DETERMINATS OF FRUITS AND VEGETABLES INTAKE OF ADOLESCENTS AND DEVELOPMENT OF COMMUNITY GARDEN

By

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Thesis submitted in partial

fulfilment of the

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I.INTRODUCTION

Adolescence is a transition phase to adulthood. The age of adolescence encapsulates a window of time when bodies are metamorphosing and evolving into that of an adult. It is a time when the adolescent tries to establish his own identity yet desperately seeks to be socially accepted by his peers (**Lulinski, 2001).** During adolescence hormonal changes accelerate growth in height (**Brasels, 1999**). According to WHO, the person aged 10 –19 years, the period of transition from childhood to adulthood is called adolescence with accelerated physical, biochemical and emotional development **(Lock et al., 2005).** Nutrition has to be the basis of judging national development. Without good nutrition, neither communicable nor non-communicable disease can be controlled. Malnutrition in India, particularly among women, children and adolescents is an emergency needing immediate attention if the country nseed has to have growth and development **(NNMB, 2003**).Nutrition literacy and leadership at all levels is needed to understand and act. Besides deficiency of calories and protein, deficiency of micronutrients namely vitamins, minerals, and anthropometric deficits are attributed to protein calorie malnutrition. Micronutrient deficiencies contribute significantly, because nutrition deficiencies are needed for utilisation of proteins and calories and to fight infection from a young age **(Whitney and Rolfs, 2000).**

Adolescence well being is a comprehensive construct that includes the ability to acquire knowledge, skills, experience,values,and social relationship, as well as access to domains, participate **(Ingersoll, 2000**).Adolescents are a nutritionally vulnerable age group because of their increased nutritional needs, eating patterns , life styles and susceptibility to environment influences. Therefore, healthy eating habitats play a fundamental role in growth and development during adolescence. However, poor eating habits are often observed in adolescents, whose diets are characterised by a low intake of fruits, green vegetables and a high intake of sugar and soft drinks both in developed and in developing countries **(Bull NL, 2008).**

The phenomenal growth that occurs in adolescence, second only to that in the first year of life, creates increased demands for energy and nutrients. Total nutrient needs are higher during adolescence than any time in the lifecycle. Nutrition and physical growth are integrally related, optimal nutrition is a requisite for achieving full growth potential **(Forbes, 2001**).Failure to consume an adequate diet at this time can result in delayed sexual maturation and can arrest or slow the growth. Nutrition is also important during this time to help prevent adult diet related chronic diseases, such as prior to puberty; nutritional needs are similar for boys and girls. It is during puberty body composition and biological changes (e.g., menarche) emerge which affect gender specific nutrient needs. Nutrient needs for both males and females increase sharply during adolescence (**Story, 2001).**

Fruit and vegetable intake is an important part of a healthy diet and is associated with numerous positive health outcomes. These outcomes include reduced risk for chronic diseases and benefits to weight management. As a result of these important health benefits, the Dietary Guidelines for Americans 2005 **(DGA 2005**) have included fruits and vegetables in the “Food Groups to Encourage” guideline, and the US Department of Agriculture's (USDA's) food guide, the current version of which is called Pyramid, has increased the recommended amounts from previous guidelines (**Kroner and Rasmussen, 2011).** My Pyramid provides recommendations for fruits and vegetables based on individual calorie requirements as determined by an individual's age, sex, and physical activity level and includes specific recommendations about the types of vegetables (e.g. dark green, orange).

Fruit and vegetable consumption is an essential source of vital nutrients for the body's micronutrient requirements. Fruit and vegetables are important elements of a healthy, balanced diet, be it as part of a main meal or as a snack. They contribute vitamins, minerals and fibre, some energy as well as certain minor components often referred to as phyto chemical or secondary plant products which are potentially beneficial for health. Fruit and vegetable consumption is crucial to the viability of micronutrients to the body. This is because these food items are a rich source of vitamins and minerals, which are required for the normal functioning, and protection of the human body (**Ruel et al, 2000**).

Fruits and vegetables also provide essential vitamins and minerals, fiber, and other substances that are important for good health. Most fruits and

vegetables are naturally low in fat and calories and are filling. The health benefits of fruits and vegetables seen in epidemiological studies are the main reasons for the recommended intake of at least 400 g of fruit and vegetables per day (**WHO, 2003**).During adolescence several factors impact on chronic diseases: the development of risk factors, the tracking of risk factors throughout life, and the development of healthy or unhealthy habits that tend to stay throughout life (**WHO 2003).** The protective role of fruit and vegetable intake has been documented in relation to a number of conditions such as cardiovascular disease and stroke (**Ness and Powles, l99l)**, cancer (**Danaei et al, 2005)** and diabetes (**Carter et al, 2010**).

High fruit and vegetable intake can promote health and prevent chronic diseases such as heart diseases and certain types of cancer (krolner, **2003).**Fruit and vegetable consumption varies considerably among and within countries, in large part reflecting the prevailing economic, cultural and agricultural environments, but consumption in many parts of the world remains low. Low intake of fruits and vegetables is frequently observed with low socioeconomic status and is often due to the high cost of fruits and vegetables relative to other foods and or limited access as well as wide availability of unhealthy options, such as energy dense foods. Additional determinants of fruit and vegetable consumption among children are parental food consumption patterns and availability of fruits and vegetables at home (**Rasmussen and Kroner, 2006**).

