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NUTRITIONAL ASSESSMENT OF SCHOOL GOING BOYS (7-9 YEARS) RESIDING IN URBAN AREAS OF BIKANER DISTRICT

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***Abstract*:** School-age children constitute a little less than one quarter of the world's population, and around three quarters of these children live in developing countries (UN,2015) A child's dietary habits acquired early in childhood continue into adulthood. Understanding the nutritional status of children has far reaching implications for the better development of future generations. The present study was undertaken to assess the nutritional status of 90 school going boys by assessing their general information, anthropometric measurements, clinical and dietary assessment. Dietary assessment was done by 24 hour dietary recall method for three consecutive days. Anthropometric measurements were used to construct indices for malnutrition that were compared to reference values. The results of the study revealed that majority of the subjects (77.0 percent) belonged to Hindu religion, MIG and were vegetarian (70.0-81.11%). Height and weight of the subjects were found to be 98.60 - 101.51 percent and 90.26 – 94.15 percent of the NCHS standards respectively. McLaren classification revealed moderate malnutrition (12.22%), mild malnutrition (34.44 %) and overweight (3.33%) based on weight. According to anthropometric indicator of BMI, majority of the subjects (30-73.33%) belonged to normal category BMI with their mean 14.33, 14.87 and 14.81 kg/m² for the age group of 7, 8 and 9 years respectively. The percent adequacy of food intake was ranging from (56.66-146.26 percent). The percent adequacy of nutrient intake ranged from 73-104.68 percent. Awareness programs regarding affordable but nutritious foods should be introduced by the government through community participation and other sectors.

Index Terms – School children, Nutritional Status, Malnutrition, Nutrient Intake, Anthropometric Measurement

I. INTRODUCTION

The school going ages form the foundation of future life in terms of physical, emotional and mental aspects and strongly influence the child's health in her/his adult life (Buttriss, 2002, Bamji et al.,2009). Describe adequate and appropriate dietary intake is essential in these ages for inculcating healthy eating habits so as to provide nutrients not just for the immediate growth, development and scholastic performance but also for long-term health. The health, physical growth, development and educational performance of schoolchildren depend largely on good nutrition. Dietary choices made by the children and their families' influence their health and may contribute towards both malnutrition and 'over nutrition'. The dietary habits of individuals /families /communities vary according to socioeconomic factors, regional customs, traditions, seasonal availability of food items etc.

Raj et al., 2009 Revealed the time trends in childhood obesity reported from India predicts an escalating burden of obesity related issues in the near future. Drake et al., 2002 Explained the nutrition and activity levels have a key impact on children's health and well being. Eating behaviour established during childhood track into adulthood and contributes to long term health. Though the problem of under nutrition still exists, the propensity of over nutrition and obesity has been increasing over the years due to changing life styles and dietary habits of citizens, as a result of the recent economic growth. With rapid socioeconomic advancements in India in the recent decades, the population has undergone significant life style changes in dietary and meal pattern such as increase consumption of fat and oils, decrease intake of complex carbohydrates, eating out and skipping meals. This unhealthy lifestyle behavior is an epidemic too (Sharma Mehan and Surbhi.2008).

Bamji et al., 2009 Explain there are various methods of qualitative and quantitative diet surveys, finding a suitable method of assessing dietary intake for the population under study poses, at times several problems. Livingstone MBE and Robson, 2000 Explained dietary assessment of schoolchildren may be difficult as children due to limited attention span and issues of recall and cognitive abilities for self-reporting may not be able to provide accurate responses. Hence researchers usually have to rely on collecting information from the parents or caregivers and while this seems to be a satisfactory alternative when the population of interest is smaller children, however parents may at times be unaware what older children consume when away from home. Qualitative diet surveys can be used to gain qualitative details of diet and for studying the patterns of food consumption, food likes/dislikes etc. at a household level. Keeping this in view, present study has therefore been planned and designed to assess nutritional status of school going children aged 7 to 9 years was undertaken.

