are at a greater risk of developing iron deficiency further leading to iron deficiency anemia.^[6] Previous researches found lack of appropriate knowledge and attitude regarding healthy eating patterns thus leading to unhealthy eating practices.^[7] Continuous practice of unhealthy foods habits and patterns lead to serious effects upon nutritional status as well as overall health status of an individual.^[8] Researchers state that achieving the desired change of behavior towards nutrition and health greatly depends upon gaining sufficient knowledge, change in attitude and developing good practices related to health and nutrition.^[9] Nutritional education is the type of intervention that aims to address deranged nutritional status in individuals by motivating them to adopt behavioral change towards healthy nutritional practices. Improving the nutrition knowledge, attitude and practices of adolescents and youth is very important in order to develop a society which is conscious towards having healthier population.^[8] According to another study knowledge, attitude and practices regarding healthy nutritional status has become the mainstay to encounter the occurrence of nutrition related health problems; and such studies are still very few in number in developing countries.^[10]

Iron deficiency anemia is a major health problem in developing countries. Individuals with anemia have reduced physical work capacity, slower cognitive functions that adversely affect learning and scholastic performance in school girls entering adolescence. A cross sectional study conducted in Iran upon young girls aged 14-20 year found

prevalence of anemia was 21.4%.^[11] Another study reported prevalence of iron deficiency anemia as 40% in preschool children, 30% in menstruating girls and women, and 38% in pregnant women; in the absence of dietary fortification. These rates reflect the increased physiological need for dietary iron during specific life stages and according to gender.^[12] Another research found overall prevalence of anemia was 8.3% among young girls as compared to 1.6% among boys; and Iron deficiency anemia was diagnosed in 59% of the anemic patients. Results suggested that socio economic status of the family, traditional eating habits of the region, fear of gaining weight, and irregular eating habits were contributing factors towards development of iron deficiency anemia among girls.^[13] Hemoglobin assessment is a reliable indicator for anemia screening and various methods are available for this purpose; among which Sahli's method has long been used for the estimation of Hb levels because it is very much cost effective, simple, and quick to administer.^[14] KAP assessment tool is a suitable instrument to assess and evaluate target group's current knowledge, attitude, and practices towards a specific problem under investigation; and it gives an effective feedback upon needs, problems, and possible barriers among the target group. In recent studies upon nutritional assessment KAP evaluation has been commonly used.^[15] KAP was also used to evaluate the knowledge in regards to dealing with management of iron deficiency anemia among young girls in European countries.^[16]

Problem statement developed for this study is: keeping in mind current scenario in Pakistan regarding nutritional facts and figures and lack of comprehensive nutritional education and counseling; there is a strong feeling that poor dietary patterns are found among females of reproductive age group. Girls of younger age are too conscious of weight maintenance without good knowledge about healthy and balanced diet and its importance. Most of the time adolescent girls are into bad dietary practices that lead to long term effect upon health in the form of various deficiencies and morbidities. This needs to be corrected through a well-planned nutritional health education program at small as well mass scale; and for this purpose, on ground status of iron deficiency anemia is required to be known.

Rationale of present study is: identification of correlation between Hb levels and KAP will enable the investigators to assess the dietary habits of young girls; thus, enabling us to formulate a well-planned nutritional guideline for the students. Results will also enable us to identify the need of further research in this area with a representative sample.

Objective of present research is: 1) to determine Hemoglobin levels among girls 20-21 year of age by Sahli's method 2) to identify correlation between Hb levels and KAP score among girls 20-21 year of age.