Although the requirement of micronutrients are in small proportions, vitamins and minerals are needed parts of the daily diet as the human body is not able to synthesize them in sufficient amounts to meet the nutritionally recommended allowances **(Ruel ,et al. , 2004**). Childhood and adolescent obesity have reached epidemic proportions especially in the USA and the alarming rate at which this condition continues to increase is of great concern (**Murielle et al., 2006**). Fruit and vegetable intake has been shown to have positive effects in terms of weight management and obesity prevention (**Tohill *et al*., 2004).**

The adolescents have undergone changes in their eating habits that have decreased the consumption of cereals , fruits and vegetables while in that these bad habits have greatly increased food rich in fats and sugars with high energy density. This phenomenon, called the nutrition transition, leads to increase in the prevalence of obesity is considered an epidemic. Healthy eating is crucial for adolescent health and optimal growth and development. Inadequate fruit and

vegetable intake may predispose adolescents to future risks of morbidity and mortality associated with chronic diseases. Fruit and vegetable intake by adolescents is low, with roughly 80 per cent consuming less than the recommended daily intake. Independence from parents and an increasing level of nutrition behaviours, preferences, and habits are formed and shaped during adolescence. There is a need for the importance of early intervention to establish, maintain, or improve healthy eating behaviours (**Krolner, et al,2011).**

Community gardens are important opportunities to partner with public health initiatives aimed at improving nutrition related outcomes through the development of nutritional knowledge, attitudes and dietary intake. Evidence suggests that when gardeners grow their own produce, overall food consumption patterns and dietary knowledge improves (**Harris, 2009).**In order to promote behaviour change that facilitates increased intake, the health behaviours associated with fruit and vegetable consumption must be addressed (**Kamahis et a1., 2006).** While research has tended to focus on individual level factors such as attitudes, knowledge, intentions and motivation, more recently, there has been a shift to assessing the impact of the environment on health behaviours (**Kamahis et al., 2006).**

The importance of community gardens as sources of healthy, fresh food as well as neighbourhood improvement and unity was demonstrated through this experience. Gardens are an important part of the neighbourhoods where they are located and have great potential for improving healthful food access and combating food deserts. In addition to providing fresh fruits and vegetables, they also act as a meeting place for neighbours. Poor food choices generally arose from a lack of awareness, availability and affordability of unhealthy food, the food that community members ate while growing up and had become accustomed to, and time and transportation constraints. Frequently, an unhealthy diet was shaped by poor social environment rather than detrimental personal choices (Smith **, 2007**).

Community gardening is gaining attention nationwide as an approach to increase the availability and intake of fruits and vegetables for urban residents. Neighbourhood and community gardening can offer affordable and convenient access to fresh produce, particularly for urban populations with limited access to supermarkets (**Alaimo and Packnett , 2008).**However, most studies have

researched the benefits of community gardening for community development, and there is limited research assessing the association between participation in community gardening and dietary intake. One case-control study of community gardens in Philadelphia found that gardeners were more likely than matched controls to eat more vegetables and consume fewer sweet foods and drinks as well as milk products. This examined the association between household-level participation in a community garden and fruit and vegetable consumption in urban areas. Those on low incomes to adhere to healthy eating guidelines and purchase nutrient dense foods such as fruit and vegetables may be compromised (**Riboli, and Norat,2003).**

Urban community gardens are local projects managed for and by members of the local community. They may be run in partnership with local authorities or as part of community development or regeneration schemes (**Hale et al., 201s1**).The gardens exist primarily in urban areas and are often established in response to a local community's lack of open green space (**Villon et al., 2005**). The scale and format of the gardens may vary. As community-based sites, their potential for Fostering environmental change irrespective of age, gender, ethnicity, and income or Education level has gained increased recognition (**Bellows et al., 2004).** Improved nutrition, increased physical activity, enhanced social engagement and improved mental health, are some of the benefits of urban community gardens that have been demonstrated to strengthen and sustain neighbourhoods (**Trig et a1.,2009**).

Development plans now emphasise the importance of sustainability in our communities. Nutritional health and urban community gardens have been recognized as integral components of such sustainable urban design (**Telstra and Suarez-Herrera, 2006**). Urban community gardens and allotments are highlighted as fundamental features in the development of sustainable communities in Dublin in terms of encouraging healthy lifestyles and improving quality of life (**Regional Planning Guidelines Office 2010, Dublin City Council 2011**). Community gardens may convey a number of positive health benefits through increased physical activity and social capital and improved mental health, education and training.

The prevalence of low consumption of fruit and vegetables is one of the indicators used by the WHO to monitor the global status of the prevention and control of non- communicable disease (**World Health Organisation, 2008**). Community based programmes have been identified as a means to reduce the modifiable risk factors for non-communicable diseases (**World Health Organisation, 2008**). Specifically in relation to fruit and vegetable intake, community based interventions have been demonstrated to have a positive effect on intake (**Pomerleau et a1.,2005).** Keeping these in mind the present study is undertaken with the broad objectives to understand the Consumption pattern of fruits and vegetables by adolescents and develop community garden

The specific objectives a

- Study the background information of the selected adolescents
- Assess the nutritional status of adolescents
- Identify the fruit and vegetable intake of adolescents
- Develop community garden in the selected urban area and
- Associate the nutritional status and food consumption pattern of the adolescents.

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II Review of Literature

The literature pertaining to study entitled on the **Determinants of fruits and vegetables intake of adolescents and development of community garden** is reviewed under the following headings:

A. Consumption pattern of fruits and vegetables and healthy benefits

B. Eating habits of adolescent girls

C .Prevalence of nutritional deficiency disorders among adolescents

D .Association of intake of fruits and vegetables and micronutrient status among adolescents

E .Significance of community garden

A.Consumption pattern of fruits and vegetables and health benefits

The vegetables are eaten in a variety of ways, as a part of main meals and as snacks. The nutritional content of vegetables varies considerably; through generally contain little protein or fat and varying proportions of vitamins, dietary minerals, fiber and carbohydrates. Consumption of fruits is also very important in the diet. Fruits are low in calories, full of fiber,vitamins, minerals and antioxidant . Fruit is full of water and has no bad cholesterol (**Krolner et al ., 2011).**Vegetables are important part of healthy eating and provide a source of the many nutrients, including potassium, fiber, folate (folic acid) and vitamins A, E and C. It is like broccoli, spinach, tomatoes, and garlic provides additional benefits, making them a food. Potassium may help to maintain healthy blood pressure. Dietary fiber from vegetables helps reduce blood cholesterol levels and may lower risk of heart disease. Folate (folic acid) helps the healthy red blood cells(**Sommer bug and Keunen ,1999**).The childhood and adolescent obesity have reached epidemic proportions especially in the use and the alarming rate at which this condition continues to increase is of great concern (**Murielle et**

al. , 2006). Among children healthy eating provides nutrient and dietary fiber and is crucially important for optimal growth development (**Begg, et al, 2008**,).