II. MATERIALS AND METHODS

The study was conducted on 7-9 years old school going children studying in elementary schools of Bikaner (Rajasthan) i.e. Central Academy School and Aakashdeep public School. After seeking prior permission and having discussion with the respective school authorities a list of children belonging to the age group of 7-9 years, was prepared. These children were studying either in class 1St 2nd and 3rd standard. Out of the procured lists, 90 male school children were randomly selected from the two identified schools. Regularity in attending the school was also considered during the study. A well structured pre-tested interview schedule was developed and used to obtain the requisite information about all the subjects. The subjects (n=90) were assessed for their general information, anthropometric indices, BMI and dietary information.

2.1 Anthropometric measurements

Body measurements which are indicators of Underweight, normal, overweight and obesity, were taken and their indices were calculated.

Weight: The mean values were compared with the reference values given by NCHS (ICMR 2010).

Height: The height measurement was compared with the standard given by NCHS (ICMR 2010).

Anthropometric measurements i.e., weight and height were measured as per the guidelines suggested by ICMR standards. Height was measured by using a height scale nearest to 0.1 cm. A portable weighing scale was used to measure the weight nearest to 0.1 kg, with minimal clothing and without shoes.

BMI for age according to the z score was calculated and interpreted as per the method given by WHO (2006) as an indicator for assessing thinness.

Prevalence of malnutrition based on height and weight was assessed with the help of indicator suggested by McLaren (1976).

2.2 Dietary survey

A 24 hours dietary recall method for three consecutive days was adopted to find out the intake of various foods consumed by the subjects.

The data was collected by using standardized cup sets for each day to assess the food and nutrient intake. Raw amounts were quantified either in terms of household measures (standardized cups sets) or numbers of these were then converted to raw weight of foods in grams and the nutritive value was calculated using the food consumption tables (Gopalan *et al.*, 1989).

The nutrient composition of foods consumed by the subjects was calculated in terms of energy, protein, fat, carbohydrate, β-carotene, retinol, vitamin C (ascorbic acid), calcium, and iron by using the food composition tables (Gopalan *et al.*, 1989). Their mean nutrient intakes were compared with RDA given by ICMR (2010) to find out nutrient adequacy ratio (NAR). The NAR represents an index of adequacy for nutrient based on RDA of that nutrient.

III. STATISTICAL ANALYSIS OF THE DATA

The percentage, mean and standard deviation were used to during present study for statistical analysis of the findings.

IV. RESULT AND DISCUSSION

The result of the study has been categorized and reported as Anthropometric assessment and dietary assessment

4.1 Anthropometric assessment

The physical dimensions of the body are much influenced by nutrition. Selected body measurements therefore can give valuable information about certain type of malnutrition in which body size and body composition are affected. In present study, height and weight, were measured and BMI and depicted in the table and discussed below:

Table 4.1 Distribution of the subjects according to their height & weight

Age (in years)	Height			Weight		
	Reference value (NCHS)	Observed value (cm)	Percentage of standard value	Reference value (NCHS)	Observed value (kg)	Percentage of standard value
7 (n=30)	121.7	120.± 6.41	98.60	22.9	20.67 ± 3.31	90.26
8 (n=30)	127	128.93 ± 6.03	101.51	25.3	23.83 ± 3.62	94.15
9 (n=30)	132.2	134.19± 6.05	101.50	28.1	25.48 ± 2.64	90.67
		127.70 ± 6.16		**27.1 2.998275**	**23.32± 3.19**	

Note: Values in parenthesis indicate percentage of the subjects

Reference value are according to NCHS (ICMR, 2010)

Weight for age: Weight of an individual indicates the current nutritional status. It is proportional to the dietary intake and any fluctuation may lead to malnutrition of either deficit or excess. Therefore, weight deficiency may be a precise indicator of the prevalence of protein energy malnutrition among any age group provided age is accurately recorded. During present investigation, the mean weight of all the subjects was recorded as 23.86 ± 3.35kg. Age wise mean weight of the subjects were noted to be 20.83 ± 4.18, 23.66 ± 2.89 & 27.1 ± 2.99 kg respectively (Table. 4.1).

