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IMPACT OF NUTRITION KNOWLEDGE ON THE NUTRITIONAL STATUS OF SCHOOL CHILDREN

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ABSTRACT

School age is a strategic point of entry for improving attitudes and well being of children. It is a detrimental period of nutritional care. A correct dietary practice of an individual notably appears to enhance their living state as well as society's development. A situational analysis as part of the School Education Program - *Nutrition and Health education* was extended among school children in the urban Mysore district. Around 28 girls and 45 boys aged between 8 to14 years were assessed for Nutritional knowledge practices using pretested standardized questionnaire. Finding revealed a 35 to 25% of girls and boys with poor knowledge, while 40 to 35% of girls and boys had average knowledge level about nutrition and health. Notably, girls showed greater nutrition knowledge level in comparison with boys. Anthropometric Evaluation revealed a difference of 2.0-3.3kgs in actual weight and respectively 10.2-6.7cms of difference in actual height among Boys and girls as compared to NCHS data. Evidently, children were observed to be shorter and lighter for their age as compared to 50th percentile of NCHS standard. A marked significance of 0.007and 0.003 correlations was noted between Nutrition Knowledge Aptitude Practice and Nutritional status among girls and boys. Relatively, Prevalence of anemia was observed among children. Thus, Research suggests that students should concentrate more towards healthy nutrition practices. It can be hypothesized that Nutrition education program conducted among children showed a positive effect on attitudes and nutrition behavior improvements.

Key Words: School Children, Nutrition knowledge, School Education, Anthropometry, NCHS Standards.

INTRODUCTION

Childhood is an important elemental period in life as it is a time of intense physical, psychosocial and cognitive development. School age period between 6-12years has been called the latent time of growth. The rate of growth varies and certainly body changes occur gradually during this period. Adolescence period is typically marked with rapid growth and increase nutrient requirements needs[4]. It is a critical period of nutritional care. During this period the nutritional needs indeed are increased as the adolescents weight gain marks up to 50% of their adult weight and more than 20% skeletal mass of their adult height (Spear, 2002).

Thereby the carbohydrate, protein, fat, Vitamin– B12 and minerals like iron, calcium and zinc essentially has to be provided in the diet in adequate amounts for better growth and development during the puberty of adolescents[3]. Most importantly inadequate intake of micronutrients in the diet seems to exhibit adverse influence on growth and development, cognitive performance and increase susceptibility to infections (Halterman JS *et al* 2001; Benton D *et.al* 2004).

Over 1/5th of Indian population comprises of children aged 5-14 years i.e. the group covering primary and secondary education (Raghava PK 2005). Typically, this age group is on the threshold of adulthood on whom the progress and welfare of the nation depends. As today's children are the citizens of tomorrow's world, their survival, protection and development are the prerequisite for the future development of humanity (WHO, 2006).

Growth monitoring during childhood and adolescent period, is not only an important health indicator but also a predictor of various morbidities in the community (Qumra SR *et.al* 1990). During school age promoting good health and nutrition programs are essential for effective growth and development (Spear, 2002, Schneiderm, 2000 and

Halterman, 2001).

Peer pressure, parent's relationship, dietary habits and media exposure markedly noted to have an influence on nutritional status, growth and development among children (Spear, 2002). Contributory socio-economic and nutritional transitions as a consequence indicated to affect the progress of developing countries like India.

It could be hypothesized that the nutritional status of the children among middle and high-income groups established to be affected by the changes in dietary habits and lifestyle. Indeed this has lead to an increase in the prevalence of overweight and obesity and micronutrient deficiencies (Frary *et.al.,* 2001, Benton, 2001 and Morton, 1998).

Realizing the intensity of the problem, several recommendations were made by WHO so as to minimize the nutrition related problems of adolescent population[5]. One of the strategies that emphasized is "Mass information and awareness programs needed in order to alert government and communities about the importance of health and nutrition" (WHO 2006). School settings often offer a readily available venue in reaching to scholastic achievement among children.