Climate conditions such as temperature and high intensity have been shown to be a strong effect on the nutritional quality of fruits and vegetables **.**Other environment factors such as altitudes, soil pH, salinity, insects and plant diseases have also been reported to affect composition and quality of fruits and vegetables. Also, processing and cooking methods do affect the nutritional value of fruits and vegetables **(Lee and Kader, 2000).** The level of education has been shown to be related to fruits and vegetables consumption in children and adult.

It is very important to wash all fruits and vegetables before cutting, slicing and eating. That support view that consumption of fruits and vegetables promotes health and reduces the risk of developing chronic disease. (**Wardle and Waller (2000**). The adequate intake of fruits and vegetables from an important part of a healthy diet and low fruit and vegetables intake constitute a risk factor for chronic disease (CHD),stroke and cataract formation **(Duyn V and Pivonka, 2000).**

There is also strong evidence that children intake of fruits and vegetables and energy dense foods tracks into adolescence and that food preference tend to be maintained in adulthood. Therefore, promoting a high intake and low intake of energy dense as a part of a healthy diet is critically important and should take place as early as possible in a child's life (**Creige et al., 2011**). Despite the recognized importance of healthy eating among children, recent surveys have revealed that only a few children consume the recommended daily intake of fruits, vegetables and energy dense foods. Moreover as children get orderly they consume even less fruits and vegetables and more soft drinks, sweets, and or high fat snacks (Rangan and Hector, 2010).

The consumption of fruits and vegetables may be associated with a decreased incidence and mortality of a variety of chronic disease which include obesity. Fruits and vegetables intake has been shown to have positive effects in terms of weight management and obesity prevention **(Tohill et al., 2004)**. that adequate intake of fruits and vegetables form an important part of a healthy diet and low fruit and vegetable intake constitute a risk factor for chronic diseases such

as cancer, coronary heart disease (CHD), stroke and cataract formation **(Duyn V and Pivonka, 2000**). Scientific evidence indicates that frequent consumption of fruits and vegetables can prevent oesophageal, stomach, pancreatic, bladder and cervical cancers and that a diet high in fruits and vegetables could prevent 20% of most of cancers **(Crawford *et al*., 1994**). According to reports, fruit and vegetable consumption is influenced by gender, age, income, education and family origin (**Wardle *et al*., 2000; Giskes *et al*., 2002).**

There are various benefits gained by consuming a diet rich in fruits and vegetables, but is not clearly understood vegetables, would prevent obesity or excessive weight gain, suggesting that further studies are needed to elucidate and confirm possible mechanisms involved in the prevention of obesity by fruits and vegetable consumption (**Daucher et al., 2005**). High fruits and vegetable intakes are related to health diet pattern and inversely associated with the consumption of saturated fat-rich food (**Tucker et al., 2005**). Adding more fruits and vegetables to a healthy diet is one possible pathway to reduce blood pressure. In the dietary approaches to stop hypertension (DASH) (**Appel et al., 1999**).Another benefit of fruit and fruit juice is their ability to promote detoxification of the human body. Fruits and vegetables help to cleans the body and tomatoes, pineapples and citruses such as orange, red grape fruits and lemons are well known for their detoxifying properties (**Cuthbertosn, 2000).**

The transportation of oxygen in the blood to the working muscles is vital for aerobic exercise function. Haemoglobin is the protein responsible for oxygen transportation and iron is an essential part of this system. Although the non-haemiron in green, leafy vegetables is not as readily absorbed when compared to the haemiron found in red meat, poultry and seafood, it can be enhanced by the inclusion of a fruit/vegetable source of vitamin C. These combinations and increased variety of fruits and vegetables is particularly important for vegetarian athletes (**Rasmussen et al., 2012).**

Vegetables and fruits contain numerous bioactive and potentially anti carcinogenic substances including carotenes, dithiolthiones, flavoids, indoles, isothiocyanates, phenols, folic acid and vitamins C and **phytonutrients** are obtained for the most part from fruits and vegetables. FDA suggested that one should consume from 5-9

servings of fruit per day (1 cup of raw or 1/2 cup of cooked is considered one serving).However it is not recommended that variety and raw foods are extremely important considerations. But it is well known that these nutrients are critical in reducing oxidative stress and related inflammation. Phytonutrients are indicated by the colors of fruit and vegetables (**Steinmetz and Potter, 1998**).

Antioxidants are the body's mechanism of protection against free radicals - nasties produced in the body. Production of free radicals is increased during exercise, resulting in oxidative stress and cell damage. The effects of oxidative stress on sporting performance may include fatigue, muscle damage and reduced immune function. Interestingly, anti-oxidant supplements may not provide the same benefit despite many supplements providing much greater quantities of antioxidants. The antioxidants found in fruit and vegetables play a major role in protecting the body against oxidative stress and subsequent effects on performance (**Gleeson et al., 2005**).

Hall and Harper (2009) pointed out tha**t** fruit and vegetable consumption is influenced by many factors, including: physical access within a community, food affordability, knowledge of healthy food choices and food skills such as shopping, budgeting, preparation, and storage.

B. Eating Habits of adolescent girls and boys

Adolescence is a time of change to adult behaviour and there by eating habits of childhood gradually change into those typical of an adult. Adolescence is, therefore, an important time that demands for health and nutrition education. Eating habits may be erratic, large quantities may be eaten one day and very little next day. It has been pointed out by researchers that adolescents in different parts of the country had nutritional deficiencies. It occurs in boys as well as in girls **(Fulkerson and Keel, 1999**).The dramatic increase in energy and nutrient requirements coincides with other factors that may affect adolescents' food choices and nutrient intake and thus, nutritional status. These factors, including the quest for independence and acceptance by peers, increased mobility, greater time spent at school and/or work activities, and preoccupation with self-image, contribute to the erratic and unhealthy eating behaviours that are common during adolescence

(**Fiddler and Kobe, 2012**).

