NUTRITIONAL STATUS AND DIETARY PATTERN OF SCHOOL GOING CHILDREN

S. PRIYADHARSHINI

(21PFD024)

Thesis Submitted to the

Avinashilingam Institute for Home Science and

Higher Education for Women, Coimbatore – 641 043

In Partial Fulfilment of the Requirements for the

Degree of Master of Science in

Food Service Management and Dietetics

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V. Uma Maheshwari
Signature of the Supervisor

Signature of the

Head of the Department

Certificate

CERTIFICATE

This is to certify that the thesis entitled **"Nutritional status and dietary pattern of school going children"** submitted to Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore for the award of degree of Master of Science in Food Service Management and Dietetics, is a record of original work done by **Ms. S. Priyadharshini** with Register number **21PFD024** during the period of her study under the supervision and Guidance of Dr. S.Uma Mageshwari, Dean Student Affairs and Professor, Department of Food Service Management and Dietetics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore – 641 043, Tamil Nadu, India.

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Signature of the Candidate

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Introduction

I.INTRODUCTION

A balanced, nutritious diet is critical during the growth and development of children. It aids in the development of a strong foundation in the child in terms of remaining healthy and instilling excellent eating habits from childhood. The three most essential advantages of early childhood nutrition are that it aids in the development of immunity against numerous infectious diseases, promotes healthy brain and other vital organ development, and increases a child's activity levels and cognitive functioning.(Yu et al., 2020).

Children are always growing, and they require adequate nutrition to maintain a healthy weight, recover quickly from illness, build strong bones and muscles, and maintain their energy levels. To Providing a well-balanced and healthy meal for children is a crucial part of their development.

Every day, children must eat a variety of meals from all dietary categories. Plenty of vegetables, legumes, and fruits, whole grain cereals, protein-rich foods such legumes, nuts fish, eggs, and poultry, milk and milk products.Junk food and takeaway should only be consumed on rare occasions.By the consumption of processed food or junk foods body could not function properly. It can be prevented by consuming fresh foods can promote general health and well- being.

Givingthree servings of dairy food every day will ensure that they get the appropriate calcium intake.Making sure children receive enough calcium will help their bones reach their full potential.It is critical to develop proper dental hygiene routines as early as possible, but good nutrition and eating habits can also help to prevent gum issues such as gingivitis.

Calcium needs calcium deposition in the body during the growing stage. It is not consistent throughout the developing period, but is greater during childhood. As a result, both boys and girls should consume 800 mg of calcium every day. (ICMR ,2018)

A healthy, active lifestyle should accompany proper nutrition. Encourage your children to be active and to participate in physical activities that they prefer. Playing outside for an hour every day can assist children in maintaining a healthy weight and overall well-being.

Malnutrition, in any form, poses serious risks to human health. the globe is dealing with a double burden of malnutrition, which comprises both undernutrition and obesity, particularly in low- and middle-income nations.

Malnutrition can take several forms, including undernutrition (wasting or stunting), a lack of vitamins or minerals, being overweight or obese, and developing diet-related non-communicable diseases.

The global burden of malnutrition has substantial and long-term developmental, economic, social, and medical consequences for individuals and their families, communities, and countries.

Malnutrition accounts for 11 per cent of the global illness burden and 22 per cent of the disease burden in India, making it a severe public health issue. The most common problem is PEM (Protein Energy Malnutrition), which affects 20-80% of primary school children (Singh et al, 2021).

children attending rural schools had nutritional statuses of 31 per cent underweight, 24 per cent stunting, and ten per cent thinness. Male children were found to be underweight in 38 per cent , when compare to female children were underweight in 27 per cent .Male children were shown to have a higher prevalence of underweight, stunting, and thinness than female children (Mansur et al.,2015).

Underweight and stunting are more common than usual, accounting for 27 per cent and 19 per cent of the population, respectively. Children in public schools have significantly poor nutrition than those in private schools. When compare to girls, boys were more likely than females to be malnourished (Amruth et al.,2015).

Overweight and obesity in children are major problem that are getting worse .One of the most common nutritional problem.Dental caries, pallor, bleeding gums, ear discharge, hypopigmented patches, and refractive errors were the most common health morbidities in schoolchildren (Srinivas et al., 2019).

Twenty per cent of children in the current study had vitamin-B deficiency, the frequency of dental caries was 23 per cent, and cutaneous parasite infestations like pediculosis and scabies were present in 24 per cent and 23 per cent of people, respectively. Anemia was 57 per cent common, four per cent of students had hypertension. Thyroid enlargement was more common in girls than in boys among students, with a prevalence of two per cent. Nine per cent of people had a respiratory infection (Hussain et al., 2015).

Availability of adequate nutrition might help them to be stable at their physical and mental ability . If there is an insufficient amount of nutrition will make them to be unstable in both physical and mental ability.

Both men and women need to eat a healthy, balanced diet, but women need it more than men because it has an impact on both their and their children's health. Millions of women and adolescent girls worldwide suffer from malnutrition, which is defined by insufficiencies of calories, protein, nutrients, and minerals. It's significantly improved people's healthy lifestyles, considering dietary intake and physical activity levels (Gour et al., 2021).

Good nutrition is defined as getting the proper amount of nutrients (from nutritious foods) in the right quantities. Children need specific amounts of nutrients at different ages.On the other side, it investigates the link between diseases and malnutrition, as well as the function that food plays in the development of chronic diseases such as diabetes and obesity.

Health and nutrition ideals can be instilled at an early age because changes in thinking and behaviours are easily altered. Nutrition knowledge can be instilled in younger children through school. As a result, children learn the value of excellent nutrition and healthy eating habits at young age and begin to create their own.

Good nutrition of children involves the following aspect such as right weight for height strong muscles, good posture, clear skin. Healthy diet including wholegrains, fruits and vegetables and limiting sugars, fat and salt are all recommended for good nutrition.

Eating variety of foods to get nutrients into ourbody. Amount of food require from each food groups to meet the nutritional requirements. Reducing fat rich foods to control weight. Skipping meals is one of the major problems. Meals and snacks provide in energy for day to life.

Whole grains are importance source of dietary fibre they contain all three parts of grains they are importance sources for maintaining health benefits high fibre whole grain are encourage for providing health benefits which includes promoting regular bowel habits and reducing blood glucose and cholesterol level. Examples such as whole grain cereals including oats, barely brown rice etc. If enough fibre is not taken properly than consumption of water should be increased to balanced the fibreintake.

Fruits and vegetables are important sources of nutrients its used to maintain health. By regular consumption of fruits and vegetables its used to protect us from cardio vascular disease, diabetes. Consumption of fresh and seasonal fruits and vegetables when possible. Eat at least three servings of vegetables and five servings of fruits.

Limit foods containing saturated fat are categorizes into three types of dietary fat such as saturated fats, mono unsaturated fats and poly unsaturated fats. All the three types of fat containing same amount of energy so while consuming it more amount of energy will lead to weight gain. Saturated fat increase bad cholesterol increasing blood. Food that are high in saturated fat are butter, cream, cheese, chips, palm oil etc.

Imbalanced nutrition in children cannot live a healthy life style. Imbalanced diet is caused by poor nutrition it also contributes the stress, tiredness, not able to work continuously.

Processed food item would contain more fat, salt, sugar and calorie dense which leads to the risk of our healthy life. The processed foods includenoodles, pasta,pizza,burgers, French fries, cakes,biscuits,chocolates, soft drinks, jam, jelly, ice cream are liked by childrens heavily that causes obesity at younger age group.

High consumption of processed foods was linked to a higher BMI and a higher likelihood of becoming overweight or obese. Processed food consumption is on the rise worldwide, accounting for 50-60% of total daily energy intake in high-income countries (Beslay et al.,2020).

Compared to rural area people junk food is consumed more by urban area people due to the high environmental development and modern cultural development. Due to consumption of junk food there is high chance of getting double – burden malnutrition (Verma et al., 2019).

Obesity, micronutrient deficiencies, diabetes mellitus, hypertension, dyslipidaemia, and cardiovascular illnesses are caused by an excessive intake of sugary beverages, fast food, and dietary fiber, as well as sedentary lifestyles.

Adorable marketing, convenient packaging, and easy accessibility are seducing children to junk food. While a strong excuse for sedentary habits is provided by the absence

of gender-sensitive regulations and the lack of opportunities for physical activity in schools (Nancy et al.,2022).

Eating pattern of junk food is influenced by the neighbourhood, food availability of ingredients, food preferences, cost. Most of children are attracted by seeing advertisement,there are mostly influenced by taste, less cost, huge varieties, easily available. It is not easy to digest and will be affected health.

The major causes of weight gain are due to poor eating habits and lack of physical activities and inadequate of sleep.

Limiting intake of saturated fat and replacing by mono unsaturated and poly unsaturated, lower cholesterol level and reduces risk of cardio vascular disease. Mono unsaturated foods includes, olive oil, peanut oil, cashew nuts and almonds avocado etc. Poly un saturated fat include all types of fish, plant-based oil, nuts and seeds.*WHO 2022.

Our bodies require dietary sources for n-3 and n-6 FA because they are not produced in our bodies. As a result, suitable amounts of nuts and oilseeds, as well as suggested levels of different meals should be consumed to satisfy the required amounts of 6.6 gram of n-6 PUFA and 2.2 gram of n-3 PUFA for all critical activities in the body.

The amount of visible fat (cooking oil) per person/day must be limited to 20-50g (4 to 10 teaspoons full) depending on the degree of energy (calorie) need, which is based on physical activity and physiological status (ICMR – NIN 2020).

Most people consume too much sodium through salt (an average of 9-12 g of salt per day) and not enough potassium (less than 3.5 g). High sodium and potassium intake both lead to high blood pressure, which raises the risk of heart disease and stroke.Limiting salt intake to less than 5 g per day. (WHO 2022)

Nutrient food contain small amount of sugar are likely to be obtain knowledge in maintaining health. Sugar ingredients are mostly used in packed food items.Sugar does not directly cause chronic diseases but excess intake will lead to overweight and obesity. It can be replaced by consuming cereals with little amount of sugars.

Children must have to drink at least six to eight glasses of water every day. It helps to eliminate waste from our body. Instead of drinking tea, coffee, artificial sweetened softdrinks it can be replaced drinking fresh juices and water.

