CONSUMPTION PATTERN OF ULTRA PROCESSED FOOD AMONG 13-15 YEARS OF SCHOOL GOING CHILDREN

Dissertation submitted to

ST. TERESA'S COLLEGE (Autonomous)
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Affiliated to

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In partial fulfillment of requirement for the

AWARD OF THE DEGREE OF MASTER OF SCIENCE IN HOME SCIENCE (BRANCH C) FOOD SCIENCE AND NUTRITION

By
SNEHA SEBASTIAN
Register No: AM22HFN011

'Certified as bonafide research work'

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This is to certify that the thesis entitled **"Consumption pattern of ultra processed food among 13-15 years of school going children"** is a research work carried out by Sneha Sebastian under my guidance and supervision.

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DECLARATION

I hereby declare that the thesis entitled **"Consumption pattern of ultra processed food among 13-15 years of school going children"** is a bonafide record of research work done by me during the course of study, under the supervision and guidance of Dr. Rashmi H Poojara, Assistant Professor, Department of Home Science, St. Teresa's College (Autonomous) Ernakulam.

Place: Ernakulam SNEHA SEBASTIAN

Date:

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ABSTRACT

The study titled "**Consumption pattern of ultra processed food among 13-15 years of school going children**" aimed at looking into the consumption pattern and frequency of UPF among subjects. The subjects of study belongs to the adolescent group who are in the transition period of childhood to adult. Adolescents bodies are changing so quickly that they require a higher calorie intake. Adolescent eating patterns may have included skipping meals, eating more often away from home, relying more on ready-to-eat foods, increasing snacking, and showing an interest in dieting. India is currently going through a nutritional shift from processed to ultraprocessed food. One of the main demographics driving this shift toward increased intake of highly processed foods is adolescence. India is changing several of its traditional food recipes to be more UPF. These days, UPF components are widely used in Indian products

The study was conducted in Bhavan's Adharsha Vidyalaya school, Kakkanad Ernakulam. 62 study subjects of age 13-15 years was selected using a purposive sampling method. The subjects consisted of 16 boys and 46 girls. Consents from parents was received for collecting data. An interviewer method was adopted for this. Data on socio-economic status of subjects collected using Kuppuswamy SES 2023. Data on anthropometry and dietary pattern collected. For collecting data on consumption pattern of UPF a specially developed questionnaire was used. The questionnaire was developed based on both NOVA classification and Indian UPF.

Based on the collected data the socio-economic status of subjects was assessed . Anthropometrical assessment was also done which helped in assessing the anthropometric status of subjects. The dietary data collected using developed questionnaire helped in assessing nutritional status and nutrient distribution among subjects. The correlation between dietary intake and SES as well as anthropometry was assessed. No significant correlation was identified with SES but little correlation found with anthropometry. Mean percent calorie distribution of UPF to total diet calorie was found using statistical analysis. A considerable amount of contribution was found. Association of UPF percent calorie to anthropometry and waist circumference was assesd an association was found with anthropometry but not with waist circumference.

By looking into the consumption pattern and frequency of UPF by subjects it was found that almost everyone consumes UPF. UPF items like tetra packed fruit juices, ready-to-heat pasta dishes,

packaged breads and buns, bread alternatives like crackers,rusk ,instant noodles,powdered mixes/batters,namkeens,nachos, flavoured yoghurt,instant chutney, sauces, packaged biscuit and aerated drinks are found with high frequency of consumption.

The study showed increased consumption pattern of ultraprocessed food among school going children of age 13-15 years. Many of these UPF’s are high in calorie,sugar content, transfat and sodium.

CHAPTER 1

INTRODUCTION

Adolescence is a wonderful time to get involved in improving nutritional status and establishing long-lasting, healthy eating and lifestyle habits because it is a period of growing maturity and independence.(Gosdin et al., 2020). Adolescence is a time of significant changes in biology, psychology, and society. People start to take charge of their lives during this time of transition between childhood and maturity. They start making decisions concerning
the kinds of lives people wish to live and establish enduring routines(Story M et al., 2002).Adolescents are people who have made the transition from childhood to adulthood; they are characterized by changes in their body composition, increased size, faster emotional development, physical changes, and psychological changes. (Mahana et al., 2016).

The word "adolescence" comes from the Latin verb "adolescere," which means to develop into adulthood(Chandrakumari and colleagues, 2019). The World Health Organization (WHO) defines adolescents as people who are between the ages of 10 and 19. Adolescents in India comprise of 10% of adolescent girls this group, making up 21.4% of the population (Reshmi & Takalkar, 2020).

A propensity to miss meals, an increase in dining out of the house, a greater reliance on ready-to-eat foods, an increase in snacking, and a growing interest in dieting may have been characteristics of teenage eating habits. Adolescence is a particularly vulnerable time in life to increased energy and nutrient requirements for growth and development, as well as nutritional alterations brought on by these variables (Schenkel et al., 2007).

There has been a noticeable change in the nutritional status of teenagers worldwide during the past 20 years. This change could be connected to global modernity and technological breakthroughs(Kaur et al, 2020).At this age, the child begins to explore his surroundings and grows used to school settings. Children's dietary decisions are heavily impacted by their parents. In this stage of the teenager's development, parents can introduce fresh dishes that support healthy eating practices and fit into diet guidelines. Adolescents should be encouraged by their parents to set an example of good nutrition for their school-age offspring (Fialkowski et al., 2020).

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Adolescents have received less attention in nutrition interventions than women and children in the majority of developing countries. To interrupt the cycle of poverty, chronic illness, and intergenerational malnutrition, it might be important to attend to the nutritional needs of teenagers. Adolescent malnutrition is linked to an increased risk of several chronic diseases in adulthood, according to research from both developed and developing countries (WHO, 2006).

Regardless of their financial situation, adolescents' irregular eating habits are the primary cause of the majority of their nutritional issues. These include, but are not limited to, missing meals (especially breakfast), eating too often, snacking, relying too much on fast food, and not eating enough fruits and vegetables. Their eating habits are influenced by a variety of elements, including self-perception, desire for independence, peer pressure, commercial pressure, and physical appearance consciousness.

In the present study of " Consumption pattern of ultra processed food among 13-15 years of school going children" the consumption pattern of ultra processed food among adolescents was studied. Adolescence's remarkable growth increases the body's need for nutrition and energy. Adolescence is the phase in the life cycle when the total nutritional needs are larger than at any other point. Physical growth and nutrition are closely linked; reaching one's full growth potential requires adequate nutrition. A inadequate diet at this time may have a negative impact on one's health. In order to help prevent adult diet-related chronic diseases like osteoporosis, cancer, and cardiovascular disease, nutrition is especially crucial throughout this time.Adolescent health and general status are typically determined in large part by an individual's nutrition. Sufficient nutrition is especially important for adolescents because it is a major factor in the growth surge that accompanies adolescence.

Diet-related non-communicable diseases are linked to increased consumption of ultra-processed foods, which are often heavy in fats, salt, sugar, preservatives, and additives. Ultra-processed foods are inexpensive, easy to prepare, and very tasty. In contrast to other foods that have had only minimal processing, these items are ready for consumption because of the types of components they use and the processing methods used to create them.(Batis, 2022)

There are no set standards in India for determining UPFs that resemble the Nova food classification system (which classifies foods according to the degree and intent of industrial processing). The Indian scientific literature labels meals as unhealthy if they contain excessive amounts of a particular nutrient, which makes it challenging to differentiate UPFs from other processed foods sold in stores. Since there is no agreed-upon definition for UPFs in India, terms like junk food, fast food, ready-to-eat food, instant food, processed food, packaged food, and high-fat, sugar-and-salt food are used as stand-ins for UPFs. (Kumar et al,2023)

Ultra-processed food items are industrial mixtures composed primarily or exclusively of ingredients extracted from food (fats, oils, sugar, starch, and proteins), generated from food ingredients (modified starch and hydrogenated fats), or created in labs from food substrates or other organic sources (colors, food additives, and flavor enhancers added to make the product extremely appetizing). Among the manufacturing processes are molding, extrusion, and frying for preprocessing. Drinks could undergo extreme processing. (Monteiro et al,2010)

India is currently experiencing a significant "nutrition transition." Food provides us with nutrition and energy, both of which are necessary for healthy life. Dietary recommendations have been developed for the general public in order to prevent sickness and promote health due to the important relationship between food, nutrition, and health. While malnutrition remains the leading cause of death worldwide, morbidity and non-communicable diseases (NCD) are also largely caused by being overweight or obese. Indians' eating habits have significantly changed from traditional, home-cooked meals to a greater intake of packaged and processed foods. One of the industries with the fastest growth is food and beverage, primarily due to rising disposable income, better distribution, and more urbanization. (Kumar et al, 2023)

Because ultra-processed foods are nutritionally imbalanced when compared to diets devoid of ultra-processed foods, analyses of nationally representative dietary surveys carried out in high- and upper middle-income countries have consistently shown that consumption of ultra-processed foods

negatively impacts the nutritional quality of diets. In comparison to minimally processed or unprocessed foods, ultra-processed foods frequently have higher levels of harmful fats, free sugar, and sodium, as well as a larger glycaemic response and a reduced capacity for satiety.

Genetically predisposed children are more likely to develop obesity and diet-related non-communicable diseases in the long run if they are exposed to bad dietary settings. Diets shifting from minimally-processed staple foods (such pulses and coarse cereals) rich in vitamins, minerals, and fiber to refined, processed, and ultra-processed foods (UPFs) are indicative of the fast changing food environment.The Indian population is exposed to a wide range of ultra-processed food products, such as chips, sugar-sweetened beverages, ready-to-cook meals, commercial bakery goods like bread and biscuits, and packaged, ultra-palatable, handy, and economical food items with a longer shelf life. These food items are more prevalent in the food supply, heavily promoted, and geared toward the most susceptible demographics—children and young people, in particular.Convenience food demand has also surged as a result of rising salaries, a rise in nuclear families, a rise in single-person households, and the rise in working women. Additionally, these commercial UPF's have spread throughout the nation's rural areas and are probably entering homes with a variety of socioeconomic and geographic characteristics.

In 2009, Monteiro et al. created the "Nova food classification system," a food classification system based on the purpose and level of processing, to identify UPF's from a wide variety of food products. Foods are divided into four categories by the Nova system: (1) minimally or non-processed foods; (2) processed culinary ingredients; (3) processed foods; and (4) ultra-processed foods. The highly appetizing and appealing UPFs are made via a number of industrial procedures, chemical preservatives, additions, artificial colors, and/or flavors. A number of these food items are poor in dietary fiber, different micronutrients, and other bioactive substances and high in added sugars, trans fats, and saturated or trans fats. (Monteiro et al, 2009)

Overconsumption of UPFs has been linked to increased body mass index (BMI), obesity, and non-communicable diseases (DR-NCDs) such as cardiovascular disease, type-2 diabetes, hypertension, and several malignancies. It's important to comprehend the variety of UPFs on the Indian market and its consumption pattern, given their possible contribution to the country's NCD burden. Early use of highly processed foods affected school-age children's LDL and total cholesterol concentrations (Costa, 2018).Therefore, this paper aimed at assessing the consumption pattern and frequency of

UPF among school going children using a questionnaire developed from both NOVA and Indian UPF classification.

Specific objectives of the study are;

- To asses the socio-demographic profile of the study population using Kuppuswamy SES 2023.
- To asses the anthropometric status of subjects.
- To asses the nutritional status of subjects.
- To determine consumption pattern and frequency of UPF among subjects.

CHAPTER 2

REVIEW OF LITERATURE

A literature review is an academic paper that, when properly formatted, shows the author's familiarity with and understanding of the corpus of research literature on a certain subject. Published data in a particular field are used in a literature review is examined and discussed. When conducted independently, literature reviews can help researchers better comprehend earlier studies in the field, which will make it easier for them to spot gaps in the body of knowledge and possible directions for future research. (Kraus et al., 2022).

The review of literature pertaining to the study **" Consumption Pattern Of Ultra Processed Food Among 13-15 Years Of School Going Children"** is discussed and presented under the following heads;

2.1) ADOLESCENTS NUTRITIONAL NEEDS AND DIETARY PATTERN

2.1.1) ADOLESCENCE

Adolescence is the stage of development and growth that occurs between childhood and maturity. Anybody between the ages of 10 and 19 is considered an adolescent according to the World Health Organisation (WHO). The process of transitioning from childhood to adulthood or the stage of development from puberty to maturity is commonly referred to as adolescence. Being a critical period in life, adolescence offers a special chance to support a positive transition from childhood to maturity. World Population Prospects (2004) estimates that 226 million individuals, or roughly 21% of the entire population of India, are between the ages of 10 and 19, with young adolescents between the ages of 10 and 14 making up the highest share of all young people (i.e., around 116 million)(World Population Prospects, 2004). Puberty and other biological developments, as well as new responsibilities and roles in the family and in social interactions, such as diminished parental involvement and higher academic demands, are the causes of the significant changes in cognitive, behavioral, social, and emotional functioning that occur during adolescence. (Le Bourgeois ,2005)

2.1.2) Characteristics of Adolescence

The adolescent stage is distinguished by a remarkably quick growth rate. Adolescents can gain up to 40–50% of their adult weight and 20% of their final adult height. There is a rise in the demand for nutrients in tandem with this quick expansion. In this time frame, body proportion varies significantly, including indices based on weight and height measurements. Three sub-periods comprise adolescence (Agarwal et al., 2007):
The term "early adolescence" (10–13 years) describes the first stage of transition, which is typically identified by a significant growth spurt. The person still looks, acts, and thinks like a child during the onset of early adolescence.After the observable changes in physical appearance have occurred, mid-adolescence (ages 14 to 16) commences. This is when unexpected mood swings happen. Late adolescence (17–19 years old): At this point, physical maturation is practically complete.

Beginning with a burst of fast physical growth, adolescence is marked by a dramatic succession of bodily changes that eventually lead to sexual maturity. Increased bodily hormone secretions, such as those of testosterone in men and estrogen in women, are what cause these alterations. More than 80% the early stages of adolescence (ages 10 to 14) are when the majority of adolescent growth (attained weight and height) is accomplished (WHO/SEARO, 2006).