Eating patterns and behaviours of adolescents are influenced by many factors, including peer influences, parental modeling, food availability, food preferences, cost, convenience, personal and cultural beliefs, mass media, and body image. Three interacting levels of influence which impact adolescent eating behaviours: personal or individual, environmental, and macrosystems. Personal factors that influence eating behaviour include attitudes, beliefs, food preferences, self-efficacy and also biological changes (**Renzaho, 2006**).

Environmental factors include the immediate social environment such as family, friends and peer networks, and other factors such as school, fast food outlets and social and cultural norms. Macro system factors, which include food availability, food production and distribution systems, and mass media and advertising, play a more distant and indirect role in determining food behaviours yet can exert a powerful influence on eating behaviours. Eating at fast food restaurants has direct bearing on the nutritional status of adolescents. Many fast foods are high in fat and low in fiber and nutrients (**Burns,2004).**

However, there are ways to increase the nutrient content of fast food meals and decrease the fat contents. Adolescents can be counselled to ask for juice or milk instead of soft drinks, order small sandwiches instead of larger choices, choose a salad as a side dish instead of fries, order grilled items as opposed to fried sandwiches, and avoid “supersizing” meals, even if they seem to offer a better economic deal. The relatively uniform growth of childhood is suddenly altered by an increase in the growth. First is the greater demand for nutrients due to the physical growth and development. Second is the adolescents change life style and food habitats, it effects of both nutrients intake and needs. Third are the adolescents with special nutrients needs such as those who participate in sports having a chronic illness. The eating habitats of adolescents are affected by their environment, life style and normal development (**Bonnie and Sue,2000**).

Adolescent girls are at special nutritional risk because of iron deficiency anaemia. The requirement of iron, which is 18 mg/day, is needed not only to make losses due to menses but also to build up reserves. Calorie requirement for most adolescent is high (**Huffman and Schofield, 2013).** An adolescent may rush off to school without eating breakfast. When away from home

he or she usually eats readily available meals that are acceptable to its peer groups. This means snacks in the form of fast-food (junk food). Breakfast is the most important meal in the dietary plan of an adolescent. Adequate intake of animal and plant sources of protein is vital for adolescence. Vitamins and minerals such as calcium, iron, and iodine must be included in adolescents' diet. Best sources of vitamins are fruits and vegetables while milk and dairy products are the best sources of calcium (**Hallstrom et al., 2012**). Adolescent girls' nutrition is vital because improving female adolescence nutrition behaviours is an investment for improving health among future generations (**Locks et al., 2013).**

Dietary habits, which affect food preferences, energy consumption and nutrient intakes, are generally developed in early childhood and particularly during adolescence. The home and school environments play a major role in determining a child's attitude to, and consumption of individual foods. Teenagers, as well as being exposed to periodic food fads and slimming trends, tend to skip meals and develop irregular eating habits. One of the most frequently missed meals is breakfast. That breakfast plays an important role in providing needed energy and nutrients after an overnight fast and can aid in concentration and performance at school. (**Neumar and Steiner, 2000).**

Snacks generally form an integral part of meal patterns for both children and teenagers. Younger children cannot eat large quantities at one sitting and often get hungry long before the next regular mealtime. Mid-morning and mid-afternoon snacks can help to meet energy needs throughout the day. Fast-growing and active teenagers often have substantial energy and nutrition needs and the teaching of food and nutrition in the school curricula will enable children to have the knowledge to make informed choices about the foods in their regular meals and snacks (**Trowel and Danton-Hill, 1999**) .

Eating habitats vary widely between individual adolescents and reflecting socio cultural trends in food availability and nutritional goals. the dietary habits of adolescents are a reflection of those of the population is general. The primary reasons for adolescent food selection include, taste, familiarity/habit, health, dieting and satiety (**Swaminathan, 2008**). Psychological pressure on adolescents influences their eating habitats. The common, physical, social and lifestyle changes their eating pattern. The eating habitats vary widely between individual adolescents and also display some general trends overtime, reflecting socio cultural trends in

away from home many consume fast foods, which are convenient, but are often high in calories and fat. It is common for adolescents to skip meals and snacks selection frequently. Adolescents exported eating a more healthy and varied meal at dinner (**Anderson et al., 2000).**

The nutritional status and development of adolescent girls are integrate related to their nutritional requirements, dietary intake, dietary practices, cultural traditions and meal patterns (**Rolland-Catcher, 2000).** The growth and prosperity of a nation depend heavily on the nutritional status and development of adolescent girls as they not only constitute one tenth of its population but also influence the growth of the remaining population. The nutritional status and development of adolescent girls are related to their nutritional requirements, dietary intake, dietary practices, cultural traditions and meal patterns. Proper nutrition promotes the optimal growth and development of children and adolescents. Healthy eating helps prevent high cholesterol and high blood pressure and helps reduce the risk of developing chronic diseases such as cardiovascular disease, cancer, and diabetes. Healthy eating helps reduce one´s risk for developing obesity, osteoporosis, iron deficiency, and dental caries (**Nairobi and Kenya, 2000).**

Eating meals and snacking away from home puts the responsibility for good food choices right in adolescents' hands. Snacks should be low in both fat and added sugar. Some healthful snack ideas include fresh fruit, sliced vegetables with low-fat dip, low-fat yogurt, low-fat string cheese, peanut butter and crackers, baked chips, granola bars, and graham crackers. Juices, fruit drinks, and sodas are usually very high in calories from natural or added sugar, so they should be consumed in moderation. The Food Guide Pyramid is an appropriate guide for adolescents' food choices, even when snacking. Adolescents tend to be very conscious of appearances and may feel pressure to be thin or to look a certain way. Fear of gaining weight may lead to overly restrictive eating habits. Some teens resort to self-induced vomiting or laxative use to control their weight. Both boys and girls are affected by eating disorders. Teens who suspect they have a problem with body image or eating habits should talk to a trusted adult (**Fathering, 1999**).