Children must eat a well-balanced diet. Should not skip meals, particularly breakfast, which is the brain's nourishment. Nutrients gained from diet have critical influence on physical growth and development, as well as the maintenance of normal physiological function.

Good nutrition is associated with general well – being. The problem that are the reason for childhood comes under less nutrition. The reason for the significant are mortality and morbidity are all over the world. Good nutrition involves in healthy food habits. Healthy eating habits is an important development as rapid growth which is associated with increased in nutritional needs. This can be maintained by doing physical activity and outdoor sports.

People who skipped breakfast on a daily basis were 4.5 times more likely to be obese than those who ate breakfast on a regular basis.Academic performance of a schooling children is very much important since it happens only when there is proper intake of food at proper age. (Elizabeth et al., 2017).

School-based programmes are an ideal environment for promoting healthy eating because most children attend school on a regular basis and consume at least one meal and a number of snacks there each day.

Nutrition for school-aged children should improve health, meet energy and nutrition needs, and not promote excessive weight gain. During their school years, children will have more opportunities to make food-related decisions. Parents may assist their children in making healthy eating choices (Wanda et al.,2017)

A healthy environment provides students with nutritious and appealing foods and beverages, consistent and accurate nutrition messages, and opportunities to learn about and practice healthy eating throughout the time children spend on school (including before and after school).

The objective of the study was to

1.Study the nutritional status of school going children and

2. Find out the dietary pattern of school going children.

II. REVIEW OF LITERATURE

The review of literature on the study entitled, **"Nutritional status and dietary pattern of school going children"**is discussed under the following heading:

A. Nutritional status of school going children

B. Dietary practices and dietary pattern of school going children

A. Nutritional status of school going children

Malnutrition accounts for 11 per cent of the global illness burden and 22 per cent of the disease burden in India, making it a severe public health issue. The most common problem is PEM (Protein Energy Malnutrition), which affects 20-80% of primary school children (Singh et al, 2021).

According to the current study by Mansur et al., (2015) children attending rural schools had nutritional statuses of 31 per cent underweight, 24 per cent stunting, and ten per cent thinness. Male children were found to be underweight in 38 per cent, when compare to female children were underweight in 27 per cent.Male children were shown to have a higher prevalence of underweight, stunting, and thinness than female children.

Underweight and stunting are more common than usual, accounting for 27 per cent and 19 per cent of the population, respectively. Children in public schools have significantly poor nutrition than those in private schools. When compare to girls, boys were more likely than females to be malnourished (Amruth et al.,2015).

Twenty- four per cent of primary school children did not have enough nutrition and were 49 per cent shorter than the average height. Boys were more likely to be underweight than girls, and they were also more likely to be malnourished. Malnutrition was found to be frequent in 50 per cent of children (Yankanchi et al.,2018).

Undernutrition (22 per cent) and overweight/obesity (25 per cent) were prevalent in the population at rates respectively. Schoolchildren aged 10 to 12 were less likely to be overweight or obese than children aged 6 to 9 (Aboagye et al., 2022).

In all age groups, the boys and girls in the study group fell short of WHO 2007 guidelines. There were 53 severely stunted children, 31 very underweight children, and 111 thin or very thin children among the 216 schoolchildren. Low socioeconomic status and inadequate educational background, that contribute to their children's poor nutritional condition (Dey et al., 2017).

According to Banstolaet al., (2015). Boys made up a greater proportion of the undernourished population compare than girls, accounting for 38 per cent of boys and 33 per cent of girls. Stunting was more common in children.

Twenty -seven per cent of primary school students are underweight or malnourished. Nineteen per cent of children stunted, which is more common, respectively. Children attending government schools had far worse nutrition than those attending private schools. Malnutrition was more common in boys than in girls (Amruth et al., 2015).

According to Singh et al., (2021). Twenty -two per cent of the disease burden in India, making it a serious issue for public health. PEM (Protein Energy Malnutrition) is the most prevalent issue, affecting 20–80 per cent of primary school students. Severely underweight children are eight per cent, stunted is four per cent.

BMI for children, the recent study found that 85 per cent had a normal BMI. Undernutrition prevalence is 43 per cent. However, the survey found that four per cent of children were overweight. Anemia prevalence was observed to be greater in girls 19 per cent than in boys eight per cent in the children age group less than 10 years (Farooq et al.,2018).

Prevalence of being underweight was (27.8 per cent,) stunting (22.9 per cent) and thinness (22 per cent) respectively. Depending on their age and gender. Females, and young girls approaching puberty all had much higher rates. The fact that the development spurt in females begins earlier than in boys suggests that this may be the result of gender indiscrimination (Nath et al., 2019).

According to Patel et al., (2015) Students in classes one through eight from 31 schools revealed that nine per cent of the children were underweight and thirty per cent were obese. Those people affected by upper respiratory tract infection, anemia, dental cavities, and refractory errors were among the most prevalent health conditions.

Sixty -five per cent of children were underweight, compared to the national average of 43 per cent for malnutrition. The most common illness affecting children was URI followed by anemia and dental caries (Swaminathan et al.,2017).

According to Verma et al, (2021) The findings revealed that 59 per cent of the children were classified as very underweight, stunted, and thin, respectively. To aid in the healthy transition from childhood to adulthood and to stop the intergenerational cycle of malnutrition, nutrition interventions for the middle childhood period must be strengthened.

According to a report, female children are especially vulnerable to malnutrition therefore, it is critical to assess their nutritional status in order to enhance their knowledge and execute various nutritional activities. This study, which was done in four schools, found that nutrient consumption was lower than the RDA in both rural and urban girls, with 40 per cent of respondents in the country reporting normal weight and 67 per cent reporting normal weight in the city (Sen et al, 2018).

Malnutrition is a serious public health issue. In a study found that, male students were more likely than female students to be obese. To stop the spread of non- communicable diseases, obesity and overweight must be addressed in schools (Kamath et al., 2021).

Thirty- seven per cent of participants were considered underweight. The study's high underweight prevalence rate. Based on height for age less than the fifth per centile of the NCHS standard, the study discovered that 38 per cent of them were stunted (Nair et al., 2017).

The diversity in children's malnutrition was explained by macro-level environmental factors to a degree ranging from 38 per cent to 58 per cent. Overweight or obesity and stunting were common together in two per cent of cases (Caleyachetty et al., 2018).

Malnutrition was widespread in 51 per cent of the population, with 41 per cent underweight. Eleven per cent severely underweight, and stunting affecting 33 per cent of children (Senthilkumar et al., 2018).

Dental caries, pallor, bleeding gums, ear discharge, hypopigmented patches, and refractive errors were the most common health morbidities in schoolchildren. Thirty – eight per cent of boys underweight, while girls were 25 per cent underweight. The prevalence of overweight in boys was eight per cent whereas it was seven per cent in girls. Obesity was two

per cent more prevalent in boys and three per cent more prevalent in girls (Srinivas et al., 2019).

Among Two hundred eighty-four children were 25 per cent underweight. It was discovered that sociodemographic characteristics such as gender and parents' educational levels were statistically associated with children's underweight (Shashank et al., 2016).

Males outnumbered females by 25 per cent of people were underweight, and 24 per cent of those were extremely underweight. Twenty- seven per cent of the study's total individuals were stunted, and 18 per cent were wasted (Goyal et al., 2023).

Children were more likely to be overweight (85th per centile or higher) than obese (95th per centile or higher) in the following proportions 21 per cent of both boys and girls. Underweight prevalence was four per cent both boys and girls. Children who were female were more likely to be overweight or obese (Bhoir et al., 2021).

Fifty -two per cent of stunting and wasting (62 per cent), and mid arm circumference smaller for age (13 per cent) were all present in 75 children. 73 per cent children’s were consumed too few calories. (Gladius et al., 2018)

According to the IAP statistics, twenty-five per cent of people were obese and 36 per cent were overweight. The prevalence of obesity and overweight, according to the CDC's standards, was 15per cent and 26 per cent, respectively. The mean BMI for the obese group was 26 kg/m2, while the mean BMI for the overweight group was 21 kg/m2. Obesity and overweight were more common in girls. It showed the highest rate of childhood obesity (Chandra et al., 2019).

A little under ten per cent of the females were under the age of seven, followed by 25 per cent of girls who were, respectively, eight to twelve years old. The findings showed that the majority of the children originate from low-income families, and anthropometry data showed that school-aged childrens were malnourished despite having much lower mean values than the normal. Iron intake and dietary habits were both determined to be extremely low (Karthika et al., 2019).

A research found that ten per cent of private school students were overweight and six per cent were obese, while 20 per cent of students were underweight and eight per cent were in grade I. The majority of mothers had good understanding of wholesome eating (Ganganahalli et al., 2016)

Age and nutritional status were strongly correlated, with mean weight increasing with age and height increasing with age. Fifty- four per cent had weight that was appropriate for their age, 25 per cent were underweight, eight per cent were overweight, and 13 per cent were obese. Male students were more often underweight and 26per cent stunted than female students (Farhin et al., 2021).

Among the four hundred seventy -eight children 21 per cent were stunted, 55 per cent were underweight, and 51 per cent were thin. In comparison to boys, girls were more likely to stunt and be underweight. Girls' average height was high until they turned 10 years old, at which point boys were discovered to be taller than girls. it was discovered that the prevalence of underweight was higher in this population than in national statistics. An effective way to prevent PEM is to encourage healthy eating habits through effective nutrition education

(Kini et al., 2016).

According to Abraham et al, (2015). The observed BMI was lower than the reference values for both gender and all the age categories. Thirty- one per cent of children aged five to nine were underweight, and one per cent of them were extremely underweight. Ten per cent of children were stunted, with one per cent of those being severely stunted. Thirty -one per cent of the children were underweight for their age. Children have Myopia , dental caries and pallor were the most prevalent morbidities seen in younger age . Girls were more likely to notice the pallor.