2.1.3) The Growth Spurt

The fastest growth happens, on average, at age twelve for girls and age fourteen for boys. It begins and concludes roughly two years earlier in girls than in boys. Girls do not grow as much during this time as boys do, but their two-year head start, so for about a year, they will be heavier and taller than the males. The two sexes are almost equal in height again by the age of thirteen, and the boys are taller by the age of fourteen (Agarwal et al, 2007).

The year before menarche is typically when teenage females gain the most height and weight, and the growth surge lasts for two years after menarche (Agarwal et al, 2007). Empirical data indicates the ideal diet throughout the brief puberty growth stage spurt, which occurs 18 to 24 months before menarche, allows for growth catch-up from nutritional deficiencies experienced earlier in life (Spear, 2002). Rich Indian girls menarche at an average age of 12.6 years (Agarwal et al, 2007).After menarche, girls continue to grow taller and their pelvic bones continue to develop for a few years (Allen et al, 2001).

2.1.4) Nutritional needs during adolescence

Adolescent growth spurts necessitate quick tissue expansion and specific dietary needs, such as amino acids for the development of striated muscle and calcium and vitamin D for the development of bones. Nutrition and energy requirements must correspond with the needs of the teenagers because they usually work out or work out recreationally (boys typically more than females), which promotes the growth of striated muscular mass. Adolescents have an increased appetite, and sedentary people who have access to high-energy foods are more prone to gain weight. Teenagers' inactivity is therefore a major contributing element to rising rates of teenage obesity worldwide. Due to larger gains in height, weight, and lean body mass, teenage boys have a higher caloric demand than teenage girls. According to dietary guidelines, at least 50% of daily calories should come from carbohydrates and no more than 10%–25% should come from sugars such high fructose corn syrup and sucrose. The greatest protein needs per height unit are for according to the typical timing of peak height velocity, for females in the 11–14 age range and for boys in the 15–18 age range.(Prentice et al.2017)

Because their bodies are changing so quickly, adolescents should consume more calories. According to the Healthy Children group, they need more calories each day than they have ever needed at any previous stage of their lives. Generally speaking, teenage boys must

consume 2,800 calories daily, whereas teenage girls should burn 2,200 calories daily. Those who participate in sports or are generally physically active have far higher calorie needs.(Cole et al., 2017).

According to WHO (2006), a person's needs for protein vary depending on their stage of physical development.
Growth and development exhibit regular changes at the point of protein deficiency. Inadequate protein consumption in teens who are still developing might result in delayed or

stunted weight and height gain. Thus, if energy intake is limited, protein from the diet may be used to meet energy requirements rather than being available for tissue repair or the synthesis of new tissues, which could slow down growth.

Consuming foods high in calcium at every meal helps to ensure that needs for calcium and many other minerals are met. According to WHO (2006), poor calcium intake in early life may be the

cause of 50% of hip fracture rates in postmenopausal years.

vitamins D, magnesium, and phosphorus are among the elements needed for strong bones. WHO (2005) states that because of the rapid growth during adolescence, iodine is critical.
Insufficiency results in poor learning outcomes and decreased success.

2.1.5) Special Concern of Adolescent Girls

For girls, the teenage growth spurt begins around age 10–12, whereas for boys, it begins two years later. Adolescent girls have strong growth rates in addition to regular blood loss at menarche, which makes them particularly iron-deficient and increases the likelihood of the the frequency of undernutrition. Accelerated growth during adolescence may exacerbate undernutrition in undernourished girls. Anemia during pregnancy is the cause of one in five maternal deaths, or around 20% of deaths connected to pregnancy. This is a reflection of their anemia, poor nutritional state, and mistreatment of the young girl kid. These issues are exacerbated during pregnancy, when the body has an increased need for iron (Suganya,2019).

In addition, teenage girls who are malnourished have low academic results and low productivity when they enter the workforce later in life. Poor nutrition can affect generations and often begins at birth, continuing into adolescence and adulthood. Girls that are malnourished on a regular basis are more likely to experience chronic malnutrition as adolescents and adults, and are more likely to give birth to low-birth-weight children when they become pregnant. Low birth weight and length are clear signs of intrauterine malnutrition (Agarwal et al., 2000; 2002). The transgenerational cycle of malnutrition refers to the ongoing nutritional issues that affect people at all stages of life, especially women and girls.

In a study conducted in teenage girls of age 12 to 15 years consumption of protein, iron, and calories was lower than needed. The range of hemoglobin was 7.2–8.2 gm/dl. monthly periods, The main causes were shown to be nutritional deficiencies and worm infestation. (Suja et al , 2011)

2.1.6) Dietary Pattern in Adolescents

Regardless of their financial situation, adolescents' irregular eating habits are the primary cause of the majority of their nutritional issues. Among them are skipping meals (particularly breakfast), eating erratically, snacking, relying too much on fast food, consuming insufficient amounts of fruits and vegetables, and so forth. Several of the their eating habits are influenced by a variety of elements, including self-perception, desire for independence, peer pressure, commercial pressure, and physical appearance consciousness. Images that are presented as desirable in the media have a powerful effect on adolescents. (Shrivastav, 2010).

Convenience and processed food consumption is rising as more and more women are working outside the home and as families grow more monogamous. Adolescents have a greater need for quick, ready-to-eat meals. Most people eat processed foods as a component of a meal, as a either as a snack or the entire meal. The bulk of processed foods are high in fat, sugar, or salt, and are typically refined. They typically lack sufficient amounts of vitamins, minerals, and dietary fiber.Regularly consuming low-nutrient snack meals lowers the amount of regular nutritious diet food consumed.

Meal Skipping

The most prevalent occurrence in adolescence is skipping meals, which might have negative dietary effects. Despite the fact that breakfast is seen to be the most significant meal of the day, a lot of people nevertheless appear to have developed the practice of missing it. Not only does skipping breakfast sap energy, but further increases the likelihood of snacking during the day. Additionally, missing breakfast throws off metabolism, which lowers calorie burn.

According to Sjoberg et al. (2003), 54% of teenage females (15–16 years old) in a Swedish study had inconsistent breakfast and lunch intake because they felt their weight was too high.

Snacking and Fast Foods

Adolescents differ more from younger children in that they have greater control over their eating habits, greater access to food outside of their homes, and a greater propensity to experiment with food selections. Teenage females in metropolitan Dhaka, aged 10 to 19, stated that eating fast food provided them with a "feeling of comfort, fresh mind, and enjoyment with friends" (Parveen and Begum, 2003). Fast food was the preferred option for adolescents due to its accessibility, convenience, flavor, and ability to be consumed quickly, even in a rush.

Food likes and dislikes / food preferences

Teenagers' dietary habits are influenced by their physiological, psychological, and social conditions. In a study of 511 schoolboys in Delhi aged 13 to 19, it was found that 81% of them enjoyed soft beverages, chips, chocolates, ice cream, and biscuits consumed one or more of these nearly every day. Still, 60% of boys and 19% of girls did not eat vegetables and milk products, which are less popular diets (Vibha and Sibal, 2003). As a result, adolescents frequently favored foods high in energy, with vegetables ranking last on their list of least favorites.

2.2) NUTRITION TRANSITION AND ITS IMPACT

The industrial revolution brought about a transformation in the food business. The majority of processed foods in use today originated to meet military requirements. To supply French troops, the vacuum bottling process was developed, which paved the way for the development of canning and tinning.

Pasteurization was found to be a key advancement in the food sector, as it guaranteed the microbiological safety of food, particularly milk. The space race, World War II, and the emergence of a consumer-driven culture were the main forces behind the food industry, particularly in the United States. In these periods, the public took a strong interest in ready-to-eat meals due to the advent of artificial sweeteners, coloring agents, and preservative agents, as well as modern techniques including freeze drying and food concentrates (APEC USA, 2020).

Food goods were heavily marketed to working moms and wives in the second half of the 20th century, as women began to hold more jobs. Time-honored meals like frozen foods and juice concentrates were particularly popular. (Toops , 2010).

It is anticipated that by 2025, the Indian food processing market will have grown from USD 263 billion in 2019–20 to USD 535 billion. India contributed significantly to global exports in 2010 with a 2.6% share, and from 2015 to 2019, it grew at a CAGR of 2.6% (KPMG, 2021).

According to the KPMG research (2021), pre-packaged meals, snacks, dairy products, and the ready-

to-eat (RTE) category have all seen increases in uptake and demand recently in rural and semi-urban India due to the Covid-19 pandemic.

Six major sub-sectors make up the Indian food processing industry: dairy, meat and seafood, cereals, grains & oilseeds, fruits & vegetables, non-alcoholic drinks, and packaged food.
Over the previous five years, the Indian industry grew by 10%, driven by the meat and marine, dairy, and segments for packaged foods. The market for packaged foods is expanding at a 16% compound annual growth rate (CAGR) because to increased demand for snacks, value-added dairy products, frozen meat, and RTE. Maharashtra, Gujarat, Uttar Pradesh, Karnataka, and Tamil Nadu contributed more than 50% of the gross value add (GVA) in the 2017–18 year. (KPMG, 2021)

2.3) ULTRA PROCESSED FOOD CLASSIFICATION AND CONSUMPTION TREND

2.3.1) Food Classification Systems

Food processing is the process of modifying harvested foods to improve their preservation and suit customer needs. Food processing is crucial to the population's access to safe, wholesome, and delicious food as well as to the preservation of food by extending its shelf life and lowering the risk of foodborne illness and can also enhance the nutrients' or bioactives' bioavailability and digestibility. Food processing comprises various operations such as washing, grinding, mixing, cooling, storing, heating, freezing, filtering, fermenting, extracting, extruding, centrifuging, frying, drying, concentrating, pressurizing, irradiating, microwaving, and packaging. These operations are outlined in Floros et al.'s (2010) and Sadler et al.'s (2021) descriptions.

There is a general lack of positive public perception and misinformation regarding processed foods.The primary goal of Sadler et al. (2021) investigation into the foundations of food classification schemes was to learn more about the connection between industrially processed food items and health. Sadler et al. (2021) found four defining themes underneath each food classification system, not withstanding the lack of agreement on the criteria determining the degree of food processing. These themes include:

1. Degree of alteration (from original state)
2. Character of alteration (adding ingredients, changing attributes).
3.Processing location (where/by whom); and

4.The reason for processing .

Food classification systems incorporate subjective terminology and socio-cultural aspects, such as naturalness degree and home cooking. The majority of food classification systems suggest a relationship rather than providing precise measurements of nutrient content.

2.3.2) NOVA classification of foods

A sizable industry, food processing includes fisheries, plantations, horticulture, agriculture, and animal husbandry. It also covers related industries that produce food goods using agricultural inputs. The scope and intent of food processing have evolved.

The global food system is recognized to be adversely affected by these changes, which is one of the main reasons behind the sharp increase in chronic non-communicable diseases like obesity and other nutrition-related chronic illnesses. The majority of food that is currently consumed has been treated in some fashion, so classifying food as unprocessed or processed is insufficient to determine which food is safe to eat and which is hazardous. (Monteiro,2009).

In order to categorize foods and food products according to the degree and intent of the industrial procedures used to extract, manufacture, preserve, or alter them, a new system called NOVA was created. The NOVA food categorization system is widely used and published throughout numerous research on the availability of food, diet quality, and health consequences. Food products are divided into four major types according to the degree and purpose of processing according to the NOVA categorization, which has changed since 2009 (Monteiro et al., 2010, Moubarac et al., 2014, Sadler et al., 2021).

"The NOVA classification considers all physical, biological, and chemical methods used during the food manufacturing process, including the use of additives," according to Monteiro et al. (2019). Greater characteristics that set dishes apart from one another are natural versus imitation,
food that is industrial, has not undergone multiple processing stages, is made from whole foods as opposed to fractioned substances (little or no whole food), is derived from food and can be recognized as food as opposed to not, has one, two, or three ingredients as opposed to five or more, has no added fat, sugar, or salt as opposed to being added to whole foods as opposed to formulations, has no additives for safety or preservation as opposed to cosmetics, is prepared at home as opposed

to having no domestic equivalent, and is likely to be overconsumed (due to convenience, marketing, and hyperpalatable).

