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Effectiveness of nutrition intervention to overcome the problem of anaemia

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Nutritional anaemia is the most common nutritional disorder in the developing world. Adolescence is a state or process of growing up from puberty to maturity. Number of adolescents in India particularly girls live under suboptimal conditions marked by poor nutritional status and high level of morbidity and mortality. The lives of adolescent girls are characterized by limited education, lack of knowledge pertaining to social as well as health aspects and also limited influence on decisions affecting their lives. Thus, nutrition intervention is one major factor for development of this group of population because of the fact that these adolescent girls would be the future housewives.

Key Words : Adolescent girls, Anaemia, Nutritional status, Nutrition intervention

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INTRODUCTION

Anaemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. Iron deficiency continues to be the leading single nutritional deficiency in the world, despite considerable efforts over the past three decades to decrease its prevalence. Iron deficiency is a principal cause of anaemia. Two billion people over 30 per cent of the world's population are anaemic (WHO, 2013). The prevalence of anaemia in India is 55.6 per cent. In Punjab it is on the worrisome front, 80.2 per cent of the children in the age group of 6 month to 3 years, 38.4 per cent young women in the age group of 15-49 years and 41.6 per cent pregnant women were recorded as suffering from anaemia (NFHS-III, 2005-06).

Nutrition education has been defined as educational measures for inducing desirable behavioral changes for the ultimate improvement in the nutritional status of all nutrition intervention programmes. Lack of knowledge of the dietary requirements and the nutritive value of different foods is the main contributory cause for the widespread occurrence of malnutrition in developing countries. Nutrition education, which is practical and adopted to suit the socioe-conomic conditions, food habits and local food resources, can tackle the problem to a great extent. Adolescents are one of the most important groups of any society but nutritionally vulnerable for iron deficiency because of double demand of growth and activity. Nutrition education might be of the important strategies to combat iron deficiency anaemia in adolescent girls, stressing the importance of haemopoitic nutrients and consumption of green leafy vegetables which are excellent source of iron and micronutrients. So, there is need to promote nutrition education on anaemia and its prevalence, causes and consequences. The importance of nutrition education as a means for improving the nutrition and health of community has been increasingly realized during recent years.

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Effectiveness of nutrition intervention regarding KAP (knowledge, attitude and practice) score :

Khanna (1997) imparted nutrition education to school girls (10-12 years) and their mothers and reported that there was a considerable improvement in knowledge, attitude and practice of the women. Sharma (2000) assessed the academic performance of school girls and reported the mean academic performance scores of school girls at baseline and after experimentation. The academic performance scores of school girls in control (C) and experimental (E) group at baseline was found as 27.5 and 27.7 and after counseling it was 28.1 and 28.9. A significant ($p<0.05$) improvement was observed in the IQ of experimental (E) group after nutrition counseling. Further, the number of respondents in E group obtaining marks between 20-25 and 25-30 increased from 10 to 12 and 9 to 12 after nutrition counseling. Shojaeizadeh (2001) carried out a study to determine the factors affecting knowledge, attitude and practice of 218 secondary school girls concerning iron deficiency anemia, in Quazvin city and found that 57.3 per cent of students had poor knowledge, 54.1 per cent unfavourable attitude and 44.5 per cent weak practice on iron deficiency anemia. The results also showed that the field of education, the level of education, age, fathers' job and mothers job had significant relation with knowledge. There was a significant relationship between knowledge with attitudes and knowledge with practice.