School-based nutrition education has shown positive success in promoting appropriate dietary behaviors in children (Ruzita AT *et.al* 2007). As such, nutrition education is an important tool that enables the children to learn at an early age the importance of healthy eating (Hammer, 1992, Wardle *et.al.,* 2000 and Qumra *et.al.,* 1990). It is an effective tool of changing the food habits of the children as well as community members. It is a process by which knowledge, attitudes and practices about food and health are channelized into actual practices which are sound and consistent with the individual needs, food preference, eating habits, health and socio-cultural background (Orstead C *et.al* 1995).

Nutrition education programs with effective implementation of IEC (Information, Education and Communication) components at formal and informal education system notably has brought out a significant change on nutrition knowledge and dietary habits of children (Worsley, 2002).

Nutrition education in schools offers a unique opportunity to integrate the teaching of nutrition and the application of that knowledge to achieve a change in behavior (Qumra *et.al.,* 1990). Without ensuring optimal child growth and development efforts to accelerate economic development significantly will be unsuccessful. Nutrition education often likely brings out a permanent and favorable solution to the problem of malnutrition.

The present investigation is focused on with following Objectives

To study –

- Nutritional status of school aged children aged between 8 to 14 years
- Level of nutritional knowledge and health about the children

- Rate of Growth pattern in children
- Associated factors like clinical status and hemoglobin levels influencing on to the school achievements

METHODOLOGY

Childhood is a formative time in the development of a human being. In fact it provides a strategic point of entry for improving children's health, self-esteem, life skills and behavior[14]. In addition it is a site for implementation of nutritional interventions that promote health and prevent various specific diseases. School-based nutrition education has shown a possible success in promoting appropriate dietary behaviors in children (Ruzita AT *et.al* 2007). As such, nutrition education is an important tool that enables the children to learn at an early age the importance of healthy eating.

Nutrition education in schools offers a unique opportunity to integrate the teaching of nutrition and the application of that knowledge to achieve a change in behavior. Nutrition education often likely brings out a permanent and favorable solution to the problem of malnutrition. It is an effective tool of changing the food habits of the children as well as community members. It is a process by which knowledge, attitudes and practices about food and health are channelized into actual practices which are sound and consistent with the individual needs, purchasing power, food availability, health and socio-cultural background (Shariff ZM *et.al* 2008).

The proposed study was conducted in three phases:

- Demographic assessment
- Nutritional assessment :
  i. Dietary assessment using 24-hour recall method
  ii. Anthropometry assessment, Clinical investigation (physical signs & symptoms for anemia) and
  iii. Biochemical analysis using WHO recommended cyanometh hemoglobin method.
- Assessment on nutrition and health knowledge using pre tested questionnaire.

RATIONALE OF THE STUDY

- Children play an important role in the family and society development; thereby it is important to focus on meeting essential requirements of children responsible for overall nutritional status, growth and development.
- Nutrition education program as an important tool helps out children in preventing nutritional problems
- Nutrition education program comprising effective nutritional Knowledge Aptitude and Practices as an important component promotes the quality of health status in children.

SAMPLING TECHNIQUE

By using a purposive sampling technique the targeted participants were drawn. A Statistical probable number of samples were included in carrying out the study.

Study Population: Children aged between 8 to 14 years participated in nutrition education program were included as a study population. Out of 86 children registered for the workshop, 73 children who voluntarily agreed were included for the study. Of which, 28 children were girls and 45 were boys. Children who voluntarily agreed were subjected for the biochemical analysis.

STUDY AREA

A situational study was conducted in the urban area of Mysore district. Study was carried out with the support extended by a non government organization – Cauvery Mahila Samaj. A nutrition education program was conducted for school going children as a part of *Nutrition, Health and Well Being* workshop.

Informed Consent: The study was carried out by obtaining an acceptance from school authority. Teacher and parents of the concerned children were briefed about the purpose of the study. A written consent was obtained from the child's parent before the commencement of the study.

NUTRITIONAL KNOWLEDGE APTITUDE PRACTICE (KAP) ASSESSMENT

43 Children both girls and boys aged between 8to 14 years who voluntarily took part in the study were assessed for Nutritional knowledge aptitude and practices. The analysis is subjected with using standardized questionnaire containing Simple and short statements. Data obtained was inferred based on the scale ranging from 'Poor', 'Average' and 'Above Average'. Details on food behavior, eating pattern, nutritional knowledge were drawn.