During adolescence there is a high susceptibility to nutritional deficiencies and poor eating habits. This may lead to problems later on in life such as osteoporosis, obesity, hyperlipedemia, sexual maturation delays, and final adult height. The development of eating disorders is also prominent during this

time. Eating disorders are common among teens whose food choices are influenced by society´s pressures to have the ideal look (**Skinner and Salvettin et al., 2001**).Some eating disorders are classified as anorexia, bulimia, compulsive overeating or binge eating. Both anorexia and bulimia can lead to convulsions, kidney failure, irregular heartbeats, osteoporosis and dental erosion. Adolescents suffering from compulsive overeating disorder are at risk for heart attack, high blood pressure and high cholesterol.

Diets of Indian adolescent girls especially in rural areas are inadequate both in terms of quality and quantity. They mainly consume cereal based food but grossly deficient in legumes, animal foods and green leafy vegetables. (**Gupta and Sen, 2001).** In poor communities adolescent girls are often last to be given food even when pregnancy further increases their nutritional needs. In addition, while staple food items (i.e. rice, pulse, bread, etc.) are distributed fairly equally, side dishes usually containing a higher proportion of micronutrients (i.e. vegetables, meat, yogurt, ghee, etc.) are often preferentially allocated to valued household members, including adult males and small children.(**Morgan and Zabik,1999**).

Adolescents need more of everything to keep up with the massive teenage growth spurt, calories and protein for growth and to build muscles and protein, calcium, phosphorus, and vitamin D for bone formation. Some use food to establish an identity, such as by becoming a vegetarian or going on a diet. Iron-deficiency anaemia is fairly common in adolescent girls; the cause is not always clear and may be a problem of absorption suddenly they have the responsibility of choosing perhaps the major part of their diet rather than the amount of iron in the diet. Anorexia and certain other eating disorders are a risk for a small group of adolescents, especially girls (**Greer and Krebs, 2006)**

C. Prevalence of nutritional deficiency disorders among adolescents

Adolescence is the transition period between childhood and adulthood, a time of life that begins at puberty**.** Adolescents are also susceptible to nutritional deficiencies, especially iron, calcium, zinc and vitamins A, C, D, E and B, due to their bodies' increased demand for nutrients to meet the fast growth rate which characterizes this stage of life (**Spear,2002**).For girls, puberty typically occurs between ages 12 and 13, while for boys it occurs between ages 14 and 15. It is one of the fastest growth periods of a person's life. During this time, physical changes affect the body's nutritional needs, while changes in one's lifestyle may affect eating habits and food choices. Nutritional health during adolescence is important for supporting the growing body and for preventing future health problem. (**Dietary guidelines for Americans, 2010).**

Growth in adolescence may be limited by prolonged under nutrition, infections and chronic disease. Stunting or short stature in adolescence is not only indicative of past under nutrition during childhood but also may be a cumulative indicator of nutritional status during adolescence. Stunting among adolescents reflects increased health risks, particularly among females who would also tend to have a small pelvis, leading possibly to obstructed labour during childbirth. Gains in weight are also considerable during the adolescent years with increases in both muscle and fat. Girls tend to gain relatively more fat, while boys gain relatively more muscle (**Murphy Wilkens, 2004)**.Under nutrition in girls during adolescence is characterized by a low weight, which may result in poor pregnancy outcomes, particularly low birth weight. Under nutrition also may limit school achievement and work productivity in later years. Lack of nutrients can result in deficiency syndromes (eg, kwashiorkor, pellagra) or other disorders .Excess intake of macronutrients can lead to obesity and related disorders, excess intake of micronutrients can be toxic. Also, the balance of various types of nutrients, such as how much unsaturated and

saturated fat is consumed, can influence the development of disorders (**Poplin, and Montero, 1996).**

Good nutrition is needed to support the growth and developmental changes of adolescence. Under nutrition, in general, has been shown to delay the adolescent growth spurt **(Brain and Brabin, 1999**). Over nutrition, a form of malnutrition where macronutrients (carbohydrates, fats, proteins) are supplied in excess of the body's needs, can lead to obesity and is a concern in industrialized nations. In the developed world, adolescents are increasingly consuming energy-rich, nutrient poor diets comprised of fast food, processed foods, and sugar-sweetened beverages **(Moreno et al., 2010**). Studies have also shown that many adolescents do not come close to meeting intake recommendations for nutrient-rich foods, such as fruits, vegetables, and milk **(Duffy and Huybrechts, 2012**). Together, these dietary behaviours place adolescents at increased risk for micronutrient deficiencies and growth, not unique physiological changes during adolescence(**Washington, 2001)**. Metabolic body weight is determined by calculating the 0.75 power of body mass (body mass^0.75).

The group of malnutrition are primary, secondary and conditioned. In primary malnutrition the deficiency is due to adequate intake of nutrients. In secondary or conditioned malnutrition, the p deficiency is produced factors other than inadequate factor intake such as interference with the amount of food consumed due to a disease are improper dentures. Multiple vitamin deficiency are present in most individuals who had deficiency conditions (**Micheal and Elia M, 2005**).

