

**Assessment of dietary practices among school going  
children (7-12 years) of selected  
private and Govt. schools**

**A**

*Thesis submitted to the  
Orissa University of Agriculture and Technology  
In partial fulfilment of the requirement  
For the degree of*

**Master in Home Science  
(Foods & Nutrition)**

**By**

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**Adm. No.: 04FN/16**



**DEPARTMENT OF FOODS & NUTRITION  
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ORISSA UNIVERSITY OF AGRICULTURE AND  
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BHUBANESWAR-751003, ODISHA  
2018**



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## **CERTIFICATE-I**

This is to certify that the thesis entitled “**Assessment of dietary practices among school going children (7-12 years) of selected private & Govt. schools**” submitted in partial fulfilment of the requirements for the award of the degree of **Master of Home Science (Foods and Nutrition)** to the Orissa University of Agriculture and Technology is faithful record of bonafide and original research work carried out by **Ranjita Mahapatra** under my guidance and supervision. No part of the thesis has been submitted for any other degree or diploma.

It is further certified that the assistance and help received by her from various sources during the course of investigation has been duly acknowledged.

**CHAIRMAN  
ADVISORY COMMITTEE**



## CERTIFICATE-II

This is to certify that the thesis entitled “**Assessment of dietary practices among school going children (7-12 years) of selected private & Govt. schools**” submitted by **Ranjita Mahapatra** to the Orissa University of Agriculture and Technology, Bhubaneswar in partial fulfilment of the requirements for the degree of **Master of Home Science (Foods and Nutrition)** has been approved/disapproved by the students’ advisory committee and the external examiner.

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## ACKNOWLEDGEMENT

First and foremost, I am indebted to “Almighty God” for having bestowed upon me. His grace and blessings in every humble step I have taken so far. There are a number of people without whom this thesis might not have been written and to whom I am greatly indebted.

I availed this unique privilege to express my prolonged and profound sense of reverence and infinitum gratitude and indebtedness to Dr. Diptimayee Jena, Associate Professor of Foods and Nutrition, College of Home Science, OUAT, Bhubaneswar, for her constant inspiration, valuable guidance, kind help, keen supervision, sustained interest, constructive criticism and painstaking efforts coupled with patience, during the entire span of my course and in the planning and preparing the manuscript.

Besides my advisor I would like to thank my advisory committee, Dr. Snehalata Nanda, Professor of Foods and Nutrition, College of Home Science, Dr. Amarendra Mohapatra Scientist, Regional Medical Research Centre for their keen interest, encouragement, insightful comments, inspiring suggestions and timely help during the course of investigation and preparation of thesis.

I expressed my heartfelt gratitude to Dr. Chitrotpala Devadarshini, Assistant Professor, Department of Foods and Nutrition, College of Home Science, OUAT, Bhubaneswar for precious guidance, help, valuable suggestions and encouragement.

My sincere thanks to Mrs Sumitra Chhotray, Assistant staff of the Department of Foods and Nutrition for her valuable support and help in my research work.

I take pleasure in thanking all the school children and their parents who participated in the study and the principal and other staffs of the school. It would not have been possible to complete my study without their co-operation.

My heartiest appreciation is also for the moral support given by my entire family, particularly my father Mr. Santosh kumar Mahapatra, my mother Mrs. Bharati Mahapatra, my sister Rashmi, my brother Rajesh and all my family members. There

are no words to thank you enough for the support and encouragement, I have given throughout my life.

Words run short to express my sence of irreversible and immense pleasure to be gifted by my friend cum roommate Tanmayee, friends Sudipta, Tapaswini, Monalisha, Saipadma and Ashwariya whose restless help, cooperation and selfless love has been a constant source of inspiration and motivation for me, I am heartily indebted to them.

Last but not the lease, I would like to thank all the faculty members, students and friends of Home Science for their direct or indirect support for helping me this work.

**Place: Bhubaneswar**

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## **ABBREVIATIONS**

BMI	:	Body mass index
CDC	:	Centres for Disease Control and Prevention
ICMR	:	Indian Council of Medical Research
IOTF	:	International Obesity Task Force
NCHS	:	National Centre for Health Statistics
OI	:	Obesity Index
RDA	:	Recommended Dietary Allowance
RDI	:	Recommended Dietary Intake
SD	:	Standard deviation
SQRT	:	Square root
WAZ	:	Weight -for -age z- score
HAZ	:	Height -for -age z- score
BAZ	:	BMI -for -age z- score
WHO	:	World health organization
MDM	:	Mid-Day Meal

# ABSTRACT

The school age is the active growing phase of childhood and dynamic period of growth. Good nutritious diet or balance diet is the basic need of every child and is highly essential for overall growth and development. The present study was undertaken to assess the dietary practices among school going children (7-12 years) in Govt. and private schools of Bhubaneswar city. One Govt. (Rajbhawan Project U.P School, Gopabandhu square) and two private schools (D.A.V Public school, unit-8 and Steward School, CRPF Square) were selected by using simple random sampling method. A total of 120, 7-12 years old school children (both boys and girls) were selected. 60 children from Govt. school and another 60 from private school were taken.

The school children and their mothers were interviewed and data were collected by using pre-designed and pre-tested questionnaire which include socio-demographic profiles of their family, anthropometry measurements, frequency consumption of fast/junk foods, consumption of diet (24-hours-recall method) and analysed for nutrient intake which was calculated by using nutritive value of Indian foods (C. Gopalan, 1989) and compared with Recommended Dietary Allowances (ICMR, 2010).

From the study it was found that the prevalence of thinness was 58.33% in Govt. school children whereas 28.33% of private school children were overweight and 11.67% were obese. The school going children of Govt. school were found to be stunted 6.67%. Consumption of all the nutrients by Govt. school children was deficit from the recommended dietary allowances but in case of private school children, consumption of all the nutrients was excess from the Recommended Dietary Allowances except vitamin-A. The low consumption of costly food items such as egg, fish, meat, milk and milk products, fruits and nuts by Govt. school children as compared to private school children. Children of private school belonging to higher socioeconomic group consuming fast/junk foods were more predisposed to overweight/obesity as compared to children of Govt. school. All the private school children carried tiffin box daily and all most all the Govt. school children eat mid-day excluding 13.33% to carry tiffin box sometimes. Duration of outdoor game, computer game, watching TV (<1 hr./day and >1 hr./day) and mode of transport to school by walking, cycle, school bus and own vehicle was found to be statistically significant on BMI.

This study attempt to highlight the dual nutritional problem, under-nutrition (thinness and stunting) among the lower socioeconomic class on one hand and growing epidemic of overweight and obesity among the higher socioeconomic class on the other.

# INTRODUCTION

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Children being the future wealth of the nation are considered as important segment of the population. Their survival, protection, and development are the prerequisite for the future development of the society. Their optimum health, overall growth and development of children depend primarily upon the genetic endowments, nutritional status, and psychosocial attitude and surrounding physical environmental conditions.

The school age is the active growing phase of childhood and dynamic period of growth when children undergo physical, mental, emotional and social changes. During this age, children establish habits of their choice in eating, selecting hobbies, sports and performing exercise that stick with them for their entire lives. Among all the factors, nutrition plays significant role in providing and preserving nutrients as required for physical and mental development towards achieving adolescence.

The availability of quality food, affordability of family, choice of children etc. are the critical factors contributing undernourishment and malnutrition. The prevalence of malnutrition and obesity is significantly higher in India than many other developed and developing countries. Malnutrition is one of the principal public health problems affecting large sections of populations especially children in developing countries (Begum and Nessa, 2008). Healthy habits of children minimize the risks of many chronic diseases but, physically inactive children with poor eating habits are vulnerable to adverse health conditions during forthcoming adulthood.

Good nutrition is an essential component of healthy life which determines health, physical and mental growth. But, diet is one of the prime determinants of health and nutritional status. Assessment of food quality and quantity through dietary surveys are therefore essential for school children

In the existing era, the school going children prefer junk food rejecting homemade healthy food. Based on the habits of children, some marketing strategies are aimed specially to convince the children. Therefore, healthy nutritious foods have been replaced by the new food mantra- Junk Food because it needs less time to

prepare, gives good taste, and is convenient and fashionable. Although, people of all age groups succumb to eat junk food, but children have stepped into the world of fast and junk foods (Sultana and Ahluwalia, 2016). Excess consumption of burger, pizza, chocolates, candy, noodles, pasta, potato chips, kurkure etc. increases the risk of cardiac disorders by elevating body cholesterol and fat. Further, drinking excess soft drinks adds dangerous toxins affecting bone, skin and kidney of the children. In addition, fast food items with high sugar, saturated fat, salt and calories lead early development of obesity and cardiovascular disease in children. The easy access to fast food items increases fast food consumption by school going children. Although, it is hazardous to health but, it has proven its importance and needs to be replaced by healthy food habits before it ruins the younger generation (Singh and Mathur, 2017). Thus, it is high time to educate the parents and the children on nutritional labelling, promotion of healthy eating habit and adverse effects of fast and junk foods.

In order to educate the school children and their parents for changing food habits, it is the needed to collect information on nutritional habits involving source of foods (e.g., mid day meal in schools etc.), associated factors of food consumption and feeding style are the pre-requisites (Patrick and Theresa, 2004). Therefore, the present study has been designed to generate the information on school going children of 7-12 years of age of Bhubaneswar city with respect to the aforesaid characters with the objectives to study:

- The nutritional status of school going children by anthropometry
- The nutrient intake of children in comparison with RDA
- The dietary pattern of school going children

# REVIEW OF LITERATURE

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A systematic and thorough review of previous studies related to the present topic help in analyzing the situation. The available review of literature was presented in the following sub heads.

- 2.1 Nutritional status of school going children by anthropometry
- 2.2 Nutrient intake of children
- 2.3 Dietary practices of school going children
- 2.4 Consumption of fast food and junk food
- 2.5 Physical activity by children

## **2.1 Nutritional status of school going children by anthropometry**

Deren *et al.* (2018) evaluated the prevalence of overweight, obesity and underweight in children from Ukraine. The measurement of body weight was performed with medical scales and height was measured using a stadiometer. Based on the results obtained, body mass index (BMI) was calculated. The combined prevalence of obesity, overweight among children aged 6–18 years old was 12.1%, 17.6%, and 12.6% based on the IOTF reference, WHO growth standard, and the CDC, respectively. Obesity was 2.1%, 4.2%, and 3.6% respectively. Significantly more girls were underweight than boys.

Qureshi *et al.* (2017) focused on nutritional status of 422 primary school going children of four Government Primary schools of Qasimabad living in urban area of Sindh Pakistan and multi-stage simple random sampling technique was adopted. They opined that Mean Height of boys and girls were 128.09 cm ( $\pm$ SD 12.90) and 130.36 cm ( $\pm$ SD 12.50) respectively. Mean Weight of boys was 25.27 Kgs ( $\pm$ SD 6.17) while in girls mean Weight was 26.83 Kgs ( $\pm$ SD 7.03). Prevalent of stunting and wasting were 24.4% and 18.3% respectively. While in 13.7% thinness (BMI for age) was seen. Stunting was statistically significant in girls 9-10 year (p value=.015, CI: .118-.823, OR=.311) and 11-  $\geq$ 12 years (p value=.018, CI: .215-.874, OR=.434).

Sharma *et al.* (2017) was designed a study to assess and compare the nutritional status of government and private school children of Muzaffarnagar city. A total of 1960 (980 each from private school and government school) school children of class 6-12 were studied for socio-epidemiological details, dietary habits, and physical activity. Information on education status, occupation and monthly income of their parents was also collected. Required anthropometric measurements were taken. Out of 980 children from private school, 90 (9.18%) were underweight, 138 (14.08%) were overweight, and 137 (13.97%) were obese. Majority of children from government school were underweight 215 (21.94%) except for 24 (2.45%) overweight children. This study shows the dual nature of nutritional problem, under-nutrition among the lower socioeconomic class of govt. school at one side and worrisome epidemic of obesity among the affluent of private school.

Pangani *et al.*(2016) studied to determine the prevalence of overweight and obesity among primary school children in Dares Salaam, Tanzania. The findings showed that the prevalence of overweight and obesity was 15.9% and 6.7%, respectively ( $N = 1781$ ). However, 6.2% of the children were underweight. There were significant differences in mean BMI between children in private and public schools ( $p = 0.021$ ), between male and female ( $p < 0.001$ ), and across age groups of 8–10 and 11–13 years ( $p < 0.001$ ).

Yeasmin *et al.* (2016) conducted a descriptive comparative study of health, nutritional status, and dietary pattern of 100 primary school going and dropout slum children in Dhaka City, Bangladesh. Based on WHO standard mean of Body Mass Index (BMI), the prevalence of underweight was higher among school dropout group (76%) than school going group (54%). A statistically significant difference between two groups were found regarding prevalence of stunting ( $P$ -value=0.03) This study also found that parent's education, family size, mother's occupation, and economic status of family have an important impact on children's education and their nutritional status.

Prakash *et al.* (2016) analyzed a Comparative Study of Nutritional Status in 350 school children aged 10-16 years of a private school and a government school. The weight and height of each child was taken and the BMI was calculated. He found

that there is no incidence of overweight and moreover there was under weight of 44% in government school. In private school there is incidence of 6.8% of overweight and there is no incidence of underweight.

Abdelaziz *et al.* (2015) investigated on nutritional status and dietary habits of 1100 school children aged (5 - 19 years) in Beni-Suef Governorate, Egypt and selected from 22 government schools. Stunting ( $HAZ < -2$ ) occurred in 53.2%.

Garg *et al.*(2015) was carried out a cross-sectional study amongst 558 school children aged 3-16 years in Ghaziabad city. Anthropometric variables age, height, weight and body mass index were recorded. Based on these parameters prevalence of underweight and stunting was calculated in comparison with NCHS standards. The results showed that out of total 558 children, 292(52.3%) were underweight (180 boys and 112 girls) and 59(10.5%) were stunted (39 boys and 20 girls).

Simeon *et al.* (2015) was carried out to assess the nutritional status of 365 primary school pupils in urban and rural areas of Anambra state, compare them and find out the factors that affect their nutritional status. Among the pupils 181 were in the rural area while 184 were in the urban area. The overall prevalence of underweight, stunting and overweight were 10.7%, 1.9% and 4.1% respectively. The prevalence of stunting was higher in the rural area (3.3%) than in the urban area (0.5%) and the difference was statistically significant. Underweight was more among the pupils whose parents had low educational level than among those whose parents had higher educational level, and the difference was statistically significant.

Subhaprada *et al.* (2015) reported in their study, the nutritional status of school children 6-10 year old of a government primary school in an urban slum, Kurnool. 101 study subjects were selected by systematic random sampling. Grade I under-nutrition was the most common (35.64%), followed by grade II (15.84%) and grade III (10.89%). Grade IV under-nutrition was not observed in any of the study subjects.

Talwar *et al.* (2015) conducted a study to evaluate Physical Growth and Nutritional Status of Children aged 6-8 years of Panchkula city (Haryana), India. The cross-sectional sample of 253 children (133 boys and 120 girls) belonging to low socio-economic status were drawn from various government schools of Panchkula.

When compared with reference population, 28.8% children were found to be under weight and stunting (height-for-age z-score  $<-2$  S.D.) was noticed among 19.4% children and wasting (BMI-for-age z-score  $<-2$  S.D.) was witnessed in 17.8% children.

Shivaprakash *et al.* (2014) undertook an observational cross sectional study on nutritional status of rural school-going children (6-12 Years) of Mandya district, Karnataka by taking 484 children. The overall prevalence of underweight was 30.3% (147).

Ali El-Sabely *et al.* (2013) conducted a Comparative study of nutritional status and dietary habits of children from public and private primary schools in Zagazig city, Egypt. A total of 288 children aged 6-12 years were recruited to the study, 182 of them belonged to public school and 106 belonged to private one. Body Mass Index (BMI), obesity and overweight constituted higher percentage among students in the private school than in the public school, while underweight was high among students in the public school (18.7%) compared to students in private school (7.5%). More than half of the public school students (52.7%) complaining of short stature compared to 27.4% of the private school students.

Mohammad *et al.* (2013) carried out a study to assess the nutritional status of primary school children from low income households in Jordan. Children's BMI-for-Age presented that normal BMI for (71%) from total school age children as (66% girls) and (71% boys) while overweight children (24%, 17% boys and 33% girls) .

Tripathi *et al.* (2013) studied on assessment of height, weight and BMI of school going children of 10-15 years of age in urban area of Varanasi. 150 school going children were selected by cluster and purposive random sampling method. BMI was calculated according to WHO criteria. Information was collected on growth pattern of school going children. The study revealed that weight, height and BMI of both boys and girls were comparatively lower in comparison with reference standards of ICMR (1990) and NCHS (2007).