Saibaba *et al.* (2002) studied the impact of education on nutritional knowledge and practice of adolescent girls from Hyderabad and Secunderabad and reported that the knowledge about iron, calcium, protein rich foods (77.6, 55.2 and 62.0 %) improved among adolescent girls. Further, it was seen that consumption of food articles was found to be significantly higher ($p<0.001$) as compared to pre intervention except oilseeds, fruits, meat and condiments. A marked increase in the intake of 'Ragi' was observed, which is very rich source of calcium as well as iron. Koon *et al.* (2006) aimed to report the outcome evaluation of the nutrition education programme in terms of nutritional status, nutrition knowledge, attitudes and practices. Nutrition education components included nutrition modules. Interactive CDs, a comic book as well as worksheets and other nutrition and health related activities. Nutrition knowledge increased significantly from 64.6±19.8 marks during baseline to 69.6±20.8 marks at follow up in school students. More students were aware of the importance of breakfast, where by 53.9 per cent agreed that breakfast was important for health and not just to curb hunger in the morning and encouraging change in the dietary habits was demonstrated by reduction in snacking practice as well as fast food consumption.

Subha *et al.* (2007) conducted the study in schools of old city of Hyderabad. A significant improvement was found in the knowledge levels of both the experimental and control groups after the intervention. The extent of improvement in the mean scores of the experimental group (3.09 ± 0.19) was significantly higher than the control group (1.65 ± 0.21) indicating positive impact of intervention. Kaur *et al.* (2007) assessed the nutritional awareness of 60 school going adolescents of 13-19 years age in rural area of district Kurukshetra before and after imparting nutrition education regarding healthy nutrition and dietary habits. The nutrition education was imparted through lectures, audiovisual aids and demonstrations for three months. After providing nutrition education, a significant improvement in their nutritional knowledge was viewed and quantum of improvement was 1.67 times. Before imparting nutrition education, majority (46%) of the respondents had obtained the scores pertaining to nutrition knowledge between 10-15 followed by 5-10 (40%) and 15-20 (13%). None of the respondents was able to get the scores at the levels of 25 and above. After imparting nutrition education, most of the respondents (53.3%) were able to get higher scores from 15-20 and 13.3 per cent of the respondents were able to get the scores up to 25-30. Increase in nutrition knowledge scores after imparting nutrition education was found significant ($P<0.01$). Payne *et al.* (2007) implemented a planned nutrition education programme aiming to promote healthy eating and consumption of a variety of foods in a residential camp setting for Australian adolescents. Nutrition education package for use at the camp restaurants included nutrition information together with individual "passport" booklets involving puzzles and questions with incentives for completion. Of those surveyed, 77 per cent felt they had learned something from the health promotion material, 94 per cent said they had changed their eating habits to include more core food groups during the camp, with more than 40 per cent stating they had increased vegetable consumption compared with their usual intake. However, approximately 60 per cent of campers were apparently unaware of the incentives offered and less than 30 per cent demonstrated completion of their passports.

John and Narasimhan (2008) conducted a nutrition education programme on the 50 breakfast consumers and 50 breakfast skipper school children. A pre and post test on knowledge and awareness was done on subject using a checklist. Children had a good knowledge and awareness in terms of nutrition, but after teaching basic nutritional needs, it helped to reinforce the ideas already known. The nutrition education programme thus served to be a vital tool in driving the children to put into practice their knowledge and awareness. Rahimi *et al.* (2010) studied the effect of nutrition education on nutritional knowledge, attitude and practice among female employees and reported that 29.0, 62.2 and 8.95 per cent and 33.6, 59.3 and 7.1 per cent had good, moderate and poor nutritional attitude, respectively before and after nutrition counseling. Singla *et al.* (2012) evaluated the

impact of nutrition counseling on 60 adolescent girls aged 16-18 years. Nutrition counseling was imparted for a period of three months to assess the Knowledge, Attitudes and Practices (KAP) test before and after nutrition counseling. It was observed that the mean scores for nutrition knowledge improved significantly (P<0.01) in post test from 25.00 to 36.24 in group E, while non-significant (21.80 to 22.13) in group C. Majority of the subjects had moved towards high score with gain in scores and quantum of improvement was 11.24 and 1.45 times in group E, respectively. An improvement was recorded in scores of knowledge, attitudes and practices in group E.