The deficiency is one the most common nutritional disorders, and adolescents are at special risk. Up to 13 percent of teenage boys and girls were found to have low iron stores. Rapid growth, coupled with a fast lifestyle and poor dietary choices, can result in iron deficiency each month following menstruation. Rapid growth, coupled with rapid growth, coupled with a fast lifestyle and poor dietary choices can result in iron-deficiency. Teenage girls need to pay particular attention to iron because their iron stores are depleted each month following menstruation. (**Worthington et al., 1999).**

Nutritional disease, any of the nutrient-related diseases and conditions that cause illness in humans. They may include deficiencies or excesses in the diet, obesity and eating disorders, and chronic diseases such as cardiovascular disease, hypertension, cancer, and diabetes mellitus (**Briefel et al.,2004**). Nutritional diseases also include developmental abnormalities that can be prevented by diet, hereditary metabolic disorders that respond to dietary treatment, the interaction of foods and nutrients with drugs, food allergies and intolerances, and potential hazards in the food supply (**Reedy and Krebs, 2009**).

Eating disorders involve extreme behaviour related to food and exercise. Sometimes referred to as “starving or stuffing,” they encompass a group of conditions marked by underrating or overeating. During adolescence there is a high incidence of nutritional deficiencies and poor eating habits. Adolescence is a period when peer pressure can affect teenage eating behaviour and they may start skipping meals or possibly under-eating or over-eating (**Croll and Neumark, 2001**). Many adolescents see themselves as being too fat, while some, particularly males, see themselves as too thin. About 34 percent of females and 13 percent of males report dieting to lose weight. Anxiety, worry, loneliness and difficulty in managing family relationships are all factors that can lead to a refusal to eat or to excessive eating. Stress and boredom often result in the compulsive eating of certain foods, called "bingeing". These disorders are more prevalent among adolescent girls, but have been increasing among adolescent boys in recent years (**Sharon and Ellie, 2008**). Because eating disorders often lead to malnourishment, adolescents with an eating disorder are deprived of the crucial nutrients their still-growing bodies need. Anaemia due to iron deficiency is common, as is anaemia due to foliate deficiency, especially among women. Vitamin D deficiency is common during late pregnancy, predisposing the child to decreased bone mass **(Duyff and Larson R, 2002).**

Eating disorders stem from stress, low self-esteem, and other psychological and emotional issues. It is important for parents to watch for signs and symptoms of these disorders, including sudden weight loss, lethargy, vomiting after meals, and the use of appetite suppressants. Eating disorders can lead to serious complications or even be fatal if left untreated. Treatment includes cognitive, behavioural, and nutritional therapy. Anorexia nervosa is a potentially fatal condition

characterized by underrating and excessive weight loss. People with this disorder are preoccupied with dieting, calories, and food intake to an unhealthy degree. Anorexics have a poor body image, which leads to anxiety, avoidance of food, a rigid exercise regimen, fasting, and a denial of hunger. The condition predominantly affects females **(David and Suskind, 2009).**

People who suffer from binge-eating disorder experience regular episodes of eating an extremely large amount of food in a short period of time. Binge eating is a compulsive behaviour, and people who suffer from it typically feel it is beyond their control. This behaviour often causes feelings of shame and embarrassment, and leads to obesity, high blood pressure, high cholesterol levels, Type 2 diabetes, and other health problems. Bulimia nervosa is characterized by alternating cycles of overeating and underrating. People who suffer from it partake in binge eating, followed by compensatory behaviour, such as self-induced vomiting, laxative use, and compulsive exercise. As with anorexia, most people with this condition are female. (**Bode and Janet, 1999).**

During adolescence there are many changes taking place as a child's body turns into that of an adult and their nutritional needs increase. throughout adolescence a teenager's iron needs increase significantly. When girls begin to menstruate their dietary iron intake must increase to compensate for the loss of iron in their menstrual blood. At this time boys also need more iron because of their rapid growth and increase in blood volume. Around the age of 19, when growth slows, a female's iron needs are almost double that of males. Calcium is also important throughout the teenage years, necessary for building strong bones and ensuring good health and wellbeing later on in life. It is essential that teenagers include at least three serves of dairy food a day to maintain an adequate calcium intake **(Jinan M and Albert, 2010).**

The iodine deficiency disorders is an essential micronutrient is required 100-150 micrograms daily for normal human growth and development. Iodine deficiency from the development of focus to all stages of human beings. If a person iodine intake is insufficient, the thyroid gland enlarges in an attempt to take up more iodide from blood. The pituitary gland hormone, “thyroid stimulating hormone(TSH) also stimulates the growth of thyroid gland. The disorders of

deficiency of iodine may cause goitre, subnormal intelligence, neuromuscular weakness, endemic cretinism, still birth, hypothyroidism, defect invasion, hearing and speech, spasticity, intrauterine death, mental retardation **(Goal S and Gupta, 2012).**

Zinc directly influences the growth hormone and insulin-like growth factor and affects bone metabolism and is involved in DNA synthesis Zinc and vitamin A affect immune function (**Black and Sazawal, 2001)**, and thus risk of morbidity and associated growth faltering. Zinc and iron deficiencies can result in anorexia, leading to decreased intakes of all nutrients, which can also limit growth. The iron and vitamin A supplementation trials did not reveal consistent results, but did show significant positive effects on linear growth in the context of severe deficiencies (**Rivera et al., 2003 and Ramakrishnan et al., 2004).** Because stunted linear growth remains widespread in countries undergoing the nutrition transition, where energy supply is generally not constrained, it is reasonable to assume that micronutrient deficiencies are likely to be the main growth-limiting nutritional influences in these setting **(Seghieri and Arimond, 2010**).

C. Association of intake of fruits and vegetables and, micronutrient status among adolescents

Fruit and vegetable intake is an important part of a healthy diet and is associated with numerous positive health outcomes. These outcomes include reduced risk for chronic diseases and benefits to weight management. Vegetables and fruits contain numerous bioactive and potentially ant carcinogenic substances including carotenes, dithiolthiones, flavoids, indoles, isothiocyanates, phenols, folic acid and vitamins C and E**(Steinmetz and Potter, 1999).** Girls' intakes of fruits and vegetables, selected micronutrients, and fat were the main outcomes of interest. Structural equation modeling was used to test a model describing relationships among parents' fruit and vegetable intake, parents' use of pressure in child feeding, and daughters' fruit and vegetable, micronutrient, and fat intakes. **(Fisher J O, et al., 2002**). Among others, energy, calcium, iron, zinc and vitamin A are consumed at less than 67% of the Recommended Dietary Allowances (RDAs), which compromises intake of micronutrients such as several B–vitamins, vitamin E, magnesium and zinc.