Batool *et al.* (2012) assessed the Nutritional Status of 432 Primary School Children between the ages of 4-12 yrs. in an Urban School of Faisalabad. A

systematic random sampling technique was applied for sample collection and standardized technique recommended by Jelliffe was used for assessing nutritional status. In the Primary section underweight were more in boys as compared to the girls. The ratios were 82.9%:17% .

Srivastava *et al.* (2012) conducted a cross-sectional study on Nutritional status of school-age children. For this study, 3 slums (Faltuganj, Kurramgotia and Kalibadi) were randomly selected from the urban area of the Bareilly district. A total of 512 children (297 boys and 215 girls) aged 5-15 years were interviewed and examined. The results revealed that the mean height and weight of boys and girls in the study group was lower than the CDC 2000 standards in all age groups. Regarding nutritional status, prevalence of underweight was highest in age group 11 yrs to 13 yrs. The risk of malnutrition was significantly higher among children living in joint families, children whose mother's education was less than or equal to 6th standard and children with working mothers.

Joshi *et al.* (2011) conducted a study on the prevalence of under-nutrition among school children in 4 – 14 year age group and the role of socio-demographic characteristics of mother on child nutrition. Among 786 students, 26% of the students were found to be undernourished and 13% stunted, 12% wasted and only 1% both stunted and wasted.

Mahajan *et al.* (2011) studied the prevalence of obesity and overweight among school children in Puducherry reported that the prevalence of overweight ( $\geq 8^{5th}$  percentile) among children was 4.41% and prevalence of obesity ( $> 9^{5th}$  percentile) was 2.12%. Mahe region had the highest prevalence of overweight (8.66%) and obesity (4.69%). Female children from private schools and urban areas were at greater risk of being overweight and obese.

Manna *et al.* (2011) observed on anthropometric assessment of physical growth and nutritional status among 4457 school children of North Bengal and selected randomly from the low socioeconomic group of Darjeeling and Jalpaiguri districts. He found that average height of the girls was more than the boys. Physical growth as well as nutritional status of boys was affected more than the girls. Children of higher age group were more affected nutritionally.

Best *et al.* (2010) evaluated the nutritional status of school-aged children. A total of 369 studies from 76 different countries were included. Underweight and thinness were most prominent in populations from South-East Asia and Africa, whereas in Latin America the prevalence of underweight or thinness was generally below 10%.

Kovalskys *et al.* (2010) assessed the nutritional status of school-aged children, aged 10-11 years in Buenos Aires, Argentina. A representative sample of 1588 children (771 boys and 817 girls) resulted from the randomization of 80 public schools from Buenos Aires. The prevalence of overweight, including obesity, for the whole sample was 35.5, 27.9 and 27.9%, respectively, depending on the reference used. Obesity was significantly more frequent among boys, and this remained consistent for the three references.

Singh *et al.* (2010) was attempted to find out the nutritional status in an urban area of Jhansi. The value of all anthropometric measurement were found to be lower in municipal school children. Boys showing higher value than girls for same age group in both types of school. Mean value of weight and height were higher than the ICAR standards in both type of school. Convent school children had a higher muscle mass than counterparts in municipal schools.

Neelu *et al.* (2009) studied the Nutritional Status of urban primary school(5-11 years)children in Meerut. Weight and height of the children were recorded on a pretested Performa and were analyzed. Out of 800, 396 children (49.5 %) were found be malnourished. Grade I malnutrition was most common (35.5%) followed by grade II (11.4%) and grade III (2.6%) malnutrition.

Lazzeri *et al.* (2008) presented data on the prevalence of different grades of nutritional status (thinness, normal weight, overweight and obesity) among Tuscan school-aged children from primary to high school. The results of this study allow us to analyze the prevalence of overweight (including obesity) among girls from 9y to 15-y-old strongly decreased, while the prevalence of thinness increased. In boys, this decrease was less marked and the prevalence of thinness displayed an irregular trend, with an increment from 9-y to 11-y-old and a decrease from 13-y to 15-y old. The

trend in the prevalence of normal weight increased with age, with a higher prevalence among boys than girls.

Bharati *et al.* (2005) conducted a study on “Anthropometric measurements of 560 school children in Raichur”. The results highlighted that the nutritional status of the children from rural and urban areas was lower than the NCHS standards, girls showed lower measurements than boys.

Wickramasinghe *et al.* (2004) studied on the nutritional status of 8–12 years old schoolchildren in an urban area of Sri Lanka. The results revealed that obesity prevalence among boys (4.3%) was higher than in girls (3.1%). (7.0%) of boys and 6.8% of girls were underweight. 66% of obese children and 43.5% of overweight children belonged to high-income category (monthly family income more than Rs.20 000).

## **2.2 Nutrient intake of children**

Perween.R (2018) was performed a study among the school going children (10-12 years) belonging to Trans Yamuna Area of Allahabad, India. A total of 120 school going children were selected and data were collected using pre-tested schedule which include general information, clinical examinations for nutrient deficiency, anthropometry measurements and dietary assessments. Significant difference in the average height and weight of both boys and girls were found as well as inadequate intake of important nutrients and presence of clinical signs of nutritional deficiencies.

Owusu *et al.* (2017) observed on nutrition intakes and nutritional status of school age children in Ghana. One hundred and eighty-two caregiver and school-age child pairs were interviewed concerning socio-demographics, dietary practices, and food security in a cross-sectional design. The private school feeding programme contributed more energy, protein and micronutrients as compared to the government school feeding programme.

Bandikolla (2016) investigated on nutritional assessment of school-going children from Govt. school Kakani, Guntur District, Andhra Pradesh. 100(boys) school going children were taken for the study. Nutrient intakes were calculated under

dietary assessment. The study found that there were lower consumption in several macro and micro nutrients intake compared to Recommended Dietary Allowances (RDA) of India, which may be reflected on their nutritional status.

Bora and Kulshreshtha (2016) was conducted a study in Pantnagar, U.S.Nagar district of Uttarakhand state to assess the nutritional status of the school going children. The results of the study revealed that consumption of foods like cereals, pulses, fruits, GLV's, milk and milk products, fats and oils, sugar and jaggery were inadequate in the diets of both boys and girls. Nutrients like energy, fat,  $\beta$ - carotene, B-complex vitamins, vitamin C, iron and calcium were found limiting in the diets of school children.

Kamble *et al.* (2016) studied on nutritional status of obese school going in Western Maharashtra i.e. Pune, Nashik and Ahmednagar districts. For this study, 600 obese school going children were selected, from which 224 boys and 376 were girls in age group of 6-16 years. He opined that the food intake especially cereals, pulses and fat based foods are found significantly excess and vegetables and fruits consumption noted less by these children. However, the nutrients intake like energy and protein were noticed excess than that of their standard level. Whereas vitamins and minerals intake were found less among these children which were as correlating factors for its effect on overweight and obesity in children.

Shaikh *et al.* (2016) reported in their study-assessment of nutritional status among school children (Aged 6 to 11 years) of Karimnagar, Telangana, India. There were total 820 children out of which 410 were belonging to rural area and similar numbers of children were in urban area. Mean caloric intake of children was deficient in relation to reference standards for all age groups and both sexes. Mean caloric intake among boys was better in early age (6 to 8 years) but in later ages their intake was less than girls as per reference.

Sultana *et al.* (2016) conducted a comparative study on eating behaviour of 300 public school and government school children between the age or 10-12 years of Lucknow city. 24 hour dietary recall method was used to assess their nutritional status. Diet intake of 3 consecutive days was taken. Intake of various foods of per day was calculated and compared with RDA (ICMR, 2010). The outcomes of the study

was both school children were found highly influenced by the products shown on TV. Deficiency of the Good quality of protein was found in government school children. The higher intake of fats was found in public school children. 71 per cent of extra fats in 10 years, 25.71 per cent in 11 years and 42.8 per cent in 12 years children was found extra in their diet.

Soni *et al.* (2014) focused on Dietary adequacy of 200 school going children in selected from four different of two Districts of Himachal Pradesh viz. Kangra and Kullu and information regarding socioeconomic background, dietary habits, frequency of consumption of foods and clinical symptoms were recorded. Intake of all the food groups such as cereals, pulses, green leafy vegetables, roots and tubers, other vegetables, milk and milk products, sugar and jaggery was lower than RDI, but intake of fat was significant in all selected school children. Intake of protein, energy, calcium, iron, carotene, thiamine, riboflavin and niacin was lower than RDA. Intake of fat and ascorbic acid was more than RDA in all the subjects.

Tiwari (2014) studied on nutritional assessment of children living in Slums Area of Maharajpur Village of Gwalior City. The samples were drawn by random method. Including 100 boys and Girls between the age of 10-15 years. It was found that no children get equal to or more than the RDA. The consumption of nutrients by children of slums is riboflavin (93%), iron (90.2), ascorbic acid (77.4%), energy (75.3%), protein (70.2%), carotene (70.1%), fat (58.2), calcium (58.0%), and thiamine (33.1%). These are less or less than 50% of RDA.

Handa *et al.* (2008) assessed on Nutritional Status of 7-10 Years School Going Children of Allahabad District. A total of 150 school going children were selected from four different schools. Data on dietary intake was collected by using 3 days dietary recall method. He found that consumption of all the nutrients by majority of the students was comparatively less than RDA.

Emam *et al.* (2005) results showed that the majority of children have bad feeding practices. Only 33.9 % of urban children and 29.3% of rural ones have complete balanced diet. Almost all children have a weak level as regard their nutritional awareness; also more than half of parents (56%) have weak level of nutritional awareness.

### 2.3 Dietary practices of school going children

Asakura (2017) correlates the relationship between nutrition knowledge and dietary intake among primary school children in Japan. Higher nutrition knowledge of the children was significantly associated with higher vegetable intake. Higher nutrition knowledge of the guardians was also associated with higher vegetable intake, except for boys in higher grades. The relationship between guardians' nutrition knowledge and intake of staple foods and fruits in children differed by children's sex.

Ganganahalli *et al.* (2016) studied on Nutritional assessment of private primary school children in Western Maharashtra. Cross-sectional study was conducted among private primary school children from class I to V were assessed for nutritional status, personal hygiene measures and their mothers regarding knowledge about nutritious foods. The study showed that 19.9% of private school children were undernourished, 8% were grade-I short/stunted whereas 10.2% were overweight and 5.7% obese. Majority mother's knowledge about nutritious foods was good.

Mushtaq *et al.* (2011) focused on dietary behaviors, physical activity and sedentary lifestyle associated with overweight and obesity and their socio-demographic correlates among Pakistani primary school children. These findings support the urgent need to develop a National strategy for diet and physical activity and to implement culturally relevant behavioral interventions in the resource-poor developing country settings.

Choi1 *et al.* (2008) investigated on nutrition knowledge and dietary behavior of 439 (male 236, female 203) elementary school children in Seoul. The results revealed that the average percentage of underweight, normal, overweight and obese of subjects was 33.7%, 32.8%, 12.3%, and 19.4%, respectively. Dietary behavior of male subjects was positively correlated with parents' education levels, monthly household income and nutrition attitude. Dietary behavior of female subjects was positively correlated with monthly household income, nutrition knowledge and nutrition attitude. Dietary behavior of female subjects was positively correlated with obesity index (OI).

Vesela *et al.* (2008) observed on eating habits of primary school pupils. Using a questionnaire and interviews with 150 pupils compares eating in the family and at school. It deals with the influence of family eating habits on the choice of meals in the school canteen. The study indicated a relationship between the satisfaction of pupils with school board and school climate.

#### **2.4 Consumption of fast food and junk food**

Bundhun *et al.* (2018) explored the dietary intake, fruits, vegetables and energy intake and lifestyle behavior among Mauritian children. 336 children aged 6-12 years (165 males and 171 females) from 8 public primary school were recruited. Statistical analyses revealed that children consumed less nutritious food such as fruits, vegetables and whole grain and more refined and calorie-laden foods. Mean energy intake of children was  $1522 \pm 282.4$  kcal per day while mean BMI was  $17.5 \pm 4.03 \text{ kg/m}^2$ . Maximum frequency of snacking was twice daily (72.7%) while consumption of fast food was once or twice weekly (44.0%).

Mukherjee *et al.* (2017) studied on dietary habit of school children in Pune city Maharashtra, India. Around 70% of children consumed milk daily though a majority that milk is their least preferred food items. Only 5% children consumed green leafy vegetables daily. A majority of children consumed fruits 2-6 times. Snacks, fast food and processed food were the most preferred food by the children.

Singh *et al.* (2017) find out the consumption of fast food by school going children aged between 7-12 years in Lucknow city. Urban children tend to enjoy soft drinks, breads, potato chips, burger etc. In Lucknow city, fast food trend is growing very fast. About 43% out of total respondents like to have fast food once a week or weekends and 21.3% school going children eat outside monthly.

Kigaru *et al.* (2015) conducted a cross-sectional study on Nutrition knowledge, attitude and practices among urban primary schoolchildren aged 8–11 years in Nairobi City, Kenya. Dietary practices were determined from frequency of food consumption, habitual patterns and attitude on what they ate. About 82 % ate food in front of TV unsupervised. Over 70 % had consumed sweetened beverages and 73 % junk foods in previous 7 days. Only 9 % consumed fruits 4–7 times a week.

Almost all study children carried money to school and made decision on foods to buy. Chips, candies, sausages and smokies, doughnuts and chocolate were preferred snacks. Nutrition knowledge had no significant relationship with dietary practices, but attitude had.

Juan *et al.* (2006) studied on dietary habits and nutritional status of school aged children in Spain. Children are abandoning the “Mediterranean Diet” in favour of industrial products, full of calories and saturated fatty acids but low in nutritional components, which is contributing to obesity and rising cholesterol levels.

## **2.5 Physical activity by children**

Shanthi *et al.* (2017) analyzed on habit of television viewing and its impact on Weight status and behavior among hundred (100) school children, both male and female between the age groups of 10 and 14 years were selected from Chennai school by purposive sampling technique. 24% of children had good habit of TV viewing in contrast with 76% of children who showed moderately good habit, none of them exhibited poor habit of TV Viewing. Majority of the children (62%) were underweight where as 23% were overweight. TV viewing showed an impact on certain aspects of behaviour such as eating (46%), physical activity (43%), Study habit (25%),emotion (43 %), sleeping (40%), and overall (39%) .

Ashok *et al.* (2014) conducted a comparative study of nutritional status between one government and one private primary school children of Mysore city and selected using multistage stratified random sampling method. A total of 1566 school children aged 6-12 years were measured for height and weight. The study concluded that 385 (24.5%) were underweight, 132 (8.4%) were overweight, and 65 (4.1%) were obese. Majority of underweight children 226 (32.5%) were found in government school. Except for two overweight children in government school, all overweight and obese children were found in private schools. Socioeconomic status, dietary habits, and physical activity of the child were found to be the determinants of their nutritional status.

Vaida (2013) was conducted a study to compare the prevalence of obesity among children studying in government and private schools in the age group of 6-12

years in District Anantnag. The data was obtained through self designed questionnaire. The main causes of obesity found among school children were decreased physical activity, increased levels of calorie intake and sedentary life style. Mostly the children from high socio-economic group were found to be more obese because of their sedentary life style and increased food intake levels.

Vohra *et al.* (2011) was undertaken to study the magnitude of overweight/obesity and its determinants among children in Lucknow city. Height and weight were measured and BMI was calculated. Overweight and obesity was found to be 4.17% and 0.73%, respectively; they together constitute 4.91% for overweight/obesity. The study revealed that the important correlates of overweight/obesity were father's education, father's occupation, class, children playing outdoor games for less than 30 min, and those consuming fast foods.

Baruki *et al.* (2006) found association between nutritional status and physical activity in Municipal Schools in Corumba. The result revealed that the older the children, the lesser the time spent in active physical activities. Normal-weight children are more active, practice more intense physical activities and spend less time watching television and playing video-games than overweight children.

# MATERIALS AND METHODS

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The details of the methods and procedure used in this study along with statistical analysis have been outlined.

## **3.1 Type of study**

It was a cross sectional study.

## **3.2 Study Population**

The school going children aged 7-12 years in Bhubaneswar City.

## **3.3 Study Area**

The study was under taken in Bhubaneswar city. Three schools were selected as the study areas namely Rajbhawan Project U.P school (Gopabandhu square), D.A.V Public school (unit-8) and Steward School (CRPF Square) in Bhubaneswar City.

## **3.4 Study Period**

The duration of the study was five months and conducted from February to June, 2018.

## **3.5 Method of data collection**

### **3.5.1 Sampling method**

Simple random sampling method was used to select the school children.