Effectiveness of nutrition intervention regarding food and nutrient intake :

Jain *et al.* (1999) studied the effect of nutrition education on food and nutrient intake of school girls of 10-12 years of Ludhiana district. The results showed that consumption of all foods increased after nutrition education, however there was a significant increase in the intake of cereals, milk and milk products. Sharma (2000) assessed the nutritional status by imparting nutrition counseling to 30 girls (7-9 years) and their mothers for a period of four months and reported a significant (p<0.01) increment in consumption of cereals, pulses, green leafy vegetables, fruits and milk and milk products in experimental group and the per cent adequacy was increased from 58, 50, 0, 23 and 38 to 80, 57.1, 60, 90 and 76.0 for cereals, pulses, green leafy vegetables, fruits and milk and milk products, respectively after nutrition counseling. Further, the intake of nutrients like energy, protein, fat, calcium, iron, beta-carotene and vitamin C also increased, respectively. Kaur (2000) studied the impact of nutrition education on the nutritional status of anaemic adolescent rural girls (13-15 years) of Ludhiana district. It was found that consumption of cereals, pulses and other vegetables increased significantly after nutrition education except green leafy vegetables due to summer season. The per cent adequacy of RDA for different nutrients *i.e.* energy (79.4 to 89.8), protein (74.7 to 81.8), ascorbic acid (115 to 137.5), iron (69.2 to 78.5) and calcium (150.6 to 161.0) was increased after nutrition education.

Arya (2002) imparted nutrition counseling to 60 school children (10-12 years) on dietary adequacy of packed lunches and observed that energy intake from packed lunches increased from 48.2 to 50.7 per cent and 50.7 to 59.2 per cent in rural and urban respondents after nutrition counseling. Further, significant increment was observed in intake of entire nutrients. Packed lunches were qualitatively and quantitatively improved along with nutrition knowledge of the children and the mothers due to nutrition counseling sessions. Kapur *et al.* (2003) assessed the effectiveness of nutrition education intervention by using a 'Flip Chart', 'Information leaflet', 'A calendar' and 'A Video Programme' focused on food-based strategies promoting consumption of iron-rich foods and foods that increase absorption of iron (vitamin C rich foods). The intervention brought about significant changes in intake of nutrients (energy, protein, iron and vitamin C). The adequacy of cereals, pulses, other vegetables, fruits, oil/fats intake was high in groups where nutrition education was a component as compared to control and supplementation group. Although the intake of green leafy vegetables was found to be inadequate among children. Further, the high vitamin C intake attributed to the high intakes of fruits and other vegetables recorded in the food intake data specific to nutrition education group may have also contributed in terms of better absorption of iron from the diet. Anderson *et al.* (2003) assessed the impact of school-based education intervention aimed at increasing the consumption of fruits and vegetables. It was found that children in the intervention schools had an average increase in fruit intake (133 ± 1.9 to 183 ± 17.0 g/day) that was significantly (P<0.05) greater than the increase (100 ±11.7 to 107 ± 14.2 g/day) estimated in subjects in control groups. Increase in scores for variables relating to knowledge about fruits and vegetables and subjective norms were also greater in the intervention than in control groups.