Nutritional status based on weight: Table 2. Exhibits the prevalence of different grades of malnutrition based on McLaren classification using NCHS reference values for body weight of 7-9 years of children. None of the subjects was found to be suffering from severe degree of malnutrition. Majority of the subjects (45.55%) remained in normal category followed by moderate malnutrition (12.22%), mild malnutrition (34.44%), overweight (3.3%) and obese (4.4%).

Height for age: The height of an individual is influenced both by genetic and environmental factors. The maximum growth potential of an individual is decided by hereditary factors, while the environmental factors, the most important being nutrition and morbidity, determine the extent of exploitation of that genetic potential. Height is affected only by long-term nutritional deprivation; it is considered as an index of chronic or long duration malnutrition (Srilakshmi, 2008).

The mean height of the subjects (n=90) was found to be 127.70 ± 6.16 cm. Further, age wise mean height of the subjects was recorded as 120 ± 6.41, 128.93 ± 6.03, and 134.19 ± 6.05 cm respectively for 7, 8 and 9 years boys. It is clear from the Table 4.1 that the mean height values were found to be 98.60 to 101.50 percent of the NCHS standards.

Nutritional status based on height: On the basis of height, subjects of present study were categorized in different grades of malnutrition given by McLaren using NCHS standards. Accordingly, majority of them (76.67 %) had normal height as compared to 17.78 percent having giant stature and short heighted. Subjects having less than 80 % of reference height termed as dwarf were not found in present study (Table.4.3).

Table 4.2: Distribution of Degree of Malnutrition Based on Weight among Subjects

*Grades of malnutrition	No. of male subjects						Total number	
	7 years		8 years		9 years			
	F (%)	Mean wt (kg)	F (%)	Mean wt (kg)	F (%)	Mean wt (kg)	F (%)	Mean wt (kg)
<60% (Severe malnutrition)	-		-		-		-	
61-80% (Moderate malnutrition)	8 (26.66)	**15.25**	2 (6.6)	**18.1**	1 (3.33)	**20.0**	11 (12.22)	18.45
80-90 % (Mild malnutrition)	5 (16.66)	**19.0**	11(36.66)	**21.56**	15 (50.0)	**24.12**	31 (34.44)	21.6
91-110% (normal)	16(53.33)	**21.9**	13 (43.33)	**25.25**	12 (40.0)	**27.21**	41(45.55)	24.76
110-120% (overweight)	-	-	1 (3.33)	**28.5**	2 (6.66)	**33.0**	3 (3.33)	28.91
120% and above (obese)	1 (3.33)	**33.8**	3 (10)	**33.2**	-	-	4 (4.44)	33.5
	30		30		30		**90**	**25.44**

Note: Values in parenthesis indicate percentage of the subjects
*McLaren (1976)

Table 4.3: Distribution of degree of malnutrition based on height among subjects

*Grades of malnutrition	Year wise no. of Boys						Total number	
	7 years		8 years		9 years		Total	
	F (%)	Mean	F (%)	Mean	F (%)	Mean	F (%)	Mean
<80% (Dwarf)	-		-		-		-	
80-93% (Short)	4 (13.33)	**90.79**	-	-	1(3.33)	**90.01**	5 (5.56)	90.63
93-105% (Normal)	21 (70)	**98.36**	26 (86.66)	**100.18**	22 (73.33)	**100.02**	69 (76.67)	99.37
>105% (Giant)	5(16.66)	**108.5**	4 (3.33)	**103.88**	7 (23.33)	**106.65**	16 (17.78)	106.19
Total subjects	30	-	30		30		90 (100.0)	98.73

*McLaren (1976)
Note: Values in parenthesis indicate percentage of the subjects

Table4. 4: Anthropometric indicators for the subjects (BMI for age)