Sugar intake is also high (84%) (**Nel and Steyn, 2002**), with low intakes of vegetables, roots/tubers and fruit (40, 64 and 70%, respectively).

There is strong evidence that children's intake of fruit, vegetables and energy-dense foods tracks into adolescence, and those food preferences tend to be maintained in adulthood (**Craigie and Lake, et al., 2003**). Therefore, promoting a high intake of fruit and vegetables and low intake of energy-dense foods as part of a healthy diet is critically important and should take place as early as possible in a child's life. Despite the recognised importance of healthy eating among children, recent surveys have revealed that only a few children consume the recommended daily intake of fruit, vegetables and energy-dense foods. Moreover, as children get older they consume even less fruit and vegetables and more soft drinks, sweets and/or high-fat snacks (**Bell and Kremer, 2010).**

According to the 2007-08 Australian Bureau of Statistics (ABS) National Health Survey, 98 percent of children aged 5-7 years and 99 percent aged 8-11 years met their recommended daily intake of one serve of fruit, but this proportion decreased to 23 percent of children aged 12-15 years and even further to 18 percent of children aged 16-17 years, for whom three serves of fruit is considered adequate (ABS, 2009). A smaller proportion of children were meeting the guidelines for vegetable intake. Around six in ten children aged 5-7 years (57%) met the recommended daily intake of two serves of vegetables, whereas only three in ten children aged 8-11 years (33%) met the recommended intake of three serves. The proportion of older children meeting their recommended intake of vegetables (four serves or more) decreased to 15 percent in children aged 12-15 years and 16 percent in children aged 16-17 years.

Micronutrients such as iron and zinc are essential trace elements involved in the high growth rates of adolescents. Micronutrients are those nutrients we require in relatively small quantities. They are vitamins and minerals, and our good health requires them in milligram and microgram amounts. Recall that fats, carbohydrates and proteins are macronutrients, meaning that we require them in relatively large quantities (**Insel Paul ,2011**).Micronutrient recommendations for adolescents are mostly the same as for adults, though children this age need more of certain minerals to promote bone growth (e.g., calcium and phosphorus, along

with iron and zinc for girls). Again, vitamins and minerals should be obtained from food first, with supplementation for certain micronutrients only (such as iron).The most important micronutrients for adolescents are calcium, vitamin D, vitamin A, and iron. Adequate calcium and vitamin D are essential for building bone mass. The recommendation for calcium is 1,300 milligrams for both boys and girls (**Maunder et al., 2001**). Low intakes of micronutrients, including calcium, folate, magnesium and potassium, have been previously reported in Australian adolescents (**Lytle,2002**).

Micronutrients are essential vitamins and minerals that are required in small amounts for various physiological functions. Micronutrients are required for growth, maintenance, repair and health of tissues and bones (**Grifith 2000**). Assessing micronutrient status in adolescents is important due to the contribution of micronutrients to disease prevention (**Sterlinko Grm,2012**). Low-fat milk and cheeses are excellent sources of calcium and help young people avoid saturated fat and cholesterol. It can also be helpful for adolescents to consume products fortified with calcium, such as breakfast cereals and orange juice. Iron supports the growth of muscle and lean body mass. Adolescent girls also need to ensure sufficient iron intake as they start to menstruate. Girls ages twelve to eighteen require 15 milligrams of iron per day. Increased amounts of vitamin C from orange juice and other sources can aid in iron absorption. Also, adequate fruit and vegetable intake allows for meeting vitamin A needs. Micronutrient malnutrition remains a serious nutritional concern, of which vitamin A, iodine and iron deficiency are highly reported (**World Health Organization, 2002).** While these deficiencies can have a number of causes not necessarily related to nutrition, a high proportion results from nutritional inadequacies (**Kennedy et al., 2010)**

D).Significant of community garden

Community kitchen gardens are the easiest way of growing desirable fruits and vegetables at the desirable place. A community kitchen garden provides for growing food that is locally available, organic, and affordable and provides scope of availability of season fruits and vegetables. Farmers have been growing different varieties of cereals, vegetables and fruits in their farms (**Troy Glover, 2004).** A kitchen garden is where herbs and vegetables are grown around

the house for household use. Since early times a small plot near to the house has been used for growing a variety of vegetables according to the season (**Williamson, Erin, 2002**).

Community gardens improve users' health through increased fresh vegetable consumption and providing a venue for exercise. The gardens also combat two forms of alienation that plague modern urban life, by bringing urban gardeners closer in touch with the source of their food, and by breaking down isolation by creating a social community. Community provide other social benefits, such as the sharing of food production knowledge with the wider community and safer living spaces (**Melville Court and Moiser, 2001).** Community food gardens contribute to the various needs of communities and are used not only for growing of nutritious foods, but also for such things as leisure, crime prevention, healing therapies, and ecological restoration (**Armstrong, 2007**).

The growing and practice around community gardens highlights their roles in re-building localised urban food systems, contributing to food security and as part of the social mobilisation required for sustainable development. Of particular note for the current research is the tendency for community gardens to include marginalised populations in social, collective endeavour where they can acquire skills, access nutritious and culturally relevant food and enjoy the physical and psychosocial benefits of tilling the earth **(Flanagan and Hancock, 2003).**

The community garden is built from some of the features that represent special significance. The garden is a place to plant species of plants that are endangered. Species such as the American chestnut tree are excellent candidates for planting at the local gardens. This enables the local citizens to be active in promoting the conservation of natural resources, so that they can be enjoyed by their children and grandchildren far into the future. The trees that are planted today, will be living reminders 50 years from now of the pride the local residents took in their neighbourhood and the environment (**Francis mark, 2003).**

A cultural feature of the community garden is its role in the residential community. A garden can act as a neighbourhood centre, similar to a city square in a commercial district. The garden is a meeting place for local residents to share work, play, and ideas. This centre piece will be a source of civic pride for the

residents, a place which can take on the cultural character of the neighbourhood where it resides. A community garden can be the standard of beauty and civic pride for any neighbourhood (**Beam and Chen, 2002) .**The cultural significance can be attributed to a community garden through a relationship with local organizations. Many existing community gardens are organized by social groups such as grade schools and churches. This adds a cultural flavour to the garden, and is an outlet for the organizations as well. These groups would adopt the plot and share in taking care of it. At harvest time, they could enjoy the produce themselves, or sell it as a fundraiser at the local farmer's market.