Anthropometric indices were normal in nearly 89 children, (17 per cent) including ten per cent boys and seven per cent of girls. The most prevalent anthropometric failures were stunting, wasting, and underweight, in that order. Males were more likely than females to experience stunting, wasting, and underweight, which was a sign of malnutrition (Ahsan, et al., 2020)

According to Hussain et al, (2015). point out, twenty per cent of children in the current study had vitamin-B deficiency, the frequency of dental caries was 23 per cent, and cutaneous parasite infestations like pediculosis and scabies were present in 24 per cent and 23 per cent of people, respectively. Anemia was 57 per cent common, four per cent of students had hypertension. In the current study, thyroid enlargement was more common in girls than

in boys among students, with a prevalence of two per cent. Nine per cent of people had a respiratory infection.

Educational intervention are analysed, it is shown that underweight was maintained in both boys and girls; however, normal BMI values increased significantly in both boys and girls as a result of a reduction in overweight and obesity in both gender . The schoolchildren who showed a significant improvement were those from an urban location, both seaside and countryside, although this should not be interpreted as a negative result of the intervention in rural schoolchildren, as these children already had the lowest levels of obesity (Menor et al., 2022).

B.Dietary practices and dietary pattern of school going children

Dietary habits can also assist in connecting with any religious group of people. Food is commonly controlled in order to promote a person's cultural identity. People of varied cultural origins consume a wide range of foods. Food preferences in children result in cultural patterns of food choices (Aldridge et al.,2019).

According to Mukherjee et al., (2017) explained dietary decisions made by families and children can result in both inadequate and excessive nutrition. Seventy- one per cent of both boys and girls consume milk and dairy products most frequently. However, the majority of the children only consumed green leafy vegetables once a week.Fruits were consumed two to six times per week The majority of those who ate meat once a week were non-vegetarians.

Information regarding diet, 26 per cent of children are vegetarians, seven per cent are eggarians, and 67per cent of children follow a non-vegetarian diet. Fifty per cent of children eat three to four meals per day, 42 per cent eat five or more, five per cent eat more than five, and three per cent eat fewer than three. Additionally, data demonstrates that 95 per cent children’s of miss meals one or two times per week, two per cent of children skip meals at two to four times, another two per cent skip meals four to five times, and the other one per cent never skip meals (Chougule et al., 2021)

WHO's dietary recommendations for children, they should have three or more servings of fruit and vegetables daily, alternate between white meat and fish, and reserve red meat, snacks, sweets, and soft drinks for special occasions. Study revealed that a sizable proportion of young people continue to engage in eating practices that are at odds with a balanced diet. The current study emphasizes the value of promoting healthy eating among

children from all domains of their development, including family, school, and community, in order to promote good habits (Guevara et al., 2020)

In order to assist children, overcome the perceived obstacles to a healthy diet, it may be helpful to teach them self-regulation skills. The following foods or meal components, mostly high in calories, were mentioned by participants as being disruptive to their eating habits: juice, chocolates, lollipops, cakes, chips, and drinks with excessive sugar. This can be a warning that children lack the self-control necessary to resist bad foods and choose for better options (Magahaes et al, 2022)

Obesity, micronutrient deficiencies, diabetes mellitus, hypertension, dyslipidaemia, and cardiovascular illnesses are caused by an excessive intake of sugary beverages, fast food, and dietary fiber, as well as sedentary lifestyles. Adorable marketing, convenient packaging, and easy accessibility are seducing children to junk food. While a strong excuse for sedentary habits is provided by the absence of gender-sensitive regulations and the lack of opportunities for physical activity in schools (Nancy et al, 2022).

Rahi et al., (2017) explained overall, the children' dietary intakes were 30per cent of them reported not eating vegetables, and 70per cent said they consumed three servings or more of high-calorie snacks. Fourty seven per cent of children drink three or more servings of energy-dense beverages, whereas 45 per cent said they didn't eat any portions of fruit. The average daily serving size for each food group ranged from six for energy-dense snacks for pulses and legumes. In general, girls consumed a diet that was more nutrient-dense compare to boys.

Seventeen per cent of children eat a breakfast every day at school, while the majority of the children polled eat a first meal every day before they go to school. The majority of childrens eat dinner every day, and 95 per cent of children eat supper every day (Potempa et al., 2022).

Nutrition for school-aged children should improve health, meet energy and nutrition needs, and not promote excessive weight gain. During their school years, children will have more opportunities to make food-related decisions. Parents may assist their children in making healthy eating choices (Wanda et al.,2017)

According to Wrottesleyet al, (2023) In all of the globe regions examined, stunting, slenderness, anemia, and other micronutrient deficiencies remained alongside increased rates of overweight and obesity. There have been noted shifts towards diets that contain an increasing amount of processed, energy-dense, and micronutrient-poor foods. Although there is evidence from intervention trials, it has been suggested that offering a variety of micronutrient-fortified foods and beverages at school may help address micronutrient deficiencies and promote weight growth in groups that are malnourished. Even fewer interventions were available to prevent or treat obesity and overweight.

Children must eat a well-balanced diet. Should not skip meals, particularly breakfast, which is the brain's nourishment. Nutrients gained from diet have critical influence on physical growth and development, as well as the maintenance of normal physiological function (Elizabeth et al., 2017).

According to Arifa et al., (2018) point out , Males were less likely than females to be overweight or obese. Urban areas had higher rates of overweight and obesity than rural ones (Eight per cent boys and three per cent females. Overweight and obesity were substantially correlated with high calorie intake, consuming fast food, carbonated beverages, food from the school canteen, and having poor levels of physical activity.

Maintaining a balanced diet and regular exercise is important for everyone, but children require a variety of meals from each food group to guarantee optimal consumption of all vitamins and minerals (Westenhoefer et al., 2019)

Calcium needs are calculated based on calcium deposition in the body during the growing stage. It is not consistent throughout the developing period, but is greater during childhood. As a result, both boys and girls should consume 800 mg of calcium every day. (ICMR , 2018)

As blood volume increases, so iron requirements. 0.3 mg of iron per day is recommended for both boys and girls (Kramer et al., 2018).

In general, there were 13per cent more people who were overweight or obese. The consumption of junk food, being a lousy eater, sneaking snacks, and having ready access to cookies at home all greatly contributed to being overweight and obese.Higher income groups and nuclear families were found to have significantly higher obesity prevalence rates (Sucharita et al., 2015).

According to Christian et al., (2023) explained the impacts of cultural and gender norms, which frequently discriminate against girls, are most likely to have an adverse effect on them. The body needs more nutrients during children in order to maintain healthy growth and development, including those for energy, protein, iron, calcium, and other nutrients. Anemiaand micronutrient shortages are common in environments with poor nutritional intake. Endocrine variables are susceptible to under nutrition and necessary for promoting normal growth.

Underweight is highly connected with junk food consumption. Children with poor nutrition or a low Body mass index (BMI). Only realised the dangers of excess. Junk food consumption is harmful to one's overall health. It is necessary to raise awareness about the dangers of junk food consumption. It is also claimed that children are drawn to junk food since it is easily accessible and inexpensive. It is advised that parents and school personnel put limits on junk food consumption, therefore supporting the government's mission to declare illegal junk food (Poudel et al., 2018).

A balanced diet with a sufficient intake of fruits and vegetables is recommended to promote health and in being a protective factor against health problems, such as obesity, heart disease, and particular types of cancer. Girls at all ages were found to consume more fruits and vegetables than boys on their fruit/vegetable intake may therefore be weakened. In light of the persistent concerns over the low intake of fruits and vegetables in children, attention should be paid to devising more individualized interventions to promote a healthy and nutritious diet for boys (Yu et al., 2020).

A diet can help prevent malnutrition in all of its manifestations, as well as noncommunicable diseases (NCDs) like diabetes, heart disease, stroke, and cancer. A poor diet and a lack of physical activity are the major global health risks. (WHO,2022)

Energy intake (calories) should be balanced with energy expenditure. Total fat should not exceed 30 per cent of total energy consumption to avoid harmful weight gain Saturated fat consumption should be less than 10% of total energy intake, and trans-fat consumption should be less than one per cent of total energy consumption, with a shift in fat consumption away from saturated fats and trans-fats and towards unsaturated fats, with the goal of eliminating trans-fats. (WHO-2022)

A healthy diet includes limiting free sugar intake to less than ten per cent of total energy intake. For extra health benefits, a further reduction to less than five per cent of total

energy intake is proposed. Limiting salt consumption to fewer than five g per day (equal to less than 2 g sodium intake per day) (WHO- 2022)

Our bodies require dietary sources for n-3 and n-6 FA because they are not produced in our bodies. As a result, suitable amounts of nuts and oilseeds, as well as suggested levels of different meals should be consumed to satisfy the required amounts of 6.6 gram of n-6 PUFA and 2.2 gram of n-3 PUFA for all critical activities in the body. The amount of visible fat (cooking oil) per person/day must be limited to 20-50g (4 to 10 teaspoons full) depending on the degree of energy (calorie) need, which is based on physical activity and physiological status (ICMR – NIN 2020).

Table - 1

ICMR- RDA (2020) for children (10-12 years and 13- 15 years)

Nutrients	Boys	Girls
Energy (kcal/d) 10 – 12 years 13 – 15 years	 2220 2860	 2060 2400
Protein (g/d) 10 – 12 years 13 – 15 years	31.8 44.9	32.8 43.2
Calcium (mg)	1000	1000
Magnesium (mg)	440	370
Iron (mg)	19	29
Zinc (mg)	17	13.0
Iodine (µg)	150	150
Thiamine (mg)	18	17
Riboflavin (mg)	2.5	2.4
Niacin (mg)	18	14
Vitamin B6 (mg)	2.4	1.9
Folate (µg) DFE	300	220
Vitamin B12 (µg)	2.2	2.2

Vitamin C (mg)	80	65
Vitamin A (µg)	1000	840
Vitamin D (IU)	600	600

***ICMR-NIN 2020**

Breakfast and lunch are the meals most often missed but social, school and work activities can cause meals to be missed as well. Skipping breakfast is a decision that children frequently make and healthy eating is often a low priority. Skipped meals and fewer family meals result in lower intake of nutrients and other food groups (fruits, vegetables and dairy). In focus groups, children associate eating healthy foods with eating family meals and identify parents as having important influences on their dietary habits(Iyalomhe et al., 2018)

A good eating pattern is an important contributory factor to overall health outcomes. The preschool years are an important part of the growth and development of a child and it is very expedient to ensure that the eating behaviour of a child is well formed and developed during this period. The importance of breakfast, the first meal of the day, cannot be overemphasized. Breakfast skipping among young children is a concern, given that meal of the day provides a good source of essential nutrients and energy (Mary et al., 2019).