METHODS

It was a cross sectional study conducted in Government Home Economics College Lahore; in the period of Nov-Dec 2016 and study population was female students 20-21 year

of age group studying in the said college. A sample of 150 students was enrolled after informed written consent through stratified random sampling technique. Inclusion criteria were: 1) willingness of the respondent 2) female student of 20-21 year age group. Exclusion criteria were: 1) female students below and above the selected age range 2) unwillingness of students. Data collection tool was personal interview. Data collection instrument was self-developed questionnaire after extensive literature research. KAP questionnaire was developed according to our cultural setup, based upon the KAP tool used in many previous researches of the same nature. Questionnaire consisted of two parts: 1) socio demographic Performa that included the variables: gender, age, number of siblings, family size, monthly family income, and parental education level. 2) KAP questionnaire was adopted from the standardized KAP on iron deficiency anemia from Food and Agriculture Organization (FAO) guidelines.^[17] It included variables: knowledge, attitude, practices; assessed through various relevant questions in each section. Question format in both sections was closed ended and no open-ended question was included. Knowledge level was assessed through questions like: heard about iron deficiency anemia, identify symptoms of anemia, knows causes of anemia, knows about prevention of anemia, knows about iron rich foods, knows about foods that aid in iron absorption, knows about beverages that decrease iron absorption when taken with meals, knows about foods that decrease iron absorption when taken during meals. Attitude level was assessed through questions like: self-awareness regarding anemia as health problem, attitude regarding seriousness of anemia as disease, feels good to prepare meals with iron rich foods, finds difficulty to prepare meals with iron rich foods, feels confident in preparing meals with iron rich foods, likes the taste of iron rich foods. Practice level was assessed through questions like: food groups consumed on previous day usually eats fresh citrus fruits, eats citrus fruits every day, time of consuming citrus fruits, usually consumes tea/coffee, and takes tea/coffee every day, time of taking tea/coffee. For the purpose of data collection students were approached and collective briefing was given upon the idea of research and its importance by the college counsel in the morning assembly. Notices were displayed upon various notice boards in the college showing; subject matter of research, date, time, and place for Hb level testing. Willing students were enrolled for the study after informed written consent. College laboratory supervisor was approached and a brief introduction to the topic of research was given; and permission sought for conduction of Hb level testing by Sahli's method. Due to resource limitation Hb level testing was sanctioned only for 150 candidates. To maintain reliability of the blood testing, laboratory assistant was involved who performed the blood test of all candidates himself under same setting. On the day of data collection all 150 students gathered at one place in laboratory premises and both questionnaire were filled in for each respondent by interview method. Each candidate after completion of the questionnaire moved inside the laboratory for Hb level

testing. For this purpose, complete aseptic method was adopted by the laboratory assistant under supervision of laboratory in charge; in order to avoid any adverse effect. Respondents were assured about confidentiality of the data. Data analysis plan was: data entered and analyzed upon SPSS 17, descriptive statistics calculated, and test of Pearson Product moment correlation was applied to identify linear correlation among KAP score and trends of Hb level. Scoring for knowledge section was done as: score of zero indicates lack of knowledge, score of 1 indicates optimum knowledge. Scoring for attitude section was done as: score of 1 indicates poor attitude, score of 2 indicates average attitude, score of 3 signifies good desired attitude. Scoring for practice section was done as: score of zero indicates poor practices, score of 1 indicates good practices, and score of 2 indicates excellent practices. Operational definition was developed according to the guidelines of WHO and Hb level below 12g/dl was labeled as anemic.

RESULTS

Data was collected from 150 female students; age ranged 20-21 years, Mean age 20.9 ± 7.13 . Among the respondents 32.7% were living in a family of six members per house. On average, each female student had three siblings. Average family income for 59.3% of households was within 50500-75500 per month; whereas 40.7% families had income range of 75500-100500 per month. Majority of parents were well educated; 80% of fathers and 70% of mothers were Graduate.

Majority of the respondents (>50%) had good knowledge about the symptoms of anemia; knew its causes; knew about prevention and iron rich food source; knew about the foods and beverages that aided or hindered the absorption of dietary iron. Still considerable number of respondents (30%) did not know about food items that reduced iron absorption (Table 1). A huge number of respondents (53%) were not aware of the fact that anemia is a disease of some importance and has grave impact upon health of an individual; whereas 65% regarded it as a serious disease (Table 2). At practice level majority (88%) were in habit of taking citrus fruits as a usual practice, 76% taking tea/coffee, and 47% were in habit of taking these beverages almost 02 hours after meal (Table 3).