BMI for age	Reference value (7 years)*	Observed value n=30		Reference value (8 years)*	Observed value n=30		Reference value (9 years)*	Observed value n=30	
		F(%)	mean		F(%)	mean		F(%)	mean
Severe undernutrition	**<12.3**	4(13.33)	11.96	**<12.4**	4(13.33)	12.23	**<12.6**	5(16.6)	12.28
Moderate	**12.3-13.1**	2(6.66)	12.85	**12.4-13.3**	9(30.0)	12.57	**12.6-13.5**	6(20.0)	13.30
Normal	**13.1-15.5**	22 (73.33)	14.33	**13.3-15.7**	9(30.0)	14.87	**13.5-16.0**	18(60.0)	14.81
Over weight	**15.5-21.5**	2(6.66)	16.34	**15.7-22.8**	8(26.66)	16.29	**16.0-24.3**	1(3.33)	16.13
Obesity	**>21.5**	-	-	**>22.8**	-	-	**>24.3**	-	-

***WHO, 2007. Mean BMI scores.**

Body Mass Index (BMI) for age

BMI provides a good correlation to fitness and low correlation with stature. It is simple index for weight-for-height that is commonly used to classify underweight, overweight and obesity.

Body Mass Index: Table 4. 4 Indicates that majority of the subjects (30-73.33%) belonged to normal category BMI with their mean 13.87, 14.01 and 14.13 kg/m² for the age group of 7, 8 and 9 years respectively .

Overall Food intake: The nutritional status of any individual is directly associated to his food intake. All the individual need a wide range of nutrients to lead a healthy and active life from the foods they consume daily. The components of diet need to be chosen judiciously so that it provides all the nutrients in proper amount and appropriate proportions (ICMR, 1989). The daily intake of various foodstuffs is displayed in table 4.5 and discussed below with to the recommended balanced diet (IDA 2011).

Table 4. 5: Mean values of food intake of the subjects

Nutrients	Suggested intake*	Mean ± SD intake	Overall intake % of RDI
Cereals, grains & products	180g	179.7 ± 35.7	99.83
Pulses & legumes	60g	34.0 ± 5.9	56.66
Leafy vegetable	100g	46.89 ± 4.45	46.89
Roots & tubers	100g	80.57 ± 10.4	80.57
Other vegetable	100g	59.81 ± 8.01	59.81
Fruits	100g	67.17 ± 59.6	67.17
Milk & milk products	500ml	434.5 ± 136.9	86.9
Fat (visible)	30g	43.88 ± 5.97	146.26
Sugar	20g	18.88 ± 9.19	94.4
Nuts & oil seeds	-	10.35± 8.5	-

Note: Values in parenthesis indicate percentage of the subjects
* RDI, NIN (2010)

Food consumption pattern revealed that the daily mean intake of food groups- cereals, pulses, leafy vegetables, roots and tubers, other vegetables, fruits, milk and milk products, fats and sugar, was found to be lower in percentage than the recommended dietary intake. The daily intake of various food groups is displayed in table 5.

Dietary intake of respondents showed that mean nutrient intake of energy, carbohydrate and other nutrients intake was lower than the Recommended Dietary Allowances as presented in Table 4.6. The adequacy of Protein, Fat and Vitamin C intake was higher than RDA.

Table 4. 6. Mean nutrient intake of the subjects (7-9 years)

Nutrients	Suggested intake*	Mean ± SD	Overall intake % of RDA
Energy (kcal)	1690	1550.89± 632.02	91.76
Protein (g)	29.5	38.11 ± 19.4	129.18
Carbohydrate (g)	253.5	209.4 ± 20.58	82.60
Fat (g)	30	48.46 ± 25.58	193.84
β-carotene (µg)	4800	5024.9 ± 81.15	104.68
Retinol (µg)	600	628.11 ± 10.70	104.68
Vitamin C (mg)	40	35 ± 1.4	87.5
Calcium (mg)	600	468.7 ± 189.4	78.11
Iron (mg)	16	11.68 ± 3	73

Note: Values in parenthesis indicate percentage of the subjects
*ICMR, 2010

CONCLUSION:

Hence, it may be concluded that consumption of foods were inadequate in the intake of vegetables, fruits and pulses which resulted into overall lower intake of β-carotene, calcium and Iron which are very important for a growing child. Although due to high intake of fat, majority of the subjects had normal health status with reference to their body weight. The present finding therefore, opens up a path for further researches on promotion of healthy food habits through nutrition intervention with special reference to vegetables and fruits in school children.

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