The overall prevalence of dental caries was found to be, Higher prevalence of dental caries was found among the girls, the lower socioeconomic class, those who consumed mixed diet, and junk foods at least once every day and among those who consumed dairy products at least once every day. Dental caries was found to be low in prevalence among those who consumed fruits several times a week, among those who brushed their teeth twice/more than twice a day and among those who washed their mouth after each meal (Parasuraman et al., 2017).

The study reveals high prevalence of anemia and intestinal parasitic infection among female school children. Preventive measures such as periodic deworming and health education about nutritional balanced diet, iron supplements, and personal hygiene practices have to be given to both the parents and their children to prevent and reduce disease burden (Gopalakrishnan et al.,2018)

Eating patterns among pupils living in the rural areas were significantly different from those living in urban areas, especially with respect to vegetable, snack and fizzy drink

consumption. Comprehensive nutritional education programme for pupils, their parents and teachers should be introduced to promote nutritional health (Bamidele et al.,2018).

School-based programmes are an ideal environment for promoting healthy eating because most children attend school on a regular basis and consume at least one meal and a number of snacks there each day. However, current research indicates that primary school instructors frequently lack nutritional knowledge, self-efficacy, and the ability to offer nutrition education successfully(Samuel et al.,2020).

The "Alien Health Game" improved primary school students' short-term nutrition knowledge, but it may lead to more sedentary behaviour and the intake of calorie dense foods and drinks. This is in line with a previous study by the German Nutrition Society, which found that 50% of German children lack appropriate knowledge of the elements of a healthy diet(Holzmann et al., 2019).

According to Rohde et al., (2019).'s explanation, for the purpose of enhancing children and adolescents eating habits, a theory-based and target group-adapted mobile app intervention was created. Target group interests, requirements, and values were translated into target group preferences for app usage, such as low usage effort, visual feedback, and recipes. There were described as being education, training, incentives, persuasion, and facilitation.

According to Joshi et al., (2021) suggested nutritioninformatics is the efficient search, collection, organization, and application of information, knowledge, and data for food and nutrition-related decision-making and problem-solving. This study focuses on how food and nutrition practices are evolving in India in order to help NI workers become better equipped to deal with the dual burden of nutrition.

According to Mcclung et al., (2022) Digital assessment of dietary intake and physical activity is becoming more and more common,however, the demand for tele nutrition may not be met by expanding protection. Registered dietitians and nutritionists are in an exceptional position to develop, apply, and evaluate technology relevant to dietary intake and physical activity.

According to Kato et al, (2020) this study, children's food preferences can be greatly enhanced by implicit and gamified learning on healthy eating that is delivered mobile app.

When players read more nutrition information about healthy foods, the effect is enhanced; however, when players read more information about bad foods.

According to Gabrielli et al., (2017) Guidelines for a healthy lifestyle, food intake tracking, and Web-based data exchange with paediatricians are all part of the TreC-Lifestyle mHealth intervention. This allows for an evidence-based conversation. To guarantee user engagement and the preservation of healthy behaviours, further improvements are required.

According to Ledoux et al, (2016) A multi-ethnic sample of 10–12-year-old children consumed more fruit and vegetables after playing the video games. The instructional mini-games were created by a multidisciplinary team of behavioural nutrition, Physical Activity, and video game professionals and were based on the Social Cognitive and Mastery Learning Theories.

According to Piziak et al., (2021) to encourage preschool-aged Hispanic communities to consume healthier foods and get more activity, two different game styles were created. Bilingual video games were used to teach nutrition and improve exercise, and a picture-based bilingual food bingo game placed an emphasis on the consumption of vegetables, water, and a limit on sugar-sweetened beverages.

According to Gour et al., (2021) Both men and women need to eat a healthy, balanced diet, but women need it more than men because it has an impact on both their and their children's health. Millions of women and adolescent girls worldwide suffer from malnutrition, which is defined by insufficiencies of calories, protein, nutrients, and minerals. ICTs have the potential to significantly improve people's healthy lifestyles, takinginto account dietary intake and physical activity levels.

According to Mendu et al., (2019) The Indian Council of Medical Research (ICMR-NIN) created Nutrition Atlas as an online informatics tool to make nutrition-related datasets in India easily accessible. It can be applied to the creation and evaluation of treatments, the dissemination of useful dietary and nutritional knowledge, and the conversion of data into policy.

The goal of the study was to assess and contrast the effects of the program on children's understanding of food and nutrition across a range of socioeconomic statuses, gender, ages, and Body Mass Index (BMI).

A knowledge questionnaire that was used both before and after the intervention was used to gauge participants' nutritional and dietary understanding. Twelve classes lasting 50 minutes each made up the intervention. Between the pre and after intervention stages, our understanding of food and nutrition had increased (Franciscato et al., 2019)

The family-based programmes that provided basic positive dietary recommendations to parents and regular follow-up dramatically lowered fat intake. If carefully developed and implemented, school and family-based studies can boost F&V intake, particularly fruit. Effective school-based programmes include role models such as peers, instructors, and heroic personalities, as well as prizes and increased access to healthy meals. (Black et al., 2020)

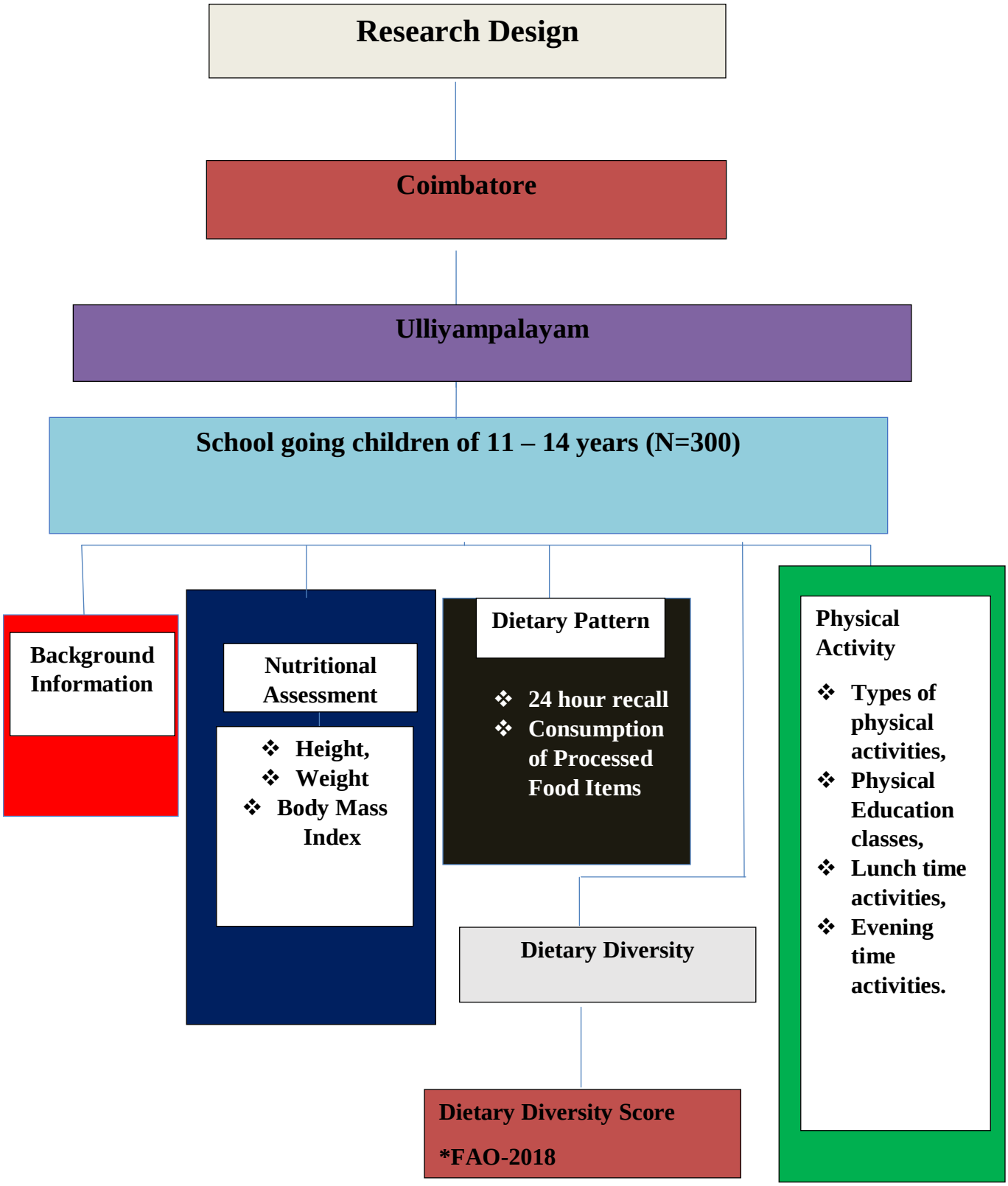
Methodology

III. METHODOLOGY

The methodology of the study entitled **"Nutritional status and dietary pattern of school-going children"** is presented under the following headings:

A. Location of the study area and identification of the subjects
B. Eliciting details on background information
C. Assessment of Nutritional Status
D. Eliciting details on 24 recall and consumption of processed food items
E. Eliciting details on dietary diversity and physical activity

Ethical approval for the study was obtained from the Institutional Human Ethics Committee (IHEC), Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore with Approval number AUW/IHEC-IHEC/22-23/FSMD-18. (Annexure - I)


Research Design
Coimbatore
Ulliyampalayam
School going children of 11 – 14 years (N=300)
Background Information
Nutritional Assessment
❖ Height,
❖ Weight
❖ Body Mass Index
Dietary Pattern
❖ 24 hour recall
❖ Consumption of Processed Food Items
Physical Activity
❖ Types of physical activities,
❖ Physical Education classes,
❖ Lunch time activities,
❖ Evening time activities.
Dietary Diversity
Dietary Diversity Score
*FAO-2018

A. Location of the study area and identification of the subjects

The study was conducted in Coimbatore, Ulliyampalayam of Thondamuthur block. Among the five schools in the Ulliyampalayam area, three are private schools and two government schools.