ANTHROPOMETRIC ASSESSMENT

Nutritional anthropometry is a measurement of human body at various ages and nutritional status level. It is based on the concept that an appropriate measurement should reflect any morphological variation occurring due to a significant functional physiological change. The measurements included in the surveys were-

BODY WEIGHT

Body weights of the selected subjects were weighed in a glass electronic personal scale having a strain gauge sensor. The capacity of the balance was 150kg with 100g grading.

HEIGHT

Height was measured in Cm, using a fiber glass tape fixed to a wall which was linear and devoid of ridges and creaveases. A scale was used as head piece

INDICES USED IN ANTHROPOMETRY

GOMEZ CLASSIFICATION - Weight for age was calculated using the following reference standard:

Malnutrition	Body of standard weight (%)
Grade - I	70 -90
Grade- II	60- 75
Grade- III	< 60

50 [th] percentile of NCHS standards

DIETARY ASSESSMENT

In this method of oral questionnaire diet survey a set of 'standardized cups' suited to local conditions are used. The children were interviewed about the types of food intake at breakfast, lunch, afternoon tea time and dinner. The intake of each food item (preparation) by the children was assessed using the standard cups. In case of milk, curd/butter milk the extent of dilution was assessed. Calorie-dense items like oils/fats were carefully noted. In the case of Dosa, Idli and chapatti etc, the amount of the raw ingredient used in their preparation was noted. Then the total number of Dosa, Idli and chapatti made out of the dough were ascertained. Individual consumption in terms of number was noted. For items like coconut, fish and certain fruits, it was mentioned whether they were dried or fresh. For items like fish/meat/mutton the number of pieces and the appropriate size of each piece were noted. Using 24 hour recall method, the energy, carbohydrates, protein and fat intake of all the subjects was calculated.

CLINICAL ASSESSMENT

Clinical manifestations help in diagnosing a disease. Clinical signs and symptoms being non-specific can be confirmed with the help of biochemical assessment. The subjects were tested for edema and also focused on anemia using the clinical parameters such as Hair, Skin, Eyes, Teeth, Gums, Tongue, Lips and Nails

BIOCHEMICAL ASSESSMENT

The estimation of hemoglobin was done using the cyanometh method. A sterile 2ml syringes were used to draw 2cc blood and then transferred into the ampoules containing anti coagulant. The name and the serial no. of the subject were mentioned on the ampoules. The samples which were collected was analyzed for hemoglobin status.

ETHICAL CONSIDERATION

The blood samples were collected after seeking a written consent from the child's parent and teacher approval.

STATISTICAL ANALYSIS OF THE DATA

The routine methods used for the statistical analysis of the data were t-test and chi-square test.

RESULTS AND DISCUSSION

There have been considerable changes in human lifestyle all over the world in the recent decades. Especially the lifestyle among the population of developing countries has rapidly been industrialized in recent years. This has caused changes in diet, type of food practices, health and nutritional knowledge etc. (Amamoto *et.al.,* 2004). Nowadays processed foods are rapidly replacing traditional foods. Studies have documented that unhealthy diet practices and poor nutrition knowledge has lead to health problems such as overweight and obesity (Harvey Berino *et.al.,* 1997, Nazni *et.al.,* 2010). Accordingly knowing students' knowledge, attitude and nutrition habits is beneficial to find the ways to enhance the nutrition levels in the community, which will consequently lead to a healthier society, as this group will form the main body of families and professionals (France, 2004). Therefore, the purpose of this study was to evaluate nutrition knowledge, the attitude and practices of students.

The population selected for this research consisted school students (girls and boys) of between 8-14 years of age. To the acceptable numbers of samples questionnaires were distributed, filled out by the students and collected. The questionnaire used was standardized suitable for children to answer easily. Questionnaire statements were simple and consisted of five parts. The first part consisted of personal information about the children and their body composition. The second part consisted measurement about the students' knowledge level about food groups, nutrition and health. The third part composed measurement about the students' attitudes toward nutrition and related diseases. The fourth part posed about choosing foods and the last part included obtaining students' recommendations.