Kaur (2009) studied the effect of weekly iron and vitamin C supplementation on the anaemic status of adolescent girls (16-18 years). Results showed that the mean daily intake of iron was 12.1±0.33, 15.0±0.68, 17.2±0.47 and 16.0±0.45 mg and the final mean values were 15.0±0.58, 17.2±0.64, 18.5±0.44 and 17.5±0.43 mg in the groups of iron folic acid supplementation (IFA), amla powder intervention (IAP), lemon water intervention (ILW) and synthetic vitamin C intervention (IVC), respectively. Further, the per cent adequacy of vitamin C was increased from 84.55, 87.3, 131 and 107 to 105, 114.5, 155.5 and 136.0 for IFA, IAP, ILW and IVC groups, respectively. Mihas *et al.* (2010) assessed the short-term (15 days) and long-term (12-month) effects of a school-based health and nutrition education intervention on diet, nutrition intake and BMI. It was found that twelve months after the intervention, the programme was effective in reducing the various indices in the intervention group (IG) compared with baseline findings (BMI: 23.3 ± 2.8 vs 24.0 ± 3.1 kg/m^2, P < 0.001; daily energy intake: 8112.4 ± 1412.4 vs 8503.3 ± 1419.3 kJ/d, P < 0.001; total fat intake: 31.3 ± 4.4 vs 35.4 ± 4.77 % of daily energy, P < 0.001). Except for BMI, decreases in the before mentioned indices were also observed fifteen days after the intervention. In addition, students of the intervention group reduced their weekly consumption of red meat and non-home-made meals and increased their frequency of fruits and breakfast cereal consumption. Singla (2011) conducted a study on efficacy of nutrition counseling on the intake of junk foods among adolescent girls of working mothers and reported a significant ($p \leq 0.01$) increment in mean

daily intake of protein (25.57±6.72 to 32.38±8.21 g), beta-carotene (2754±4741 to 3102±4719± µg), folic acid (70.33±16.91 to 72.20±15.22 µg), ascorbic acid (43.15±2621 to 53.33±32.30 mg) and iron (7.71±1.78 to 9.33±2.19 mg) by experimental group from before nutrition intervention to after nutrition intervention. Further, a significant ($p \leq 0.01$) improvement in daily food intake was also observed by experimental group after nutrition intervention.

Effectiveness of nutrition intervention regarding haemoglobin level :

Gopaldas (2002) studied the efficacy of nutrition education and dietary changes in lunch of young working women (18-23 years) of Bangalore, in reducing the iron deficiency anaemia. After an intervention of 180 days, the results showed an improvement in the haemoglobin levels and impressive knowledge gains. Sharma (2003) showed that giving guava daily with two major meals to young anaemic women and children who often eat 30-35 g green leafy vegetable per day had significantly high haemoglobin levels. Adding 100 mg vitamin C in the two meals for two months improved haemoglobin level and prevent anaemia in adolescent girls. Kapur *et al.* (2003) designed a study to compare the impact of nutrition education and/or iron supplementation (weekly) on iron status of children (9-36 months) in urban slum of Delhi. A total of 451 children and their mothers were assigned to one of the following groups: group I nutrition education, group II supplementation (with 20 mg of elemental Fe) group III nutrition education and supplementation (with 20 mg of elemental Fe); group IV control given to placebo. After 4 months of intervention, serum ferritin values were found to be significantly higher for nutrition education group <p-0.001 as compared to control. The mothers of nutrition education group had significantly higher nutrition knowledge and the dietary iron intake of their children was significantly higher than their control group counterparts ($p < 0.0001$).

Goel and Talikoti (2003) studied the impact of nutrition and health education and deworming on cognitive functions and haemoglobin levels of 150 adolescent girls. The post-intervention indicated acceleration in cognitive functions and an increase of 3-5 g of haemoglobin depending on level of severity of anaemia. A significant correlation was noted between the iron, vitamin C, protein and folic acid contents of diets consumed by the subjects and their haemoglobin levels. Jamima and Bhavani (2004) reported that cauliflower leaves are valuable source of micro nutrients and anaemia can be prevented and blood haemoglobin levels can be successfully elevated in adolescent girls by incorporating cauliflower leaves in their diet. Kaur (2000) studied the impact of nutrition intervention on haematological profile of selected anaemic young Punjabi women (18-22 years) and observed that before nutrition intervention, 30 per cent of subjects in group anaemic vegetarian (AV) and 16.6 per cent in group anaemic non-vegetarian (ANV) were moderately anaemic whereas majority of subjects of group AV (70.0%) and group ANV (83.4%) were mildly anaemic. After nutrition intervention, the percentage of moderately anaemic subjects was reduced to nil in both the groups and percentage of mildly anaemic subjects was reduced to 26.7 and 20.0 per cent in group AV and ANV. Further, mean haemoglobin level was reported before and after nutrition intervention as 8.7 to 10.9 g/dl for AV group and 10.4 to 12 gm/dl for ANV group. Increase in blood Hb level was statistically significant ($p \leq 0.01$) increase in both groups AV and ANV was observed.