One private school which is a co-educational school for both boys and girls was selected for the study by convenience sampling. Convenience sampling refers to the practice of selecting demographic components for inclusion in a sample based on their accessibility (Kothari et al.,2019). A total of 1,500 students are studying in the school from kindergarden to twelfth grade.

The subjects for the study were selected by census sampling, from the age group of 11-14 years from sections of sixth to eighth grade. A census sampling is a thorough enumeration of each individual in the population (Kothari et al,2019).

i. Total number of subjects is given in table I.

Table - I

Total number of subjects

Grades	**Section – A**	**Section- B**
Sixth	52	52
Seventh	45	45
Eighth	53	53
Total	150	150

A total of three hundred subjects both boys and girls were selected from the school.

Criteria for inclusion and exclusion of subjects for the study

Inclusion Criteria

School going children in the age groups of 11 to14 years both boys and girls willing for participating in the study.

Exclusion criteria

School going children's below 11 years and above 14 years of age group, both boys and girls not willing to participate in the study.

B. Eliciting details on the background information

The background information was collected from all the selected 300 school-going children aged from 11-14 years using an interview schedule. An interview schedule includes a set of structured questions that have been prepared to serve as a guide for the interviewers and researchers in gathering the data (Arokiamary et al,2020).

The background information on the socioeconomic status of the school-going children like name, gender, age, class standard, number of family members, occupational status of family members and monthly income was elicited using the interview schedule. (Annexure-II)

C. Assessment of Nutritional Status

Anthropometric assessment of a person is a simple and powerful predictor of future disease. Anthropometry is a widely used, portable, inexpensive, straightforward, and easy-to-use technique that includes several body measurements. The best method for assessing a child's nutritional status is to use anthropometric measurements, including height, weight, and body mass index. (Karim et al, 2020) Annexure II.

Measurement of Weight

Weight is a more sensitive indicator of nutritional sufficiency in children than height because it reflects more recent food intake and provides an approximate assessment of overall fat and muscle reserves (Krause et al., 2017)

The weight was measured for all the school going children. A digital scale, was used to measure weight for both boys and girls. The children were asked to stand on the scale with their feet flat on the weighing scale. The scale was calibrated to '0' and the individual subject's weight was measure to the nearest error.

Plate 1 - Recording weight of the selected subjects.

Measurement of Height

The height was measured for all the 300 children. Using a stadiometer, height was measured. The children were instructed to stand barefoot with feet together and legs straight on the floor. The wooden stick was then placed against the children's heads and the measurement was taken, with the measurement being 0.1 cm.

Plate 2 - Recording height of the selected subjects.

c.Body Mass Index (BMI)

BMI, which is calculated by squaring weight in kg and height in meters, is also commonly used in children to determine underweight, overweight, and obesity.

[redacted]

The calculated BMI was compared with the standards given by IAP 2015.

BMI	**Category**
Less than 16 kg /m^2	Severely underweight
More than 16 kg /m^2	Moderately underweight
More than 17 kg/ m^2	Normal weight
19 kg/ m^2	Slightly overweight
21 kg/ m^2	Moderately overweight
23 kg/ m^2	Severely overweight
27 kg/ m^2	Obesity

*IAP.,2015

D. Eliciting details on 24 recall and consumption of processed food items

a. 24- Hour recall

A 24 -hour recall diet is a survey structured interview designed to record the specific information about the food and drink intake of all the subjects for the past 24 hours. The food intake and nutritive value of each food item was calculated using the Indian Food Composition Table (IFCT, 2020) in comparison with RDA (2020). Annexure III.

b. Consumption of processed food items

Processed food items contain high calories, high fat, more sugar and salt which leads to poor health condition. Most children are likely to prefer processed foods as they are grown up in modern society.

A questionnaire was handed out to each subjects and the information about the consumption of processed food items was collected individually for all the subjects. All the food items in the questionnaire are listed out along with the frequency of intake such as daily, once a week, twice a week or occasionally. (Annexure -IV)

E. Eliciting details on dietary diversity and physical activity

The dietary diversity score known as the proxy measure is based on the idea that dietary diversity is a crucial feature of diet quality and that a diverse diet helps to maintain an appropriate intake of vital nutrients that promote health. The dietary diversity score is simple to use, affordable, and useful, and it can be used to get results rapidly. (FAO et al., 2018).

a. Dietary diversity questionnaire

The questionnaire consists of 17 food groups such as Cereals, Vitamin A rich vegetables and tubers, Otherfruits, fleshmeat, Milk and Milk products,Sweets, Spices and so on information regarding dietary diversity was collected for three consecutive days in order to understand the various types of food groups included in the regular diets of the selected children. (Annexure -V)

b. Physical activity

Physical activity is defined as any physiological movement produced by skeletal muscles that involves energy expenditure. Physical activity encompasses any movement, whether in leisure time, for transportation to and from places. Both moderate and strenuous physical activity promote health. (WHO et al., 2022)

A physical activity questionnaire was developed to collect information about the physical activities of the selected school going children. The types of physical activities such as skipping, walking, cycling, running, aerobics, football, and volleyball were included in the questionnaire. The subjects answered according to the duration of time they spend for physical activity.

The answers of the subjects varied for physical education such as hardly ever, sometimes, quite often and always. A lunchtime activity was done to know the physical activity such as sitting or walking around, running or playing a little, running around or playing quite a bit. Also, the information regarding the evening time physical activity were also collected individually. (Annexure -VI). (Sirajudeen et al.,2022)

IV. Result and Discussion

The result and discussion for the study entitled "**Nutritional status and dietary pattern of school going children"** are discussed under the following headings:

A. Demographic profile of the selected subjects

B. Details on Nutritional Status of the selected subjects

C. Dietary diversity scores regarding the consumption of food groups

D. Comparison of Processed food items and BMI for boys

E. Comparison of Processed food items and BMI for girls

F. Details on Physical Activity of the selected subjects

A. Demographic profile of the selected subjects

a. Distribution of Age and Gender

The age and gender distribution of the subjects are given in table I.

Table- I

Distribution of the selected subjects according to Age and Gender

Age/Years	Boys		Girls		Total	
	(n=150)	%	(n=150)	%	(n=300)	%
11	23	15	33	22	56	19
12	63	42	48	32	111	37
13	52	35	62	41	114	38
14	12	8	7	5	19	6

Among the three hundred subjects selected 37 per cent were in the 12-year age group and 38 percent were in the 13-year age group. Since equal number of boys and girls were selected 50 per cent (150) were boys and 50 per cent (150) were girls.

b. Educational Status

Educational status of the subjects is given in table II.

Table- II

Education status of the subjects

Standard	Boys		Girls		Total	
	(n=150)	%	(n=150)	%	(n=300)	%
6th	49	33	55	37	104	35
7th	53	35	37	25	90	30
8th	48	32	58	38	106	35

An equal 35 per cent of subjects were studying in sixth grade and eighth grade respectively. Thirty per cent of subjects were studying in seventh standard.

c. Occupational Status

Occupational status of the parents is given in table -III.

Table- III

Occupational status of the parents

Occupation	Boys		Girls		Total	
	(n= 150)	%	(n=150)	%	(n=300)	%
Labourer	45	30	45	30	90	30
Farmer	16	11	10	7	26	9
Business	42	28	51	34	93	31
Services	47	31	44	29	91	30

Among the occupational status of the parents, business was the highest with 31 per cent followed by services who were in government sector and labourers. The percentage of farmers was only nine per cent.

d. Family Members

The number of family members of subjects are given in table – IV

Table-IV

Number of family members

Family Members	Boys		Girls		Total	
	(n= 150)	%	(n= 150)	%	(n=300)	%
1-2	3	2	2	1	5	2
3-4	116	77	117	78	233	78
5-6	31	21	31	21	62	20

The above table shows that 78 per cent had three to four members. While two per cent had one to two members where in the grand parents or a single parent were living with them.

e. Monthly Income level

The Monthly income of the families shown in table below.

Table- V

Monthly income of families

Monthly Income* (Rs)	Boys		Girls		Total	
	(n= 150)	%	(n= 150)	%	(n= 300)	%
Economically weaker Section	53	35	47	31	100	33

Lower Income group	65	44	77	51	142	48
Middle income group	24	16	18	12	42	14
High Income group	8	6	8	6	16	5

*HUDCO, (2021)

Among the subjects lower income group children were 48 per cent followed by 33 per cent who were economically weak. Only five per cent of the children belong to the high-income group.

B.Details on Nutritional Status of the selected subjects

a. Body Mass Index of the boys

The Body Mass Index of the selected boys is categorized in table VI.

Table - VI

BMI of the boys

BMI*	**Boys**							
	11 years		**12 years**		**13 years**		**14 years**	
	(n=23)	**%**	**(n=63)**	**%**	**(n=52)**	**%**	**(n=12)**	**%**
Under weight(Severe)	3	13	12	19	5	10	2	17
Underweight (Moderate)	Nil	Nil	2	3	4	8	1	8
Normal	12	52	15	24	10	19	2	17
Over weight (Mild)	5	22	7	11	17	33	1	8

Over weight (Moderate)	2	9	15	24	6	11	2	17
Overweight (Severe)	1	4	8	13	7	13	3	25
Obesity	Nil	Nil	4	6	3	6	1	8