Risk factor analysis:

Questions in the Knowledge, Attitude, and Practice section were scored appropriately and comparison was done with Hb levels. Correlation coefficient was applied in order to identify any possible relation between the variables.

DISCUSSION

Anemia is a term given to a pathological process in which erythrocyte, hemoglobin, hematocrits, and concentration of red blood cells per unit volume are deranged as compared to the reference values respectively. These values can vary in accordance with age and stage of developmental life, gender, and as a function of hormonal stimulation.^[18] Iron deficiency

is the most advanced stage of anemia characterized by many features including low hemoglobin levels.^[19] It affects more than two billion people worldwide.

Table 1: Multiple responses upon knowledge level of respondents n (%)

1. Heard about iron deficiency anemia	
Yes	150(100%)
No	0(0%)
2. Identify symptoms of anemia	
Weakness/fatigue	109(72.7%)
Pallor	126(84%)
Unusual rapid heartbeat	42(28%)
Shortness of breath	66(44%)
Difficult concentration	48(32%)
Headache	31(20.7%)
3. Knows causes of anemia	
Lack of dietary iron	122(81.3%)
Sickness/infection	8(5.3%)
Heavy menstrual bleeding	16(10.7%)
Don't know	4(2.7%)
4. Knows about ways to prevent anemia	
Eat iron rich foods	136(90.7%)
Eat Vit. C rich foods during or right after meals	72(48%)
Take iron supplements	86(57.3%)
Treat other causes of anemia	59(39.3%)
Don't know	10(6.7%)
5. Knows about iron rich foods	
Liver	133(88.7%)
Kidney	62(41.3%)
Mutton	110(77.3%)
Beef	80(53.3%)
Fish	67(44.7%)
Chicken	31(20.7%)
Spinach	136(90.7%)
Sweet potato	17(11.3%)
Kale	46(30.7%)
Beet greens	48(32%)
Soya beans	72(48%)
Lima beans	44(29.3%)
Fortified breakfast cereals	112(74.7%)
Whole wheat flour	64(42.7%)
6. Knows about foods that help in iron absorption	
Oranges	115(76.7%)
Lemons	113(75.3%)
Bell peppers	23(15.3%)
Guavas	40(26.7%)
Strawberries	65(43.3%)
Don't know	18(12%)
7. Knows about beverages that decrease iron absorption when taken with meals	
Coffee	116(77.3%)
Tea	107(71.3%)
Don't know	19(12.7%)
8. Knows about foods that hinder iron absorption if taken during meals	
Milk	73(48.7%)
Yoghurt	44(29.3%)
Walnuts	9(6%)
Lentils	10(6.7%)
Eggs	9(6%)
Don't know	45(30%)

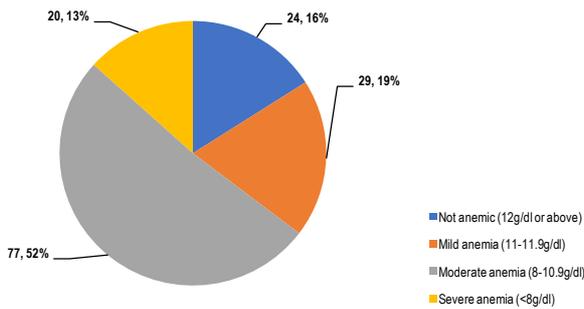
Table 2: Multiple responses upon attitude level of respondents n (%)