Laneroll and Atukorala (2006) studied the effect of nutrition education on nutrition related knowledge, food consumption patterns and serum retinal concentrations among 229 school girls aged 15-19 years. Intervention included nutrition education as lecture discussion, interactive group discussions and four different methods of reinforcement. After 10 weeks intervention period, an improvement in the knowledge and food consumption pattern was seen among these girls. Vir *et al.* (2008) reported that weekly iron folic acid supplementation combined with deworming every 6 months has been found as a feasible and cost effective intervention for the prevention of anaemia in adolescent girls in institutional and community settings and recommended that the weekly iron folic acid supplementation should therefore be made an integral part of education and reproductive health programmes for achieving the Millennium Development Goals of improving maternal health and reducing child mortality.

Kotecha *et al.* (2009) observed the reduction in anaemia prevalence from 74.7 per cent at the baseline to 53.2 per cent after intervention with a reduction of 21.5 per cent and ranged from 16 to 24 per cent in different areas. The difference was significant for each area. At this stage, an appropriate interpretation would have been to see a control group of girls in whom the intervention was not done. However, as the entire district was covered, there were no school girls in this district who were not part of the programme (this being operational programme situation and not primary research). The reduction achieved was maximum in rural areas followed by urban areas both showing a net reduction of over 23 per cent while tribal area showed about 16 per cent reduction of anaemia. These differences could be because of difference in the compliance of IFA tablets by the girls or because of inherent nature of differences between the areas. Severe anaemia prevalence reduced from 1.6 per cent at baseline to 0.5 per cent in the impact study, suggesting a reduction of 68 per cent in severe anaemia from the baseline value. Similar reduction values for moderate and mild anaemia were 51 and 22 per cent. The proportion of normal girls (non-anaemic girls) increased from

25.3 to 46.8 per cent suggesting a rise of normal girls by 85 per cent from the baseline anaemic level.

Patel *et al.* (2009) conducted a study on intervention of iron folic acid in school children and reported 63 per cent prevalence of anaemia amongst school children from Surat which was decreased to 48.4 per cent after one month of IFA supplementation given on alternate day. The overall increase in mean Hb was 0.59 g from 11.29 to 11.88 g/dl. Kabir *et al.* (2010) conducted a cross sectional study on five adolescent girls aged 15-19 years of Dhaka, Bangladesh and examined their dietary pattern and nutritional status with a particular focus on the prevalence of anaemia and appropriate knowledge about it among them. About 65 per cent of the participants had correct knowledge about the causes of anaemia, while 72.3 and 80 per cent, respectively, knew about the prevention and treatment of anaemia. Surprisingly, 73.8 per cent of the participants were not aware about the sources of iron-rich foods. Joshi and Gumashta (2013) studied the effect of weekly iron folate supplementation in adolescent girls for management of iron deficiency anaemia and found that the overall prevalence of anaemia was brought down by 25 per cent in Daily Iron Folic Acid Supplementation group after the supplementation for 3 months while it was brought down by 31.67 per cent in weekly supplementation group. The prevalence of moderate anaemia was brought down from 36.67 to 10 per cent in Daily Iron Folic Acid Supplementation group while for weekly regime it was brought down from 26.67 to 6.6 per cent. The prevalence of mild anaemia had remained unchanged pre and post intervention in both daily and weekly regimes, which may have been due to shifting of certain subjects from moderately anemic group to mildly anemic group in both the regimes as there was no study subject with severe anaemia in weekly supplementation group.