*IAP., 2015

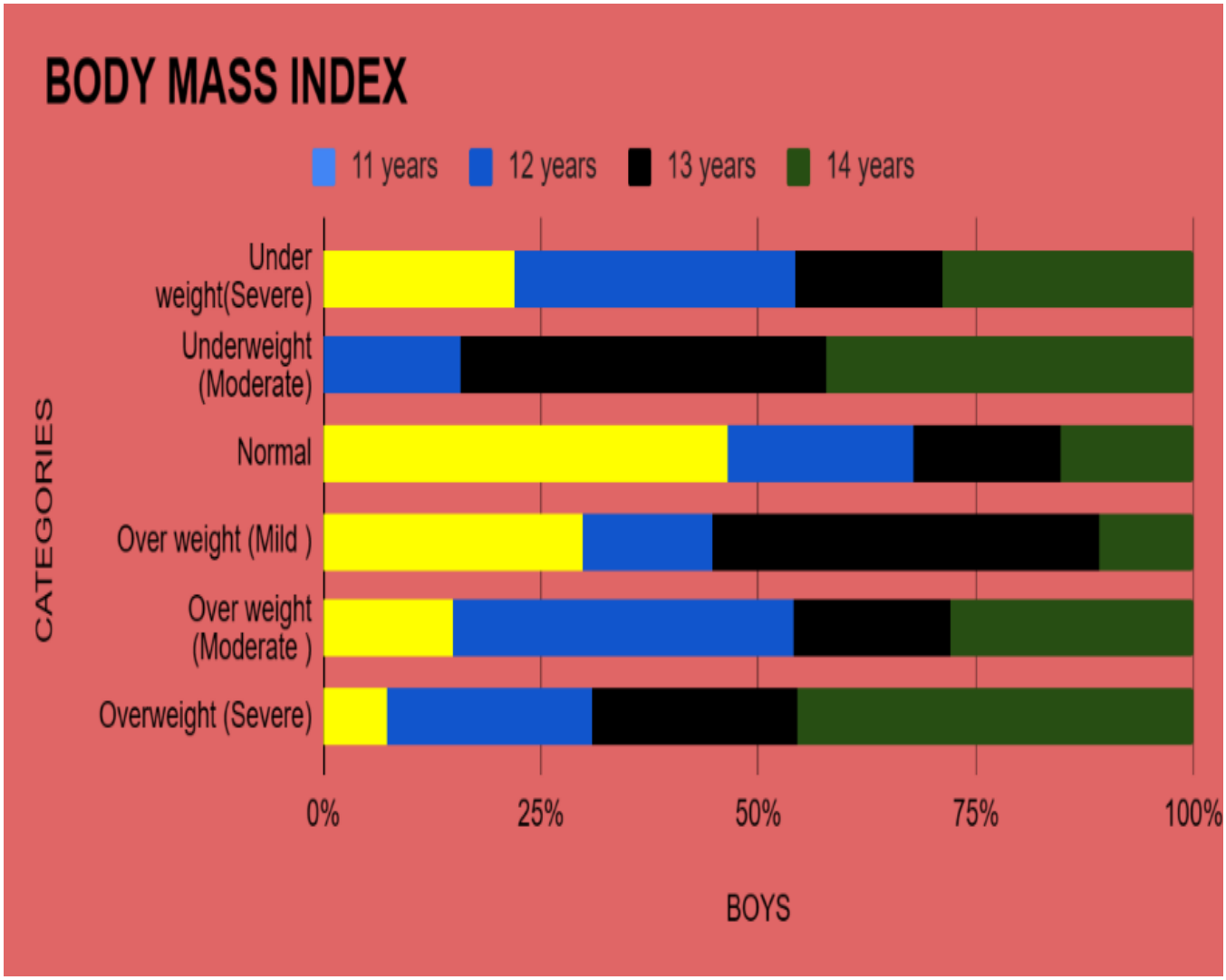


Figure 1- Body Mass Index of theboys

The Body Mass Index calculation of the selected boys shows that 82 boys were in the overweight to obese category. Twenty - two boys were severely underweight while seven were moderately underweight. These finding points out that double burden of malnutrition namely underweight and obesity was both seen among the selected boys.

b. Body Mass Index of the girls

The Body Mass Index of the selected girls is categorized in table VII.

Table- VII

BMI of the girls

BMI*	Girls							
	11 years		12 years		13 years		14 years	
	(n= 33)	%	(n= 48)	%	(n=62)	%	(n= 7)	%
Under weight(Severe)	6	19	9	19	7	11	Nil	Nil
Underweight (Moderate)	1	3	1	-2	4	6	1	14
Normal	11	33	13	27	15	24	1	14
Over weight (Mild)	7	21	8	17	13	21	1	14
Over weight (Moderate)	3	9	7	15	10	16	3	44
Overweight (Severe)	4	12	6	12	11	18	1	14
Obesity	1	3	4	8	2	4	Nil	Nil

*IAP., 2015

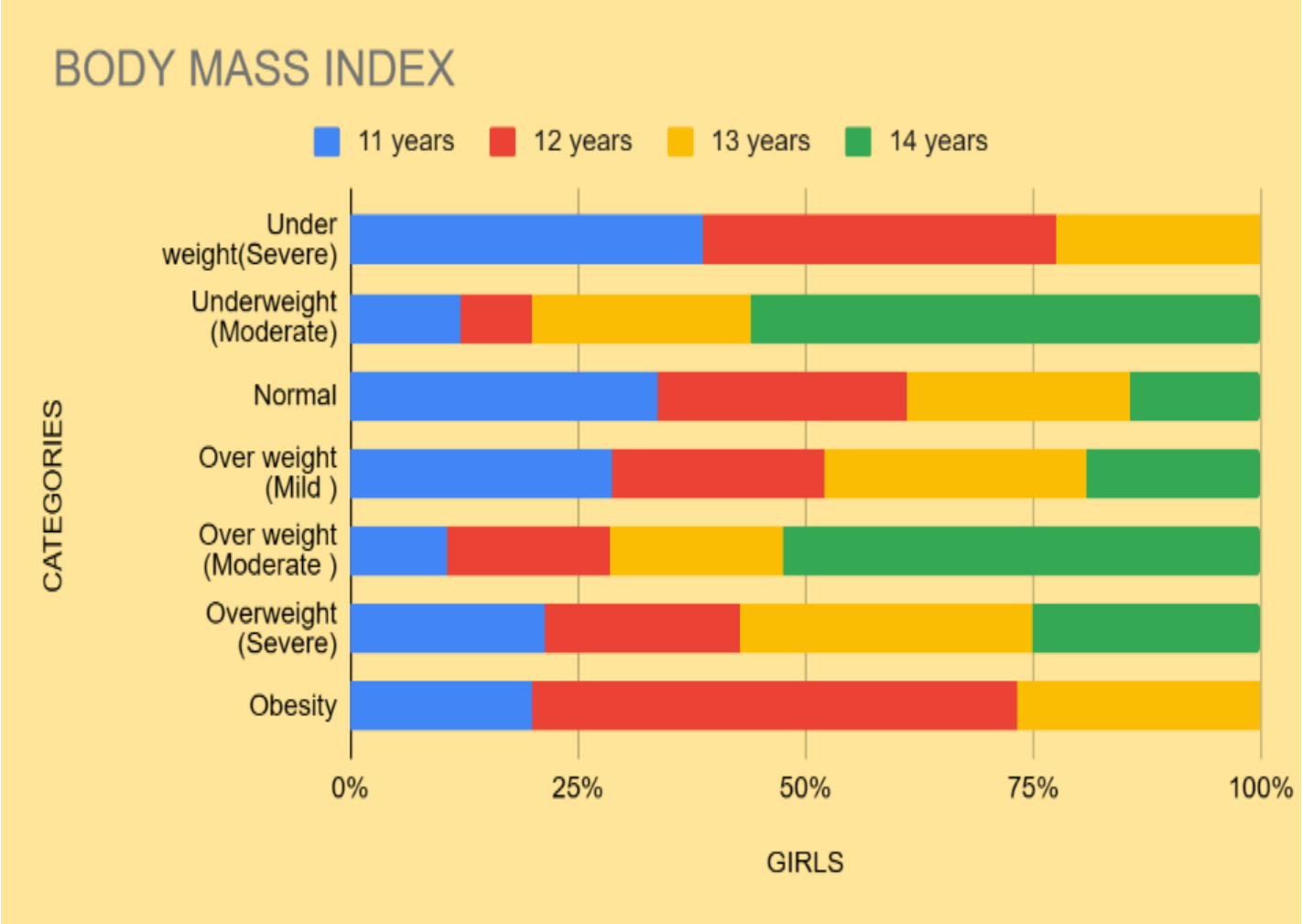


Figure 2 – Body Mass Index of the girls

The pattern of obesity among the girls also showed similar a picture which 81 girls being overweight and obese while 28 per cent were under weight. Both the boys and girls showed a similar pattern of nutritional status pointing out that good nutrition is essential in the growing age group.

C. Dietary diversity scores regarding the consumption of food groups

Dietary diversity scores regarding the consumption of food groups is shown in table VIII.

Table -VIII

Dietary diversity scores regarding the consumption of food groups

Food group	Dietary diversity scores regarding the consumption of food groups							
	11 years		12 years		13 years		14 years	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	(n=23)	(n=33)	(n=63)	(n=48)	(n=52)	(n=62)	(n=12)	(n=7)
Cereals	1	1	1	1	1	1	1	1
Vitamin A rich vegetables and Tubers	0	0	0	0	0	0	0	0
White Tubers and Roots	0	0	0	0	0	0	0	0
Dark green leafy vegetables	0	0	0	0	0	0	0	0
Other vegetables	1	1	1	1	1	1	1	1
Vitamin A rich fruits	0	0	0	0	0	0	0	0
Other fruits	0	0	0	0	0	0	0	0
Organ meat	0	0	0	0	0	0	0	0
Flesh meat	0	0	0	0	0	0	0	0
Eggs	0	0	0	0	0	0	0	0
Fish	0	0	0	0	0	0	0	0
Legumes, nuts and seeds	1	1	1	1	1	1	1	1

Milk and Milk Products	1	0	1	1	1	1	1	1
Oils and Fats	1	1	1	1	1	1	1	1
Red Palm products	0	0	0	0	0	0	0	0
Sugar and sugar products	1	0	1	1	1	1	1	1
Spices, Condiments Beverage	1	1	1	1	1	1	1	1
Total	7	5	7	7	7	7	7	7

The above table reveals that the food groups such as cereals, other vegetables, legumes, oil and fats, spices and condiments were consumed. On the otherhand,vitamin-A rich vegetables and fruits, dark green leafy vegetables, fleshy foods were not consumed which shows that the children did not have diverse diet by consuming all the food groups.