The processed food is classified into four groups: Unprocessed or Minimally Processed Foods, Processed Culinary Ingredients, Processed Foods, Ultra Processed Foods (Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

GROUP 01: Unprocessed or Minimally Processed Foods

Meaning: "Unprocessed" After being separated from nature, edible components of plants (fruit, seeds, leaves, stems, roots, and tubers) and animals (muscle, fat, offal, eggs, and milk) can be found. Fungi and algae can also be used. Water from the spring and the tap. very little processing foods not processed yet modified by industrial procedures that don't include adding salt, sugar, oils, fats, or other food ingredients to the original food include vacuum packaging, drying, powdering, squeezing, crushing, grinding, fractioning, steaming, poaching, boiling, roasting, and pasteurization along with chilling, freezing, and putting in containers. The major goals of these procedures are to increase the shelf life of unprocessed foods, allowing them to be stored for longer periods of time, or to make them palatable and, frequently, easier to prepare.(Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

Examples; Legumes such beans, lentils, and chickpeas; starchy roots and tubers like potatoes, sweet potatoes, and corn cobs or kernels; grains like brown, parboiled, or white rice; fresh, squeezed, chilled, frozen, or dried fruit and leafy and root vegetables grits, flakes, or flour made from corn, wheat, oats, or cassava; fungi such as fresh or dried mushrooms; meat, poultry, fish, and seafood, whole or in the form of steaks, fillets, and other cuts; fresh, powdered, chilled, or frozen eggs; fresh, powdered or pasteurized milk; fresh or pasteurized fruit or vegetable juices (without added sugar, sweeteners, or flavors); tree and ground nuts and other oily seeds (without added salt or sugar); herbs and spices used in culinary preperations.(Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

GROUP 02: Processed Culinary Ingredients

Definition: "Substances that are extracted, refined, extracted, mined, pressed, centrifuged, or obtained directly from group 1 foods or from nature through industrial processes." used to cook, season, and prepare items in category 1. Additives that extend the shelf life of the product and provide protection to original characteristics or stop microbes from multiplying.(Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

Examples include: butter and lard from milk and pork; sugar and molasses from cane or beet; honey from combs and syrup from maple trees; vegetable oils pulverized from seeds, nuts, or fruit (especially olives); starches extracted from corn and other plants; added antioxidants to vegetable oils; seawater or mined salt; and table salt with additional drying agents. contains goods like salted butter that are part of group 2 as well as group 2 items that have additional vitamins or minerals, such iodized salt.(Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

GROUP 03: Processed Foods

"Products made by adding salt, oil, sugar, or other group 2 ingredients to group 1 foods, and using non-alcoholic fermentation for breads and cheeses, as well as canning and bottling preservation techniques." Here, the components and procedures are intended to boost the robustness of foods in group 1 and improve their sensory aspects to make them more pleasurable. They could have ingredients to extend the shelf life of the product, preserve its original qualities, or stop microbes from growing.(Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

Examples include preserved fish (with or without added preservatives), fruit in syrup (with or without added antioxidants), freshly produced unpackaged foods, canned or bottled vegetables and legumes in brine, salted or sugared nuts and seeds, and salted, dried, cured, or smoked meats and fish.(Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

GROUP 04: Ultra-Processed Foods

Definition: "ultraprocessed" refers to mixtures of materials, the majority of which are exclusively used in industry and are produced by a number of industrial processes, many of which call for advanced machinery and technology. Ultra-processed foods are created by breaking down complete foods into their component parts, modifying these parts chemically, and assembling both unprocessed and changed food ingredients utilizing industrial processes such prefrying, molding, and extrusion; usage of additives at different manufacturing stages, which serve to make the finished product edible or extremely palatable; and elegant packaging, typically made of synthetic materials like plastic. (Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

High fructose corn syrup, hydrogenated or interesterified oils, protein, and other sources of energy and nutrients that are not used in cooking are examples of ingredients. Sugar, oils, or fats, and salt are also typically included in combinations. isolates, classes of additives like flavors, flavor enhancers, colors, emulsifiers, sweeteners, thickeners, and agents that prevent foaming, bulking, carbonating, foaming, gelling, and glazing; and additives that extend the shelf life of the product, preserve its original qualities, or stop the growth of microorganisms. Ultra-processed food products are manufactured using ingredients and processes that are intended to provide very profitable (extended shelf life, low cost of ingredients, strong branding), convenient (ready-to-consume), and extremely delicious products that could eventually replace freshly made meals and dishes. (Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

Examples include packaged snacks, chocolate, sweets, ice cream, ready-to-eat items such carbonated soft beverages, packaged sweet or savory snacks, mass-produced packaged breads and buns, margarines and other spreads, cookies (biscuits), pastries, cakes, and cakes. mixes; energy drinks; milk drinks, "fruit" yogurts and "fruit" beverages; "cocoa" drinks; "instant" sauces; breakfast "cereals," "cereal," and "energy" bars. Numerous premade, easily reheatable items, such as pies, spaghetti, and pizza meals; fish and poultry "nuggets" and "sticks"; sausages, burgers, hot dogs, and other dehydrated meat products; and packed, powdered, "instant" soups, noodles, and desserts. formulae for babies, follow-on milks, and other infant supplies; "health" and "slimming" goods, like powders and shakes for meal replacements.(Monteiro et al, 2010, Moubarac et al, 2014, Monteiro et al, 2019).

2.3.3) Indian UPF screening tool

Diet-related non-communicable diseases are linked to increased consumption of ultra-processed foods (UPFs), which are often rich in salt, sugar, fats, preservatives, and additives. There are no set standards in India for determining UPFs comparable to the Nova food categorization (according to the scope and intent of industrial processes). Because foods are classified as harmful in Indian scientific literature due to the presence of high amounts of certain nutrients, it might be challenging to differentiate commercially available processed foods like UPFs from other foods. Since there is no standard definition for UPFs in India, terms like junk food, fast food, ready-to-eat food, instant food, processed food, packaged food, and high-fat, sugar-and-salt food are used as stand-ins for UPFs. (Kumar et al, 2023)

A literature analysis and an online grocery market survey were used by Kohli et al. (2023) to map the availability and consumption of UPFs in Indian food markets. The research used no uniform terminology to classify the types of UPFs ingested in India between 2012 and 2022, during the literature review period. Research has combined a number of food categories under fictitious names to give an overview of the UPF landscape in India. Data from other nations, like Brazil, Ecuador, and Argentina, also point to the necessity of a uniform, precise definition of UPFs in order to avoid misclassification.According to saliency research, the most favored UPFs among Indians were sugar-sweetened beverages, whereas the least favored UPFs were frozen non-vegetarian foods. This might also be linked to the length of time that sugar-sweetened beverages have been available in the Indian market, whereas frozen snacks are a very recent addition. (Kumar et al, 2023)

Following an analysis of the UPF ingredient list, it was discovered that the substances used in the product formulation of a number of traditional Indian meals have changed from being unprocessed or mildly processed to ultra-processed components. With the use of artificial colors, flavors, anti-caking agents, and other additives, the new generation of traditional Indian cuisine has evolved into UPFs. Based on the ideas of the Nova food classification system, 24 subcategories of UPFs for India were developed .(Kohli 2023)

2.3.4) Increased demand of UPF and rise in consumption

The term "nutrition transition" describes how a person's food habits shift over time from traditional to westernized. The transition to a healthier diet also includes changes in the economy, population, and epidemiology. A shift in nutrition occurred in developed countries over a longer time period as opposed to emerging nations, where this major nutritional shift occurred in a matter of decades. Ultraprocessed food consumption is surging and is displacing the usage of fresh, naturally occurring, indigenous, home-cooked, and culturally acceptable food. According to Law et al. (2019), there has been a noticeable shift in the consumption of sugar, oil, and highly processed meals among Indians in recent times, particularly in metropolitan areas.

Studies have shown that although the average American, Canadian, or British consumer gets between 50 and 60 percent of their daily calories from ultra-processed foods, the average Indian consumer gets only 10 percent of their daily calories from ultra-processed foods, and that number is rising quickly. urban homes found that processed food consumption was highest, accounting for 30% of daily caloric intake. According to studies by Pagliai et al. (2020) and Sharma et al. (2020), the calorie proportion of processed food is highest in Southern India and lowest in North-Eastern and Northern India.Similarly, a recent NIN-ICMR analysis (Hemalatha et al, 2020) discovered that additional items such as chips, cookies, chocolates, drinks, candies, accounted to 11% of daily calorie consumption in urban regions, whereas 4% of the same products were consumed in rural areas.

Between 1998 and 2012, 79 high- and low-income nations' per capita sales of ultra-processed foods, such as frozen goods, snacks (which include candy, ice cream, and savory and sweet nibbles), and soft drinks, were analyzed. The results showed a consistent rise in the sales of frozen goods have increased globally, but sales of soft drinks and snacks have consistently increased in middle-income nations. A study of 19 European nations found that in Portugal, 10.2% of household food was made up of ultra-processed foods, compared to 50.4% in the United Kingdom. Crucially, a strong positive correlation was shown to exist between the national prevalence of adult obesity in these nations and the availability of ultra-processed foods (Dadhich ,2018). According to Ponce et al. (2017), ultra-processed foods accounted for 29.8% of the calorie consumption in the Mexican diet and were more common among preschoolers than in other age groups.

Large multinational food manufacturing, retailing, and fast-food service firms are currently molding and influencing the global food systems through extensive promotion of ultra-processed items, which drives their profits.(Monteiro et al,2019)

Similarly, a study on the changes in the purchase of ultra-processed foods from 1984 to 2016 carried out in Mexico revealed that the purchases of ultra-processed foods have doubled over the last three decades, coinciding with a slow decline in the sales of unprocessed or slightly processed meals.The sociodemographic shifts in household size and composition, income, education level, women's occupations, urbanization, and geographic location can all contribute to this upward trend. These tendencies are also significantly influenced by other societal, environmental, and macroeconomic aspects (Ponce, 2019).

2.3.5) Nutrition Quality of Ultra-Processed Food

According to multiple studies cited by Sadler et al. (2021), the term "ultra-processed foods" is synonymous with "junk food" or "empty calories." Ultraprocessed foods are defined as "intrinsically unhealthy" as they are high in calories and low in fiber and protective micronutrients, or "empty" calories. Numerous investigations have been conducted to evaluate the nutritional value or makeup of processed foods in different regions of the world. (Monteiro et al, 2019)

1. Sodium in Ultra-processed foods

Due to their higher sodium content for reasons of palatability or food safety, processed foods and foods from restaurants are likely to contribute to increased sodium consumption (He and MacGregor, 2009).

Singh and Chandorkar's (2018) study, which examined Indian packaged goods, revealed that soups had the greatest sodium level (4823 mg/100 g), followed by noodles, pasta, and macaroni (1360 mg/100 g) and chips (1118 mg/100 g).

Similarly, Johnson et al. (2017) discovered that soups (2117 mg/100 g), vegetable pickles (1759 mg/100 g), sauces and spreads, and herbs and spices had the greatest mean sodium concentration. The average sodium content of products from 2010 and 2014 was also compared in the study, and it was discovered that there was a rise in cereal and grain products (+30%), dairy and dairy substitutes (+99%), non-alcoholic beverages (+103%), and sauces and spreads (+50%), but a decrease in none of these categories.

2. Sugar in Ultra-processed foods

Another significant nutrient in ultra-processed foods is added sugar, which is defined as industrially manufactured, refined sugars (often sucrose) that are added to food at the table or as an ingredient in processed foods (Usmanova and Thor, 2003). Over the past few years, fructose, often known as "high-fructose corn syrup," is widely used in soft drinks, baked products, sauces, prepared desserts, and other processed foods. It has replaced sucrose in many processed foods due to its low cost (Elliott et al., 2002).

According to a four-city study conducted in India (Gulati et al, 2013), there is a significant intake of sugar-sweetened beverages and sweet snack foods. Between one and three times per week, the majority of youngsters drank sweetened aerated beverages, sweetened beverages, and sweetened fruit drinks.

According to a 2017 survey by the Centre for Science and Environment (Bhushan et al) with 13,274 students in grades 9 through 17, 53% of children ate packaged food or drinks at least once a day and sweet, highly processed foods like chocolate and ice cream on average more than twice a week. 49% of kids drank ultra-processed, sugar-sweetened beverages more than twice a week on average.

3. Fat in Ultra-processed food

Many nations throughout the world are attempting to estimate the amount of trans fatty acids (TFA) in ultra-processed meals and are devising strategies to lower the TFA levels through strict laws and novel product developments. TFAs are frequently included in shortenings, baked goods,
cooking oils and margarines. Through an amendment to the Food Safety and Standards (Prohibition and Restriction on Sales) Regulations, the Food Safety and Standards Authority of India (FSSAI) has limited the amount of trans fatty acids (TFA) in oils and fats from the current permissible limit of 5% to 3% for 2021 and 2% by 2022 (FSSAI, 2021).

Chinese packaged foods and beverage products had the highest median saturated fat level (3.4 g/100 g), whereas Canadian packaged foods and beverage products had the lowest median (Dunford et al, 2019). The study compared the healthiness of packaged foods and beverages from 12 different countries followed by Mexico (1.1 g/100 g) in terms of saturated fat content (1.0 g/100 g). With a

median saturated fat content of 14.3 g/100 g, edible oils were the food group with the highest content, followed by confectionary with 10.7 g/100 g.

According to a study by Reshma et al. (2012), cakes had the greatest fat content (25.36±2.49%) of all packaged and labeled bakery foods, while puff products had the highest trans-fat level (3.09±1.5%). Cakes had the highest levels of free fatty acid, while biscuits had the lowest.

CHAPTER 3

METHODOLOGY

Research methodology is the methodical, theoretical examination of approaches used in a field of study, encompassing data collecting, result interpretation, and conclusion formation (Sauders et al, 2016). Kumar (2019) indicated that research methodology is "the way in which research problems are systematically studied and solved." Research methodology is defined as "the philosophical and theoretical framework that inform the design and conduct of research" (Saunders et al, 2018). Research methodology is a structured approach used to plan, conduct, and analyse investigations. Research methodology is the primary principle that will guide (Dawson, 2019). A research methodology is a plan for carrying out research. A research methodology describes the techniques and procedures used to identify and analyze information regarding a specific research topic. It is a process by which researchers design their study so that they can achieve their objectives using the selected research instruments. A research
methodology provides a framework and guidelines for researchers to clearly define research questions, hypotheses, and objectives.

The methodology of the present study can be discussed under the following heads:

3.1 Selection of area
3.2 Selection of subjects
3.3 Selection of methods
3.4 Selection of tool and techniques
3.5 Data analysis and interpretation.

3.1 Selection of area:

Ernakulam, one of the most urbanized districts in Kerala, is the study locale. Urban areas often experience changes in dietary patterns due to increased availability of processed and fast foods. This can lead to a shift towards diets that are high in calories, sugars, and saturated fats but may lack essential nutrients. Urbanization may improve access to diverse food options, but it can also result in the prevalence of food deserts, areas with limited access to fresh and nutritious foods, impacting

overall nutrient intake. The present study was conducted in Bhavan's Adarsha Vidyalaya School, Kochi Kendra is a senior secondary school affiliated to the Central Board of Secondary Education. The school is situated at Kakkanad, Kochi, Kerala. School children are exposed to energy dense foods as most food chain outlets and franchises target children for marketing their junk food products, which provide little nutrition but of high caloric content and leads to unhealthy weight gain. The particular school was selected to investigate the nutritional status variations and their associations with socio-demographic factors among school going children in urban setting, a population that is potentially going through a nutritional transition due to the quick changes in eating habits brought about by globalization.

3.2 Selection of subjects:

Sampling is defined as a procedure to select a sample from individual or from a large group of population for certain kind of research purpose (Bhardwaj, 2019). Sampling can be defined as the process through which individuals or sampling units are selected from the sample frame.According to Bhardwaj (2019), sample is a small portion of the population from which information may be collected and analyzed for the purpose of describing or making conclusion or inferences on the total population. A sample is a subset of a population of individuals, objects, or events chosen to participate in a research study (Grinnel et al., 2010).