1. Self-awareness regarding anemia	
Not likely	24(16%)
Not sure	80(53.3%)
Likely	46(30.7%)
2. Attitude regarding seriousness of anemia	
Not serious	19(12.7%)
Serious	98(65.3%)
Not sure	33(22%)
3. Feels good to prepare meals with iron rich foods	
Not good	4(2.7%)
Not sure	19(12.7%)
Good	127(84.7%)
4. Finds it difficult to prepare meals with iron rich foods	
Not difficult	68(45.3%)
So-so	77(51.3%)
Difficult	5(3.3%)
5. Feels confident in preparing meals with iron rich foods	
Not confident	15(10%)
So-so	75(50%)
Confident	60(40%)
6. Like the taste of iron rich food items	
Dislike	

Table 3: Multiple responses upon Practice level of respondents n (%)

1. Foods consumed on previous day	
Liver	1(0.7%)
Kidney	5(3.3%)
Mutton	34(22.7%)
Beef	18(12%)
Fish	32(21.3%)
Chicken	58(38.7%)
Spinach	44(29.3%)
Sweet potato	43(28.7%)
Kale	4(2.7%)
Beet greens	6(4%)
Soya beans	3(2%)
Lima beans	2(1.3%)
Fortified breakfast cereals	17(11.3%)
Whole wheat flour	104(69.3%)
2. Usually eat fresh citrus fruits	
Yes	132(88%)
No	18(12%)
3. Eat fresh citrus fruits every day	
Yes	25(16.7%)
No	107(71.3%)
4. Time of consuming fresh citrus fruit	
Before meal	84(56%)
During meal	23(15.3%)
After meal	43(28.7%)
5. Usually consume coffee or tea	
Yes	114(76%)
No	36(24%)
6. Consume coffee/ tea everyday	
Yes	56(37.3%)
No	58(38.7%)
7. When do you usually drink coffee/ tea	
2 hours or more before meal	14(9.3%)
During meal	15(10%)
2 hours or more after meal	70(46.7%)
Right before meal	4(2.7%)
Right after meal	13(8.7%)
Never	34(22.7%)

Table 4: Frequency of anemia among respondents tested by Sahli's method (n=150)



and iron deficiency anemia remains the top most cause of anemia; where preschool children and young women have the highest risk of developing it.^[20]

Table 5: Correlation analysis between Knowledge score and Hb level (n=150)

Variable	Mean	SD	Correlation coefficient (r)	P-value
Knowledge score (max. score 39)	21.09	5.83	.092	.263
Hb g/dl	10.16	1.83		

Table 6: Correlation analysis between Attitude score and Hb level (n=150)

Variable	Mean	SD	Correlation coefficient (r)	P-value
Attitude score (max. score 18)	14.16	1.93	-.005	.950
Hb g/dl	10.16	1.83		

Table 7: Correlation analysis between Practice score and Hb level (n=150)

Variable	Mean	SD	Correlation coefficient (r)	P-value
Practice score (max. score 12)	7.18	2.00	.174	0.033**
Hb g/dl	10.16	1.83		

*correlation is significant at 0.05 levels

Present study found higher trends of anemia (according to WHO classification) among young girls: overall prevalence of anemia was found to be 84% in current study; categorized as 19.3% had mild anemia, 51.3% had moderate anemia, and 13.3% had severe anemia. Only 16% girls had normal Hb levels. This higher trend of anemia among the respondents was related to the life style, dietary habits, fear of gaining weight, and irregular eating habits among our respondents. This finding is consistent to a previous finding that iron deficiency anemia is common in developing countries and typically results from insufficient dietary intake.^[20] Present higher trend of anemia is much higher than another previous study that found overall prevalence of anemia 72.6%; with 52.6% mildly anemic and 21% moderately anemic.^[21]