### **3.5.2 Sample size**

A total of 120, 7-12years old school children ( both boys and girls) were selected. Out of 120, 60 children from Govt. school and another 60 from private school were taken.

### **3.5.3 Selection Criteria**

#### **(i) Inclusion Criteria**

- Those who gave consent and participate for interview

## **(ii) Exclusion Criteria**

- Students, whose parents did not provide consent and those who were absent or sick during the period of study were excluded.
- The student who were staying in hostel.

### **3.5.4 Limitations of the Study**

- It was very difficult to conduct interview with mothers.

## **3.6 Study design**

### **3.6.1 Survey Schedule**

A semi-structured questionnaire was used to elicit the desired information regarding socio-demographic variables of a child such as age, sex, date of birth, religion, height, weight, type of diet, frequency of consumption of junk food/ fast food, physical exercise and outdoor games, duration of watching TV and time spent in front of the computer.

### **3.3.2 Interview**

Information about the children was obtained by personal interviewing the child with their parents.

## **3.7 Anthropometric Measurement**

### **3.7.1 Weight**

A bath room scale weighing machine was used for taking weight measurement of girls and boys. Every time before taking measurement zero error was checked and data were recorded.

### **3.7.2 Height**

The child was made to stand with feet flat together against the wall with legs straight, arms at sides, and shoulders at level and removes their footwear. Mark was made where the bottom of the head piece meets the wall. Then by using a measuring tape. Height was measured from the base on the floor to the wall to the nearest 0.1 centimetre.

**Table 3.1. BMI for age (WHO reference,2007)**

<b>Nutritional Status</b>	<b>WHO Indicator</b>
Severe thinness	$\leq -3S.D$
Thinness(underweight)	$\leq -2S.D$
Normal	$\geq 1S.D$ to $-2S.D$
Overweight	$\geq +1S.D$
Obesity	$\geq +2S.D$

**Table 3.2. Height for age (WHO reference,2007)**

<b>Nutritional Status</b>	<b>WHO Indicator</b>
Stunting	$\leq -2S.D$
Normal	$\geq -2S.D$

### **3.8 Dietary Intake Assessment**

#### **3.8.1 24-hour recall method**

In recalling foods consumed by the child in the past 24-hours, asked to indicate the time and source of the food (whether purchased, home-made, or school-meal) for each eating event. Standardised cups were used to estimate quantities of foods consumed. From the raw ingredients amounts, the nutritive value of each food item was calculated by using the nutritive values given by C. Gopalan (1989). It was compared with Recommended Dietary Allowances (RDA) of nutrients for those of specific age groups.

#### **3.8.2 Food Consumption Frequency**

It was recorded in terms of cereals & millets, pulses and legumes, green leafy vegetables, roots and tubers, other vegetables, fruits, milk and milk products, egg, fish, meat, sugar and jaggery, nuts and oil seeds.

#### **3.8.3 Consumption of fast food and junk food**

Information about the consumption of fast food and junk food of both the school children was collected.

### **3.9 Method of Analysis**

Then data thus collected were coded, transferred on to the transfer sheets. Tables were generated manually. The various methods in analysis were as follows.

#### **3.9.1 Dietary data Analysis**

Nutrient value of calorie, protein, CHO, fat, calcium, iron and vitamin-A were computed by using the nutritive value of Indian foods (C.Gopalan, 1989). The RDA value(2010) was also taken into consideration for comparing the values.

#### **3.9.2 Statistical Analysis**

##### **(i) Percentage**

Simple percentage was worked out to assess the contribution of the desired observations.

$$\text{Percentage (\%)} = \frac{\text{Number of respondents}}{\text{Total number of respondents}} \times 100$$

##### **(ii) Average Mean**

The mean of a sample or a population is computed by adding all of the observations and dividing the number of observations.

$$X = \Sigma x / n$$

$\Sigma x$  is the sum of all the sample observations and  $n$  is the number of sample observations.

##### **(iii) Standard deviation**

The standard deviation of a population is defined by the following formula:

$$\sigma = \text{sqrt}[\Sigma (X_i - X)^2 / N]$$

Where  $\sigma$  is the population standard deviation,  $X$  is the population mean,  $X_i$  is the  $i^{\text{th}}$  element from the sample, and  $N$  is the number of element in the population. The standard deviation of a sample is defined by slightly different formula:

$$s = \text{sqrt} [\Sigma (X_j - X)^2 / (n-1)]$$

Where  $s$  is the sample standard deviation,  $\bar{X}$  is the sample mean,  $X_i$  is the  $i^{\text{th}}$  element from the sample, and  $n$  is the number of elements in the sample.

**(iv) t- test (Two independent samples)**

This test was used to test the difference between two population means on the basis of two sample means.

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{Se^2 (1/n_1 + 1/n_2)}}$$

$$Se^2 = \frac{n_1 - 1 S_1^2 + n_2 - 1 S_2^2}{n_1 + n_2 - 2}$$

Where

$\bar{x}$  = Mean of the first sample

$\bar{y}$  = Mean of the second sample

$n_1$  = Sample size (i.e. number of observation) of the first sample

$n_2$  = Sample size (i.e. number of observation) of the second sample

$s_1$  = Standard deviation of first sample

$s_2$  = Standard deviation of second sample

$se^2$  = Pooled estimate of the population

**(v) Chi-squared test:**

It is also referred to as  $\chi^2$  test (or chi-square test), is any statistical hypothesis test in which the sampling distribution of the test statistic is a chi-square distribution when the null hypothesis is true. Chi-squared test are often constructed from a sum of squared errors or through the sample variance. A Chi-squared test can be used to reject the hypothesis that the data are independent.

$$\chi^2 = \sum (O-E)^2/E$$

O = The frequencies observed

E = The frequencies expected

$\Sigma$  = The sum of

**Degree of freedom was calculated as**

**d.  $f = (C-I) \times (R-I)$**

Where C= Number of columns

R= Number of rows

**Statistical Significance:**

To test the association between 2 or more groups a statistics  $\chi^2$  was worked out and specific inference was drawn on the basis of acceptance or rejection of null hypothesis.



**Figure 3.1 Measurement of weight in Govt. school children**



**Figure 3.2 Measurement of weight in private school children**



**Figure 3.3 Measurement of height in Govt. school children**



**Figure 3.4 Measurement of height in private school children**



**Figure 3.5 Dietary survey among Govt. school children**



**Figure 3.6 Dietary survey among private school children**

## RESULTS

### 4.0 Results

The study on “Assessment of dietary practices among school going children (7-12 years) in Govt. and private schools” was conducted in Bhubaneswar. The school children and their mothers were interviewed through pre-designed and pre-tested questionnaire on socio-demographic profiles of their family, consumption of diet (24-hours-recall method), taking of fast/ junk foods etc. Measurement of Height and weight were taken from the children under study with appropriate equipments. The data was analysed statistically for correlating the dietary practices with the health status of children studying in Govt. and private schools. The result of the study was presented below.

**Table 4.1. Socio-demographic profile of the school going children N=120**

Sl. No.	Variables	Categories	Govt. School (n=60)	Private School (n=60)
01	Age	7-9yr.	30 (50.0)	30 (50.0)
		10-12 yr.	30 (50.0)	30 (50.0)
02	Type of family	Nuclear	21 (35.0)	42 (70.0)
		Joint	39 (65.0)	18 (30.0)
03	Caste	General	7 (11.67)	53 (88.34)
		OBC	39 (65.0)	2 (3.33)
		SC	10 (16.67)	5 (8.33)
		ST	4 (6.66)	-
04	Socio-economic status	Upper	-	21 (35.0)
		Upper middle	2 (3.33)	39 (65.0)
		Lower middle	21 (35.0)	-
		Upper lower	37 (61.67)	-

#### Figures in the parenthesis indicate percent value

The socio-demographic profile of study children between age group of 7-12 years of age was presented in Table 4.1. Out of total children 50.0% were taken from Govt. school and 50.0% from private school. It was observed that majority children (70.0%) from private school belonged to nuclear family whereas children (65.0 %) from Govt. school were from joint family system. Out of total children from private school, majority were from general caste category (88.34%) followed by Sc (8.33%)

and OBS (3.33%). In Govt. school majority children from OBC (65.0%) followed by SC (16.67%), general (11.67%) and ST category (6.66%). The all children of private school belonged to upper (35.0%) and upper middle class (65.0%) category, but in Govt. school children were from upper middle (3.33%), lower middle (35.0%) and upper lower (61.67%).

**Table 4.2. Nutritional status according to BMI-for-age** **N=120**

<b>Nutritional Status</b>	<b>WHO Indicator</b>	<b>Govt. School (n=60)</b>	<b>Private School (n=60)</b>
Thinness	$\leq -2S.D$	35 (58.33)	-
Normal	$\geq 1S.D$ to $-2S.D$	25 (41.67)	36 (60.0)
Overweight	$\geq +1S.D$	-	17 (28.33)
Obesity	$\geq +2S.D$	-	7 (11.67)

**Figures in the parenthesis indicate percent value**

The nutritional status of school children according to BMI-for-age was presented in Table 4.2. The school going children of Govt. school were found to be thinned and normal group i.e. 58.33% and 41.67% respectively. There were no children found in overweight and obesity group of Govt. school. But in private school 60.0 per cent children were in the normal group followed by overweight (28.33%) and obese (11.67%). Thinness was not found in children from private school.

**Table 4.3. Nutritional status according to height-for-age** **N=120**

<b>Nutritional Status</b>	<b>WHO Indicator</b>	<b>Govt. School (n=60)</b>	<b>Private School (n=60)</b>
Stunting	$\leq -2S.D$	4 (6.67)	-
Normal	$\geq -2S.D$	56 (93.33)	60 (100.0)

**Figures in the parenthesis indicate percent value**

The nutritional status of school children according to height-for-age was presented in Table 4.3. The school going children of Govt. school were found to be stunted and normal group i.e. 6.67% and 93.33% respectively. But in private school all children (100.0%) were in the normal group and stunting was not found in children from private school.

**Table 4.4. Association of nutritional status according to type of school children****N=120**

<b>BMI</b> <b>Type of school children</b>	<b>Thinness</b> <b>≤ -2S.D</b>	<b>Normal</b> <b>≥ 1S.D to -2S.D</b>	<b>Overweight</b> <b>≥ +1S.D</b>	<b>Obesity</b> <b>≥ +2S.D</b>	<b>Total</b>
Govt. school	35	25	0	0	60
Private school	0	36	17	7	60
Total	35	61	17	7	120

 $\chi^2$  table value- 11.35 $\chi^2$  calculated value- 60.98

d.f= 3

At 1% level of significance

It was observed that overweight and obese children found in private school but thinned children found in Govt. school. Table-4.4 showed that the calculated  $\chi^2$  value was greater than the table  $\chi^2$  value (cal.  $\chi^2=60.98 >$  tab.  $\chi^2 = 11.35$ ). This implies that type of school children was found to be statistically significant on BMI. So BMI was dependent on type of school children.

**Table 4.5. Age wise anthropometric measurement of Govt. and private school children****N=120**

<b>Sl. No.</b>	<b>Age group</b>	<b>Parameters</b>	<b>Govt. School (n=60)</b>	<b>Private School (n=60)</b>	<b>t-value</b>
01	7-9 yrs.	Height (cm.)	121.53±6.68	125.5±8.54	2.002**
		Weight (kg.)	24.8±3.75	35.93±5.68	8.946**
02	10-12yrs.	Height (cm.)	137.43±9.40	138..63±12.10	0.428(NS)
		Weight (kg.)	33.33±6.11	42.4±7.93	4.955**

**Figures was presented as (Mean± SD)****\*\*\*denotes significant variation (p<0.01) between columns**

The mean anthropometric measurement of Govt. and private school children were presented in Table-4.4. Significant variation (p<0.01) between the mean height of children from Govt. and private school were observed where higher values (125.5±8.54) was observed in private school children than Govt. school children (121.53±6.68) at age of 7-9 years. Similar result was observed in the age group of 7-9 years with respect to weight, the mean weight was significantly higher (<0.01) in

private school children (35.93±5.68) as compared to Govt. school children (24.8±3.75).

The mean height of Govt. and private school children did not vary significantly in the age group of 10-12 years. Significant variation ( $p < 0.01$ ) between the mean weight of children from Govt. and private school were observed where higher values (42.4±7.93) was measured in private school children as compared to Govt. school children (33.33±6.11) in 10-12 year.

**Table 4.6. Food consumption pattern by school children**

**N=120**

Sl. No.	Food groups	Classification	Govt. School Frequency (%)	Private School Frequency (%)
01	Cereals	Daily	60 (100.0)	60(100.0)
		4-6times/wk.	-	-
		Fortnightly	-	-
		Occasionally	-	-
02	Pulses	Daily	19 (31.67)	37 (61.67)
		4-6times/wk.	41(23.33)	23 (38.33)
		Fortnightly	-	-
		Occasionally	-	-
03	Green leafy vegetables	Daily	-	-
		4-6times/wk.	7 (11.67)	12(20.0)
		Fortnightly	30 (50.0)	26 (43.33)
		Occasionally	23 (38.33)	22 (36.67)
04	Root & tuber	Daily	30 (50.0)	49 (81.67)
		4-6times/wk.	27 (45.0)	7 (11.67)
		Fortnightly	27 (45.0)	7 (11.67)
		Occasionally	-	-
05	Other vegetables	Daily	18 (30.0)	44 (73.33)
		4-6times/wk.	23 (38.33)	12 (20.0)
		Fortnightly	16 (26.67)	4 (6.67)
		Occasionally	3 (5.0)	-
06	Fruits	Daily	-	23 (38.33)
		4-6times/wk.	4 (6.66)	18 (30.0)
		Fortnightly	18 (30.0)	28 (46.67)
		Occasionally	28 (46.67)	-
07	Milk & milk product	Daily	10 (16.67)	50 (83.33)
		4-6times/wk.	-	-
		Fortnightly	18 (30.0)	10 (16.67)
		Occasionally	32 (53.33)	-

08	Egg	Daily	-	-
		4-6times/wk.	4 (6.67)	38 (63.33)
		Fortnightly	48 (80.0)	22 (36.67)
		Occasionally	8 (13.33)	-
09	Fish	Daily	-	-
		4-6times/wk.	25 (41.66)	37 (61.67)
		Fortnightly	28(46.67)	21 (35.0)
		Occasionally	7 (11.67)	2 (3.33)
10	Meat	Daily	-	-
		4-6times/wk.	6 (10.0)	21 (35.0)
		Fortnightly	36 (60.0)	33 (55.0)
		Occasionally	18 (30.0)	6 (10.0)
11	Sugar & jaggery	Daily	30 (50.0)	33 (55.0)
		4-6times/wk.	23 (38.33)	22 (36.67)
		Fortnightly	7 (11.67)	5 (8.33)
		Occasionally	-	-
12	Nuts & oil seeds	Daily	-	16 (26.67)
		4-6times/wk.	-	17 (28.33)
		Fortnightly	15 (25.0)	24 (40.0)
		Occasionally	45 (75.0)	3 (5.0)

Table-4.6 revealed that all the children (100%) of both schools consumed cereals on daily basis Govt. school children consumed pulses daily (31.67%) and 4-6 times in a week (23.33%) whereas 61.67% and 38.33% children from Govt. school consumed pulses daily and 4-6 times in a week respectively.

No subjects from the Govt. and private school consumed green leafy vegetables, egg, fish and meat on daily basis. Root and tubers were consumed daily by 50.0% of Govt. school children and 81.67% of private school children. About 30.0% and 73.33% of Govt. and private school children consumed other vegetables daily. No Govt. school children consumed fruits daily, but daily fruit consumption was seen among private school children (38.33%). Only 16.67% of Govt. school children and maximum number of private school children (83.33%) consumed milk and milk products daily. Around half of the children (50.0% of Govt. school and 55.0% of private school) consumed sugar and jaggery daily. About 26.67% of private school children ate nuts and oil seeds daily, but no Govt. school children ate nuts and oil seeds on daily basis.

Green leafy vegetables, root & tubers, other vegetables, fish, meat and sugar & jaggery were consumed 4-6times /week by 11.67%, 45.0%, 38.33%, 41.66% and 38.33% of Govt. school children respectively. Similarly, 20.0%, 11.67%, 20.0%, 61.67%, and 36.67% of the private school children consumed Green leafy vegetables, root & tubers, other vegetables, fruits, egg, fish, meat and sugar & jaggery 4-6times in

a week respectively. Fruits, egg and meat were consumed 4-6 times /week only 6.66%, 6.67%, 10.0% of Govt. school children and 30.0%, 63.33%, 35.0% of private school children respectively. No Govt. school children consumed nuts and oil seeds often whereas 28.33% of private school children consumed it 4-6times in a week. No children from both schools consumed milk and milk products 4-6times in a week.