Mean scores, standard deviation and percents were calculated for interpreting nutrition knowledge, attitude and food habit parameters. Pearson's correlation coefficient was used to assess the correlation between nutrition knowledge, the attitude and practices of school aged children. Analysis of variations (ANOVA) was used to evaluate nutrition knowledge and the attitude between majors, and an independent t-test was used to compare the nutrition knowledge and attitude between males and females. Statistical results were considered to be significant at $p \leq 0.05$.

The Data obtained in the present study were discussed under the following headings

- Demographic profile of the selected subjects.
- Anthropometric assessment of nutritional status.
- Dietary pattern.
- Health and nutritional knowledge.
- Morbidity profile

Children subjected in the study were aged between 8 to 14 years. Out of the 86 registered children, 73 children were voluntarily took part in the Nutritional Status and Knowledge Aptitude and Practice Assessment. Of which 28 were girls and 45 were boys.

Table 1: Demographic profile of the study population

Characteristics		Girls N=28 (%)	Boys N=45(%)
Caste	Hindu	72.2	68
	Muslim	16.7	20
	Christian	11.1	12
Parent education level	10+2	19.5	28
	Graduation	52.8	46
	Higher graduation	27.7	26
Type of Family	Nuclear	55.6	64
	Joint	27.8	20
	Extended	16.7	16
Economic status	Low ses	16.7	16
	Middle ses	61.1	60
	High ses	22.2	24

Perusal of the table-1 indicates that most of children belong to Hindu family (68-73%), while 16.7 – 20 % of them are Muslim and only 11-12 % of the children are from Christian. It is noted worthy that 46-52.8% of the parents were graduates and nearly 27% of the parents were post graduates. 55-64 % of the family among boys and girls were nuclear and 20 to 27 % were from joint family. However a small segment (16 %) of the family belongs to low income group, while 60 % of the children were from middle class income group. 22-24 % of the family had high income.

Table 2: Presence of weight and height status among girls/ boys in relation to their age

Girls(N=28)			Boys(N=45)		
Age in yrs	Wt in kgs (Mean± SD)	Ht in cms (Mean ±SD)	Age in yrs	Wt in kgs (Mean ±SD)	Ht in cms (Mean ±SD)
8	27±3.5	125±3.5	8	25±2.6	128±4.0
9	27±5.7	129.6±6.8	9	26±2.0	130±2.8
10	29±9.9	132±7.7	10	29±1.5	138±6.1
11	30±3.0	134.3±4.6	11	30±8.5	140±4.4
12	33±4.7	142±0	12	31±2.3	142±4.2
13	36±0	146±1.0	13	33±6.4	147±4.4
14	41±2.0	149.6±3.2	14	40±6.1	152±4.7

The mean height and weights of girls and boys are calculated with respect to their age from anthropometric assessment. The Table 2 presents the mean anthropometric measurements of the children from different age groups along with the standard deviations. Study reveals that mean weight of girls and boys ranged between 25±5.7 to 41±12.0 and 25±2.6 to 33±6.0 respectively.

The boys were lower than that of the girls in all age groups except the 9 years old age group in which boys were heavier than girls. The difference in height of boys and girls was not significant in any age group. The mean height of boys and girls of the study group ranged between 128±4.0 to 152±4.7 and 125±3.5 to 146±10.0 respectively. In comparison with 50th percentile of NCHS standards it was noted that the observed actual height and weight for the age were below the normal standards among boys and girls respectively. The 2.0-3.3kgs of difference in weight as compared to NCHS standards was observed in both girls and boys respectively.