Present study found that 100% of the respondents had heard about iron deficiency anemia; majority could identify major symptoms, causes, prevention of iron deficiency anemia;

majority knew about foods and beverages that enhanced or reduced iron absorption; <50% knew that milk and milk products reduce iron absorption when taken during meals; <10% knew that phytates containing food items interfered with iron absorption. Mean score for knowledge level indicates that respondents had 54% awareness and knowledge about anemia. Pearson product moment correlation for knowledge and Hb level shows that 92% of the time strong positive linear correlation exists between the two variables; and this finding is strength of present study. Although P-value is statistically non-significant, this can be explained on the ground that small sample size could be a probable reason. These findings are strongly supported by another research that found good knowledge scores among the respondents and strong positive linear correlation seen between the two variables but P-value did not find significant association to the Hb levels; indicating that having good knowledge regarding the problem was not a surety to have improved levels of Hb.^[22] This finding is also supported by another previous research conducted under almost the same setting as present study; and found that knowledge level of respondents was not significantly associated with their Hb levels.^[21] Present study trends upon individual questions in knowledge section are strongly supported and are much improved than the benchmark study in which 42% of the respondents did not know about the food that helps in iron absorption and 53% did not know about the beverages that reduce iron absorption.^[21]

Present study finding upon mean score for attitude indicates that respondents had 79% positive attitude towards self-awareness of anemia as a disease. Whereas an inverse relation exists among attitude of respondents and their Hb levels with a non-significant (P-value=.950); indicates towards strongly negative correlation among these two variables. This finding is in contrast to previous finding where highly significant positive correlation was found among attitude score and respondent's Hb levels.^[21] This finding in present research is also opposite to the study conducted upon Malaysian adolescents that stated: nutrition education resulted in better attitudes and higher Hb levels among adolescents.^[23] Present study trends upon individual questions in Attitude section show consistent trends as previous research.^[21]

Present research finding upon correlation between practices level score and Hb levels found that 53% showed desired practices in relevance to iron deficiency anemia. Strong positive linear correlation among the two variables was found with statistically highly significant association (P-value=0.033). This finding is strength of current study, indicating that good practices can lead to good Hb levels. This finding is strongly supported by previous findings that state significant positive correlation among practices score and Hb levels.^[21] Although if this finding of significant P-value is seen in backdrop of the Hb levels of girls upon which they are labeled as anemic or not; it can be stated cautiously that small sample size can be a probable reason for this statistical significance. Present study trend of higher

number of respondents taking whole wheat flour (69.3%) is different to previous finding of the research where maximum (57.3%) respondents were in the habit of taking fish.^[21] In our study, no significant association was found among education level of respondents and compliance which is contrary to a study that found higher compliance level among women who are educated and had better knowledge.^[24]

CONCLUSION

Present study findings are suggestive of increasing trend of iron deficiency anemia among young girls of reproductive age group. Attitude towards desired good dietary habits and importance of balanced diet is found to be poor among young girls.

Suggestions:

It is suggested that nutritional health education sessions should be incorporated by educational institutions in their teaching plans; conducted by expert nutritionist and health professionals. This should be taken up as policy matter by institution administration; while teaching, focus should be upon emphasizing the need of taking balanced diet. Results are suggestive of conducting another research in this area with a representative sample so as the results can be used for central policy making at mass scale; as iron deficiency anemia is a serious public health problem among females of reproductive age group in developing countries.