Intake of green leafy vegetables, fruits, egg, fish, meat and sugar & jaggery by the subjects of Govt. school were also found to be 50.0%, 46.67%, 80.0%, 46.67%, 60.0% and 11.67% a fortnight respectively. Similarly, 43.33%, 31.67%, 36.67%, 35.0%, 55.0% and 8.33% of the private school consumed green leafy vegetables, fruits, egg, fish, meat and sugar & jaggery a fortnight respectively. 45.0% and 26.67 % of Govt. school children ate root & tubers and other vegetables a fortnightly whereas only % 11.67 and 6.67% of private school children ate it fortnightly.40.0% of private school children consumed nuts and oil seeds fortnightly while 25.0% of Govt. school children consumed it fortnightly.

There were no subjects from both the school who consumed root & tubers and sugar & jaggery occasionally. 5.0%, 46.67%, 53.33% and 13.33% of Govt. school children consumed other vegetables, fruits, milk & milk products and egg occasionally while no private school consumed other vegetables, fruits, milk & milk products and egg occasionally. Majority of Govt. school children (75.0%) consumed nuts and oil seeds rarely but only 5.0% of private school children consumed it occasionally.

**Table 4.7. Average daily nutrient intake\* of children (7-9 yr.) boys N=30**

Sl. No.	Nutrients intake	ICMR RDA value	Children from Govt. School (n=15)	Children from Private School (n=15)	t-value
01	Energy (Kcl)	1690	1543.23±114.44	1906.73±301.36	4.367**
02	Protein (gm)	29.5	26.70±3.0	33.70±3.05	6.333**
03	CHO (gm)	253	238.79±47.22	286.93±18.26	3.394**
04	Fat (gm)	30	27.16±3.14	36.30±3.37	7.669**
05	Calcium (mg)	600	510.36±85.78	630.36±43.08	4.841**
06	Iron (mg)	16	14.17±2.22	16.50±2.15	3.373**
07	Vitamin-A (µg)	4800	2556.79±615.09	4195.34±595.78	7.410**

**Figures was presented as (Mean± SD)**

**\*\*\*denotes significant variation (p<0.01) between columns**

**\* \* denotes Nutritive value of Indian foods**

The mean energy intake/day by 7-9 years boys was found to be higher in private school ( $1906.73 \pm 301.36$ ) than Govt. school ( $1543.23 \pm 114.44$ ). When 7-9 yrs. boys of private and Govt. school children were compared the mean protein intake was also found much higher in private school children ( $33.70 \pm 3.05$ ) than their counterparts in Govt. school ( $26.70 \pm 3.0$ ). Similarly, the mean intake of Carbohydrate (CHO) was more in private school children ( $286.93 \pm 18.26$ ) than Govt. school children ( $238.79 \pm 47.22$ ) under 7-9 yrs. boys. The mean fat intake among the private school children ( $36.30 \pm 3.37$ ) was higher than the Govt school children ( $27.16 \pm 3.14$ ) under the age group of 7-9 yrs. boys. The mean intake of calcium ( $510.36 \pm 85.78$ ) and iron ( $14.17 \pm 2.22$ ) were also less among 7-9 yrs. boys of Govt. school children than private school children. The mean of vitamin-A intake showed huge difference between boys of Govt. school children ( $2556.79 \pm 615.09$ ) and. boys of private school children ( $4195.34 \pm 595.78$ ).

The average intake of energy, protein, Carbohydrate, fat, calcium, iron and vitamin-A by the boys under 7-9 yrs. of age group was observed significantly higher ( $p < 0.01$ ) in private school than the boys from Govt. school. The average intake of all the nutrients by the boys under 7-9 years in Govt. school were less than the RDA value but the average intake of all the nutrients by the boys under 7-9 years in private school were more than the RDA value except vitamin-A which was less than the RDA value.

**Fig. 4.1. Percent deficit and adequacy of nutrients with RDA (7-9 yrs. boys)**

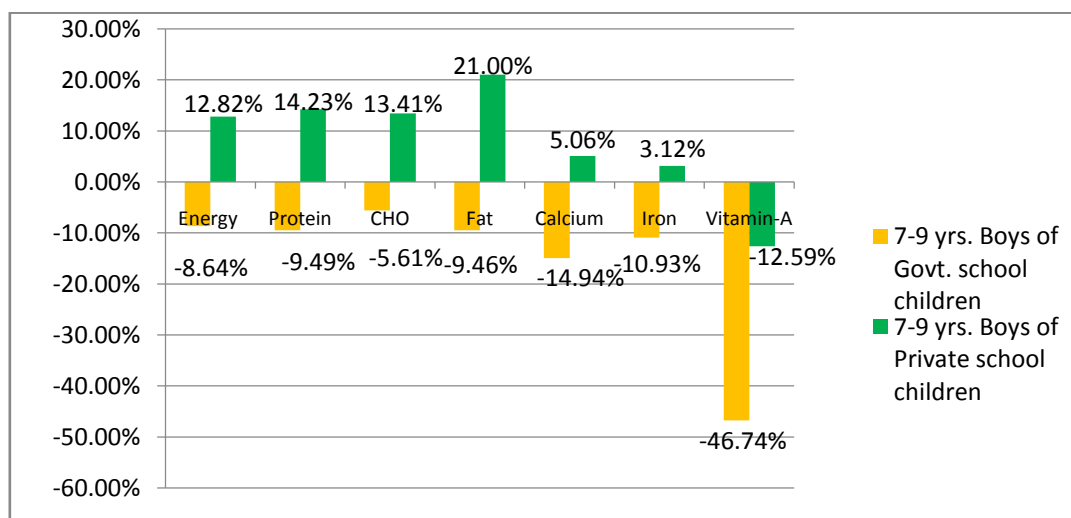


Figure - 4.1 revealed information about the percent deficit and adequacy of nutrients for 7-9 years boys with the RDA value. In 7-9 years boys of Govt. school children, 8.64%, 9.49%, 5.61%, 9.46%, 14.94%, 10.93% and 46.74% of all the nutrients i.e. energy, protein, CHO, fat, calcium, iron and vitamin-A were deficit from the ICMR recommended dietary allowances respectively But in case of private school boys of the same age all the nutrients except vitamin-A i.e. energy, protein, CHO, fat, calcium and iron were adequate i.e. 12.82%, 14.23%, 13.41%, 21.0%, 5.06% and 3.12% respectively from the ICMR recommended dietary allowances. But 12.59% respondents having Vitamin –A was observed deficit in private school children.

**Table 4.8. Average daily nutrient intake\* of children (7-9 yr.) girls N=30**

Sl. No.	Nutrients intake	ICMR RDA value	Children from Govt. School (n=15)	Children from Private School (n=15)	t-value
01	Energy (Kcl)	1690	1536.56±86.02	1883.23±141.88	8.091**
02	Protein (gm)	29.5	26.71±2.23	33.37±1.90	9.365**
03	CHO (gm)	253	240.13±45.72	284.61±27.39	3.232**
04	Fat (gm)	30	27.09±3.04	35.97±2.34	8.943**
05	Calcium (mg)	600	512.79±87.12	627.02±68.11	4.177**
06	Iron (mg)	16	14.25±1.95	16.19±2.02	2.601**
07	Vitamin-A (µg)	4800	2541.74±651.52	4128.48±682.19	6.676**

**Figures was presented as (Mean± SD)**

**‘\*\*’denotes significant variation (p<0.01) between columns**

**‘\*’ denotes Nutritive value of Indian foods**

The average mean intake of energy was higher in 7-9 yrs. girl of private school (1883.23±141.88) than girl of Govt. school (1536.56±86.02). The mean protein intake was found to be higher among girls of private school (33.37±1.90) than girls of Govt. school (26.71±2.23). When. girls of private and Govt. school were compared the mean CHO and fat intake were also found much higher in private school children (284.61±27.39 and 35.97±2.34 ) than their counterparts of Govt. school (240.13±45.72, 27.09±3.04) respectively. Similarly, the average mean intake of calcium and vitamin-A were much higher in girls of private school (627.02±68.11 and 4128.48±682.19) than girls of Govt. School (512.79±87.12 and 2541.74±651.52) respectively. The average intake of iron was slightly higher in girls of private school (16.19±2.02) than girls of Govt. school (14.25±1.95). All these nutrients were significantly higher (p<0.01) in girls of private school than. girls of Govt. school. The average intake of all the nutrients were less than the RDA value of girls in Govt. school children but the average intake of all the nutrients were more than the RDA

value of girls in private school children except vitamin-A which was less than the RDA value.

**Fig. 4.2. Percent deficit and adequacy of nutrients with RDA (7-9 yrs. girls)**

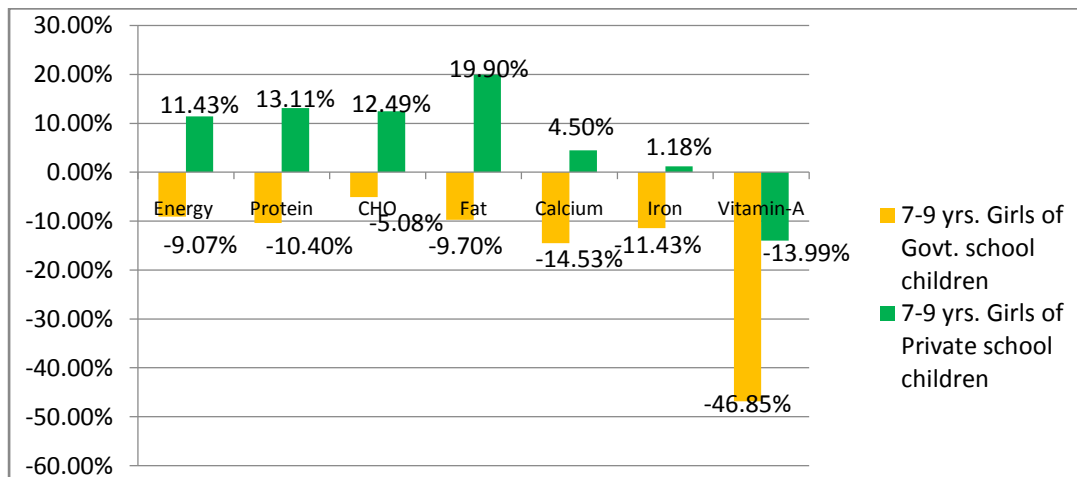


Figure -4.2 revealed the information about the per cent deficit and adequacy of nutrients of girls between the age of 7-9 years with the RDA value. In Govt. school children, 9.07%, 10.40%, 5.08%, 9.70%, 14.53%, 11.43% and 46.85% of energy, protein, CHO, fat, calcium, iron and vitamin-A were deficit from the ICMR recommended dietary allowances respectively where as in private school children, 11.43%, 13.11%, 12.49%, 19.90%, 4.50% and 1.18% of energy, protein, CHO, fat, calcium and iron were adequate from the ICMR recommended dietary allowances respectively. But 13.99% of Vitamin-A was observed deficit in girls of private school.

**Table 4.9. Average daily nutrient intake\* of children (10-12 yr.) boys N=30**

Sl. No.	Nutrients intake	ICMR RDA value	Children from Govt. School (n=15)	Children from Private School (n=15)	t-value
01	Energy (Kcl)	2190	1992.90±134.67	2420.40±119.16	9.207**
02	Protein (gm)	39.9	36.29±2.57	45.85±2.57	10.165**
03	CHO (gm)	328.5	286.11±53.78	370.83±17.74	5.793**
04	Fat (gm)	35	31.87±11.41	41.61±3.37	3.169**
05	Calcium (mg)	800	683.83±119.51	824.30±121.01	3.198**
06	Iron (mg)	21	18.65±2.40	21.71±1.23	4.384**
07	Vitamin-A (µg)	4800	2510.12±657.42	3963.45±669.53	5.998**

Figures was presented as (Mean± SD)

\*\*\*denotes significant variation (p<0.01) between columns

\*\* denotes Nutritive value of Indian foods

The average mean intake of energy/day by Govt. and private school boys of 10-12 yrs was (1992.90±134.67) and (2420.40±119.16) respectively which was higher in private school children than in Govt. school children. The mean protein intake among the private school children (45.85±2.57) was higher than the Govt school children (36.29±2.57) under the age group of (10-12 yrs.) boys. Similarly, the mean energy intake was found to be higher among boys of private school children (370.83±17.74) than boys of Govt. school (286.11±53.78). When boys of private and Govt. school children were compared the mean fat intake was also found much higher in private school children (41.61±3.37) than of Govt. school (31.87±11.41). The mean intake of calcium (683.83±119.51), iron (18.65±2.40) and vitamin-A (2510.12±657.42) were also less among boys in Govt. school children than private school.

The average intake of energy, protein, CHO, fat, calcium, iron and vitamin-A by the boys under 10-12 yrs. of age group was observed significantly higher ( $p < 0.01$ ) in private school than the boys from Govt. school. The average intake of all the nutrients by the boys under 10-12 years in Govt. school were less than the RDA value but the average intake of all the nutrients by the boys under 10-12 years in private school were more than the RDA value except vitamin-A which was less than the RDA value.

**Fig. 4.3. Percent deficit and adequacy of nutrients with RDA (10-12 yrs. boys)**

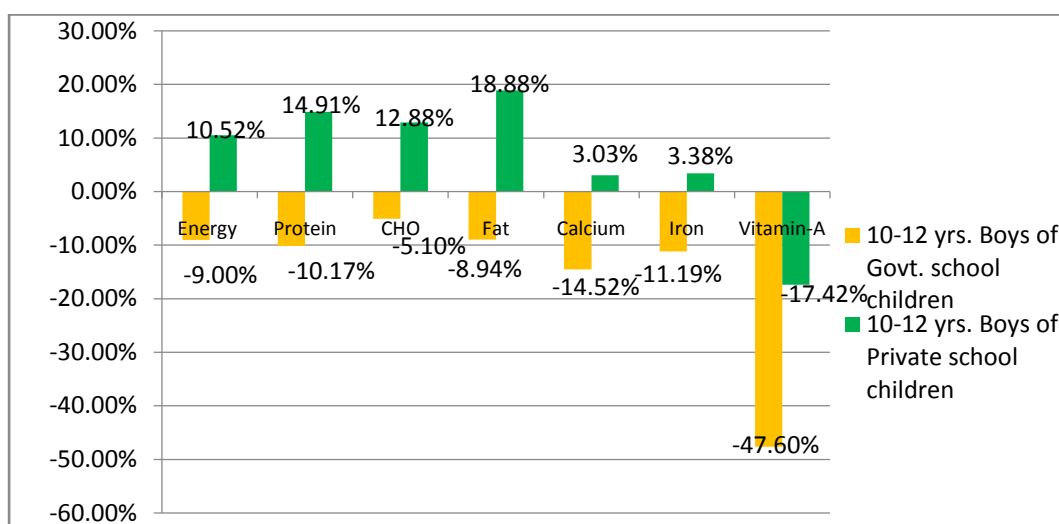


Figure -4.3 revealed information about the percent deficit and adequacy of nutrients of 10-12 years boys with the RDA value. In Govt. school children, 9.0%, 10.17%, 5.10%, 8.94%, 14.52%, 11.19% and 47.60% of energy, protein, CHO, fat, calcium, iron and vitamin-A were deficit from the ICMR recommended dietary allowances respectively but in private school children, 10.52%, 14.91%, 12.88%, 18.88%, 3.03% and 3.38% of energy, protein, CHO, fat, calcium and iron were adequate from the ICMR recommended dietary allowances respectively. But 17.42% of Vitamin-A was observed deficit in boys under 10-12years of age in private school.