Boys and girls were shorter by 10.2- 6.7cms respectively. Thereby the children assessed were shorter and lighter for their age as compared to NCHS standards. The short stature found among children could be consequence of high morbidity drains out the nutrient reserves, which may be resulting in shorter and lighter for their age.
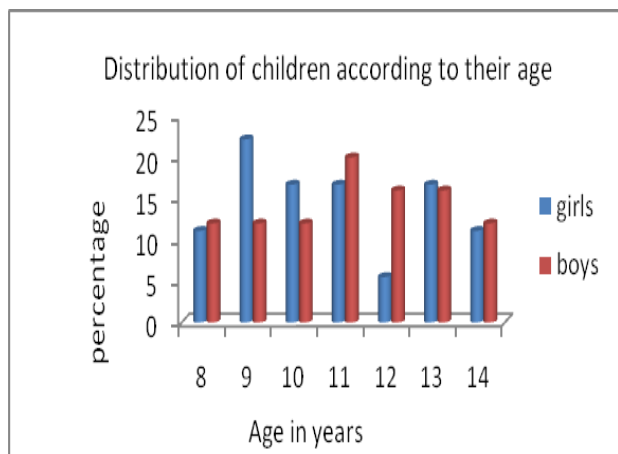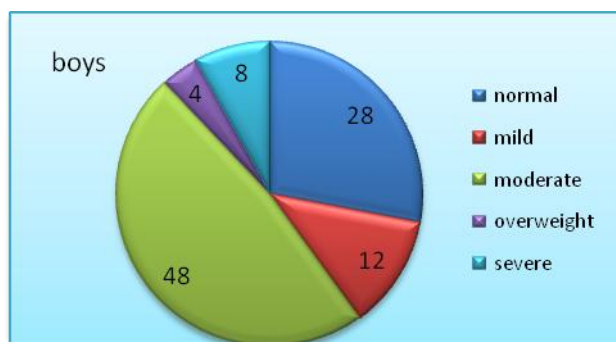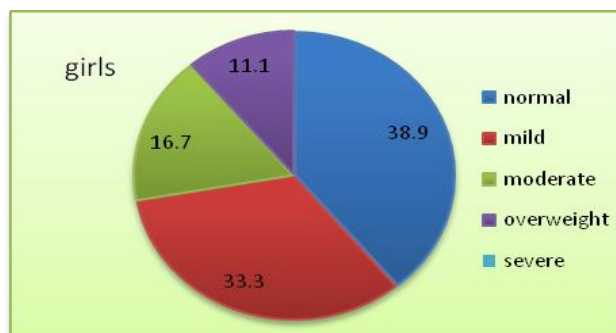

Fig. 2: Distribution of children according to Gomez classification (%)

The prevalence of malnutrition was assessed using Gomez classification. Figure 2 provides the percentage distribution of children into various grades of malnutrition as mild, moderate and severe. Investigation indicates that the majority of boys and girls were in normal status. The actual observed height and weight of the children were found to be poor in comparison with Gomez standards. The investigation reveals the incline in the occurrence of malnutrition among children. An average proportion of boys and girls were moderately malnourished.

A general dietary practices observed among the selected children is presented in the Table.3. It can be observed most of the children who participated were vegetarians. Majority of children had more preference to junk foods. However considerable children mentioned the use of spicy food.

Fig. 1: Distribution of children in relation to their age

Table.3: Dietary pattern followed by selected children

Girls %							
Type of Diet		**Meals/day**		**Food Habits**			
Vegetarian	**Non-vegetarian**	**3 times**	**4 times**	**More Preference to packed lunch**	**More preference to sweets**	**More preference to fried foods**	**More preference to aerated drinks**
65.0	35.0	58.0	42.0	61.0	71.0	68.0	56.0
Boys%							
48.0	52.0	44.0	56.0	51.0	79.0	52.0	78.0

A Majority of 58.0% children had 3 meal pattern practices in a day. To a great extent 51.0% children exhibited more preference on completing packed lunch. Markedly a greater proportion of children exhibited more preference to sweet, fried foods and aerated drinks at 79.0%. 68.0% and 56.0% respectively.

Table.4: Food frequency consumption pattern of the subjects

Food stuffs	Daily	Alternative days	Weekly	Fortnightly
Cereals:				
Rice	100		---	---
Ragi	--	10	17	8
Wheat	---	10	40	50
Legumes:				
Red gram dhal	19	47	5	---
Greengram dhal	---	17	73	10
Others	---	22	58	20
Vegetables	30	58	9	3
Green leafy vegetables	---	29	47	24
Roots and tubers	16	37	39	8
Milk	100[*]	---	---	---
Curds	64	36	---	---
Oil	100	---	---	---
Meat	---	---	79	21
Fish	---	---	---	80
Egg	---	---	---	82
Fruits	---	---	34	49
Bakery items/junkfoods	49	29	22	--
Beverages : Soft drinks/ coffee/tea/	29	46	35	--

Frequency of consumption of various food items by the children is presented in the table 8. Information about food preference was obtained. It is worthwhile to mention that the children included in the study had exhibited regularity in eating breakfast, lunch and dinner meals to a certain extent. Despite a consumption of snack foods than family meals was more among children.