REFERENCES

- Benoist B, McLean E, Egli I, Cogswell M. Worldwide prevalence of anemia 1993-2005 (1st ed). WHO; 2008
- McLean E, Cogswell M, Egli I, Wojdyla D, DeBenoist B. Worldwide prevalence of anemia, WHO vitamin and mineral nutrition information system 1993-2005. *Public health nutrition* 2009; 12(4): 444-454
- The global prevalence of anemia in 2011. WHO; 2015
- Report on National Nutrition Survey. Pakistan; 2011
- Mahan L, Escott-Stump S. Krause's food and nutrition therapy (13th ed). St. Louis, Mo. Saunders/ Elsevier; 2008
- Haemoglobin concentrations for the diagnosis of anemia and assessment of severity. Vitamin and Mineral Nutrition Information System. WHO; 2011
- Divakaran B, Muttapillymyalil J, Sreedharan J, Shalini K. Lifestyle risk factors of non-communicable diseases: awareness among school children. *Indian Journal of Cancer* 2010; 47(5): 9-13
- Elhassan M.R, Gamal H.E, Mohammad G.S. nutrition knowledge, attitude and practices among students of Ahfad University for Women. *Indian Journal of Scientific Research* 2013; 4(1): 25-34.
- Shariff M.Z, Abu Samah B, Paim L, Ismail M, Kasim M.S, Othman N, et al. Nutrition education intervention improves nutrition knowledge, attitude and practices of primary school children: a pilot study. *International Electronic Journal of Health Education* 2008; 11(1): 119-132
- Patimah S, Royani I, Mursaha A, Thaha A.R. knowledge, attitude and practice of balanced diet and correlation with hypochromic microcytic anemia among adolescent girls in Maros district, South Sulawesi, Indonesia. *Biomedical Research* 2016; 27(1): 165-171
- Akramipour R, Rezaei M, Rahimi Z. prevalence of iron deficiency anemia among adolescent school girls from Kermanshah, Western Iran. *Hematology* 2013; 13(6): 352-355
- Pasricha S.R, Drakesmith H, Hipgrave D, Biggs B.A. control of iron deficiency anemia in low and middle-income countries. *Blood* 2013; 121(14): 2607-2617
- Balci Y.I, Karabulut A, Gurses D, Covut I.E. Prevalence and risk factors of anemia among adolescents in Denizli, Turkey. *Iranian journal of pediatrics* 2013; 22(1): 77-81
- Srivastava T, Negandhi H, Neogi S.B, Sharma J, Saxena R. methods for hemoglobin estimation: a review of 'what works'. *J Hematol Transfus* 2014; 2(3): 1028
- Hiew C, Chin Y, Mohd N.M. development and validation of knowledge, attitude and practice on healthy life style questionnaire for Malaysian Adolescents. *Journal of Nutrition and Health Sciences* 2015; 2(4): 1-11
- Sichert-Hellert W, Beghin L, De Henauw S, Grammatikaki E, Hallstrom L, Manios Y, Piccinelli R. nutritional knowledge in European adolescents: results from the HELENA (Healthy Lifestyle in Europe by Nutrition in Adolescence) study. *Public Health Nutrition* 2011; 14(12): 2083-2091
- Macias Y.F, Glasauer P. guidelines for assessing nutrition related Knowledge, Attitude, and Practices. Food and Agriculture Organization of United Nations 2014; available at: <http://www.fao.org/docrep/019/13545e/13545e.pdf>
- Jordao R.E, Bernardi J.L, Barros Filho A.D.A. Prevalence of iron deficiency anemia in Brazil: a systematic review. *Rvista Paulista de Pediatria* 2009; 27(1): 90-98
- Whitney E.N, Rolfes S.R, Crowe T, Cameron-Smith D, Walsh A. *Understanding Nutrition*. Cengage Learning 2011
- Kassebaum N.J, Jasrasaria R, Naghavi M, Wulf S.K, Johns N, Lozano R, et al. A systematic analysis of global anemia burden from 1990-2010. *Blood* 2014; 123(5): 615-624
- Jose S, Antony S.C, Issac B.R. Impact of knowledge, Attitude and Practice on anemia status among women in coastal Kochi, Kerala. *Int. J. of Multidisciplinary and Current Research* 2016; 4: available at <http://ijmcr.com>
- M'cormack F.A, Drolet J.C. Assessment of anemia knowledge, attitudes and behavior among pregnant women in Sierra Leone. *Health Educator* 2012; 44(2): 9
- Yusoff H, Daud W.N.W, Ahmad Z. Nutrition education and knowledge, attitude and hemoglobin status of Malaysian adolescents. *Southeast Asian Journal of Tropical Medicine and Public Health* 2012; 43(1): 192
- Dutta A.J, Patel P, Bansal R.K. compliance to iron supplementation among pregnant women: a cross sectional study in urban slum. *National Journal of Community Medicine* 2014; 5(4): 457-462