D.Comparison of Processed Food items and BMI for boys is shown in table below

Table -IX

Comparison between processed food items and BMI for boys

Food Items	**Chi-square (df)**	**Sig.value**
Noodles	228.331	.270
Pasta	232.022	.216
Pizza	237.638	.149
Burgers	239.858	.127
French fries	239.832	.127
Cakes	306.017	.065
Bread	314.395	.033
Biscuits	270.323	.483
Chocolates	279.057	.339

Sauces	249.110	.061
Sugary drinks	252.964	.043
Jam	324.556	.013
Jellies	295.914	.134
Ice cream	187.707	.081

***Statistically significant <0.05**

Table IX shows the comparison between processed food items and Body Mass Index. The selected subjects (82 boys) are overweight and obese category. The chi-Square and p-value for processed food items such as bread, sugary drinks, jam were less than 0.05, which signifies that it's statistically significant.

a. Consumption of processed food items among boys

The consumption of processed food items among the boys is given in the table below

Table - X

Consumption of processed food items among boys

Food items*	**Boys**									
	Daily		**Once a week**		**Twice a week**		**Occasionally**		**Never**	
	(n=150)	**%**	**(n=150)**	**%**	**(n=150)**	**%**	**(n=150)**	**%**	**(n=150)**	**%**
Noodles	Nil	Nil	51	34	46	31	45	30	8	5
Pasta	Nil	Nil	42	28	29	19	70	47	9	6
Pizza	Nil	Nil	46	31	27	18	64	43	13	8
Burgers	Nil	Nil	38	25	26	17	73	49	13	9
French fries	Nil	Nil	49	33	37	25	55	38	9	6
Cakes	6	4	53	35	54	36	30	20	7	5

Bread	4	3	23	15	59	39	58	39	6	4
Biscuit	11	7	52	35	57	38	27	18	3	2
Chocolate	14	9	49	33	54	36	26	17	7	5
Sauces	Nill	Nill	49	33	54	36	38	25	9	6
Sugary drinks	Nil	Nil	51	34	52	35	38	25	9	6
Jam	3	2	24	16	46	31	66	44	11	7
Jellies	3	2	34	23	39	26	65	43	9	6
Ice cream	Nil	Nil	72	48	33	22	45	30	Nil	Nil

* Multiple response

The consumption of processed food items among the boys shows that nine per cent of the selected subjects consumed chocolates daily. Forty-eight per cent of boys consumed ice cream once a week which was higher when compared with other processed foods. Thirty-nine per cent consumed bread twice a week and 49 per cent of boys consumed burgers occasionally.

E.Comparison of Processed Food items and BMI for girls is shown in table below

Table -XI

Comparison betweenprocessed food items and BMI for girls

Food Items	**Chi-square (df)**	**p-value**
Noodles	219.752	.161
Pasta	159.091	.290
Pizza	151.733	.445
Burgers	153.393	.408
French fries	152.655	.424
Cakes	94.120	.647

Bread	214.593	.228
Biscuits	143.962	.624
Chocolates	163.395	.215
Sauces	201.823	.451
Sugary drinks	197.937	.528
Jam	201.948	.448
Jellies	209.460	.344
Ice cream	203.537	.417

*Statistically Not significant

Table XI shows the comparison between the processed food items and Body Mass Index. The selected subjects (81 girls) come under overweight and obese category. The chi-Square and p-value for all the processed food items were more than 0.05,which signifies that it's statistically no significant.

a. Consumption of processed food items among girls

The consumption of processed food items among the girls is given in the table below

Table - XII

Consumption of processed food items among girls

Food items*	**Girls**									
	Daily		**Once a week**		**Twice a week**		**Occasionally**		**Never**	
	(n=150)	%	(n=150)	%	(n=150)	%	(n=150)	%	(n=150)	%
Noodles	2	1	41	27	51	34	53	36	3	2
Pasta	Nil	Nil	28	19	20	13	72	48	30	20
Pizza	Nil	Nil	22	15	18	12	78	52	32	21
Burgers	Nil	Nil	16	11	26	17	73	49	35	23

French fries	Nil	Nil	26	17	30	20	63	42	31	21
Cakes	2	1	34	23	57	38	57	38	Nil	Nil
Bread	5	3	49	33	39	26	48	32	9	6
Biscuit	13	9	30	20	62	41	45	30	Nil	Nil
Chocolate	7	5	50	33	57	38	36	24	Nil	Nil
Sauces	5	3	21	14	22	15	69	46	33	22
Sugary drinks	4	3	38	25	27	18	74	49	7	5
Jam	3	2	27	18	29	19	66	44	25	17
Jellies	3	2	24	16	45	30	72	48	6	4
Ice cream	4	3	46	31	40	27	54	35	6	4

* Multiple response

The consumption of processed food items among the girls shows that seven per cent of the selected subjects consumed chocolates daily. Fourty – nine per cent of girls consumed bread once a week. Fifty – four per cent consumed ice cream and73 per cent of girls consumed burgers occasionally.

F. Details on Physical Activity of the selected subjects

a.Types of physical activities among the boys is shown in table XIII

Table XIII –

Types of physical activity among boys

Types Of Physical Activity	Boys									
	1-2 Times		3-4 Times		5-6 Times		7 Times		Never	
	(n=150)	%	(n=150)	%	(n=150)	%	(n=150)	%	(n=150)	%
Skipping	50	33	31	21	16	11	32	21	21	14
Walking	49	33	35	23	20	13	40	27	6	4
Bicycling	29	19	21	14	24	16	68	46	8	5
Running	41	27	34	23	21	14	37	25	17	11
Aerobics	38	25	27	18	16	11	9	6	60	40
Foot ball	40	27	22	15	18	12	42	28	28	18
Volley ball	42	28	22	15	15	10	27	18	44	29

Among the boys, 33 per cent of the selected subjects spent one or two times per week for skipping, walking and 28 per cent preferred playing volley ball. Forty- six per cent of the subjects preferred cycling and 28 percent preferred playing football more than seven times a week. Twenty-seven per cent of the subjects preferred running and 25 per cent preferred doing aerobics one or two times per week.

b. Types of physical activities among the girls is shown in table XIV

Table XIV

Types of physical activity among girls

Types of Physical Activity	Girls									
	1-2 Times		3-4 Times		5-6 Times		7 Times		Never	
	(n=150)	%	(n=150)	%	(n=150)	%	(n=150)	%	(n=150)	%
Skipping	47	31	39	26	15	10	29	20	20	13
Walking	40	27	33	22	28	19	46	31	3	2
Bi cycling	30	20	26	17	31	21	44	29	19	13
Running	46	31	28	19	21	14	38	25	17	11
Aerobics	43	29	20	13	24	16	16	11	47	31
Foot ball	50	33	17	11	15	10	7	5	61	41
Volley ball	38	25	13	9	12	8	21	14	66	44

Among the girls, 31 per cent of the selected subjects spent one or two times per week for skipping and running. Thirty -one per cent of the subjects likes to go for a walk, 29 per cent of the subjects preferred cycling and 33 per cent of the subjects likes to play football more than seven times a week. Twenty- nine per cent of the subjects preferred doing aerobics while 25 per cent played volley ball one or two times a week.

c. Physical education classes is given in table XV.

Table - XV

Physical education classes

Physical Education Classes																	
I don't do PE				**Hardly ever**				**Sometimes**				**Quite often**				**Always**			
Boys		**Girls**		**Boys**		**Girls**		**Boys**		**Girls**		**Boys**		**Girls**		**Boys**		**Girls**	
(n=150)	**%**	**(n=150)**	**%**	**(n=150)**	**%**	**(n=150)**	**%**	**(n=150)**	**%**	**(n=150)**	**%**	**(n=150)**	**%**	**(n=150)**	**%**	**(n=150)**	**%**	**(n=150)**	**%**
6	4	2	1	24	16	21	14	39	26	58	39	18	12	13	9	63	42	56	37

Table XV shows the activity status of 150 boys in physical education classes. It is clear from the above table that 42 per cent of the subjects were very active and four per cent less active in the class.

Among 150 girls, 39 per cent of the subjects were less active, and one per cent were less active during the class. Hence, the girls were less active when compared to boys in the physical education classes.

d.Lunch time activity is given in table XVI

Table - XVI

Lunch Time Activity

Lunch Time Activity															
Sat down				**Stood around or walked around**				**Run or played a little bit**				**Run around and played quite a bit**			
Boys		**Girls**		**Boys**		**Girls**		**Boys**		**Girls**		**Boys**		**Girls**	
(n= 150)	**%**	**(n= 150)**	**%**	**(n= 150)**	**%**	**(n= 150)**	**%**	**(n= 150)**	**%**	**(n= 150)**	**%**	**(n= 150)**	**%**	**(n=150)**	**%**
103	69	106	71	23	15	25	16	14	9	16	11	10	7	3	2

Table XVI, shows that among 150 boys, 69 per cent sat down during lunchtime activities, and seven per cent ran around and played quite a bit.

Among the girls, 71 per cent sat down, and two per cent of them ran around and played quite a bit. The boys were less active when compared to girls during lunch time activities.

e. Evening time physical activities is given in table XVII

Table - XVII

Evening Time Physical Activities

Evening Time Physical Activities															
None				Once				2 or 3 times per week				4-5 times per week			
Boys		Girls		Boys		Girls		Boys		Girls		Boys		Girls	
(n=150)	%	(n=150)	%	(n=10)	%	(n=150)	%	(n=150)	%	(n=150)	%	(n=150)	%	(n=150)	%
20	13	11	7	36	25	29	20	44	29	60	40	50	33	50	33

Table XVII, shows the physical activity status performed during the evening. Out of 150 boys, 33 per cent perform physical activities four or five times per week and 13 per cent does not do any physical activities.

Among the girls, 40 per cent do the physical activities two or three times per week and seven per cent does not do any physical activities in the evening. While comparing with boys, girls were highly active in evening time activities.

Summary and Conclusion

V.SUMMARY AND CONCLUSION

The summary and conclusion for the study entitled,**"Nutritional status and dietary pattern of school-going"** is given below,

Good nutrition is known as getting the proper amount of nutrients (from nutritious foods) in the right quantities. Malnutrition, causes serious risks to human health. Globally dealing with a double burden of malnutrition, which comprises both undernutrition and over nutrition is dealing particularly in low-and middle-income countries.

The diet which is good in nutrients helps to prevent malnutrition in all forms as well as non – communicable diseases like diabetes, heart diseases. The diet which lacks nutrients and physical activity leads to global health risks.