**Table 4.10. Average daily nutrient intake\* of children (10-12 yr.) girls N=30**

Sl. No.	Nutrients intake	ICMR RDA value	Children from Govt. School (n=30)	Children from Private School (n=30)	t-value
01	Energy (Kcl)	2010	1828.65±80.19	2268.48±123.69	11.555**
02	Protein (gm)	40.4	36.11±3.33	45.04±3.65	6.996**
03	CHO (gm)	301.5	285.16±37.96	340.76±31.84	4.345**
04	Fat (gm)	35	31.96±5.23	41.96±4.24	5.746**
05	Calcium (mg)	800	685.00±124.44	821.70±100.59	3.308**
06	Iron (mg)	27	23.49±3.42	27.84±4.78	2.868**
07	Vitamin-A (µg)	4800	2508.57±969.02	4071.14±716.68	5.021**

**Figures was presented as (Mean± SD)**

**‘\*\*’denotes significant variation (p<0.01) between columns**

**‘\*’ denotes Nutritive value of Indian foods**

The average mean intake of energy and protein were higher in 10-12 yrs. girl of private school (2268.48±123.69 and 45.04±3.65) than girl of Govt. school (1828.65±80.19 and 36.11±3.33) respectively. The mean fat intake was found to be higher among girls of private school (41.96±4.24) than 10-12 yrs. girls of Govt. school (31.96±5.23). When girls of private and Govt. school were compared the mean CHO, calcium and iron intake were also found much higher in private school children (340.76±31.84, 821.70±100.59 and 27.84±4.78) than children of Govt. school (285.16±37.96, 685.00±124.44 and 23.49±3.42) respectively. Similarly, the average mean intake of vitamin-A was much higher in girls of private school (4071.14±716.68) than girls of Govt. school (2508.57±969.02) respectively. All these nutrients intake were significantly higher (p<0.01) in girls of private school than in girls of Govt. school. The average intake of all the nutrients were less than the RDA value in girls of Govt. school children but the average intake of all the nutrients were

more than the RDA value of girls of private school children except vitamin-A which was less than the RDA value.

**Fig. 4.4 Percent deficit and adequacy of nutrients with RDA (10-12 yrs. girls)**

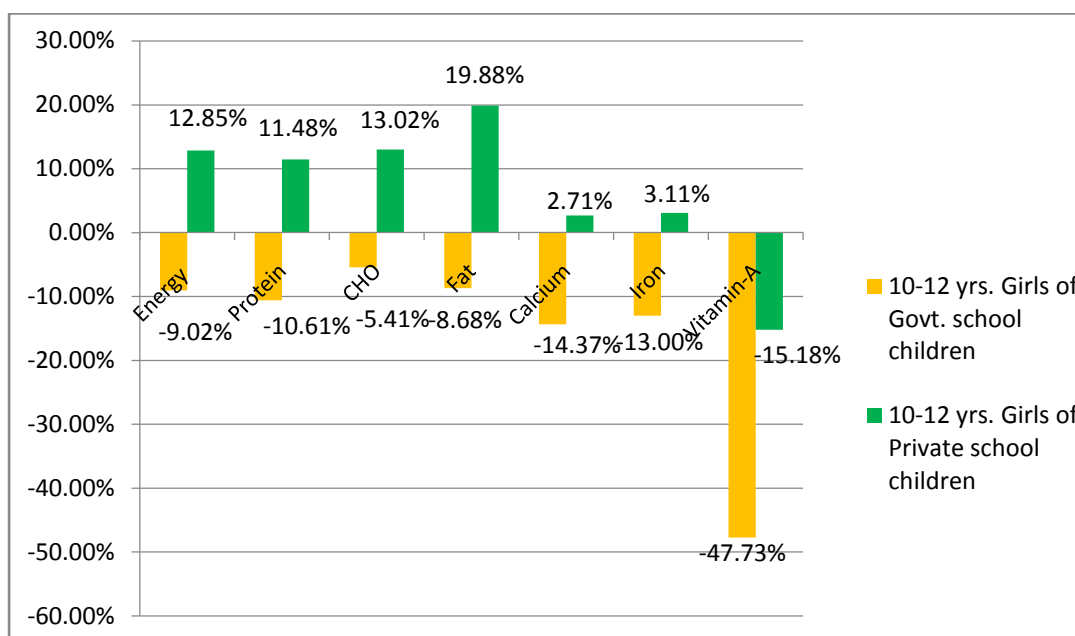


Figure - 4.4 revealed the information about the percent deficit and adequacy of nutrients taken by girls under 10-12 years of age group with the RDA value. The degrees of deficiency were observed 9.02%, 10.61%, 5.41%, 8.68%, 14.37%, 13.0% and 47.73% in intake of energy, protein, CHO, fat, calcium, iron and vitamin-A by girls of Govt. school children respectively where as in private school, 12.85%, 11.48%, 13.02%, 19.88%, 2.71% and 3.11% of energy, protein, CHO, fat, calcium and iron were adequate from the ICMR recommended dietary allowances respectively. But 15.18% of Vitamin-A was observed deficit in 10-12 years girls of private school children from the ICMR recommended dietary allowances.

**Fig. 4.5. Consumption of fast food by children**

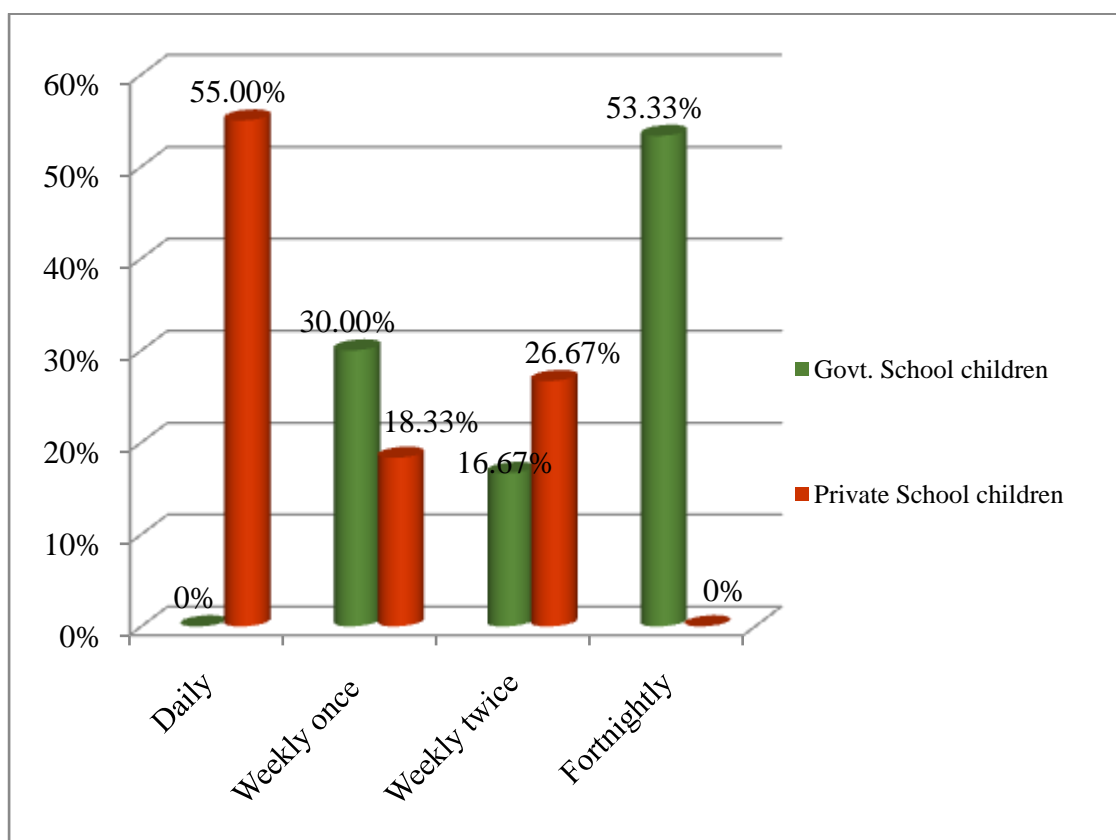


Figure-4.5 showed the distribution of children's frequency of eating fast food. More than half of the private school children (55.0%) were consuming outside foods daily in contrast to Govt. School, the children did not prefer to take outside food daily. Children (18.33%) of private school ate fast food once a week whereas 30.0% children of Govt. school ate it once a week or weekends. The private school children were habituated to consume fast food (26.67%) twice in a week than the children of Govt. school (16.67%). There were no children found in private school who preferred to take fast food fortnightly than their counterparts of the Govt. school i.e. 53.33%.

**Table 4.11. Consumption of fast food preferred by Govt. and private school  
N=120**

Sl. No.	Varieties of fast food	Classification	Govt. School Frequency (%)	Private School Frequency (%)
01	Dahiwada	1-6 times/wk.	-	6 (10.0)
		Fortnightly	9 (15.0)	15 (25.0)
		Monthly	28 (46.67)	21 (35.0)
02	Chole-bhature	1-6 times/wk.	-	4 (6.67)
		Fortnightly	-	16 (26.67)
		Monthly	9 (15.0)	18 (30.0)
03	Roll	1-6 times/wk.	-	9 (15.0)
		Fortnightly	-	23 (38.33)
		Monthly	9 (15.0)	28 (46.67)
04	Chowmin	1-6 times/wk.	-	11 (18.33)
		Fortnightly	-	36 (60.0)
		Monthly	4 (6.67)	13 (21.67)
05	Panipuri	1-6 times/wk.	4 (6.67)	19 (31.67)
		Fortnightly	21 (35.0)	33 (55.0)
		Monthly	35 (58.33)	8 (13.33)
06	Samosa	1-6 times/wk.	2 (3.33)	13 (21.67)
		Fortnightly	28 (46.67)	47 (78.33)
		Monthly	30 (50.0)	-
07	Pokada	1-6 times/wk.	-	23 (38.33)
		Fortnightly	12 (20.0)	37 (61.67)
		Monthly	37 (61.67)	-
08	Chaat	1-6 times/wk.	-	6 (10.0)
		Fortnightly	6 (10.0)	19(31.67)
		Monthly	14 (23.33)	26(43.33)
09	Sandwich	1-6 times/wk.	-	38 (63.33)
		Fortnightly	-	22 (36.67)
		Monthly	-	-

The preference of consumption of fast food type of nine varieties by Govt. and private school children was presented as in Table-4.11. Besides other frequencies of consumption the children of Govt. school prefer to consume dahiwada at the maximum frequency of 46.67% in monthly manner followed by fortnightly 15.0%

frequency. But dahiwada consumption among private school children was estimated 10% with the frequency of 1-6 times /wk., 25.0% in fortnightly and 35.0% in monthly basis.

The frequency consumption of chole-bhature was not appreciable by Govt. school children but only 15.0% children of Govt. school consumed it monthly basis. In contrast, the private school children were habituated with chole-bhature consumption 6.67% 1-6 times in a week, 26.67% fortnightly and 30.0% monthly basis.

The frequency consumption of roll and chowmin was not preferred by Govt. school children, but only 15.0% and 6.67% children of Govt. school consumed roll and chowmin in a month respectively. On the other hand, all the children of private school consumed roll and chowmin with maximum number 15.0% and 18.33% with the frequency of 1-6 times/ wk. respectively.

The consumption percent of panipuri and samosa was varied from 6.67-58.33% and 3.33-50.0% in Govt. school children respectively. But the consumption of panipuri and samosa by private school children was different with maximum number (55.0%) and (78.0%) in a frequency of fortnightly respectively.

Children (61.67%) of Govt. school consumed pokada in monthly manner followed by fortnightly (20.0%). But 38.33% and 61.67% children of private school preferred pokada for 1-6 times in a week and a fortnight respectively.

The children of Govt. school did not eat chaat 1-6 times in a week but 23.33% and 10.0% children of Govt. school ate it fortnightly and monthly respectively. But 43.33% children of private school consumed at the maximum number in monthly followed by 31.67% fortnightly and 10.0% 1-6 times in a week.

The children of Govt. school did not consume sandwich at all where as 63.33% and 36.67% children of private school ate sandwich 1-6 times in a week and fortnightly respectively.

**Table 4.12. Consumption of fast food items related to socio-economic status****N=120**

Socio-economic status	Per capita consumption of fast food items			
	Dahiwada, Chole-bhature (Times/month)	Roll, Chowmin, (Times/month)	Panipuri, Samosa, Pokada (Times/month)	Chaat, Sandwich (Times/month)
Upper class (n=21)	75 (3.57)	138 (6.57)	307 (14.61)	275 (13.09)
Upper -middle class (n=41)	90 (2.19)	209 (5.09)	487 (11.87)	489 (11.92)
Lower -middle class (n=21)	31 (1.47)	9 (0.42)	105 (5.0)	17 (0.8)
Upper-lower class (n=37)	24 (0.64)	4 (0.1)	132 (3.56)	9 (0.24)

**Figures in the parenthesis indicate number**

From Table 4.12 it was observed that , the children those who belonged to upper class whose per capita consumption of dahiwada and chole-bhature was 3.57 times/month followed by 2.19 times/ month for children of upper-middle class, 1.47 times/ month for children of lower-middle class and 0.64 times/ month for upper-lower class. Similarly, per capita consumption of roll and chowmin was 6.57 times/month and 5.09 times/month for upper class and upper -middle class respectively, but per capita consumption of roll, chowmin, chole-bhature was almost nil for lower -middle class and upper-lower class i.e. 0.42 times/month and 0.1 times/month respectively. Per capita consumption of panipuri, samosa and pokada was highly appreciable among all the socio-economic group of children and varied from 14.61-3.56 times/month. Per capita consumption of chaat and sandwich was 13.09 times/month for upper class and 11.92% for upper -middle class. But per capita consumption of chaat and sandwich was negligible for lower -middle class and upper-lower class i.e. 0.8 times/month and 0.24 times/ month respectively.

**Table 4.13. Consumption of junk food preferred by Govt. and private school  
N=120**

Sl. No.	Varieties of junk food	Classification	Govt. School Frequency (%)	Private School Frequency (%)
01	Noodles	1-6 times/wk.	-	53 (88.33)
		Fortnightly	11 (18.33)	7 (11.67)
		Monthly	28 (46.67)	-
02	Pasta	1-6 times/wk.	-	33 (55.0)
		Fortnightly	-	27 (45.0)
		Monthly	13 (21.67)	-
03	Pizza	1-6 times/wk.	-	-
		Fortnightly	-	-
		Monthly	-	25 (41.67)
04	Burger	1-6 times/wk.	-	5 (8.33)
		Fortnightly	-	17 (28.33)
		Monthly	-	22 (36.67)
05	Cake	1-6 times/wk.	-	12 (20.0)
		Fortnightly	8 (13.33)	23 (38.33)
		Monthly	21 (35.0)	25 (41.67)
06	Cookies	1-6 times/wk.	-	47 (78.33)
		Fortnightly	11 (18.33)	13 (21.67)
		Monthly	29 (48.33)	-
07	Biscuits	1-6 times/wk.	9 (15.0)	60 (100.0)
		Fortnightly	28 (46.67)	-
		Monthly	23 (38.33)	-
08	Chocolates	1-6 times/wk.	34 (56.67)	60 (100.0)
		Fortnightly	26 (43.33)	-
		Monthly	-	-
09	Carbonated beverages	1-6 times/wk.	-	6 (10.0)
		Fortnightly	-	32 (53.33)
		Monthly	17 (28.33)	22 (36.67)
10	Ice-creams	1-6 times/wk.	-	6 (10.0)
		Fortnightly	3 (5.0)	18 (30.0)
		Monthly	11 (18.33)	29 (48.33)
11	Potato chips	1-6 times/wk.	5 (8.34)	41 (68.33)
		Fortnightly	29 (48.33)	19 (31.67)
		Monthly	21 (35.0)	-
12	Kurkure	1-6 times/wk.	7 (11.67)	37 (61.67)
		Fortnightly	27 (45.0)	23 (38.33)
		Monthly	19 (31.66)	-
13	French fries	1-6 times/wk.	-	-
		Fortnightly	-	7 (11.67)
		Monthly	-	21 (35.0)

The preference of consumption of junk food type for thirteen varieties by Govt. and private school children was studied and the result was showed in Table-4.13. 18.33% and 46.67% children of Govt. school consumed noodles fortnightly and monthly respectively. The frequency of noodles consumption was not appreciable by Govt. school children 1-6 times in a week but 88.33% and 11.67% children of private school consumed noodles 1- 6 times in a week and a fortnight respectively.

No subjects of Govt. school consumed pasta 1-6 times in a week and fortnightly and 21.67% children of Govt. school ate pasta monthly whereas 55.0% and 45.0% children of private school ate pasta 1-6 times in a week and fortnightly respectively.

Students of Govt. school children did not consume pizza, burger and french fries at all. But 41.67% children of private school preferred to take pizza monthly. Burger was highly appreciable among private school children at variable rate and frequency that ranging from 8.33-36.67%. Private school children consumed french fries fortnightly (11.67%) and monthly (35.0%) respectively.

Children of Govt. school did not eat cake and cookies 1-6 times in a week but 13.33% and 35.0% of Govt. school children ate cake fortnightly and monthly respectively. Similarly, 18.33% and 48.33% children of Govt. school consumed cookies for a fortnight and a month respectively. On the other hand, cake consumption of private school children was observed at variable frequencies i.e. 41.67% cake consumed for a month followed by 38.33% for fortnightly and 20.0% for 1-6 times in a week. The majority of private school children (78.33%) ate cookies 1-6 times in a week followed by 21.67% for a fortnight.