Subjects selected for the study include school going students in the age of 13-18 year. A total of 62 subjects (18 boys and 44 girls) were selected by using purposive sampling method. The purposive sampling technique, also known as judgment sampling, is the purposeful selection of an informant based on their traits. It is a non-random technique that does not require underlying ideas or a predetermined number of informants. The researcher determines the necessary information and seeks out individuals with relevant knowledge or experience.
(Tongco, 2007)

Purposive sampling is ideal for studying a small universe with specific characteristics. The sample is chosen based on a specific objective, excluding individuals who do not fit the criteria. The purposeful method empowers researchers to extract valuable information from samples,relying heavily on their abilities, judgment, and intellect.

The primary goal of purposive sampling is to focus on particular characteristics of a population that are of interest. The sample being researched is not representative of the population, but for researchers using qualitative or mixed methods research designs, this is not a problem (Rai and Thapa, 2015).

Permission was seeked to conduct the study at the school. Once the permission was granted, a consent form was given to 100 students out of which 62 students gave consents to collect their dietary information. After that one- on- one personal interview was conducted to collect the data.

3.3 Selection of method:

Interview method is adopted for data collection in the present study. An interview method is a qualitative research approach in which researchers interact directly with participants to gather information, opinions, or insights about a specific topic. The interview method of data collection entails presenting oral-verbal stimuli and receiving oral-verbal responses. The method of collecting information through personal interviews is usually carried out in a structured way. Such interviews use a planned list of questions. In structured interviews, the interviewer follows a set protocol and asks questions in a specific order.

Interviewing is an art form regulated by scientific principles. Interviewers should be carefully selected, trained, and instructed to ensure the interview method's success. They should be honest, truthful, industrious, and impartial, as well as have the appropriate technical knowledge and practical expertise. (Kothari, 2004)

The information pertaining to socio-demographic profile, anthropometry, and dietary status of the subjects were obtained by conducting one- to- one interview.

3.4 Selection of tool and technique for data collection:

The tool and technique used for data collection was a developed questionnaire and structured interview. “A questionnaire is a research tool consisting of a series of questions and other prompts for the purpose of gathering information from a sample of individuals”- Neumann (2018).

The answers to the question form the primary data for investigation. A successful research requires a well-designed questionnaire, which will directly achieve the research objectives, provide complete and accurate information, is structured to allow for sound analysis and interpretation. The primary tool used for data collection is the questionnaire. An interviewer administered FFQ developed based on both NOVA classification and Indian UPF classification was used. (Appendix 4) One-on-
One interview method is adopted to gather information from the subjects.

Interview schedule include the following:

- Socio-demographic profile
- Anthropometric data
- Dietary status using FFQ

The primary data was collected from the sample population through survey method. A pilot study was first conducted among ten subjects and necessary modifications were done based on the results obtained from the pilot study. The pretested questionnaire was used for data collection.

Socio demographic data:

Socioeconomic status (SES) is a significant indicator to access the health status of a family. The evaluation of SES is done by considering a family's income, level of education, and the occupation of the head of the family. It indicates a family's overall health and their access to resources. In India, the updated modified Kuppuswamy SES is used to access the socioeconomic status of urban residents. The updated modified Kuppuswamy SES for the year 2023 in India was chosen for the present study.
The components of Kuppuswamy SES (2023) is included in (Appendix 1) of the study. Based on the scoring of Kuppuswamy socioeconomic status scale (2023)subjects were categorized as depicted in Table 1.

Table 1. Socioeconomic class on the basis of modified Kuppuswamy scale, 2023

SL. No.	Total score	Socio economic class
1.	26-29	Upper (I)
2.	16-25	Upper middle (II)
3.	11-15	Lower middle (III)
4.	5-10	Upper lower (IV)
5.	<5	Lower (V)

Anthropometric Measurement:

Anthropometry, helps diagnose malnutrition and obesity. It is a vital part of pediatric evaluations as well as the assessment of an adult. Body height is one of the main anthropometric measurements obtained in children and adults. The measured value is compared to a reference population and monitored over time to ensure adequate growth. These measurements were used to assess the physical development of the selected group of study. Various anthropometric measurements used were height, weight and BMI. Anthropometry focusses on development of bodily features such as body shape and body composition (static anthropometry), the body's motion and strength capabilities and the use of space (dynamic anthropometry) (Herron, 2006).

Height:

The height of an individual is an inherent characteristic that has clinical implications in assessing nutritional status, estimating body mass index (BMI), and diagnosing underlying disorders in children and adults. Height or stature measurement is valuable and practical method in assessing the growth of children (Dhingra et al., 2010).

Procedure: Height was measured using Stadiometer. The stadiometer consists of a ruler and a sliding horizontal headpiece which can be fixed above the head to measure height. The subjects were asked to remain barefoot. Both feet were together with heels, buttocks, shoulders touching the wall. They

were asked to stand erect looking straight ahead the top of the ear and the outer corner of the eye were in line parallel to the floor. The hands were hanging by the sides in natural manner and a horizontal bar was allowed to rest flat on top of the head and height was recorded to the nearest 0.1 cm.

Weight:

Weight is a sensitive indicator of malnutrition and can be useful for diagnosing acute protein calorie malnutrition in children of all age groups. Normal growth and development pattern affecting body shapes and sizes could be inferred using body weight measurements in children (Barslow, 2007). Weight is an important part of the physical growth of children and is an indicator of health and wellness. Recording of weight helps in monitoring the growth of children and in detecting any weight irregularities in comparison with standard growth charts (CDC, 2011).

Procedure: Weight can be measured by using a calibrated digital weighing scale. The subject was asked to stand erect on the scale without touching anything, with no heavy clothing or foot wear and looking straight ahead. Ensured that the subjects were not wearing any heavy jewelry while taking the weight. The weight was then taken twice in order to ensure accuracy. The weight should be measured to the nearest 0.1 Kg.

Body Mass Index (BMI):

The body mass index (BMI) is the metric used for the evaluation of overweight and obesity and are classified based on percentile cut off points. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems (CDC, 2011).BMI is calculated by dividing weight in kg by the square of height in meters. The calculations were compared with standard for classification of the sample.

$$BMI = \frac{\text{Weight (Kg)}}{\text{Height (m2)}}$$

BMI percentiles are the most commonly used indicators to assess the size and growth patterns of individual children. The percentiles indicate the relative position of the child's BMI number among children of the same sex and age and denotes whether a child is underweight, healthy weight, overweight or obese (CDC, 2011). The percentile classification of BMI recommended by IAP is included in (Appendix II) of the study.

Table 2: Classification of subjects Based on Body Mass Index

SL No.	BMI Percentiles	Nutritional status
1.	< 3	Thinness
2.	3-23	Normal weight
3.	23-27	Over weight
4.	>27	Obese

(IAP, 2015)

Waist Circumference:

Waist circumference is the measure of distance around the abdomen. It measures central adiposity. Waist circumference predicts metabolic syndrome abnormalities in children (Hirschler, 2007). Waist circumference is also a predictor of insulin resistance syndrome in children and adolescents and could be included in clinical practice as a simple tool to help identify children at risk (Hirschler et al., 2007).

The WHO STEPS protocol for measuring waist circumference instructs that the measurementbe made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest (WHO, 2008). A stretch resistant fiber glass tape was used for the process and the tape was extended around the waist of the children at the superior border of the iliac crest. The tape was positioned in the horizontal plane to the site of measurement. The tape was checked for its parallel position to the floor and that it did not compress the skin. The readingshould be taken to the nearest 0.1cm.

Table 3. Classification of subjects based on waist circumference

SL No.	WC Percentiles	Nutritional status
	≤ 70	Normal
	>70	Central adiposity

(IAP, 2023)

Dietary assessment:

Processed and ultra processed food consumption are widely increasing among people and it's consumption pattern are more among adolescents. Adolescents are seen to show unusual eating pattern which affects their growth and development. A standardised food frequency questionnaire is essential for collecting data on ultra processed food pattern.

A Food Frequency Questionnaire is an indicator of habitual intake. FFQ is a preferred way of evaluating intake for nutrients with high day-to-day fluctuation, and it is intended to rank individuals based on their intakes. FFQs are useful for recording changes in dietary patterns over time, which allows for longitudinal analysis of the impact of food on health outcomes. FFQs are advantageous since they have a low respondent burden.

NOVA classifies food items into four categories which are ; minimally processed, processed culinary ingredients, processed foods and ultra processed foods. But based on this it is not able to find out UPF's in India because Indian foods undergo many alterations and include addition of many ingredients which are identified ingredients of UPF's. Inorder to solve this problem a grocery survey study and literature review was done by Kumar et al, 2023 and based on this 24 subcategories of Indian UPFs was identified and listed. (Appendix 3)

For the present study a combination of both classification systems was used. A standard FFQ was developed from both NOVA classification and Indian classification of UPF's. (Appendix 4). Using

this FFQ interviewer administered method was used to get relevant information as the study subjects were school students. The tool used to collect information is included in (Appendix 4) of the study.

Nutrient intake was computed from the collected information using DietCal software. DietCal is a tool for dietary assessment and planning developed by Gurdeep Kaur and marketed by profound tech solutions. DietCal has a data bank that contains information about numerous nutrients, food items, food groups, nutritional values, and food measures. In addition to the 117 nutrients added to the software by IFCT (2017), NIN, and ICMR, more nutrients can be added. Aside from the 542 food items (from IFCT 2017) that have been included in the dietcal, there is provision to add more nutrients. In addition to the ones already listed, other food groups can be added. The software also provides several size measures such as kattori, spoons, scoops, ladles, plates, and edible portion weight. For research purposes, subjects details including basic background information and anthropometric data be added prior to the entry of food intake.
After entering all the foods consumed by each of the subjects, there is provision for analyzing the nutrient intake which can be exported to excel for further analysis.

3.5 Data analysis and Interpretation

Statistical methods involved in carrying out a study include planning, designing, collecting data, analysing, drawing meaningful interpretation and reporting of the research findings. The data collected for the study was edited, coded, tabulated and statistically analyzed. The data was entered into the MS Excel spreadsheet and was subsequently analysed using IBM SPSSversion 20 (Chicago USA). Distribution of categorical variables were represented in number and percentage. Numerical variables were represented in mean and standard deviation also median and quartiles.

To test the statistical significance of the difference in the mean or median values of all
continuous variables between categories of BMI and SES, One way ANOVA for normal data and Kruskal Wallis test for skewed data was applied. A p value of < 0.05 was considered to be statistically significant.

CHAPTER 4

RESULTS

The results of the study entitled "**CONSUMPTION PATTERN OF ULTRA PROCESSED FOOD AMONG 13-15 YEARS OF SCHOOL GOING CHILDREN"** discussed under the following headings:

4.1 Sociodemographic profile of subjects

4.2 Anthropometric profile of subject

4.3 Nutritional status assessment of subjects

Table 4. **SOCIODEMOGRAPHIC PROFILE OF SUBJECTS (n=62)**

Criteria	**Frequency (n)**	**Percentage (%)**
Age (years)		
13	26	41.9
14	29	46.7
15	7	11.2
Gender		
Male	16	25.8
Female	46	74.1
Type of Family		

Nuclear	43	69.3
Joint	17	27.4
Extended	2	3.2
Number of Family Members		
2	1	1.6
3	10	16.1
4	26	41.9
5	14	22.5
6	7	11.3
7	2	3.2
8	1	1.6
9	1	1.6
Socio Economic Class*		
Lower	0	0
Upper lower	0	0
Lower middle	2	3.2

Upper middle	35	56.5
Upper	25	40.3

***Kuppuswami Socio Economic Scale, 2023**

Table 1 looks into the socio demographic profile of subjects of number 62. Here age ,gender, type of family of subjects, their number of family members and their socio economic class are assessed using Kuppuswami Socio Economic Scale ,2023.

Among the total subjects 46.7 percent belongs to 14 years of age, 41.9 percent belongs to the age 13, and 11.2 percent subjects belongs to the age 15. From the total subjects 74.1 percent represents the females and remaining 25.8 percent is males.

On studying the type of family it was seen that 69.3 percent of the subjects belong to nuclear family followed by 27.4 percent to joint family. A very small percent (3.2%) subjects belong to extended family. On studying the distribution of the number of members in the families of the study participants, the majority of families (41.9%) had four members, followed by families with five members (22.5%). Smaller portions were observed for families with three members (16.1%) and six members (11.3%) and seven members (3.2%). Additionally, families with eight members, two and nine members for 1.6% of the participants. On evaluating the socioeconomic status using Kuppuswamy socioeconomic scale (2023), it was found that majority of the subjects (56.5%) of the subject belong to upper middle and 40.3 percent belong to upper class. Only a small percent (3.2%) belong to lower middle and nobody was there in the lower category. No one belonged to the lower and upper lower class. This shows an improved level of socio economic class among subjects.

TABLE 5. **ANTHROPOMETRIC PROFILE OF SUBJECT (n=62)**

Mean height for age and weight for age of subjects by age and gender		
Criteria	Height (cm) **Mean± SD**	Weight (Kg) **Mean± SD**
Age (years)		
13	156.8 ± 5.5	43.7± 7.0
14	157.2 ± 9.1	46.4 ± 10.5
15	160.8 ± 5.9	52.8 ± 9.9
Gender		
Male	158.0 ± 12.0	48.3 ± 11.5
Female	157.3 ± 5.1	45.2 ± 8.6

Here in the table the mean height for age and weight for age of subjects by age and gender classification are given. On studying the mean height and weight for age it was observed that the subjects belongs to the age 13 has a mean height of 156.8cm, subjects with age 14 has a mean height of 157.2cm, and mean height was found to be 160.8cm for subjects with age 15.

Similarly, the mean weight was observed 43.7 Kg, 46.4 Kg, and 52.8 Kg for the subjects with age 13, 14, and 15 respectively. On estimating the mean height and weight based on gender, the mean height and weight of females found to be 157.3 cm and 45.2 Kg respectively. Likewise the mean height and weight of males observed as 158 cm and 48.3 Kg respectively.