The study was conducted in the School in Ulliyampalayam, of thondamuthur block. The total of 300 school going children aged between 11 – 14 years, based on census sampling, were selected for the study.

The nutritional status of school going children, were using anthropometry measurements. Weight and height measurements were used to calculate BMI for the children which determine the nutritional status. To find out the dietary pattern of school going children, questionnaire was framed to collect information from all 300 school going children.

The consumption of processed food items, by the children and duration of physical activities were noted.

The results of the study are summarised below:

- Among the three hundred subjects selected 37 per cent were in the 12-year age group and 38 percent were in the 13-year age group. Since equal number of boys and girls were selected 50 per cent (150) were boys and 50 per cent (150) were girls.
- Educational status shows that, an equal 35 per cent of subjects were studying in sixth grade and eighth grade respectively. Thirty per cent of subjects were studying in seventh standard.
- Occupational status of the parents shows that, business was the highest with 31 per cent followed by services who were in government sector and labourers. The percentage of farmers was only nine per cent.

- Number of family members of the subjects shows that 78 per cent had three to four members. While two per cent had one to two members where in the grand parents or a single parent were living with them.
- Monthly income level shows that,48 per cent followed by 33 per cent who were economically weak. Only five per cent of the children belong to the high-income group.
- The Body Mass Index calculation of the selected boys shows that 82 per cent boys were in the overweight to obese category. Twenty - two boys were severely underweight while seven were moderately underweight. These finding points out that double burden of malnutrition namely underweight and obesity was both seen among the selected boys.
- The pattern of obesity among the girls also showed similar a picture which 81 girls being overweight and obese while 28 per cent were under weight. Both the boys and girls showed a similar pattern of nutritional status pointing out that good nutrition is essential in the growing age group.
- Scores regarding the consumption of food groups reveals that the food groups such as cereals, other vegetables, legumes, oil and fats, spices and condiments were consumed. On the other hand vitamin- A rich vegetables and fruits, dark green leaf vegetables, fleshy foods were not consumed which shows that the children did not have diverse diet.
- Table IX shows the comparison between processed food items and Body Mass Index. The selected subjects (82 boys) are overweight and obese category. The chi-Square and p-value for processed food items such as bread, sugary drinks, jam were less than 0.05, which signifies that it's statistically significant.
- The consumption of processed food items among the boys shows that nine per cent of the selected subjects consumed chocolates daily. Forty-eight per cent of ice cream were consumed once a week which was higher when compared with other processed foods. Thirty-nine per cent consumed bread twice a week and 49 per cent of burgers were consumed occasionally.
- Table XI shows the comparison between the processed food items and Body Mass Index. The selected subjects (81 girls) come under overweight and obese category. The chi-Square and p-value for all the processed food items were more than 0.05, which signifies that it's statistically no significant.

- The consumption of processed food items among the girls shows that seven per cent of the selected subjects consumed chocolates daily. Fourty – nine per cent of girls consumed bread once a week. Fifty – four per cent consumed ice cream and 73 per cent of girls consumed burgers occasionally.

- **Types of physical activity among the boys shows that, 33 per cent of the selected subjects spent one or two times per week for skipping, walking and 28 per cent preferred playing volley ball. Forty- six per cent of the subjects preferred cycling and 28 percent preferred playing football more than seven times a week. Twenty -seven per cent of the subjects preferred running and 25 per cent preferred doing aerobics one or two times per week.**
- **Among the girls, 31 per cent of the selected subjects spent one or two times per week for skipping and running. Thirty -one per cent of the subjects likes to go for a walk, 29 per cent of the subjects preferred cycling and 33 per cent of the subjects likes to play football more than seven times a week. Twenty- nine per cent of the subjects preferred doing aerobics while 25 per cent played volley ball one or two times a week.**
- Activity status of 150 boys in physical education classes, 42 per cent of the subjects were very active and four per cent less active in the class.
- Among 150 girls, 39 per cent of the subjects were less active, and one per cent were less active during the class. Hence, the girls were less active when compared to boys in the physical education classes.
- Out of 150 boys, 69 per cent sat down during lunchtime activities, and seven per cent ran around and played quite a bit.
- Among the girls, 71 per cent sat down, and two per cent of them ran around and played quite a bit. The boys were less active when compared to girls during lunch time activities.
- Evening time physical activities shows that ,33 per cent perform physical activities four or five times per week and 13 per cent does not do any physical activities.
- Among the girls, 40 per cent do the physical activities two or three times per week and seven per cent does not do any physical activities in the evening. While comparing with boys, girls were highly active in evening time activities.

Conclusion

The study was conducted on “Nutritional status and dietary pattern of school-going children” in Ulliyampalayam, Thondamuthur block. This study has concluded that nutritional status represents, both boys and girls equally belonging to the overweight and obese category. This is due to the interest shown in the intake of processed food items. Although processed food items contain high calorie dense, more salt, more sugar, and high fat. Children does not have sufficient physical activity.These are the effects on children’s health. Both boys and girls had similar traits in terms, of their dietary patterns indicating the reality that each age group needs proper nutrition and care.

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Annexure

ANNEXURE – I

INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam
Institute for Home Science and Higher Education for Women
(Deemed to be university under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956) Re-accredited with 'A^{++}' Grade by NAAC.
Recognised by UGC Under Section 12 B
Coimbatore- 641043, Tamil Nadu, India

06.01.2023

To
Ms. S. Priyadharshini,
Department of Food Service Management and Dietetics
Avinashilingam Institute for Home Science and
Higher Education for Women
Coimbatore- 641043

Dear Priyadharshini,

Ref: Your proposal No. IHEC/22-23/FSMD-18 entitled "Nutritional Status and Dietary Patterns of School-Going Children and the Impact of Dietary Informatics" submitted for approval of IHEC 21.11.2022

The Institutional Human ethics Committee of our University hereby grants approval to your research proposal No. IHEC/22-23/FSMD-18 entitled "Nutritional Status and Dietary Patterns of School-Going Children and the Impact of Dietary Informatics" submitted by you. The Approval number for the same is AUW/IHEC/FSMD- 22-23/XPD-18.

We wish you all the best in your research endeavours.

Regards

6.1.23

Dr. A. Thirumani Devi
Member Secretary

Institutional Human Ethics Committee

ANNEXURE– II

Background Information

1.Name of the student:

2.Gender :

3.Age :

4.Class :

5.School:

6.Number of family members :

7. Monthly income:

8.

Name	Relationship	Age	Occupation	Monthly income

ANNEXURE – III

Anthropometric Measurement

Weight (kg):

Height (cm):

BMI :

ANNEXURE - IV.

24- hour recall

Time /Meal			Day 1			Day 2			Day 3			
	Menu	No	Cup (ml)	Wt (g)	Menu	No	Cup (ml)	Wt (g)	Menu	No	Cup (ml)	Wt (g)
Early Morning												
Break Fast												
Mid Morning												
Lunch												
Mid evening												
Dinner												
Bed Time												

ANNEXURE - V .

Consumption of Processed Food Items

S.no	Processed Food items	Daily	Once a week	Twice a week	occasionally
1.	Noodles				
2.	Pasta				
3.	Pizza				
4.	Burgers				
5.	French fries				
6.	Cakes				

7.	Bread				
8.	Biscuits				
9.	Chocolates				
10.	Sauces				
11.	Sugary drinks				
12.	Jam				
13.	Jelly				
14.	Ice cream				

ANNEXURE - VI.

Dietary diversity scores regarding the consumption of food groups

Question number	Food group	Examples	Yes=1 No=0
1.	CEREALS	corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, noodles, porridge or other grain products) + insert local foods e.g. porridge or pastes or other locally available grains	
2.	VITAMIN A RICH VEGETABLES AND TUBERS	pumpkin, carrots, squash, or sweet potatoes that are orange inside + other locally available vitamin-A rich vegetables (e.g. red sweet pepper)	
3.	WHITE TUBERS AND ROOTS	white potatoes, white yams, white cassava, or other foods made from roots	
4.	DARK GREEN LEAFY VEGETABLES	dark green/leafy vegetables, including wild ones + locally	

		available vitamin-A rich leaves such as amaranth, cassava leaves, kale, spinach etc	
5.	OTHER VEGETABLES	other vegetables (e.g. tomato, onion, eggplant) , including wild vegetables	
6.	VITAMIN A RICH FRUITS	ripe mangoes, cantaloupe, apricots (fresh or dried), ripe papaya, dried peaches + other locally available vitamin A-rich fruits	
7.	OTHER FRUITS	other fruits, including wild fruits	
8.	ORGAN MEAT (IRONRICH)	liver, kidney, heart or other organ meats or blood-based foods	
9.	FLESH MEATS	beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds	
10.	Eggs	chicken, duck, guinea hen or any other egg	
11.	Fish	fresh or dried fish or shellfish	
12.	LEGUMES, NUTS AND SEEDS	beans, peas, lentils, nuts, seeds or foods made from these	
13.	MILK AND MILK PRODUCTS	milk, cheese, yogurt or other milk products	
14.	OIL AND FATS	oil, fats or butter added to food or used for cooking	
15.	RED PALM PRODUCTS	Red palm oil, palm nut or palm nut pulp sauce	
16.	SWEETS	Sugar, honey, sweetened soda or sugary foods such as chocolates, candies, cookies and cakes	
17.	SPICES,CONDIMENTS AND BEVERAGES	Spices(black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages OR local examples	

ANNEXURE-VII

Physical Activity

1.Physical activity in your spare time : Have you done any of the following activities ? If yes how many times?

S.NO	Activity	1-2 times	3-4 times	5-6 times	7 times or more
1	Skipping				
2	Walking				
3	Bicycling				
4	Running				
5	Aerobics				
6	Foot ball				
7	Volley ball				

2. During your physical education (PE)classes , how often were you active ?

I don’t do PE ☐

Hardly Ever ☐

Sometimes ☐

Quite often ☐

Always ☐

3. What do you normally do at lunch (besides eating lunch)

Sat down (talking, reading, doing school work) ☐

Stood around or walked around ☐

Run or played a little bit ☐

Run around and played quite a bit ☐

4. How many evenings did you do sports in which you were very active?

None ☐

Once ☐

2 or 3 times per week ☐

4 -5 times per week ☐