Biscuit and chocolate were highly preferred by both school children. All the children of private school (100.0%) consumed biscuit and chocolate in 1-6 times/week while 46.67% children of Govt. school consumed biscuit fortnightly followed by 38.33% for monthly and 15.0% for 1-6 times/week and 56.67% and 43.33% children of Govt. school preferred chocolate for 1-6 times in a week and for a fortnight respectively.

28.33% and 18.33% children of Govt. school consumed carbonated beverages and ice-cream in a fortnight respectively whereas the maximum number of private school children (53.33%) and (48.33%) consumed carbonated beverages and ice-cream in a fortnight and a month respectively. Equal number of private school children i.e. 10.0% consumed carbonated beverages and ice-cream 1-6 times in a week.

All the children of both schools ate potato chips and kurkure at variable frequencies. 48.33% children of Govt school ate potato chips for fortnightly followed by 35.0% for monthly and only 8.34% for 1-6 times in a week whereas 68.33% and 38.33% children of private school ate potato chips 1-6 times in a week and a fortnight respectively. 45.0% children of Govt school ate kurkure for fortnightly followed by 31.66% for monthly and only 11.67% for 1-6 times in a week whereas 61.67% and 38.33% children of private school ate kurkure 1-6 times in a week and a fortnight respectively.

**Table 4.14. Consumption of junk food items related to socio-economic status**  
N=120

Socio-economic status	Per capita consumption of junk food items			
	Noodles, pasta (Times/month)	Bakery products i.e. Pizza, burger, cake, cookies, biscuit and chocolates (Times/month)	Carbonated beverages, ice-creams (Times/month)	Potato chips, kurkure, french fries (Times/month)
Upper class (n=21)	407 (19.38)	1460 (69.52)	78 (3.71)	311 (14.8)
Upper -middle class (n=41)	561 (13.68)	2365 (57.68)	95 (2.31)	482 (11.75)
Lower -middle class (n=21)	36 (1.71)	232 (11.04)	21 (1.0)	84 (4.0)
Upper-lower class (n=37)	27 (0.72)	357 (9.64)	13 (0.35)	116 (3.13)

**Figures in the parenthesis indicate number**

It was observed from Table 4.14 that, the children those who belonged to upper class whose per capita consumption of noodles and pasta was 19.38 times/month followed by 13.68 times/ month for children of upper -middle class,

1.71 times/ month for children of lower -middle class and 0.72 times/ month for children of upper-lower class. Per capita consumption of bakery products i.e. pizza, burger, cake, cookies, biscuit and chocolates was 69.52 times/ month for upper class, 57.68 times/ month for upper -middle class, 11.04 times/ month for children of lower -middle class and 9.64 times/ month for children of upper-lower class. Per capita consumption of carbonated beverages and ice-creams was 3.71 times/month for upper class and 2.31 times/month for upper -middle class, 1 times/month for lower -middle class. But per capita consumption of carbonated beverages and ice-creams was negligible for children of upper-lower class i.e. 0.35 times/ month. Per capita consumption of potato chips, kurkure, french fries was highly appreciable among all the socio-economic group of children and varied from 14.8-3.13 times/month.

**Table 4.15. Status of school lunch**

**N=120**

Sl. No.	Variables	Classification	Govt. School (n=60)	Private School (n=60)
01	Take mid-day meals in Govt. school	Yes	60 (100.0)	-
02	Carry Tiffin box to school	Yes	-	60(100.0)
		No	52(86.67)	-
		Sometimes	8(13.33)	-
03	Share tiffin box with others	Yes	-	18(30.0)
		No	8(13.33)	16(26.67)
		Sometimes	-	26(43.33)
04	Carry money to school for Tiffin	Yes	-	-
		No	56(93.33)	42(70.0)
		Sometimes	4(6.67)	18(30.0)

**Figures in the parenthesis indicate percent value**

From the Table 4.15 it was observed that, in private school all children (100%) carried tiffin box daily to school but in Govt. school all children (100%) ate mid-day school meal which was offered by school and mass education department. There were 13.33% children carried tiffin box sometimes in Govt. school. The study noted that those who carried tiffin box to private school (30.00%) usually shared with other children and the majority of (43.33%) children shared sometimes in private school. In Govt. school 13.33% of children carried tiffin box to school sometimes. 30.0% of the private school children carried money sometimes to school to buy either mid morning

snacks or lunch but only 6.67% of the children of Govt. school carried money sometimes to school.

**Table 4.16. Average nutrient intake of children from mid- day meal in Govt. school N=60**

Sl. No.	Class	Nutrient intake	Recommended MDM value	Actual intake from mid- day meal
01	Primary class (2-5) (n=40)	Energy	450	424.21± 18.03
		Protein	12	10.22 ±1.22
02	Upper-primary class(6-7) (n=20)	Energy	700	635.39 ±34.38
		Protein	20	18.24 ± 0.85

**Figures was presented as (Mean± SD)**

The average nutrients taken by the Govt. school children from mid-day meal were calculated and presented through the Table-4.16. The nutrients were calculated from their intake of mid-day meals which was provided as lunch in school. Then the mean intake of energy and protein was compared with the recommended MDM value. The mean energy and protein intake was slightly less than the recommended value in both primary and upper-primary class children.

**Table 4.17. Preference of selecting foods for children by their parents N=120**

Sl. No.	Variables	Classification	Govt. School (n=60)	Private School (n=60)
01	Consumption of foods based on TV advertisement	Some food	2 (3.33)	33 (55.0)
		Very few	21 (35.0)	25(41.67)
		Almost nil	37(61.67)	2 (3.33)
02	Prefer to give fast food	Save time & energy	-	12(20.0)
		Satisfies child hunger	57(95.0)	20(33.33)
		Opportunity for family get together	3(5.0)	26(43.34)
		Feeling of elite class	-	2(3.33)
03	Criteria for buying food products	Nutritive value	-	5 (8.33)
		Brand name	13 (21.67)	55 (91.67)
		Price	47 (78.33)	-

**Figures in the parenthesis indicate percent value**

The above Table 4.17 showed that about half of the private school children parents (55.0%) selected some foods based on TV advertisement for their children's consumption but in case of Govt. school children, the number of parents found, were only 3.33%. Very few foods based on TV advertisement were selected by parents of private school children 41.67% for their children consumption whereas 35.0% was found in Govt. school children. More than half of the parents of Govt. school children 61.67% did not prefer to consume foods based on TV advertisement as compared to 3.33% parents of private school children.

According to preference of giving fast food to their child, 20.0% parents (of private school children) told that giving fast food to child for saving time and energy but parents of government school children did not say that the exact. On the other hand, 95.0% parents (government school children) said that fast food satisfies the child's hunger whereas in private school it was 33.33%. The majority of 43.34% parents (of private school children) told that giving fast food to child was to create opportunity for family gatherings whereas it was found to 5.0% in Govt. school. Only 2% % parents (of private school children) giving fast food to child for feeling of elite class.

The aspects before buying the food products, most of the parents of private school children (91.67%) said that they were influenced by the brand name and bought the product for their children but 21.67% parents of Govt. school children were found in the same category. The majority of 78.33% parents of Govt. school children gave importance to price while buying any food products. But only 8.33% the parents of private school children gave importance to nutritive value of food products.

**Table 4.18. Eating environment among the school children at home N=120**

Sl. No.	Eating environment in home	Classification	Govt. School (n=60)	Private School (n=60)
01	Intake of meals together with family	Yes	48 (80.0)	28 (46.67)
		No	-	6 (10.0)
		Sometimes	12 (20.0)	26 (43.33)
02	Eat meals in front of TV	Yes	26(43.33)	42 (70.0)
		No	10 (16.67)	-
		Sometimes	24 (40.0)	18 (30.0)
03	Parents eat meals in front of TV	Yes	22 (36.67)	36 (60.0)
		No	11 (18.33)	4 (6.67)
		Sometimes	27 (45.0)	20 (33.33)

**Figures in the parenthesis indicate percent value**

More children in Govt. school (80.0%) ate their meals together with family daily but only 46.67% was observed in private school. In this study, 20.0% children of Govt. school ate their meals together with family sometimes and 43.33% was found in private school.

Table 4.18 indicated that most of the children of private school (70.0%) ate meals in front of the TV at home daily but 43.33% was seen in Govt. school. 40.0% of the Govt. school children ate meals in front of the TV sometimes at home whereas children of private school were 30.0%. More than half of the parents of private school children (60.0%) take their meals in front of TV whereas the parents of Govt. school children (45.0%) take their meals in front of TV sometimes.

**Table 4.19. Association of nutritional status with outdoor game N=120**

BMI Outdoor games	Thinness ≤ -2S.D	Normal ≥ 1S.D to -2S.D	Overweight ≥ +1S.D	Obesity ≥ +2S.D	Total
	<1 hr./day	0	12	13	5
>1 hr./day	35	49	4	2	90
Total	35	61	17	7	120

$\chi^2$  table value- 11.35

$\chi^2$  calculated value- 44.65

d.f= 3

At 1% level of significance

It was observed that those children who played outdoor game <1 hr./day found to be overweight and obese as compared to those children who played outdoor game >1 hr./day. Table 4.19 showed that the calculated  $\chi^2$  value was greater than the table  $\chi^2$  value (cal.  $\chi^2=44.65 >$  tab.  $\chi^2 = 11.35$ ). This implies that duration of outdoor game was statistically significant on BMI. So BMI was dependent on duration of outdoor game.

**Table 4.20. Association of nutritional status with computer game N=60**

<b>BMI</b> <b>computer games</b>	<b>Thinness</b> <b>≤ -2S.D</b>	<b>Normal</b> <b>≥ 1S.D to -2S.D</b>	<b>Overweight</b> <b>≥ +1S.D</b>	<b>Obesity</b> <b>≥ +2S.D</b>	<b>Total</b>
<1 hr./day	5	19	3	1	28
>1 hr./day	0	12	14	6	32
Total	5	31	17	7	60

$\chi^2$  table value- 11.35                       $\chi^2$  calculated value- 17.07                      d.f= 3  
At 1% level of significance

It was observed that those children who played computer game >1 hr./day found to be overweight and obese as compared to those children who played computer game <1 hr./day. Table 4.20 showed that the calculated  $\chi^2$  value was greater than the table  $\chi^2$  value (cal.  $\chi^2=17.07 >$  tab.  $\chi^2 = 11.35$ ). This implies that duration of computer game was statistically significant on BMI. So BMI was dependent on duration of computer game.

**Table 4.21. Association of nutritional status with watching TV N=120**

<b>BMI</b> <b>Watching T.V</b>	<b>Thinness</b> <b>≤ -2S.D</b>	<b>Normal</b> <b>≥ 1S.D to -2S.D</b>	<b>Overweight</b> <b>≥ +1S.D</b>	<b>Obesity</b> <b>≥ +2S.D</b>	<b>Total</b>
<1 hr./day	15	31	2	0	48
>1 hr./day	20	30	15	7	72
Total	35	61	17	7	120

$\chi^2$  table value- 11.35                       $\chi^2$  calculated value- 13.40                      d.f= 3  
At 1% level of significance

It was observed that those children who watched TV >1 hr./day found to be overweight and obese as compared to those children who watched TV <1 hr./day. Table 4.21 showed that the calculated  $\chi^2$  value was greater than the table  $\chi^2$  value (cal.  $\chi^2=13.40 > \text{tab. } \chi^2 = 11.35$ ). This implies that duration of watching TV was statistically significant on BMI. So BMI was dependent on duration of watching TV.

**Table 4.22. Association of nutritional status with mode of transport to school  
N=120**

<b>BMI</b> <b>Transport to school</b>	<b>Thinness</b> <b>≤ -2S.D</b>	<b>Normal</b> <b>≥ 1S.D to -2S.D</b>	<b>Overweight</b> <b>≥ +1S.D</b>	<b>Obesity</b> <b>≥ +2S.D</b>	<b>Total</b>
Walking	31	13	0	0	44
Cycle	4	10	0	0	14
School bus	0	5	5	2	12
Own vehicle	0	33	12	5	50
Total	35	61	17	7	120

$\chi^2$  table value- 21.67

$\chi^2$  calculated value- 76.67

d.f= 9

At 1% level of significance

It was observed that those children who went to school by school bus and own vehicle found to be overweight and obese as compared to those children who went to school by walking and cycling. Table 4.22 showed that the calculated  $\chi^2$  value was greater than the table  $\chi^2$  value (cal.  $\chi^2=76.67 > \text{tab. } \chi^2 = 21.67$ ). This implies that mode of transport to school was statistically significant on BMI. So BMI was dependent on mode of transport to school.

## DISCUSSION

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The results of the study are discussed under the following headings.

### 5.1 Socio-demographic profile and nutritional status

The socio-demographic profile study revealed that, majority children (70.0%) from private school belonged to nuclear family whereas children (65.0 %) from Govt. school were from joint family system. Out of total children from private school, majority were from general caste category (88.34%) followed by Sc (8.33%) and OBS (3.33%). In Govt. school majority children from OBC (65.0%) followed by SC (16.67%), general (11.67%) and ST category (6.66%). The all children of private school belonged to upper (35.0%) and upper middle class (65.0%) category, but in Govt. school children were from upper middle (3.33%), lower middle (35.0%) and upper lower (61.67%).

The school going children of Govt. school were found to be thinness and normal group i.e. 58.33% and 41.67% respectively. There were no children found in overweight and obesity group of Govt. school. But in private school 60.0 per cent children were in the normal group followed by overweight (28.33%) and obese (11.67%). Thinness was not found in children from private school. The school going children of Govt. school were found to be stunted and normal group i.e. 6.67% and 93.33% respectively. But in private school all children (100.0%) were in the normal group and stunting was not found in children from private school. Type of school children (Govt. and private school) was found to be statistically significant on BMI.

Although, various Govt. schemes have been introduced to encourage primary education, but due to lack of public awareness, existing poverty and very low economic standard of the people, our nation is yet to achieve significant result in child education. In the present era, despite several factors, economic back ground, caste, gender and existing social myths in the society play the critical role in educating children. The quality and cost of education in private school is higher than in Govt. school. This may be attributed for accommodation of more number of children from sound economic back ground in private school than in Govt. school. Generally, people of lower, SC and ST class remain always busy to earn their livelihood and pay less or no attention towards children education as per their myths and believe.

Observation of less number of children from these classes of population in both the types of school may be due to the aforesaid reason.

Out of 253 children, 28.8% were in underweight, 19.4% stunting and 17.8% in wasting in Panchakula city, Haryana (Talwar *et al.*, 2015). But study conducted in the Western Region of Nepal, among 786 students, 26% of the students were found to be undernourished, 13% stunted and 12% wasted (Joshi *et al.*, 2011). On the other hand, the private school children were estimated 19.9% for under-nourished, 10.2% for overweight and 5.7% for obese categories (Ganganahalli *et al.*, 2016). Further a study was carried out amongst 558 school children aged 3-16 years in Ghaziabad city reported that 59(10.5%) were stunted (Garg *et al.*, 2015).

The observations of the present study were in good agreement with the aforesaid reported values. Due to low cost, easy affordability and accessibility, people of low economic background and caste are compelled to choose Govt. school for their children education. Since, because of low income, their children are compelled to avail low quality nutrition and remain in different categories of under nourishment. This is the reason of observing more malnutrition children in Govt. school. In contrast, the children of private school are from medium and high income family with different life style and food habits. High consumption of fatty, junk and fast food by private school children is the reason for observing more children in overweight and obese categories.

## **5.2 Anthropometric study**

Under the age group of 7-9 years, the mean height ( $121.53 \pm 6.68$  &  $125.5 \pm 8.54$ ) and weight ( $24.8 \pm 3.75$  and  $35.93 \pm 5.68$ ) of Govt. and private school children varied significantly ( $p < 0.01$ ) where higher values were measured for private school children than those for Govt. school. Similar results with significant variation ( $p < 0.01$ ) were observed for weight ( $33.33 \pm 6.11$  and  $42.4 \pm 7.93$ ) in Govt. and private school children leaving the variation of height non-significant under the age group of 10-12 years.

The mean height and weight of 7-10 years of school going children of Allahabad district were significantly ( $p < 0.05\%$ ) less than the National Centre for Health Statistics standards (Handa *et al.*, 2008). Further, the prevalence of overweight and obesity was higher in private school (15.9%) than in Govt. school (6.7%).

The findings of the present study resemble with the aforesaid reports. Observation of high values for height and weight in private school children may be attributed to higher nutritional status of the family based on economic background of private school parents. On the other hand, the general lower economic standard of the parents of Govt. school, may not maintain the recommended nutritional standard for their children for which the growth factors are adversely affected.