Conclusion :

After reviewing the various literatures, it is concluded that nutrition education is an effective tool in increasing the level of nutrition knowledge as well as nutrient intake. The diets consumed by the adolescent girls before as well as after imparting nutrition education were found to be inadequate in most of the nutrients when compared to ICMR recommendations.

Recommendations :

It is recommended after reviewing the literature that nutrition education can be used as an effective measure to bring about favourable and significant changes in the nutritional status and haemoglobin level of adolescent girls who are future mothers and who would be responsible for bringing nutritious balanced diet to their family members.

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LITERATURE CITED

Anderson, A.S., Porteous, L.G., Foster, E., Higgins, C., Stead, M., Heterington, M., Ha, M.A. and Adamson, A.J. (2003). The impact of a school-based nutrition education intervention on dietary intake and cognitive and attitudinal variables relating to fruits and vegetables. *Pub. Health Nutr.,* **8** (6) : 650-656.

Arya, C. (2002). Impact of nutrition counseling on dietary adequacy of packed lunches of school children. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, PUNJAB (INDIA).

Goel, N. and Talikoti, P. (2003). The impact of nutrition and health education and deworming on the cognitive functions and the haemoglobin levels of adolescent girls in urban slums of Jaipur. In: *Abstr. IX Asian Congress of Nutrition*. Nutrition Foundation of India, NEW DELHI (INDIA). pp. 235-236.

Gopaldas, T. (2002). Iron deficiency anaemia in young working women can be reduced by increasing the consumption of cereal based fermented foods or gooseberry juice at work place. *Food Nutr. Bull.,* **23** (1) : 94-105.

Jain, R., Khanna, S., Chawla, P. and Nagi, M. (1999). Effect of nutrition education on food and nutrient intake of school girls. In: XXXII Annual Convention India, Dietetics Association, NEW DELHI (INDIA).

Jemima, B.M. and Bhavani, K. (2004). The efficacy of cauliflower greens preparation in improving blood hemoglobin in selected adolescent girls. *Indian J. Nutr. Diet.,* **41** (2) : 63-66.

John, S. and Narasimhan, V. (2008). Impact of breakfast pattern on the nutrient intake, physical, cognitive and academic performance of school children. *Indian J. Nutr. Dietet.,* **45** (2) : 54-62.

Joshi, M. and Gumashta, R. (2013). Weekly iron folate supplementation in adolescent girls: An effective nutritional measure for the management of iron deficiency anaemia. *Global J. Health Sci.,* **5** (3) : 188-194.

Kabir, Y., Shahjalal, H.M., Saleh, F. and Obaid, W. (2010). Dietary pattern, nutritional status, anaemia and anaemia-related knowledge in urban adolescent college girls of Bangladesh. *J. Pak. Med. Assoc.,* **60** (8) : 633-638.

Kapur, D., Sharma, S. and Agarwal, K.N. (2003). Effectiveness of nutrition education, iron supplementation or both on iron status in urban slums of Delhi. *J. Pediatr.,* **4**: 68-73.

Kaur, G. (2000). Impact of nutrition education on the nutritional status of rural adolescent girls. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, PUNJAB (INDIA).

Kaur, S. (2009). Effect of weekly iron and vitamin C supplementation on the anaemic status of adolescent girls. M.Sc. Thesis, Punjab Agricultural University Ludhiana, PUNJAB (INDIA).

Kaur, T.J., Kochar, G.K. and Agarwal, T. (2007). Impact of nutrition education on nutrient adequacy of adolescent girls. *Stud. Home Commu. Sci.,* **1** (1) : 51-55.

Khanna, S. (1997). Effect of nutrition education on nutritional knowledge, practices and status of school going children. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, PUNJAB (INDIA).