Table 6: BMI CLASSIFICATION

BMI Classification of Subjects			
BMI classification	**Percentile cutoff**	**Frequency (n)**	**Percentage(%)**
Thinness	<3	5	8.1
Normal weight	3-23	25	40.3
Over weight	23-27	32	51.6
obese	>27	0	0
Waist Circumference Classification of Subjects			
Waist circumference	**Percentile cutoff**	**Frequency (n)**	**Percentage (%)**
Normal	< 70 Percentile	12	19.4
Central adiposity	>70 Percentile	50	80.6

Table 2. looks into the anthropometric profile of subjects which is an important determinant of health status. On evaluating the BMI percentile values, more than half of the subjects (51.6%) came under the overweight category, 40.3 percent belongs to the normal category and only 8.1 percent belongs to thinness category. None of the subjects were obese. On assessing the percentile values of waist circumference, 80.6 percent has central adiposity and only 19.4 percent were normal.

This shows the crucial transition of anthropometry weighting towards overweight in adolescents which will eventually results in obesity during the adult years. Overeating and increased consumption pattern of processed and ultra processed foods are among the important reasons for this transition.

Table 7: **NUTRITIONAL STATUS ASSESSMENT OF SUBJECTS**

Percent Calorie Distribution of Nutrients among Subjects		
Classification	**Frequency**	**Percentage (%)**
Carbohydrate		
≤50.00	5	8.1

50.01-60.00	32	51.6
≥60.01	25	40.3
Protein		
≤12.00	60	96.8
12.01-16.00	2	3.2
≥16.0	-	-
Fat		
≤25.00	11	17.7
25.01-35.00	44	71.0
≥35.01	7	11.3

Fig. 1: PERCENT CALORIE DISTRIBUTION OF CARBOHYDRATE

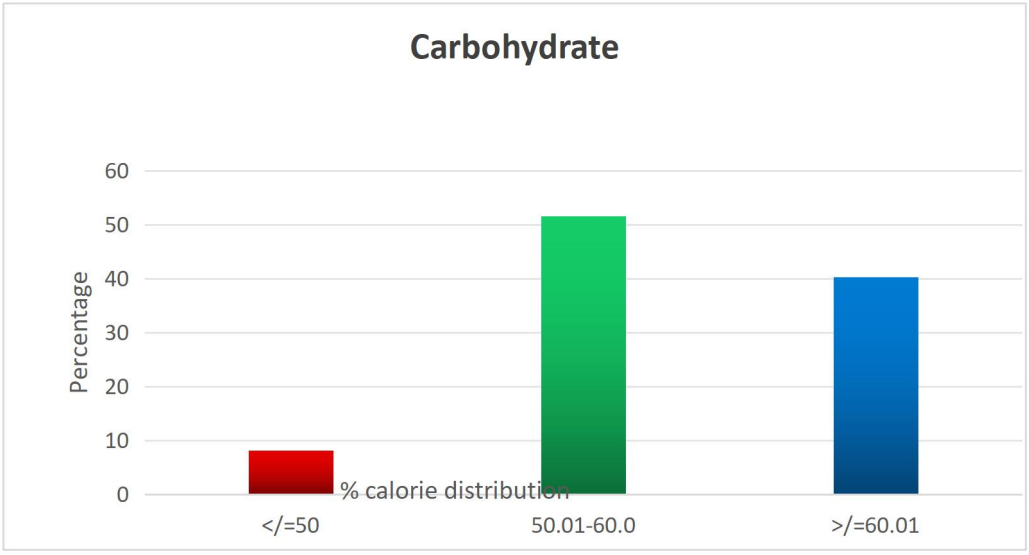

Fig. 2: PERCENT CALORIE DISTRIBUTION OF PROTEIN

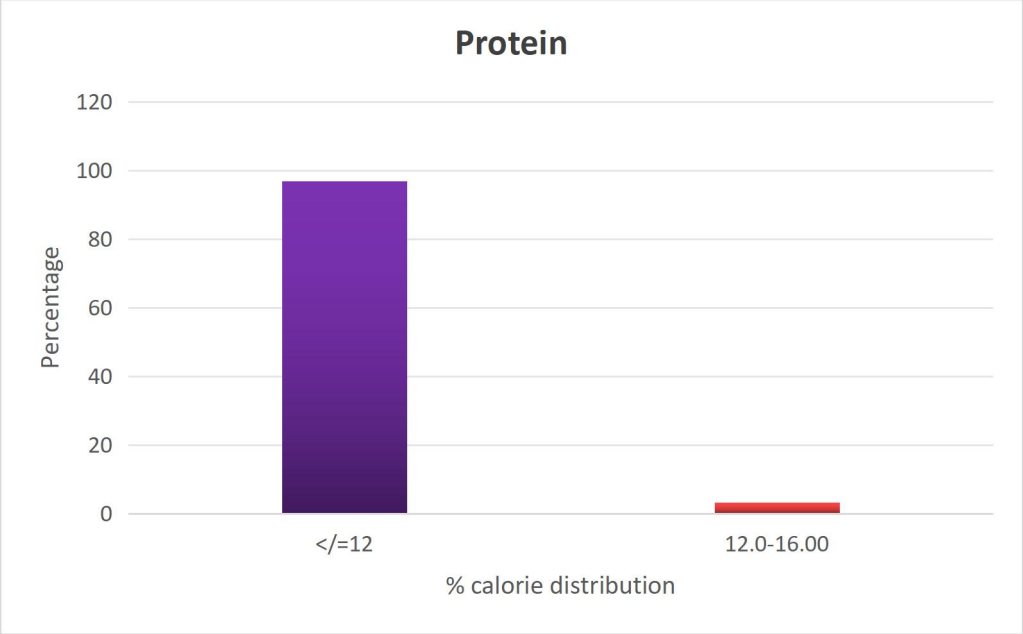

Fig. 3: PERCENT CALORIE DISTRIBUTION OF FAT

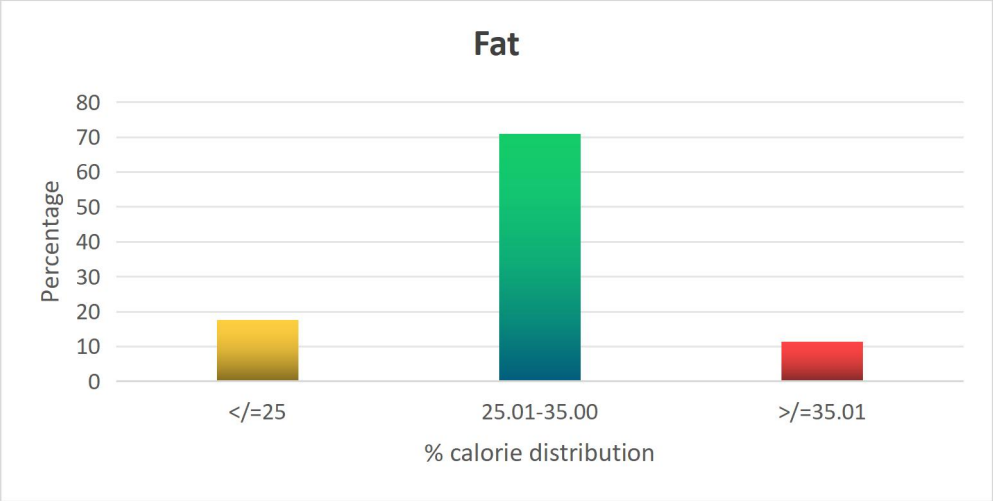

Table 3 looks into the nutritional status assessment of subjects. Here percent calorie distribution of nutrients among subjects are assessed. In terms of carbohydrates, Here percent calorie distribution of nutrients among subjects are assessed. In terms of carbohydrates, (8.1%) had carbohydrates accounting for 50.00% or less of their total calorie intake. A majority of individuals (51.6%) fell within the range of 50.01% to 60.00% of their calorie intake coming from carbohydrates. (40.3%) had carbohydrates making up 60.01% or more of their calorie intake.

Regarding protein intake, a majority of subjects (96.8%) had protein contributing to 12.00% or less of their total calorie intake. A small portion of subjects (3.2%) had protein intake ranging from

12.01% to 16.00% of their calorie intake, suggesting a moderate protein consumption level. No subjects was found to be consuming protein ≥16.0 %.

When considering fats, the data reveals that 17.7% of subjects had fats contributing to 25.00% or less of their total calorie intake. The majority of subjects (71%) fell within the range of 25.01% to 35.00% of their calorie intake coming from fats. A smaller proportion (11.3%) had fat accounting for 35.01% or more of their calorie intake.

Among nutrients carbohydrates are found to be contributing more than CHO calorie requirement for 40.3 % subjects which results in overweight and central adiposity while in the case of protein 96.8% are found with an intake ranging from minimum or below it only 3.2% are found with moderate intake. Protein is an important nutrient vital for the physical growth demands during adolescence and these are being contributed less.

Table 8: CORRELATION BETWEEN SES AND NUTRIENT INTAKE

Nutrient	**SES SCALE**		
	Lower middle	**Upper middle**	**Upper**
Energy (Kcal)	1895 ± 38	2278 ± 577.2	2050.03. ± 529
CHO (g)	301.5 ± 22.0	338.4 ± 73.04	287.23 ± 76.53
Protein (g)	43.2 ± 3.42	51.5 ± 14.4	47.5 ± 15.6
Fat (g)	52.2 ± 34	73 ± 27	70.21 ± 36
Total fibre (g)	16 ± .40	20.10 ± 6.23	17.2 ± 5.24
MUFA (mg)	6322 ± 1459	8730.1 ± 3877	8508 ± 4854
PUFA (mg)	4283.03 ± 1056	5575 ± 4201.03	4175 ± 2086

Here the table provides information regarding the correlation between SES and nutrient intake. The analysis shows correlation of nutrient intake to socio economic status. The lower middle class are found with lower nutrient intake compared to upper middle and upper class but the variations are not much noticeable. This provides information that nutrient intake are not much influenced by SES among adolescents.

Table 9: CORRELATION BETWEEN DIETARY INTAKE AND ANTHROPOMETRY

Nutrients	Anthropometry		
	Thinness	**Normal Weight**	**Overweight**
Energy	2002. ± 503.5	2069 ± 532	2282 ± 582
Protein	46.39 ± 17	48.83 ± 15.7	50 ± 13.73
Fat	66.4 ± 22.6	69.6 ± 29.2	74.15 ± 34.9
Total saturated fatty acids	40529.21 ± 11458.7	37873.41 ± 14135.22	42980.3 ± 23714.9
Total Fibre	17.45 ± 6.04	17.53 ± 5.83	20.12 ± 5.83
Total trans fatty acids	.02± .02	.05± .07	.07 ± .09
Sodium	1178.8 ± 453.7	1022.3 ± 745.5	1131.3 ± 679.15
Iron	5.25 ± 1.93	4.8 ± 1.9	5.7 ± 1.6

The table provides information on the correlation between dietary intake and anthropometry. The anthropometric status that was found among the subjects are thinness, normal weight and overweight. The table shows a correlation between the anthropometry and dietary intake as overweight subjects are found with more calorie, protein, fat etc.

Table 10: CONSUMPTION PATTERN AND FREQUENCY OF UNPROCESSED/MINIMALLY PROCESSED FOODS BASED ON NOVA

	Frequency (%)								
Food	**Never**	**Monthly**	**Once a week**	**2 times a week**	**3 times a week**	**4 times a week**	**5 times a week**	**6 times a week**	**Daily**
Fresh, sliced,squeezed, Chilled or frozen fruit	7 (11.3)	8 (12.9)	6 (9.7)	10(16.1)	7(11.3)	3(4.8)	6(9.7)	-	15(24.2)
100% fruit juice	22 (35.5)	12(19.3)	8(12.9)	6(9.7)	8(12.9)	3(4.8)	-	-	3 (4.8)
Dried fruit	14	15 (24.2)	2 (3.2)	8 (12.9)	5 (8.1)	6	3	6	5 (8.1)

	(22.6)					(9.7)	(4.8)	(9.7)	
Vegetables and mushrooms	7 (11.3)	1 (1.6)	5 (8.1)	4 (6.4)	10 (16.1)	12 (19.3)	2 (3.2)	6 (9.7)	15 (24.2)
Salad	24 (38.7)	10 (16.1)	8 (12.9)	6 (9.7)	3 (4.8)	5 (8.1)	3 (4.8)	-	3 (4.8)
100% vegetable juice	54 (87)	-	5 (8.1)	3 (4.8)	-	-	-	-	-
Grains	-	-	-	-	-	-	-	-	62 (100)
Meat and poultry	1 (1.6)	8 (12.9)	16 (25.8)	24 (38.7)	12 (19.3)	-	-	1 (1.6)	-
Fish and seafood	7 (11.3)	9 (14.5)	16 (25.8)	14 (22.6)	6 (9.7)	1 (1.6)	5 (8.1)	4 (6.4)	-
Fresh or pasteurised milk	3 (4.8)	8 (12.9)	8 (12.9)	3 (4.8)	5 (8.1)	6 (9.7)	2 (3.2)	1 (1.6)	26 (41.9)
Fresh or pasteurised plain yoghurt	28 (45.2)	8 (12.9)	8 (12.9)	-	4 (6.4)	4 (6.4)	-	-	10 (16.1)
Eggs	1 (1.6)	6 (9.7)	20 (32.2)	9 (14.5)	5 (8.1)	8 (12.9)	2 (3.2)	6 (9.7)	5 (8.1)
Honey or maple syrup	40 (64.5)	10 (16.1)	5 (8.1)	-	-	3 (4.8)	-	4 (6.4)	-
Tea and herbal infusions	19 (30.6)	10 (16.1)	8 (12.9)	6 (9.7)	3 (4.8)	2 (3.2)	-	-	14 (22.6)
Coffee	22 (35.5)	12 (19.3)	8 (12.9)	6 (9.7)	3 (4.8)	1 (1.6)	-	-	10 (16.1)

The table provides information on unprocessed/minimally processed foods based on NOVA classification. It shows that a majority of 24.2% consumes fresh fruits on a daily basis and 11.3% never consumes fruits. 100% fruit juices were never consumed by majority 35.5% of subjects and 19.3% consumed monthly and 4.8% consumed on a daily basis. Majority subjects of 24.2% consumed dried fruits on a monthly basis and 22.6 % never consumed dried foods. Vegetables were daily consumed by 24.2% of subjects and 11.3% of subjects never consumed vegetables. Majority of 38.7% never consumed salads and 4.8% consumed on a daily basis. 87% never consumed 100%

vegetable juices and 8.1% consumed weekly once. Grains were consumed on a daily basis by everyone a percentage of 100. 38.75% consumed meat and poultry weekly twice and 1.6% never consumed. Fish and seafood were consumed weekly twice by 25.8% and 11.3% never consumed. A majority of 41.9% daily consumed fresh or pasteurised milk and 4.8% consumed never. 45.2% never consumed fresh or plain yoghurt and 16.1% consumed on a daily basis. 32.2% consumed eggs weekly once and 8.1% consumed daily . 64.5% never consumed honey and maple syrup and 16.1% consumed monthly. A majority 22.3% consumed tea and herbal infusions daily and a majority of 30.6% never consumed. A majority of 35.5% never consumed coffee and 19.3% consumed monhly.