Cereals and pulses were consumed every day. Among the cereals, rice was consumed by everyone, while ragi was disliked for its color and taste, Wheat was frequently used. Similarly red gram dhal and green gram was used by 19% of the children daily, while majority used it alternate days. Other legumes were used less frequently. Vegetables especially brinjal and gourds formed a disliked item by the children. Non-vegetarian foods like meat, fish and egg were consumed fortnightly. Fruits consumption was occasionally. Children expressed dislike towards most

of the vegetables and preferred junk foods like pani puri, gobi manchuri and soft drinks.

Table 5: Level of nutrition knowledge in children

Level of Nutritional knowledge	Girls	Boys
Poor	25	35
Average	40	35

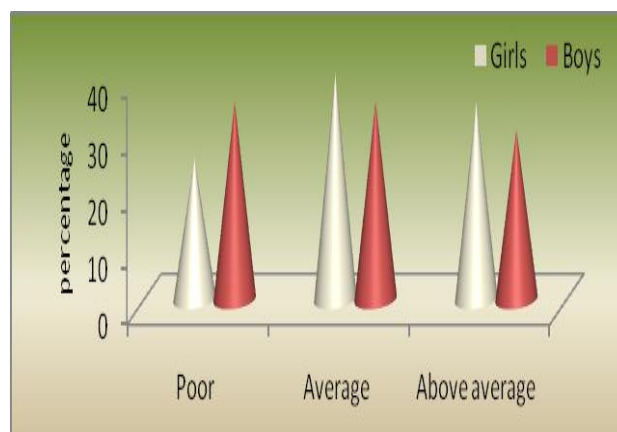(Percentage in parenthesis)

Fig 3: level of nutrition knowledge in children

Nutrition knowledge has a potential relationship with dietary and health status of an individual. Importantly meeting nutrition needs during growing period has greater impact on learning achievements[16, 17] (Wong et al., 1999). The level of knowledge, aptitude and practices towards nutrition and health were noted to be average among Children [18, 19] (Sakamaki et al., 2005).

The Nutrition and Health education is considered to be one of the important components in the children academic achievements. Findings have shown that nutritional knowledge has been significantly associated to dietary habits including consumption of meat, dairy, whole grains and water (Sharma et al., 2008).

The data on nutrition and health knowledge assessed in the children is presented in the figure and table 3. It is evident from the table and the figure that, 25-35 % of boys and girls had poor knowledge, while 40-35% of them had average knowledge about nutrition and health. In this current research, the nutritional knowledge of the boys was 35% and that of the girls were at 40%, indicating average nutrition knowledge levels among children.

It has been observed in this research that the nutrition knowledge of high school students were highest among the participants. In this current research a positive and marked association between nutrition attitude and knowledge were noted among male students (r=0.30) and female students (0.41). This research was conducted according to the knowledge-attitude-practice model based on the cognitive-affective-behavior theory in the area social psychology (Figure 1) and this model suggests that

an increase in knowledge affects attitude and consequently

changes the diet.

Table 6: Clinical manifestation of nutritional deficiencies among children (%)

Sex	Discolored Hair	Night Blindness	Pale & dull Eyes	Decayed / pigmented Teeth	Lips angular stomatitis	Flat Nails
Boys	0.7	1.5	29.4	22.9	2.0	33.5
Girls	0.4	--	27.6	30.6	4.1	37.3

It is evident that occurrence of symptoms for nutrient deficiency was in the group with pale and dull eyes and flat nails in higher percentages. Hair discoloration and angular stomatitis was seen in only 2-4% of the children, pale and dull eyes were observed in 27 and 29 %

of the boys and girls respectively, while decayed and pigmented tooth was observed in nearly 30%. This could be apparently due to poor oral hygiene. Only 1.5 % of the boys complained of night blindness.