Koon, P.B., Karim, N.A., Talib, R.A. and Taib, M.N. (2006). Nutrition education for Malaysian students: evaluation of a school based nutrition intervention conducted in Kuala Lumpur and Selangor, Malaysian. *Malaysia J. Nutr.,* **5**: 87-109.

Kotecha, P.V., Nirupam, S. and Karkar, P.D. (2009). Adolescent girls? anaemia control programme, Gujarat, India. *Indian J. Med. Res.,* **130** (5) : 584-89.

Laneroll, P. and Atukorala, S. (2006). Nutrition education improves serum retinal concentration among adolescent school girls. *Asia Pac. J. Clin. Nutr.,* **15** (1) : 43-49.

Mihas, C., Mariolis, A., Manios, Y., Naska, A., Arapaki, A., Mariolis-Sapsakos, T. and Tountas, Y. (2010). Evaluation of a nutrition intervention in adolescents of an urban area in Greece: short- and long-term effects of the VYRONAS study. *Public Health Nutr.,* **13** (5) : 712-809.

NFHS-III (2005-06). Report on National Health Survey Department of Health and Family Welfare, Govt. of India.

Patel, B.H., Saxena, D. and Singhal, D. (2009). Intervention of iron folic acid in school children. *J. Hum. Ecol.,* **25** (1) :61-62.

Payne, J., Capra, S. and Hickman, I. (2007). Residential camps as a setting for nutrition education of Australian adolescents. *Australian & Nutr. J. Pub. Health,* **26** (4) : 383-388.

Rahimi, A.R., Safarian, A.R., Modaresi, Z.H., Pourabdelahi, P. and Rezan (2010). Effect of nutrition education on nutritional knowledge, attitude and practice among female employees of Tabiz University of medical science. *Medical J. Tabiz Uni. Medical Sci.,* **31** : 1-7.

Saibaba, A., Ram, M.M., Rao, G.V.R., Devi, U. and Syamala, T.S. (2002). Nutritional status of adolescent girls of urban slums and the impact of IEC on their nutritional knowledge and practices. *Indian J. Commu. Medi.,* **27** (4) : 151-156.

Sharma, K.K. (2003). Iron deficiency anaemia ascorbic acid in its prevention or improving availability of food iron an overview. Nutrition goal for Asia-Vision 2020. Abstract. IX Asian Congress of Nutrition, 100 pp.

Sharma, S. (2000). Impact of nutrition counseling on nutritional status of school girls of 7-9 years. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, PUNJAB (INDIA).

Shojaeizadeh, D. (2001). A study on knowledge, attitude and practice of secondary school girls in Qazvin on iron deficiency anemia. *Iranian J. Publ. Health,* **30** (1-2) : 53-57.

Singla, P. (2011). Efficacy of nutritional counseling on the intake of junk foods among adolescent girls of working mothers. M.Sc. Thesis, Punjab Agricultural University Ludhiana, PUNJAB (INDIA).

Singla, P., Sachdeva, R. and Kochhar, A. (2012). Impact of nutrition counseling on consumption pattern of junk foods and knowledge, attitudes and practices among adolescent girls of working mother. *J. Hum. Ecol.,* **39** (3) : 221-227.

Subha, G.M., Vijayapushpam, T., Raghunatha, Rao, D. and Pavarala, V. (2007). Nutrition education for adolescents in classroom settings - different approaches and lessons least - part 1. *NIN Hyderabad,* **28** : 1-4.

Vir, S.C., Singh, N., Nigam, A.K. and Jain, R. (2008). Weekly iron and folic acid supplementation with counseling reduces anaemia in adolescent girls: A large-scale effectiveness study in Uttar Pradesh, India. *Food & Nutrition Bulletin,* **29** (3) : 186-194.

■ WEBLIOGRAPHY

WHO (2013). *http://www.worldhunger.org/articles/Learn/world%20hunger%20facts%202 002.htm#Micronutrients*

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