Table 11: CONSUMPTION PATTERN AND FREQUENCY OF PROCESSED CULINARY INGREDIENTS

	Frequency (%)								
Food	**Never**	**Monthly**	**Once a week**	**2 times a week**	**3 times a week**	**4 times a week**	**5 times a week**	**6 times a week**	**Daily**
Sour cream	49 (79)	4 (6.4)	2 (3.2)	4 (6.4)	-	3 (4.8)	-	-	-
Olive oil and vegetable oils	-	-	-	-	-	-	-	-	62 (100)
Butter, salted butter	18 (29)	10 (16.1)	14 (22.6)	12 (19.3)	5 (8.1)	-	3 (4.8)	-	-

Here the table shows consumption pattern and frequency of processed culinary ingredients. Sour cream were never consumed by 79% of subjects and 6.4% consumed monthly and weekly two times. Olive and vegetable oil were consumed on a daily basis by everyone of 100%. 29% never consumed butter and 22.6% consumed weekly once.

Table 12: CONSUMPTION PATTERN AND FREQUENCY OF PROCESSED FOODS BASED ON NOVA

	Frequency(%)								
Food	**Never**	**Monthly**	**Once a week**	**2 times a week**	**3 times a week**	**4 times a week**	**5 times a week**	**6 times a week**	**Daily**
Fruit drinks	20 (32.2)	18 (29)		10 (16.1)	8 (12.9)	6 (9.7)			
Fruit in syrup	52 (83.9)	8 (12.9)		2 (3.2)					
Salted or sugared nuts	12 (19.3)	23 (37.1)		8 (12.9)	12 (19.3)		5 (8.1)		2 (3.2)
Fresh pasta	40 (64.5)	11 (17.7)	8 (12.9)	3 (4.8)					
Freshly made unpackaged bread	55 (88.7)	5 (8.1)	2 (3.2)						
Packaged savoury pies	59 (95.2)	3 (4.8)							
Grits,flakes or flour	-	-	13 (21)	12 (19.3)	18 (29)	9 (14.5)	5 (8.1)	1 (1.6)	4 (6.4)
Salted,dried, cured or smoked meat	44 (71)	14 (22.6)	4 (6.4)						
Salted,dried,cured, or smoked fish	38 (61.3)	16 (25.8)	8 (12.9)						
Canned fish in brine	49 (79)	9 (14.5)	4 (6.4)						
Canned fish in oil	58 (93.5)	4 (6.4)							
Soft cheese	8 (12.9)	21 (33.9)	12 (19.3)	9 (14.5)	8 (12.9)		4 (6.4)		
Hard cheese	48 (77.4)	6 (9.7)	8 (12.9)						

Grated cheese	53 (85.5)	6 (9.7)	3 (4.8)						
Home made sauces/mayonnaise	38 (61.3)	16 (25.8)		5 (8.1)	3 (4.8)				
Freshly made unpackaged biscuits	58 (93.5)		3 (4.8)	1 (1.6)					
Freshly made spoon desserts and puddings	16 (25.8)	8 (12.9)	14 (22.6)	8 (12.9)	12 (19.3)		2 (3.2)		2 (3.2)
Ice-cream artisanal	60 (96.8)	2 (3.2)							
Jams and marmalades	38 (61.3)	16 (25.8)	5 (8.1)	3 (4.8)					

The table provides information on frequency of consumption of processed foods based on NOVA. Fruit drinks were never consumed by 32.2% of subjects and 29% consumed monthly. 83.9% never consumed fruit in syrup and 12.9% consumed monthly. 37.1 % monthly consumed salted or sugared nuts and 3.2% consumes daily.Fresh pasta were never consumed by 64.5% and 17.7% consumed monthly. 88.7% never consumed freshly made or unpackaged bread and 8.1% consumed monthly. 95.2% never consumed packaged savoury pies and 4.8% consumed monthly. A majority of 29% consumed grits,flakes and flour weekly thrice and it was consumed in different frequencies by everyone. 71% never consumed smoked,dried or cured meat and 22.6% consumed monthly. 79% never consumed canned fish in brine and 14.5% consumed monthly. Soft cheese were consumed monthly by 33.9% subjects and 12.9% never consumed. 77.4% never consumed hard cheese and 12.9% consumed weekly once. Home made sauces and mayonnaise were consumed by 25.8% monthly and 61.3% never consumed. 61.3% never consumed jams and marmalades and 25.8% consumed monthly.

Table 13: CONSUMPTION PATTERN AND FREQUENCY OF UPF BASED ON NOVA

	Frequency(%)								
Food	**Never**	**Monthly**	**Once a week**	**2 times a week**	**3 times a week**	**4 times a week**	**5 times a week**	**6 times a week**	**Daily**
Ready-to-heat vegetables	47 (75.8)	3 (4.8)	6 (9.7)	2 (3.2)	4 (6.4)				
Ready-to-heat pasta dishes	31 (50)	17 (27.4)	8 (12.9)	6 (9.7)					
Packaged breads and buns	2 (3.2)	21 (33.9)	18 (29)	8 (12.9)	5 (8)	6 (9.7)	1 (1.6)	1 (1.6)	
Bread alternatives	20 (32.2)	17 (27.4)	14 (22.6)	4 (6.4)	4 (6.4)		3 (4.8)		
Packaged sandwich	48 (77.4)	8 (12.9)	6 (9.7)						
Packaged instant rice,soups,noodles	10 (16.1)	13 (21)	27 (43.5)	8 (12.9)	4 (6.4)				
Breakfast cereals,cereal and energy bars	40 (64.5)	11 (17.7)	6 (9.7)	3 (4.8)		2 (3.2)			
Ready-to heat potatoes and potato croquettes	56 (90.3)	4 (6.4)	2 (3.2)						
Nuggets and sticks	33 (53.2)	18 (29)	8 (12.9)		3 (4.8)				
Sausages,kebabs,frankfurter and other reconstituted meat products	45 (72.6)	11 (17.7)	6 (9.7)						

Fish nuggets	60 (96.8)	2 (3.2)							
Milk drinks	21 (33.9)	8 (12.9)	10 (16.1)	3 (4.8)	6 (9.7)	6 (9.7)		8 (12.9)	
Fruit or flavoured yoghurts	31 (50)	17 (27.4)	5 (8.1)	2 (3.2)		2 (3.2)	5 (8.1)		
Melted cheese	33 (53.2)	19 (30.6)	6 (9.7)			4 (6.4)			
Margarines and other spreads	49 (79)	6 (9.7)	4 (6.4)	3 (4.8)					
Packaged sauces	15 (24.2)	26 (42)	9 (14.5)	5 (8.1)	7 (11.3)				
Packaged biscuits/cream biscuits/cookies	4 (6.4)	13 (21)	19 (30.6)	12 (19.3)	10 (16.1)		2 (3.2)		2 (3.2)
Packaged spoon desserts and puddings	44 (71)	5 (8.1)	8 (12.9)	5 (8.1)					
Croissant,pastries and packaged snacks	24 (38.7)	23 (37.1)	9 (14.5)	6 (9.7)					
Ice-cream packaged	4 (6.4)	26 (42)	14 (22.6)	6 (9.7)		8 (12.9)	4 (6.4)		
Chocolate	2 (3.2)	23 (37.1)	14 (22.6)	5 (8.1)	8 (12.9)	6 (9.7)		2 (3.2)	2 (3.2)
Candies	22 (35.5)	18 (29)	10 (16.1)	6 (9.7)	4 (6.4)		2 (3.2)		
Spreads(nut spread,peanut	35	6 (9.7)	8	10	2			1	

spread)	(56.4)		(12.9)	(16.1)	(3.2)			(1.6)	
Soft/ aerated drinks	3 (4.8)	31 (50)	8 (12.9)	6 (9.7)	8 (12.9)	2 (3.2)	4 (6.4)		
Energy drinks	57 (91.9)	5 (8.1)							
Cocoa drinks	51 (82.2)	8 (12.9)	3 (4.8)						
Sweet or savoury packaged snacks	34 (54.9)	8 (12.9)	12 (19.3)	4 (6.4)		2 (3.2)	2 (3.2)		
Plant based drinks	62 (100)	-	-	-	-	-	-	-	-
Plant based yoghurt	62 (100)	-	-	-	-	-	-	-	-
Plant based cheese substitutes	62 (100)	-	-	-	-	-	-	-	-
Plant based meat substitutes	62 (100)	-	-	-	-	-	-	-	-
Health and slimming products including meal replacement shakes	60 (96.8)	2 (3.2)	-	-	-	-	-	-	-

The table provides information on consumption pattern and frequency of ultra processed food based on NOVA among subjects. Ready-to-heat vegetables were never consumed by 75.8% subjects while 9.7% consumed weekly once. Ready-to-heat pasta dishes were consumed by 27.4% monthly and 50% never consumed. Packaged breads and buns were consumed by 33.9% monthly and only 3.2% never consumed it. 43.5% consumed instant rice,noodles and soups weekly once and 16.1% never consumed. Nuggets and sticks were consumed monthly by 29% and 53.2% never consumed. 33.9% never consumed any milk drinks while 12.9% consumed monthly and weekly 6 times.50% never consumed flavoured or fruit yoghurt while 27.4% consumed monthly. Packaged sauces were consumed 42% monthly and 24.2% never consumed. 30.6% consumed packaged biscuits/cream

biscuits/cookies weekly once and only 6.4% never consumed. Ice-cream were consumed by 42% subjects monthly and 6.4% never consumed. 37.1% and 26.2% consumed chocolates monthly and weekly once and 3.2% never consumed. Soft aerated drinks were consumed by 50% of subjects monthly and 4.8% never consumed. Energy drinks were consumed only by small percentage of 8.1% monthly. Plant based drinks, yoghurt, and substitutes of cheese and meat were not consumed by anyone.Only 3.2 % consumed slimming and meal replacement drinks.

This shows an increased pattern of consumption of packaged sauces,biscuits,ice-creams,chocolates,instant noodles, pastries and soft aerated drinks.Moderate intake of spreads, nuggets, milk drinks, flavoured yoghurt, cheese etc. Plant based UPF showed lower frequency of consumption.

Table 14: CONSUMPTION PATTERN AND FREQUENCY OF INDIAN UPF

	Frequency(%)								
Food	**Never**	**Monthly**	**Once a week**	**2 times a week**	**3 times a week**	**4 times a week**	**5 times a week**	**6 times a week**	**Daily**
Bottled or tetrapacked fruit juices	3 (4.8)	28 (45.2)	13 (20.9)	9 (14.5)	6 (9.7)		3 (4.8)		
Vermicelli	44 (71)	13 (21)	3 (4.8)	2 (3.2)					
Pizza	33 (53.2)	25 (40.3)	3 (4.8)	1 (1.6)					
Burger	21 (33.9)	29 (46.8)	8 (12.9)	4 (6.4)					
French fries	24 (38.7)	21 (33.9)	13 (21)	4 (6.4)					

Instant dishes/snacks (poha/oats)	19 (30.6)	16 (26)	8 (13)	6 (9.7)	4 (6.4)	6 (9.7)		3 (4.8)	
Powdered mixes/batters like idli,dosa,vada	13 (21)	6 (9.7)	8 (12.9)	14 (22.6)	10 (16.1)	8 (12.9)	3 (4.8)		
Wraps	33 (53.2)	14 (22.6)	8 (12.9)	5 (8)	2 (3.2)				
Packaged Indian namkeens (mixtures,murukku)	7 (11.3)	16 (25.8)	12 (19.3)	8 (12.9)	6 (9.7)	10 (16.1)	3 (4.8)		
Packaged banana chips	27 (43.5)	14 (22.6)	12 (19.3)	9 (14.5)		3 (4.8)			
Packaged potato chips,nachos,puffs	20 (32.2)	15 (24.2)	14 (22.6)	4 (6.4)	6 (9.7)		3 (4.8)		
Chutneys/instant chutney powders/salad dressings	37 (59.7)	8 (12.9)	16 (25.8)	8 (12.9)	3 (4.8)	2 (3.2)			
Packaged pickles	20 (32.2)	13 (21)	9 (14.5)	12 (19.3)	4 (6.4)	3 (4.8)		1 (1.6)	
Coconut cream/milk	43 (69.3)	6 (9.7)	6 (9.7)	4 (6.4)	2 (3.2)	1 (1.6)			
Muffins,waffles, donuts	31 (50)	10 (16.1)	15 (24.2)	6 (9.7)					
Packaged sweets(soan papdi,gulab jamun)	32 (51.6	18 (29)	8 (12.	4 (6.4)					

	)		9)						
Flavoured mouth freshner	49 (79)	6 (9.7)	5 (8.1)	2 (3.2)					
Packaged drink concentrates	44 (71)	14 (22.6)	4 (6.5)						
Packaged and powdered drink mixes	27 (43.5)	15 (24.2)	10 (16. 1)	4 (6.4)	4 (6.4)	2 (3.2)			
Instant curries/gravies/pastes	51 (82.2)	8 (13)	2(3. 2	1 (1.6)					

The table provides information on consumption pattern of Indian UPF . Tetra packed fruit juices were consumed by 45.2% subjects and 4.8% never consumed. 46.8 % consumed burger monthly and 33.9% never consumed. 33.9% consumed french fries monthly and 38.7% never consumed. 22.6% consumed powdered mixes/batters weekly twice and 21% never consumed. Packaged Indian namkeens were consumed by 25.8% monthly while 11.3% never consumed. 24.2% and 22.65 consumed packaged nachos monthly and weekly once 32.2% never consumed. 25.8% consumed chutneys/instant chutneys weekly once and 59.7% never consumed. 19.3% consumed packaged pickle weekly twice and 32.2% never consumed. 9.7% consumed coconut cream milk monthly and weekly once and 69.3% never consumed. 24.2% consumed packaged drink mixes monthly once and 43.5% never consumed. Instant curries or gravies were consumed by 13% subjects monthly and 82.2% never consumed. 9.7% consumes flavoured mouth freshner monthly and 79% never consumed.