### **5.3 Food consumption pattern and nutrient intake**

As observed, no children of Govt. and private school consumed green leafy vegetables, egg, fish and meat on daily basis. However, root-tubers (50.0% and 81.67%), other vegetables (30.0% and 73.3%), milk-products (16.67% and 83.33%) and sugar and jaggery (50.0% and 55.0%) were consumed daily by Govt. and of private school children respectively. Green leafy vegetables, root & tubers, other vegetables, fish, meat and sugar & jaggery were consumed 4-6 times in a week by 11.67%, 45.0%, 38.33%, 41.66% and 38.33% of Govt. school children respectively. Similarly, 20.0%, 11.67%, 20.0%, 61.67%, and 36.67% of the private school children consumed Green leafy vegetables, root & tubers, other vegetables, fruits, egg, fish, meat and sugar & jaggery 4-6 times in a week respectively. Fruits, egg and meat were consumed 4-6 times in a week by only 6.66%, 6.67%, 10.0% of Govt. school children and 30.0%, 63.33%, 35.0% of private school children respectively. The Govt. school children consumed fortnightly green leafy vegetables, fruits, egg, fish, meat and sugar & jaggery at 50.0%, 46.67%, 80.0%, 46.67%, 60.0% and 11.67% respectively. The respective consumption rates in private school children were 43.33%, 31.67%, 36.67%, 35.0%, 55.0% and 8.33%. But, the rate of fortnightly root & tuber consumption was 45.0% and 26.67% (Govt. school) and 11.67% and 6.67% (private School) children. The occasional consumption of vegetables, fruits, milk & milk products and egg by Govt. school children were 5.0%, 46.67%, 53.33% and 13.33% respectively leaving the children of private school under nil consumption rates.

Private school boys (7-9 yrs), the nutrient intake was significantly higher ( $p < 0.01$ ) than those of Govt. school. But, in case of Govt. school boys, it was less than the RDA value. The intake of energy, protein, CHO, fat, calcium, iron and vitamin-A at 8.64%, 9.49%, 5.61%, 9.46%, 14.94%, 10.93% and 46.74% by the boys (7-9years) of Govt. school was deficit with respect to RDA of ICMR. On the other

hand, the respective consumption at 12.82%, 14.23%, 13.41%, 21.0%, 5.06% and 3.12% of energy, protein, CHO, fat, calcium and iron by private school children were adequate and 12.59% of Vitamin-A was deficit basing on RDA of ICMR.

In case of private school girls (7-9 yrs), the nutrient intake was significantly higher ( $p < 0.01$ ) than those of Govt. school. But, in case of Govt. school girls, it was less than the RDA value. The energy, protein, CHO, fat, calcium, iron and vitamin-consumption at 9.07%, 10.40%, 5.08%, 9.70%, 14.53%, 11.43% and 46.85% were deficit in 7-9years Govt. school girls and the respective consumption at 11.43%, 13.11%, 12.49%, 19.90%, 4.50% and 1.18% in private school girls was adequate with respect to RDA of ICMR. But, private school girls consumed low (13.99%) of Vitamin-A.

The study also revealed significantly higher ( $p < 0.01$ ) energy, protein, CHO, fat, calcium, iron, vitamin-A and nutrient consumption by the boys (10-12 yrs) of private school children than those in Govt. school and the average nutrient intake by Govt. school boys was less than the RDA value. The Govt. school boys (10-12years) consumed energy, protein, CHO, fat, calcium, iron and vitamin-A at 9.0%, 10.17%, 5.10%, 8.94%, 14.52%, 11.19% and 47.60% which was deficient with respect to RDA of ICMR. On the other hand, the respective consumption rate at 10.52%, 14.91%, 12.88%, 18.88%, 3.03 and 3.38% by private school boys was adequate except vitamin-A for deficit category.

Significantly higher ( $p < 0.01$ ) nutrient consumption more than RDA value was observed in private school girls (10-12 yrs) as compared to Govt. school girls except Vitamin-A which was less than the RDA value. The Govt. school girls (10-12years) consumed energy, protein, CHO, fat, calcium, iron and vitamin-A at 9.02%, 10.61%, 5.41%, 8.68%, 14.37%, 13.0% and 47.73% which was deficient with respect to RDA of ICMR. On the other hand, the respective consumption rate at 12.85%, 11.48%, 13.02%, 19.88%, 2.71% and 3.11% by private school boys was adequate except vitamin-A for deficit category.

Lower intake of food by public school children under 7-10 years of age in Allahabad district was attributed for poor anthropometric indices, under-nutrition and iron deficiency anaemia (Handa *et al.*, 2008). Further, low consumption of high quality protein from meat, eggs, margarines, fish and oils and African leafy

vegetables by the school-going children in Machakos district of was the reason for poor anthropometric and nutritional status (David *et al.*, 2012). The consumption of cereals, pulses and fat based foods in excess and vegetables and fruits in deficient manner were the reason for obesity in school going children of Western Maharashtra (Kamble *et al.*, 2016). However, all the school going children belonging to Trans Yamuna Region of Allahabad consumed cereals, pulses, sugar, fats and oils daily (Perween., 2018).

Based on the RDA value, significantly higher ( $p < 0.01$ ) energy, protein, CHO, fat, calcium, iron, vitamin-A and nutrient consumption was observed by the boys (7-9 yrs) of private school than those in Govt. school. The present findings corroborate with the report of Handa *et al.*, 2008 on assessment of nutritional status of 7-10 years of age of school going children of Allahabad district where energy, protein, fat, calcium, iron, retinol, vitamin-c, folic acid and zinc were evaluated.

Obese school going children in Western Maharashtra consumed excess nutrients (energy and protein) and less vitamins and minerals than those of their standard level correlating these factors for overweight and obesity (Kamble *et al.*, 2016). High economic standard, education background, nutritional concerns and choice of children may be the reason for higher consumption of energy, protein, CHO, fat, calcium, iron, vitamin-A and nutrients by the private school children than the Govt. school children.

The average intake of protein (49.4 g/day), calorie (1640 Kcal/day), calcium (569.65 mg/day), iron (22.82 mg/day), vitamin A (472.43 $\mu$ g/day), thiamine (0.93 mg/day), riboflavin (1.02mg/day), niacin (9.90 mg/day) and pyridoxine (0.85 mg/day) by school going children (10-12 years) in Trans Yamuna area of Allahabad was less than the RDA of ICMR (Perween, 2018). In addition, low consumption of macro and micro nutrients as compared to Recommended Dietary Allowances (RDA) of India was also observed (Bandikolla, 2016).

The average intake of protein (42.46 g/day), calorie (1161.46 Kcal/day), calcium (354.16 mg/day), iron (17.37 mg/day), vitamin A (384.06 $\mu$ g/day), thiamine (0.91 mg/day), riboflavin (0.99 mg/day), niacin (11.21 mg/day) and pyridoxine (0.68 mg/day) by the school going children (10-12 years) of Trans Yamuna area of Allahabad was less than the RDA of ICMR (Perween, 2018).

The intake of protein, energy, calcium, iron, carotene, thiamine, riboflavin and niacin was lower and fat and ascorbic acid was more than the RDA in 7-9 years of school going children of Himachal Pradesh (Soni *et al.*, 2014). The obese school going children in Western Maharashtra were observed for excess energy and protein and deficit vitamins and minerals consumption (Kamble *et al.*, 2016).

The food consumption pattern and nutrient intake of school going children depends on multiple factors such as choice of the subject, availability of food items, affordability of parents, economic standard and background of family, social myths etc. The parents of middle and higher economic group are the inhabitants of urban locality and that of lower and poor economic background mostly live in rural areas with exception of some labour class population. The parents of private school children are educated and well concerned on nutritional status of their children. Therefore, they pay attention for consumption of green and leafy vegetables, roots and tubers, milk and milk products by their children. This might be the reason for higher consumption of the aforesaid nutrients at different patterns by the private school children than by the Govt. school children. The low consumption of costly food items such as meat, egg, fruits and nuts by Govt. school children and the low nutritional status may be due to less affordability by their parents.

The overall nutrient consumption including vitamins and minerals depends on quality of ration. The children of private school take comparatively better quality food than those in Govt. school. Therefore, in the present study adequate rate of energy, protein, CHO, fat, calcium, and iron consumption was observed in private school children. But, deficit of vitamin-A may be due to less incorporation of fruits and vegetables rich in vitamin-A in the diet.

The variation of nutrient consumption between Govt. and private school girls may due to difference in the quality and type of food consumed by them. The private school girls receive comparatively better quality food than those in Govt. school. Therefore, in the present study, higher nutrient consumption was observed in private school girls than in Govt. school.

#### **5.4 Consumption of fast food and junk food**

The private school children of 55.0%, 18.33%, 26.67% and 0% consumed outside fast food daily, once a week or weekends, twice in a week, and fortnightly.

But the Govt. school children only consumed fast food of 30.0%, 16.67% and 53.33%. in once a week or weekends, twice in a week, and fortnightly respectively.

The children of Govt. school preferred consuming dahiwada at 46.67% and 15.0% in monthly and fortnightly manner whereas the rates of consumption in private school was 10% for 1-6 times /wk., 25.0% for fortnightly and 35.0% for monthly. Only 15.0% children of Govt. school consumed Chole-bhature monthly but private school children consumed 6.67% for 1-6 times in a week, 26.67% for fortnightly and 30.0% for monthly. Roll and Chowmin was consumed monthly at 15.0% and 6.67% by Govt. school children but, all the children of private school consumed at 15.0% and 18.33% with the frequency of 1-6 times/ wk. respectively. The consumption percent of panipuri and samosa were varied from 6.67-58.33% and 3.33-50.0% in Govt. school children but, in private school the children consumed panipuri and samosa fortnightly at 55.0% and 78.0%. 61.67% and 20.0% children of Govt. school consumed pokada for monthly and fortnightly. But 38.33% and 61.67% children of private school preferred pokada for 1-6 times in a week and a fortnight respectively. Children of Govt. school ate chaat at 23.33% and 10.0% fortnightly and monthly respectively. But 43.33%, 31.67% and 10.0% children of private school consumed it in monthly, fortnightly and 1-6 times in a week respectively. The children of private school consumed sandwich at 63.33% and 36.67% in 1-6 times/ week and fortnightly respectively.

The per capita consumption of dahiwada and chole-bhature of upper class, upper-middle class, lower-middle class and upper-lower class was 3.57, 2.19, 1.47 and 0.64 times/ month. Similarly, the values for roll and chowmin was 6.57 and 5.09 times/month for upper and upper-middle class respectively. Per capita consumption of panipuri, samosa and pokada was highly appreciable among all the socio-economic group of children and varied from 14.61-3.56 times/month. Chaat and sandwich consumption was 13.09 and 11.92 times/month for upper class and upper-middle class.

About 18.33% and 46.67% children of Govt. school children consumed noodles fortnightly and monthly respectively. But 88.33% and 11.67% children of private school consumed noodles 1- 6 times in a week and a fortnight respectively. Govt. school children consumed pasta at 21.67% monthly only whereas 55.0% and

45.0% of private school children ate it 1-6 times in a week and fortnightly respectively. Although, Govt. school children did not consume pizza, burger and french fries at all. But, private school children of 41.67% preferred pizza monthly, 8.33-36.67% preferred burger and french fries at 11.67% and 35.0% fortnightly and monthly respectively. Govt. school children of 13.33% and 35.0% consumed cake and 18.33% and 48.33% ate cookies at the frequency of fortnightly and monthly respectively. Private school children ate cake 41.67% monthly, 38.33% fortnightly and 20.0% for 1-6 times in a week and 78.33% ate cookies 1-6 times in a week and 21.67% for a fortnight. Private school children of 100.0% consumed biscuit and chocolate in 1-6 times/week. But, 46.67% children of Govt. school preferred biscuit fortnightly, 38.33% monthly and 15.0% 1-6 times/week along with 56.67% and 43.33% preferred chocolate 1-6 times in a week and for a fortnight respectively. Carbonated beverages and ice-cream consumption by Govt. school children was 28.33% and 18.33% and that of private school children was 53.33% and 48.33% in a fortnight and month respectively keeping 10.0% students for consumption at 1-6 times in a week. 48.33% of Govt school children ate potato chips for fortnightly, 35.0% monthly and 8.34% for 1-6 times in a week whereas 68.33% and 38.33% children of private school ate 1-6 times in a week and a fortnight respectively. Kurkure consumption of Govt school children was 45.0% for fortnightly, 31.66% for monthly and 11.67% for 1-6 times in a week whereas 61.67% and 38.33% children of private school ate kurkure 1-6 times in a week and a fortnight respectively.

Per capita consumption of noodles and pasta by the children of upper, upper-middle, lower-middle and upper-lower class was 19.38, 13.68, 1.71 and 0.72 times/month respectively. The respective values for consumption of bakery products (pizza, burger, cake, cookies, biscuit and chocolate) was 69.52, 57.68, 11.04 and 9.64 times/ month. The consumption percent of carbonated beverages and ice-creams was 3.71, 2.31, 1.0 and 0% by the respective class of children. But, consumption of potato chips, kurkure, french fries varied from 14.8-3.13 times/month among all the socio-economic group of children.

It was reported that, 43% and 21.3% of school going children of Lucknow city eat outside fast food once a week or weekends and once in a month respectively (Singh *et al.*, 2017). Study conducted by (Juan *et al.*, 2006) on dietary habits and nutritional status of school aged children in Spain revealed that children are

abandoning the “Mediterranean Diet” in favour of industrial products, full of calories and saturated fatty acids but low in nutritional components, which is contributing to obesity and rising cholesterol levels.

Consumption of fast and junk food by the children of Govt. and private school depends on locality, economic background, life style, food habit of the family, environment in the school and surroundings, habit of the friend circle, availability of fast and junk food. Due to high economic status and advanced urban life style, the parents of private school children encourage these foods over traditional ones to save time, show status and to maintain false dignity. Even though, they are well educated and known about the adverse effects of fast and junk food. This may be attributed higher rate of consumption of fast and junk foods by private school children. On the other hand, the parents of Govt. school do not afford money for fast and junk food items for their children and they are compelled to rely on traditional food. Moreover, the availability of these food items around Govt. school is minimum. Therefore, in the present study, the consumption of fast and junk food is observed less for Govt. school children.

The school going age is the critical time for overall growth and organic development where diet and nutrient play important role to support the body metabolism. Therefore, the children should receive adequate and balanced diet of high quality to meet the additional need for body growth. Consumption of fast and junk food at the young age leads to multiple ailments like overweight and obesity in school going children. Prolonged consumption of these food items declines the appetite, digestibility, nutrient availability and thereby body metabolism is derailed from the right tract. The preservatives in packaged food items, non-recommended food colours beyond permissible limit, microbes, heavy metals in soft drinks and ice creams create a large platform for development of health hazards.

#### **5.5.0. Selection of food and eating habits**

All the private school children carried tiffin box daily and all most all the Govt. school children ate mid-day meal excluding 13.33% to carry tiffin box sometimes. 30.00% children of private school with tiffin box shared with others always and 43.33% shared sometimes excluding 30.0% children to carry money sometimes for snacks / lunch whereas 6.67% of Govt. school children were with

money for the purpose. The mean energy and protein intake from mid-day-meal was slightly less than the recommended MDM value in both primary and upper-primary class children.

About 55.0% and 3.33% of private and Govt. school children parents selected food of their children based on TV advertisement for which the eating behaviour of private school children was higher. 20.0% parents of private school children considered fast food to save time and energy but 95.0% parents of govt. school children did not consider the same. 43.34% private school children parents believed fast food created opportunity for family gatherings and 2% for feeling of elite class whereas it was only 5.0% in Govt. school. Similar results were observed by Sultana *et al.*, 2016 for public and Govt. school children of Lucknow city where 19.0% and 22% of private school children ate fast food for opportunity of social gatherings and for hunger satisfaction respectively. But, the respective values for Govt. school children were 9.0% and 36.0%.

The aspects before buying the food products, most of the 91.67% and 21.67% parents of private and Govt. school children were influenced by the brand name but, 78.33% of Govt. school children parents emphasised on price to buy food whereas 8.33% of private school children parents emphasised on the nutritive value of the foods. In the present study 80.0% and 46.67% Govt. and private school children ate together with family daily and 20.0% and 43.33% ate together with family sometimes respectively. 70.0% in private and 43.33% in Govt. school children ate in front of the TV daily and 30.0% and 40.0% took food in front of the TV sometimes at home respectively. 82.1% of children ate food in front of the TV at home, either daily or at least 2–3 times in a week (Kigaru *et al.*, 2015). More than half of the parents of private school children (60.0%) take their meals in front of TV whereas the parents of Govt. school children (45.0%) take their meals in front of TV sometimes. Most of the private school children parents were watching TV at meal time. Therefore, the children followed them and they were also watching TV at meal time.