Table.6: Percent prevalence of anemia among the children

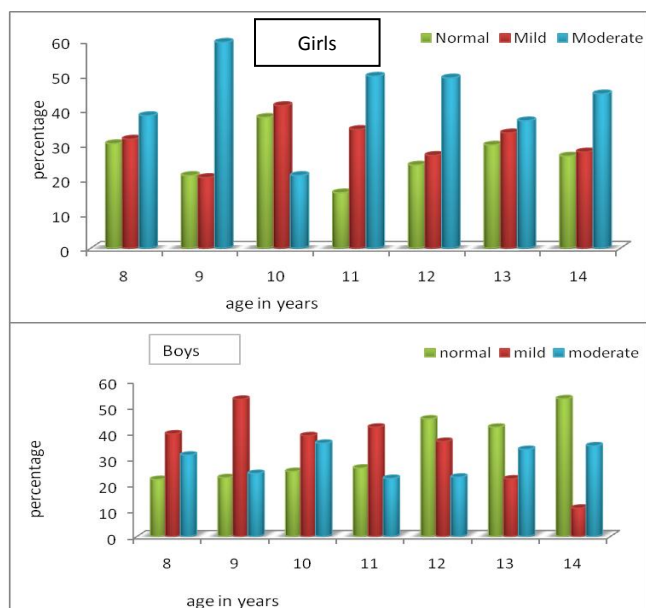| Girls	(N=28)				Boys	(N=45)			
Age in years	Normal	Mild	Moderate	Severe	Age in years	Normal	Mild	Moderate	Severe
8	30.2	31.5	38.3	----	8	22.0	39.6	31.4	----
9	21.0	20.4	59.5	----	9	22.7	53.0	24.3	----
10	37.8	41.2	21.0	----	10	25.1	38.9	36.0	----
11	16.0	34.3	49.7	----	11	26.4	42.2	22.4	----
12	24.0	26.8	49.2	----	12	45.4	36.7	22.9	----
13	29.8	33.3	36.8	----	13	42.2	22.2	33.6	----
14	26.6	27.8	44.6	----	14	53.2	10.9	35.0	----

Fig.4: Classification of children into grades of anemia (%)

Prevalence of anemia in the children is presented in the table-6. The children were distributed based on the level of anemia as normal, mild and moderate. The total percentage of moderate and mild level anemia occurrence forms to be more than 60 percent. It is evident that a small portion of girls had normal hemoglobin levels at 16.0- 37.8 percentage and comparatively among boys was 22.0- 45.4 percent. Nevertheless it is difficult to suggest the reasons for the high prevalence of anemia, since a variety of

factors are known to influence iron status. However there were no cases of severe anemia. This report is supported by the food choice where children disliked vegetables and consumed very less.

Table-7: Correlation of KAP and nutritional status of children

T -test	Girls		Boys	
	KAP	Nutrition status	KAP	Nutrition status
Standard deviation	7.63	3.055	2.88	4.358
Standard error	4.40	1.763	1.666	2.516
P value	0.00721***		0.00371***	

*** Highly significant

KAP and nutritional status of children was compared using simple T- tests and the results indicated there was significant correlation between KAP of nutrition and the nutritional status of the children i.e 0.00721 in girls and 0.00371 in boys. It is supported Gomez classification of nutritional status and Prevalence of anemia in the children.

SUMMARY AND CONCLUSION

A correct dietary practice of an individual has a considerable effect on quality of health. Dietary practices acts as a vital component in the enhancement of society's development. In the current research the knowledge attitude and practices towards nutrition among children

were observed to be average. Noticeably it is observed that there is a need to improve the children dietary practices. From our findings it can be hypothesized that the nutrition knowledge and attitude has a possible relationship with dietary practices and nutritional status. Evidently the research suggests the importance of nutrition knowledge and its influence on healthy eating practices and life styles in children.

Nutrition intervention and nutritional education programs in schools notably are found to enhance school excellence in children. Implementation of nutrition courses in the curriculum could bring out positive attitudes, skills and achievements in children. Research suggests that children should pay more attention to nutritional values on their quality of living. There by it can be concluded that the promotion of nutrition knowledge has lead to the improvement in children nutritional and health status.

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