This provides information that Indian UPF's like tetra packed fruit juices, burger, french fries, instant dishes like poha/ oats , powdered mixes/batter, packaged indian namkeens, packaged nachos, chutney/instant chutney, packaged pickles, packaged drink mixes are consumed more frequently. Foods like packaged sweets soan papdi, coconut cream, instant chutney, pizza, etc are consumed moderately. Instant curries, flavoured mouth freshner ,packaged drink concentrates were consumed less frequently.

Table 15: MEAN PERCENT CALORIE CONTRIBUTION OF UPF TO TOTAL CALORIE

		UPF calorie	% calorie of UPF
Mean ± SD		673.8 ± 397.43	29.15 ± 11.92
Percentiles	25	312.83	18.12
	50	614.2	28.03
	75	896.2	36.9

The table provides information about the percent calorie contribution of UPF to total dietary calorie. Here it is found that about a mean value of 673.8 ± 397.43 calorie is provided by UPF in daily dietary calorie. It accounts for a mean UPF calorie % of 29.15 ± 11. The subjects were divided into percentiles based on their UPF calorie intake and then mean was found.

This provides information regarding the contribution of UPF to total calorie and it's consumption pattern. UPF such as tetra packed fruit juices, packaged sweets, icecream and chocolates, instant dishes and noodles, packaged bread and cereals, Indian namkeens and junk foods like french fries are among few which are consumed frequently and contributes to total calorie. Plant based products are not being frequently consumed.

Table 16: ASSOCIATION OF PERCENT CALORIE INTAKE OF UPF WITH BMI

BMI classification	**UPF calorie** **Mean ± SD**	**% calorie of UPF** **Mean ± SD**
Thinness	438.6 ± 209.21	21.62 ± 6.51
Normal weight	664.43 ± 446.92	29.6 ± 14.1
Overweight	717.8 ± 373.53	30.0 ± 10.53

The table shows association of percent calorie intake of UPF with BMI to know if they are associated somehow. An association between the two were assessed from the table. Subjects with higher percent calorie of UPF belonged to overweight category and on decrease in UPF percent shown change in the anthropometry accordingly. Subjects with highest percent calorie of 30.0 ±

10.53 belonged to overweight category, of 29.6 ± 14.1 belonged to normal weight and with 21.62 ± 6.51 belonged to thinness category.

Table 17: ASSOCIATION OF PERCENT CALORIE INTAKE OF UPF WITH WAIST CIRCUMFERENCE

Waist circumference	**UPF calorie** **Mean ± SD**	**% calorie of UPF** **Mean ± SD**
Normal **< 70 Percentile**	699.9 ± 468.65	30.02 ± 13.62
Central adiposity **> 70 Percentile**	645.90 ± 309.7	28.23 ± 9.94

The table provides association of percent calorie intake of UPF with waist circumference and no significant association was found between the two. Subjects with % calorie of UPF of 30.02 ± 13.62 belonged to normal <70 Percentile and with 28.23 ± 9.94 belonged to central adiposity >70 Percentile. This may be due to their genetic body phenotype or may be due to some other variables.

CHAPTER 5

SUMMARY AND CONCLUSION

The study titled "**Consumption pattern of ultra processed food among 13-15 years of school going children**" aimed at looking into the consumption pattern and frequency of UPF among subjects. The subjects of study belongs to the adolescent group who are in the transition period of childhood to adult. Adolescence is marked by accelerated emotional development, physical transformations, changing body composition ,increased body size , psychological changes and biological changes.

Adolescents need to take more calories in light of the fact that their bodies are developing quickly. The eating habits of adolescents may have been characterised by a tendency to skip meals, a rise in eating out of the house, an increased reliance to ready-to-eat foods, an increase in snacking and a developing interest in dieting. India is in a nutritional transition period from processed food towards ultra processed food. Adolescence are among the major group leading this transition towards more ultra processed food consumption. Many traditional culinary dishes in India are undergoing alteration towards UPF. Many ingredients now found in Indian items are of UPF ingredients. This facilitated the need for studying consumption pattern of UPF among adolescents.

Most of the UPF items present in Indian market are not identified as UPF's because of lack of proper definition for UPF in India. The ingredients used for same food item varies widely in India thus enforcing the need for a fixed definition and classification of UPF. Based on this an Indian classification of UPF was done which facilitated the need for identifying prevelance of UPF in Indian market. The study aimed to identify consumption pattern and frequency of UPF among 13-15 years of school going children.

The study was conducted in Bhavan's Adharsha Vidyalaya school, Kakkanad Ernakulam. 62 study subjects of age 13-15 years was selected using a purposive sampling method. The subjects consisted of 16 boys and 46 girls. Consents from parents was received for collecting data. An interviewer method was adopted for this. Data on socio-economic status of subjects collected using Kuppuswamy SES 2023. Data on anthropometry and dietary pattern collected. For collecting data on

consumption pattern of UPF a specially developed questionnaire was used. The questionnaire was developed based on both NOVA classification and Indian UPF.

Based on the collected data the socio-economic status of subjects was assessed . Anthropometrical assessment was also done which helped in assessing the anthropometric status of subjects. The dietary data collected using developed questionnaire helped in assessing nutritional status and nutrient distribution among subjects. The correlation between dietary intake and SES as well as anthropometry was assessed. No significant correlation was identified with SES but little correlation found with anthropometry. Mean percent calorie distribution of UPF to total diet calorie was found using statistical analysis. A considerable amount of contribution was found. Association of UPF percent calorie to anthropometry and waist circumference was assesd an association was found with anthropometry but not with waist circumference. The conclusions are;

- The sociodemographic profile of subjects showed that no one belonged to lower or upper lower class of SES and the maximum number of family members found were 9. A majority of subjects belonged to nuclear family and moderate to joint family and a very small percent to extended family. Majority of subjects belonged to upper middle and next to upper class and a very small percent to lower middle and no one belonged to lower and upper lower class.
- The anthropometric profile of subjects which is an important determinant of health status showed that more than half of the subjects came under the overweight category, 40.3 percent belongs to the normal category and only 8.1 percent belongs to thinness category.
- On assessing the percentile values of waist circumference, 80.6 percent has central adiposity and only 19.4 percent were normal.
- Regarding the nutritional status assessment of subjects percent calorie distribution of nutrients showed that 8.1% of subjects had 50.00% or less of their total calorie intake. A majority of individuals fell within the range of 50.01% to 60.00% (40.3%) had carbohydrates making up 60.01% or more of their calorie intake.
- Regarding protein intake, a majority of subjects (96.8%) had protein contributing to 12.00% or less of their total calorie intake. A small portion of subjects (3.2%) had protein intake ranging from 12.01% to 16.00% of their calorie intake, suggesting a moderate protein consumption level. No subjects was found to be consuming protein ≥16.0 %.
- When considering fats, the data reveals that 17.7% of subjects had fats contributing to 25.00% or less of their total calorie intake. The majority of subjects (71%) fell within the range of 25.01%

to 35.00% of their calorie intake coming from fats. A smaller proportion (11.3%) had fat accounting for 35.01% or more of their calorie intake.

- The correlation between SES and nutrient intake. The analysis shows correlation of nutrient intake to socio economic status. The lower middle class are found with lower nutrient intake compared to upper middle and upper class but the variations are not much noticeable. This provides information that nutrient intake are not much influenced by SES among adolescents.
- The correlation between dietary intake and anthropometry. The anthropometric status that was found among the subjects are thinness, normal weight and overweight. The table shows a correlation between the anthropometry and dietary intake as overweight subjects are found with more calorie, protein, fat etc.
- The study on consumption pattern of UPF based on NOVA showed increased pattern of consumption of packaged sauces,biscuits,ice-creams,chocolates,instant noodles, pastries and soft aerated drinks. Moderate intake of spreads, nuggets, milk drinks, flavoured yoghurt, cheese etc. Plant based UPF showed lower frequency of consumption.
- The study on consumption pattern of Indian UPF showed that foods like tetra packed fruit juices, burger, french fries, instant dishes like poha/ oats , powdered mixes/batter, packaged indian namkeens, packaged nachos, chutney/instant chutney, packaged pickles, packaged drink mixes are consumed more frequently. Foods like packaged sweets soan papdi, coconut cream, instant chutney, pizza, etc are consumed moderately. Instant curries, flavoured mouth freshner ,packaged drink concentrates were consumed less frequently.
- Mean percent calorie distribution of UPF to total diet calorie was found using statistical analysis. A considerable amount of contribution was found. Association of UPF percent calorie to anthropometry and waist circumference was assesd an association was found with anthropometry but not with waist circumference.

LIMITATIONS OF THE STUDY

- The limitations of the study was that sample size was small so more studies and correlations was not possible.
- There was no subjects belonging to the lower SES and obese subjects was also not found. So study based on these variables was not possible.
- The study was not able to look into the specific nutrient contribution of UPF and larger UPF consumption pattern was not found because of small size of sample.

RECOMMENDATIONS

- Detailed study on UPF consumption pattern can be conducted involving big sample size.
- Study on micronutrient contribution of UPF can be done.

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APPENDIX I

SOCIO ECONOMIC STATUS

Background Information

1. Name :
2. Age in years :
3. Type of family :
    a) Nuclear Family
    b) Joint Family
    c) Extended family
4. Number of members in family:
5. Occupation of Head Of Family :
    a) Legislators, Senior Officials & Managers
    b) Professionals
    c) Technicians and Associate Professionals
    d) Clerks
    e) Skilled Workers and Shop & Market Sales Workers
    f) Skilled Agricultural & Fishery Workers
    g) Craft & Related Trade Workers
    h) Plant & Machine Operators and Assembler
    i) Elementary Occupation
    j) Unemployed
6. Education of the head of the family :
    a) Profession or Honours
    b) Graduate
    c) Intermediate or diploma
    d) High school certificate
    e) Middle school certificate
    f) Primary school certificate
    g) illiterate
7. Monthly family income :
    a) ≥249044
    b) 124489-249043
    c) 93381-124488
    d) 62273-93380
    e) 37325-62272
    f) 12445-37324
    g) ≤ 12444

Scoring of education

Education scores are attributed to the head of family, regardless of the subject. Credit for completed degrees is only awarded for the highest level attained, not those that are still being pursued or have not yet been finished.

Table 1. Scoring system used for education of the head of the family

SL No.	Education	Score
1	Professional	7
2	Graduate	6
3	Intermediate / diploma	5
4	High school	4
5	Middle school	3
6	Primary school	2
7	Illiterate	1

Scoring of occupation

Only the head of the family's occupation is scored. If the family head has retired, credit for his or her previous role may be granted. When assigning a score, it's important to move from unemployed to professional categories. For example, an engineer's occupation score should be 1 (for "unemployed") if they have never taken a position after receiving their degree.

Table 2. scoring system used for occupation of the head of the family

SL No.	Occupation	Score
1	Legislators, Senior Officials & Managers	10
2	Professionals	9
3	Technicians and Associate Professionals	8
4	Clerks	7
5	Skilled Workers and Shop & Market Sales Workers	6
6	Skilled Agricultural & Fishery Workers	5
7	Craft & Related Trade Workers	4
8	Plant & Machine Operators and Assembler	3
9	Elementary Occupation	2
10	Unemployed	1

Scoring of income

Income categories are based on the current inflation rate, which is calculated using the CPI for Industrial Workers. The Consumer Price Index (CPI) measures price changes for products and services routinely purchased by typical wage workers. It is stated as a percentage compared to a base period or year. It's also called the cost-of-living index.