Private school children ate their meals together with family daily was found lesser. Family environment has the potential to influence and enhance good dietary practices as children were likely to mimic their parents' practices. The proportion of private school children spent more time away from their parents was increasing thus

parents miss out the opportunity to impact good nutritional knowledge and practices. The finding of Kigaru *et al.*, 2015 concluded that, most children in their study ate meals at home without parent's supervision. The 68.3 % of urban primary school children in Nairobi City, Kenya carried lunch box daily, 77.3 % carried usually and shared with others and 95.5 % carried money for snacks due to influence of habits of other children (Kigaru *et al.*, 2015). Majority of the children in this study ate while watching television and those that had access to TV had higher consumption of fast foods and sweetened beverages. While the television is an avenue for food advertisement and promotion, most of the televised foods are junk and highly processed with high sugar, fat and salt content. These televised adverts greatly influence dietary habits of children. The observation of the present study was in line that, children of private and Govt. schools were highly influenced by TV advertised products (Sultana *et al.*, 2016). Study conducted by (Sultana *et al.*, 2016) reported public school children parents of 26.0% bought products on brand name and 11.0% on nutritive value. But 15.0% parents of Govt. school children bought the product on brand name and 19.0% on price.

Children being the critical component of the nation, due attention should be given for their optimum health for which, quality and quantity of nutrition, selection of food and feeding habits are of great concern. Eating together with family members and nears and dears, school mates and in social functions enhances the eating habits of the children. Sometimes, group discussion and pet activity also promotes the food consumption of children. Now a days, selection of children food by the parents has been biased by TV advertisement, brand names, price and environment of the food court. Mostly, the economic status, advanced lifestyle, and high society of the parents lead them towards change of eating habits and to select food items not recommended for their children. Therefore, a larger section of private school children on being influenced by their parents perform unusual food habits. However, population of the parents of Govt. school children is comparatively less in this regard.

#### **5.6.0. Performance of physical activity**

Those children who played outdoor game <1 hr./day found to be overweight and obese as compared to those children who played outdoor game >1 hr./day. Those children who played computer game and watched TV >1 hr./day found to be

overweight and obese as compared to those children who played computer game and watched TV <1 hr./day. Those children who went to school by school bus and own vehicle found to be overweight and obese as compared to those children who went to school by walking and cycling. Duration of outdoor game, computer game, watching TV (<1 hr./day and >1 hr./day) and mode of transport to school (walking, cycle, school bus and own vehicle) was found to be statistically significant on BMI. Therefore, BMI was dependent on duration of outdoor game, computer game, watching TV and mode of transport to school.

Similar findings on exercise were reported by Vaida, (2013) stating outdoor <30 minutes as one of the important determinants of the overweight/obesity. The study on government and private primary school children of Mysore city concluded playing outdoor games more than an hour/day reduced the prevalence of overweight and obesity in private school and raised the underweight prevalence in govt. school (Ashok *et al.*, 2014). Playing computer games was significantly associated with high prevalence of overweight and obesity in private school (Ashok *et al.*, 2014). Watching TV for more time by private school children was attributed for the cause of obesity (Vaida, 2013). The duration of TV time was associated with elevated energy and calorie leading to rise in BMI (Bundhun *et al.*, 2018). Travelling by bus was higher for private school children which lead to overweight and obesity due to lack of physical activity (Vaida, 2013).

Physical exercise in different forms is indispensable for the growing children at school. The age of growth and development needs food to quench energy requirement and exercise to utilize the energy rightly for optimum health. The outdoor games of children are more important for performing physical exercise required for growth and development of height, weight, bone, muscle, organs and organ systems. In addition, physical exercise is also required to burn excess calorie to avoid excess stored fat and obesity. Cycling, walking, playing outside, swimming, participating in sports and games of the school are the avenues of the school children for performing physical exercise. Although, mental exercise is equally important for growth especially of hormonal system, but spending more time on TV and computer does not satisfy the required mental activity of school going children. Remaining busy in study, building new concepts and ideas for different purposes, studding the nature, analysing the problems are the ways to perform mental exercise.

The advanced lifestyle has killed the attitude for physical exercise and has promoted lazy habits to spend time on TV, computer and other audio-visuals. In the present study, due to family environment, the lack of these avenues as required for children of private school depicts high prevalence of overweight, obesity. However, due to the opportunity for outdoor physical activity, the children of Govt. school performed cycling, walking, games etc. and are estimated for less frequency for these ailments. Obesity, opens a platform for development of low performance, atherosclerosis, problems of cardiac and hormonal dysfunction and, infertility. Therefore, it is totally discouraged in school children and they are to be educated for performing more physical activity than spending time on TV and computer.

## SUMMARY AND CONCLUSION

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The school age is the active growing phase of childhood and dynamic period of growth. School age is being the precious time for acquisition of skills that permits independence in eating and developing liking and disliking of food, study incorporating school children is also important. Nutrition plays significant role in providing and preserving nutrients as required for physical and mental development towards achieving adolescence. Good nutritious diet or balance diet is the basic need of every child of 7-12 years of age and is highly essential for overall growth and development.

So this study was undertaken to

- Assess the nutritional status of school going children by anthropometry
- Determine the nutrient intake of children in comparison with RDA
- Assess the dietary pattern of school going children

Three schools were selected as the study areas namely Rajbhawan Project U.P school (Gopabandhu square), D.A.V Public school (unit-8) and Steward School (CRPF Square) in Bhubaneswar City by using simple random sampling technique. For this study, 120 school going children (both boys and girls) were selected, 60 children from Govt. school and another 60 from private school were taken in age group of 7-12 years.

The school children and their mothers were interviewed through pre-designed and pre-tested questionnaire on socio-demographic profiles of their family, consumption of diet (24-hours-recall method), taking of fast/ junk foods etc. Measurement of Height and weight were taken from the children under study with appropriate equipments. The data was analysed statistically for correlating the dietary practices with the health status of children studying in Govt. and private schools. The silent findings of the study are summarized below.

- The majority children (70.0%) from private school belonged to nuclear family whereas children (65.0 %) from Govt. school were from joint family system.

- Out of total children from private school, majority were from general caste category (88.34%) followed by Sc (8.33%) and OBS (3.33%). In Govt. school majority children from OBC (65.0%) followed by SC (16.67%), general (11.67%) and ST category (6.66%).
- The all children of private school belonged to upper (35.0%) and upper middle class (65.0%) category, but in Govt. school children were from upper middle (3.33%), lower middle (35.0%) and upper lower (61.67%).
- The prevalence of thinness was 58.33% in Govt. school children whereas 28.33% of private school children were overweight and 11.67% were obese. The school going children of Govt. school were found to be stunted 6.67%.
- The type of school (Govt. and private) was found to be statistically significant on BMI. So BMI was dependent on type of school.
- Under the age group of 7-9 years, the mean height and weight of Govt. and private school children varied significantly ( $p < 0.01$ ) where higher values were measured for private school children than those for Govt. school.
- Similar results with significant variation ( $p < 0.01$ ) were observed for weight in Govt. and private school children leaving the variation of height non-significant under the age group of 10-12 years.
- No children of Govt. and private school consumed green leafy vegetables, egg, fish and meat on daily basis. Intake of pulses, root and tuber, other vegetables are consumed more daily by private school children as compared to Govt. school children. Majority of private school children consumed milk and milk products daily but in very few children of Govt. school consumed milk and milk products daily. The low consumption of costly food items such as egg, fish, meat, fruits and nuts 4-6 times in a week by Govt. school children as compared to private school children. Around half of the children from both Govt. and private school consumed sugar and jaggery daily.
- Private school children (7-12 yrs), the nutrient intake was significantly higher ( $p < 0.01$ ) than those of Govt. school children. But, in case of Govt. school children, it was less than the RDA value. The intake of energy, protein, CHO, fat, calcium, iron and vitamin-A by the children of Govt. school was deficit with respect to RDA of ICMR. On the other hand, the consumption of energy,

protein, CHO, fat, calcium and iron by private school children were adequate and Vitamin-A was deficit basing on RDA of ICMR.

- The private school children of 55.0%, 18.33%, 26.67% and 0% consumed outside fast food daily, once a week or weekends, twice in a week, and fortnightly. But the Govt. school children only consumed fast food of 30.0%, 16.67% and 53.33% in once a week or weekends, twice in a week, and fortnightly respectively.
- With regards to consumption of fast foods like dahiwada, roll, chowmin etc. are frequently consumed by private school children as compared to Govt. school children.
- Per capita consumption of fast foods like dahiwada, roll, chowmin etc. are more preferred by the children of upper and upper-middle class as compared to the children of lower–middle and upper-lower class.
- With regards to consumption of junk foods like noodles, bakery products, carbonated beverages etc. are frequently consumed by private school children as compared to Govt. school children.
- Per capita consumption of junk foods like noodles, bakery products, carbonated beverages etc. are more preferred by the children of upper and upper-middle class as compared to the children of lower–middle and upper-lower class.
- All the private school children carried tiffin box daily and all most all the Govt. school children ate mid-day meal excluding 13.33% to carry tiffin box sometimes. 30.00% children of private school with tiffin box shared with others always and 43.33% shared sometimes excluding 30.0% children to carry money sometimes for snacks / lunch whereas 6.67% of Govt. schoolchildren were with money for the purpose. The mean energy and protein intake was slightly less than the recommended value in both primary and upper-primary class children.
- About 55.0% and 3.33% of private and Govt. school children parents selected food of their children based on TV advertisement for which the eating behaviour of private school children was higher.
- 20.0% parents of private school children considered fast food to save time and energy but 95.0% parents of govt. school children did not consider the same.

43.34% private school children parents believed fast food created opportunity for family gatherings and 2% for feeling of elite class whereas it was only 5.0% in Govt. school.

- The aspects before buying the food products, most of the parents of private and school children were influenced by the brand name but, the parents of Govt. school children parents emphasised on price to buy food despite the nutritive value.
- In the present study 80.0% and 46.67% Govt. and private school children ate together with family daily and 20.0% and 43.33% ate together with family sometimes respectively.
- About 70.0% in private and 43.33% in Govt. school children ate in front of the TV daily and 30.0% and 40.0% took food in front of the TV sometimes at home respectively. Most of the private school children parents were watching TV at meal time. Therefore, the children followed them and they were also watching TV at meal time.
- Duration of outdoor game, computer game, watching TV (<1 hr./day and >1 hr./day) and mode of transport to school by walking, cycle, school bus and own vehicle was found to be statistically significant on BMI. Therefore, BMI was dependent on duration of outdoor game, computer game, watching TV and mode of transport to school.

Govt. school children were found undernourished (thinness and stunting) in spite of availing mid-day meal programme than the children of private school because the children studying in Govt. school belong to lower socio-economic condition whereas private school children consumed frequent fast/ junk foods and were found normal to obese.

In general negligible consumption of green leafy vegetables and minimal consumption of other vegetables and fruits due to which their diet deficient in vitamin-A were observed in the children of both schools.

## **RECOMMENDATIONS**

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Based on foregoing conclusions the following recommendations are offered.

- More studies on a large population are needed to understand the forthcoming alarming threats of child obesity, overweight, underweight, malnutrition and deficiency diseases.
- To enhance the quality of eating of children from high and low socio-economic strata by imparting nutrition education at school course curriculum.
- Specially, mothers should be educated about the importance of balanced diet, right choice of foods, limiting fast/ junk foods consumption, nutrient conservation by proper cooking methods, utilization of foods available in season for their children to ensure food and nutrition security.
- Television and internet use should be limited because they have greater impact on children's eating habits.

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Sl. No. \_\_\_\_\_

## QUESTIONNAIRE

ON

### Assessment of dietary practices among school going children (7-12 years) of selected private & Govt. schools

School name: \_\_\_\_\_

Date: \_\_\_\_\_

#### (I) General information:

A. Name of the child : \_\_\_\_\_ B. Age: \_\_\_\_\_ C. Date of birth: \_\_\_\_\_

D. Class: \_\_\_\_\_

E. Name of father : \_\_\_\_\_

F. Name of mother : \_\_\_\_\_ G. Mob. \_\_\_\_\_ Father/Mother

H. Address : \_\_\_\_\_

I. Religion : 1. Hindu 2. Muslim 3. Others

J. Caste : 1. General 2. OBC 3. SC 4. ST

K. Type of family : 1. Nuclear 2. Joint

L. Size of family: \_\_\_\_\_

#### (II) Details information about the family

Sl. No.	Name	Age	Sex	Educational background	Relationship with respondent	Occupation	Income/month

A. Other source of income:-

1. Agriculture 2. Livestock 3. Business 4. Any other specify

B. Total income of the family/month:-

C. Per capita income per month:-

### (III) Socio-economic status

(Modified Kuppuswamy scale, 2017)

<b>Education of head of family</b>	<b>Score</b>
Profession or honours	7
Graduate or postgraduate	6
Intermediate or post high school diploma	5
High school certificate	4
Middle school certificate	3
Primary school certificate	2
Literate	1
<b>Occupation of head of family</b>	
Profession	10
Semi-profession	6
Clerical, Shop-owner	5
Skilled worker	4
Semi-skilled worker	3
Unskilled worker	2
Unemployed	1
<b>Monthly income of family</b>	
>41430	12
20715-41429	10
15536-20714	6
10357-15535	4
6214-10356	3
2092-6213	2
<2091	1
<b>Socioeconomic class</b>	<b>Total score =</b>
(I) Upper	( 26-29)
(II) Upper middle	(16-25 )
(III) Lower middle	(11-15)
(IV) Upper lower	(5-10)
(V) Lower	(<5)

**(IV) Anthropometric measurements of the child**

Height-            cm    Weight-            kg

BMI-

**(V) Specific information**

24 –hours recall method

Meal time	Menu	Portion size	Ingredient	Amount
Early morning				
Breakfast				
Lunch				
Evening snacks				
Dinner				
Post-dinner				

**(VI) Diet survey**

A. Dietary habit            1. Veg.            2. Non-veg.

B. If veg., why you are not taking non-veg.            1. Religion    2. Not liking    3. Disease

C. If non –veg, frequency of taking non –veg.            1. Regularly    2. Weekly    3. Occasionally

D. Any food allergy- 1. Yes            2. No

E. If yes, specify\_\_\_\_\_

F. Frequency of meals in a day            1. 3 times            2. 4 times            3. 5 times            4. 6 times

G. Which type of food do you preferred very much 1. Homemade food    2. Outside food

H. How often do you prefer to take traditional food

1. Always    2. Often    3. Sometimes    4. Rarely

I. How often do you consume outside foods

1. Always      2. Often      3. Sometimes      4. Rarely

J. Amount of drinking water/ day \_\_\_\_\_

K. Whether you drink milk Yes/No, If yes, then amount \_\_\_\_\_

L. Whether you consume fast foods      1. Yes      2. No

M. If yes, then frequency

1. Daily      2. Weekly once      3. Weekly twice      4.

Fortnightly

N. Do you take meals together with family      1. Yes      2. No      3.

Sometimes

O. Do you eat meals in front of TV. at home      1. Yes      2. No      3.

Sometimes

P. Do you wash your hands before eating      1. Yes      2. No

Q. Do you wash your hands after defecation      1. Yes      2. No

R. Do you take Tiffin box to the school      1. Yes      2. No      3.

Sometimes

S. Do you share lunch box with others      1. Yes      2. No      3.

Sometimes

T. Do you carry money to school for lunch      1. Yes      2. No      3.

Sometimes

U. Do you take mid-meals in school (for govt. school)      1. Yes      2. No

### (VII) Intake of food groups

Intake of food groups	Frequencies			
	Regularly	Often	Sometimes	Rarely
Cereals & millets				
Pulses & legumes				
Green leafy vegetables				
Roots and tubers				
Other vegetables				
Fruits				
Milk and milk products				
Egg				
Fish				
Meat				
Sugar and jaggery				
Nuts and oil seeds				



F. If yes, then how much times per day 1. </1hr per day 2. >1 hr

G. How much times do you spend in watching TV. 1. </1hr per day 2. >1 hr per day

H. How much times do you spend in sleeping 1.<6 hrs 2. 6-8 hrs 3. >8 hrs

I. Do you perform any household work 1. Yes 2.No

**(XI) Questions for parents**

A. Do you consume foods advertised on TV.

1. All foods 2. Some foods 3. Very few 4. Almost nil

B. Why do you prefer to give fast food to your child

1. Save time & energy 2. Satisfies child's hunger  
3. Opportunity for family get together 4. Feeling of elite class

C. While buying any food products, do you give importance to

1. Nutritive value 2. Brand name 3. Influenced by TV 4. Price

**(XII) Any suggestion**