Table 3. Scoring system used for the total monthly income of the family

SL No.	**Updated monthly family oncome in Rupees (2023)**	**Score**
1	≥249044	12
2	124489-249043	10
3	93381-124488	6
4	62273-93380	4
5	37325-62272	3
6	12445-37324	2
7	≤ 12444	1

APPENDIX II

ANTHROPOMETRY

Body Mass Index (BMI):

Table 1. BMI percentiles and standard deviation for boys

Age	*3*	*5*	*10*	*25*	*50*	*23 Eq(71)*	*27 Eq(90)*	*SD*
5.0	12.1	12.4	12.8	13.6	14.7	15.7	17.5	1.6
5.5	12.2	12.4	12.9	13.7	14.8	15.8	17.6	1.5
6.0	12.2	12.5	12.9	13.7	14.9	16.0	17.8	1.8
6.5	12.3	12.5	13.0	13.8	15.0	16.1	18.0	1.8
7.0	12.3	12.6	13.1	13.9	15.1	16.3	18.2	1.9
7.5	12.4	12.7	13.2	14.1	15.3	16.5	18.5	2.2
8.0	12.5	12.8	13.3	14.2	15.5	16.7	18.8	2.5
8.5	12.6	12.9	13.4	14.4	15.7	17.0	19.2	2.8
9.0	12.7	13.0	13.5	14.5	15.9	17.3	19.6	2.6
9.5	12.8	13.1	13.7	14.7	16.2	17.6	20.1	2.8
10.0	12.9	13.2	13.8	14.9	16.4	18.0	20.5	3.1
10.5	13.0	13.3	14.0	15.1	16.7	18.3	21.0	3.2
11.0	13.1	13.5	14.1	15.4	17.0	18.7	21.5	3.2
11.5	13.2	13.6	14.3	15.6	17.3	19.1	22.1	3.3
12.0	13.3	13.8	14.5	15.8	17.7	19.5	22.6	3.4
12.5	13.5	13.9	14.6	16.0	17.9	19.8	23.0	3.6
13.0	13.6	14.0	14.8	16.3	18.2	20.2	23.4	3.5
13.5	13.7	14.2	14.9	16.5	18.5	20.5	23.8	3.7
14.0	13.8	14.3	15.1	16.7	18.7	20.8	24.2	3.7
14.5	14.0	14.5	15.3	16.9	19.0	21.1	24.5	3.5
15.0	14.2	14.7	15.5	17.2	19.3	21.4	24.9	3.7
15.5	14.4	14.9	15.8	17.4	19.6	21.7	25.2	3.4
16.0	14.6	15.1	16.0	17.7	19.9	22.0	25.5	3.7
16.5	14.9	15.4	16.3	18.0	20.2	22.4	25.8	3.8
17.0	15.1	15.6	16.6	18.3	20.5	22.6	26.0	3.8
17.5	15.4	15.9	16.8	18.6	20.8	22.9	26.3	3.6
18.0	15.6	16.2	17.1	18.9	21.1	23.2	26.6	3.2

(IAP, 2015)

Table 1. BMI percentiles and standard deviation for girls

Age	*3*	*5*	*10*	*25*	*50*	*23 Eq(75)*	*27 Eq(95)*	*SD*
5.0	11.9	12.1	12.5	13.3	14.3	15.5	18.0	1.4
5.5	11.9	12.2	12.6	13.4	14.4	15.7	18.3	1.7
6.0	12.0	12.2	12.7	13.5	14.5	15.9	18.6	1.7
6.5	12.1	12.3	12.8	13.6	14.7	16.1	18.9	2.0
7.0	12.1	12.4	12.8	13.7	14.9	16.4	19.3	2.1
7.5	12.2	12.5	12.9	13.9	15.1	16.6	19.7	2.2
8.0	12.3	12.6	13.1	14.0	15.3	16.9	20.1	2.3
8.5	12.3	12.7	13.2	14.2	15.6	17.2	20.5	2.7
9.0	12.4	12.8	13.3	14.4	15.8	17.6	21.0	2.7
9.5	12.5	12.9	13.5	14.6	16.1	18.0	21.4	2.8
10.0	12.7	13.1	13.7	14.9	16.5	18.4	21.9	2.9
10.5	12.8	13.2	13.9	15.2	16.8	18.8	22.5	3.1
11.0	13.0	13.4	14.1	15.5	17.2	19.3	23.0	3.1
11.5	13.2	13.7	14.4	15.8	17.6	19.8	23.6	3.3
12.0	13.4	13.9	14.7	16.1	18.0	20.2	24.1	3.2
12.5	13.7	14.2	15.0	16.5	18.4	20.7	24.7	3.3
13.0	13.9	14.4	15.2	16.8	18.8	21.1	25.2	3.2
13.5	14.1	14.6	15.5	17.1	19.1	21.5	25.6	3.5
14.0	14.3	14.9	15.7	17.3	19.4	21.8	25.9	3.4
14.5	14.5	15.1	16.0	17.6	19.7	22.0	26.2	3.3
15.0	14.7	15.2	16.1	17.8	19.9	22.3	26.3	3.4
15.5	14.9	15.4	16.3	18.0	20.1	22.4	26.4	3.1
16.0	15.0	15.6	16.5	18.2	20.3	22.6	26.5	3.1
16.5	15.2	15.8	16.7	18.4	20.4	22.8	26.6	3.2
17.0	15.4	16.0	16.9	18.6	20.6	22.9	26.7	3.0
17.5	15.5	16.1	17.1	18.7	20.8	23.1	26.7	3.1
18.0	15.7	16.3	17.3	18.9	21.0	23.2	26.8	3.6

(IAP, 2015)

Waist Circumference:

Table 2. WC percentile values for boys and girls

	WC percentile								
Age, y	5th	10th	15th	25th	50th	75th	85th	90th	95th
Boys									
2+	41.9	42.9	43.5	44.6	46.8	49.3	50.8	51.9	53.7
3+	43.3	44.4	45.1	46.3	48.7	51.5	53.1	54.3	56.3
4+	45.1	46.2	47.1	48.4	51.1	54.2	56.0	57.4	59.6
5+	46.9	48.2	49.1	50.5	53.5	57.0	59.1	60.6	63.1
6+	48.8	50.2	51.2	52.8	56.1	59.9	62.2	64.0	66.7
7+	50.7	52.2	53.3	55.1	58.7	62.9	65.5	67.4	70.5
8+	52.6	54.3	55.5	57.4	61.3	66.0	68.8	70.9	74.3
9+	54.7	56.5	57.8	59.9	64.2	69.2	72.3	74.6	78.2
10+	57.0	59.0	60.4	62.6	67.3	72.7	76.0	78.4	82.3
11+	59.3	61.5	63.0	65.4	70.4	76.2	79.7	82.3	86.4
12+	61.5	63.8	65.4	68.0	73.3	79.4	83.1	85.8	90.1
13+	63.4	65.8	67.6	70.3	75.8	82.2	86.0	88.8	93.2
14+	64.9	67.5	69.3	72.2	78.0	84.5	88.4	91.2	95.6
15+	66.2	68.9	70.8	73.8	79.8	86.5	90.4	93.2	97.6
16+	67.4	70.2	72.1	75.2	81.3	88.1	92.1	94.9	99.2
17+	68.4	71.3	73.3	76.5	82.7	89.6	93.5	96.3	100.6
Girls									
2+	41.6	42.6	43.3	44.5	46.9	49.9	51.8	53.2	55.7
3+	42.5	43.5	44.3	45.5	48.0	51.1	53.1	54.6	57.2
4+	44.7	45.8	46.6	48.0	50.8	54.2	56.4	58.1	60.9
5+	46.8	48.1	49.0	50.4	53.5	57.3	59.8	61.6	64.7
6+	48.8	50.1	51.1	52.7	56.1	60.3	62.9	64.9	68.3
7+	50.6	52.1	53.2	55.0	58.7	63.2	66.0	68.1	71.7
8+	52.4	54.1	55.3	57.2	61.2	66.0	69.0	71.3	74.9
9+	54.5	56.3	57.6	59.7	64.0	69.1	72.3	74.6	78.4
10+	56.8	58.8	60.3	62.5	67.2	72.6	75.9	78.3	82.2
11+	59.3	61.5	63.1	65.5	70.5	76.2	79.6	82.1	86.0
12+	61.7	64.0	65.7	68.3	73.5	79.5	83.0	85.5	89.5
13+	63.6	66.1	67.9	70.6	76.1	82.2	85.7	88.3	92.2
14+	65.0	67.6	69.5	72.3	78.0	84.2	87.8	90.3	94.2
15+	66.0	68.7	70.6	73.5	79.3	85.6	89.1	91.6	95.4
16+	66.6	69.5	71.4	74.4	80.3	86.5	90.1	92.5	96.3
17+	67.1	70.1	72.1	75.2	81.1	87.4	90.9	93.3	96.9

(The Journal of Pediatrics, 2014)

APPENDIX III

Interview schedule to elicit information pertaining to socio demographic profile, anthropometry and nutritional status of school going children.

SOCIO ECONOMIC STATUS (Kuppuswamy Socioeconomic Scale,2023)

i) Background Information

1.Name :
2.Date of Birth :
3.Type of family :

Nuclear family	
Joint family	
Extended family	

4. Number of members in the family:

5. Occupation of Head Of Family

Legislators, Senior Officials & Managers	
Professionals	
Technicians and Associate Professionals	
Clerks	
Skilled Workers and Shop & Market Sales Workers	
Skilled Agricultural & Fishery Workers	
Craft & Related Trade Workers	
Plant & Machine Operators and Assembler	
Elementary Occupation	
Unemployed	

6. Education of the head of the family :

Profession or Honours	
Graduate	
Intermediate or diploma	
High school certificate	
Middle school certificate	

Primary school certificate	
Illiterate	

7. Monthly family income in Rs.

≥249044	
124489-249043	
93381-124488	
62273-93380	
37325-62272	
12445-37324	
≤ 12444	

ANTHROPOMETRY

Height (cm)	
Weight (kg)	
BMI (kg/m²)	

FOOD FREQUENCY QUESTIONNAIRE TO ASSESS CONSUMPTION OF UPF AMONG SCHOOL GOING CHILDREN

1. FRUIT AND NUTS

		How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Never	1 time per month	2-3 times per month	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day, how many times a day	Quantity consumed (g/ml)
Fresh, sliced, squeezed, chilled or frozen fruit												
100% Fruit juice (fresh o pasteurised fruit juice wit no added sugar, sweeteners o flavours)												
'Fruit' drinks												
Bottled or tetra packed fruit juices												
Fruit in syrup												
Dried fruit (e.g. apricots, plums, figs, dates)												
Salted or sugared nuts and seeds												

2. VEGETABLES AND LEGUMES

	How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Not eaten this month	Less than once a week	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day, how many times a day	Quantity consumed (g/ml)
Vegetables and mushrooms (fresh, uncooked, frozen with no added ingredients)											
Ready-to-heat vegetables (with added ingredients)											
Salad											
100% Vegetable juice (Fresh or pasteurised vegetable juice with no added sugar or other ingredients)											

3. CEREALS AND TUBERS

	How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Not eaten this month	Less than once a week	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day, how many times a	Quantity consumed (g/ml)

										day	
Grains (e.g. rice, spelled, barley, wheat)											
Fresh pasta (with or without eggs)											
Ready-to-heat pasta dishes											
Vermicelli											
Freshly made unpackaged bread (homemade or artisanal)											
Packaged breads and buns											
Bread alternatives (crackers, rusks)											
Packaged sandwich											
Pizza											
Burger											

French fries											
Packaged savoury pies											
Packaged instant rice, soups, noodles											
Instant dishes/snacks (poha/oats)											
Powdered mixes/batters like idli,dosa,vada											
Grits, flakes or flour (made from corn, wheat, oats) or granola made from cereals, nuts and dried fruit with no added sugar, honey or oil											
Breakfast cereals, cereal and energy bars (with added sugar)											
Wraps											
Packaged Indian namkeens (mixtures, murukku)											
Packaged banana chips											

Packaged potato chips, nachos, puffs											
Ready-to-heat potatoes and potato croquettes											

4. MEAT AND FISH

	How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Not eaten this month	Less than once a week	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day – how many times a day	Quantity consumed (g/ml)
Meat and poultry, whole or in the form of steaks, fillets and other cuts, fresh or chilled or frozen with no added ingredients											
Salted, dried, cured, or smoked meats (also used to stuff sandwich)											
Nuggets and sticks											
Sausages, kebabs,frankfurter, and other reconstituted meat products											
Fish and seafood, whole or in the form of steaks, fillets and other cuts, fresh or chilled or frozen											

Salted, dried, cured, or smoked fish											
Canned fish in brine (with or without added preservatives)											
Canned fish in oil (with or without added preservatives)											
Fish nuggets and sticks											

5. MILK, DAIRY PRODUCTS AND EGGS

	How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Not eaten this month	Less than once a week	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day, how many times a day	Quantity consumed (g/ml)
Fresh or pasteurised milk											
Milk drinks											

Fresh or pasteurised plain yoghurt											
Fruit or flavoured yoghurts (e.g. vanilla flavoured)											
Soft cheese (also used to stuff sandwich)											
Hard cheese (also used to stuff sandwich)											
Melted cheese (also used to stuff sandwich)											
Grated cheese											
Sour cream											
Eggs (also used to stuff sandwich and to make omelette)											

6. OILS, FATS AND DRESSING

	How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Not eaten this month	Less than once a week	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day, how many times a day	Quantity consumed (g/ml)
Olive oil and vegetable oils											
Butter, salted butter											
Margarines and other spreads											
Home-made sauces (e.g., mayonnaise, ketchup)											
Packaged sauces (e.g., mayonnaise, ketchup)											
Chutneys/Instant chutney powders/salad dressings											
Packaged pickles											
Coconut cream/milk											

7. SWEETS AND SWEETENERS

	How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Not eaten this month	Less than once a week	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day, how many times a day	Quantity consumed (g/ml)
Freshly made unpackaged biscuits											
Packaged biscuits/cream biscuits/cookies											
Freshly made spoon desserts and puddings											
Packaged spoon desserts and puddings											
Croissant, pastries and packaged snacks											
Ice-cream (artisanal)											
Ice-cream (packaged)											
Chocolate											
Candies											
Spreads (nut spread, peanut butter)											

Jams and marmalades											
Honey and maple syrup											
Cakes, muffins, waffles, donuts											
Packaged sweets(soan papdi, gulab jamun, laddu)											
Flavoured mouth fresheners											

8. DRINKS

	How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Not eaten this month	Less than once a week	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day, how many times a day	Quantity consumed (g/ml)
Tea and herbal infusions											
Coffee											
Soft /aerated drinks											
Energy drinks											
Cocoa drinks (e.g., hot chocolate)											
Packaged drink concentrates (Sherbets)											

Packaged and powdered drink mixes											

9. OTHER

	How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Not eaten this month	Less than once a week	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day, how many times a day	Quantity consumed (g/ml)
Sweet or savoury packaged snacks											
Plant-based drinks (e.g., soy drinks)											
Plant-based yogurt (e.g., soy yogurt)											
Plant-based cheese substitutes (e.g., tofu)											
Plant-based meat substitutes (e.g., veggie burger)											
Health and slimming products including meal replacement shakes and powders											
Instant curries/gravies/pastes											

If you usually consume other foods not listed above, please fill the form below also indicating the amount consumed:

	How often have you eaten the following during the past year (12 months)? *Complete only one frequency column per food*										**How much did you eat ?**
Food	Not eaten this month	Less than once a week	Once a week	2 times a week	3 times a week	4 times a week	5 times a week	6 times a week	Every day	If more than once a day, how many times a day	Quantity consumed (g/ml)