Community gardens fall under the umbrella of urban agriculture, defined as “the growing, processing, and distribution of food and other products through intensive plant cultivation and animal husbandry in and around cities.” Community gardens belong to a system linked to the larger urban context of food production and distribution. Community gardens join urban commercial farms, market gardens, and private gardens in this category If offers the opportunity for community building. Worldwide, 80 percent of wealth is held by a handful of countries and those highly developed countries, such as the United States, consume more natural resources than the rest of the world combined (**Tranel and Handlin, 2004)**

Community building is important because it is an opportunity to teach others how to become self sufficient again. Building sustainable neighbourhoods begins by educating the public about what a sustainable neighbourhood is all about. That process can begin by teaching people how to garden. It is common knowledge that educated women have fewer children. This has been shown in developing countries for several decades. Reducing fertility rates in poor neighbourhoods helps to decrease the cost of social programmes. Teaching people to garden is just another option to improve the quality of life in every neighbourhood **(Diers and Jim, 2005**).

A community garden is any piece of land gardened by a group of people, utilizing either individual or shared plots on private or public land. The land may produce fruits, vegetables, and/or ornamentals. The distinguishing characteristic is that community gardeners grow their produce on shared lots that

have been divided into smaller plots of land for each household's use (usually for a small fee). Distribution of land does not come without much organization and programme development to coordinate gardeners, manage land and resources, and facilitate educational or social activities and disputes. Some gardens may have larger goals of education, community supported agriculture entrepreneurship, or food bank gardening. (**Helm and Stang, 2009).**

Community based programmes have been identified as a means to reduce the modifiable risk factors for non communicable diseases (**World Health Organisation, 2008**). Specifically in relation to fruit and vegetable intake, community based interventions have been demonstrated to have a positive effect on intake (**Pomerleau et a1., 2005**). Community gardens offer important opportunities to partner with public health initiatives aimed at improving nutrition related outcomes through the development of nutritional knowledge, attitudes and dietary intake. Evidence suggests that when gardeners grow their own produce, overall food consumption patterns and dietary knowledge improves (**Pothukuchi, 2004**).

Many community gardeners, especially those from immigrant communities, take advantage of food production in community gardens to provide a significant source of food and/or income. Community gardens allow families and individuals without land of their own the opportunity to produce food. Community gardens provide access to nutritionally rich foods that may otherwise be unavailable to low-income families and individuals. Community gardens donate thousands of pounds of fresh produce to food pantries and involve people in processes that provide food security and alleviate hunger.

Eating locally produced food reduces asthma rates, because children are able to consume manageable amounts of local pollen and develop immunities. Exposure to green space reduces stress and increases a sense of wellness and belonging. Increasing the consumption of fresh local produce is one of the best ways to address childhood lead poisoning **(Maller and Mardie,et al, 2005).**

Community gardens add beauty to the community and heighten people's awareness and appreciation for living things. Community gardens filter rainwater, helping to keep lakes, rivers, and groundwater clean. Community

gardens restore oxygen to the air and help to reduce air pollution. Community gardens recycle huge volumes of tree trimmings, leaves, grass clippings, and other organic wastes back into the soil. Community gardens provide much needed green space in lower-income neighbourhoods which typically have access to less green space than do other parts of the community **(Been V et al., 2006).**

III. METHODOLGY

The methodology followed for undertaking the present study entitled **Determinants of fruits and vegetables intake of adolescents and development of community garden** is given below:

A. Selection of area and adolescents

B. Collection of background information from the selected adolescents

C. Assessment of Nutritional status of the adolescents

1. Anthropometry
2. Clinical examination and
3. Dietary practices

D. Nutrition education

E. Development of community garden

A. Selection of area and adolescents

The area selected for the study was Coimbatore city. The specific locations such as Saibaba Colony, Edayar Palayam, Velandi Palayam and KNG Puthur were selected by purpose sampling method from Coimbatore city because of their easy access and convenience of the investigator. A total of 200 adolescents comprising 100 each adolescent girls and boys in the age group of 18 to 20 years were selected randomly.

B. Collection of background information from the selected adolescents

A pretested interview schedule shown in Annexure I encompassing the details related to the background information.The socio economic data such as age, education, type of family, size of the family, gender and monthly income of the

family were included.Since the selected adolescents were going to schools and collages the questionnaire was distributed and explained in details of filling the questionnaire.

C. Assessment of Nutritional Status of the adolescents

Anthropometric measurements, Clinical assessment and a 24 hour dietary recall survey were carried out to assess the nutritional status of the adolescents.

1. Anthropometric Measurements

Anthropometric measurement such as height and weight were measured for all the selected adolescents by using the standard procedures.

a) Height

Height was measured by using non- stretchable measuring tap. The adolescents were made to stand erect, looking straight on leavealed surface with heels together, buttocks, shoulder and back of the head touching the upright and without shoes. The height was measured to the accuracy to 0.5 cm.

b) Weight

Body weight is the most widely used and sensitive and simplest reproducible anthropometric measurement.

The body weight was taken from all the selected adolescents by using bathroom scales with accuracy to 0.1kg. The balance was made adjusted to zero and the adolescents were made to stand erect without barefoot and the reading was noted.

c) Body Mass Index(BMI)

Body mass index (BMI)is a number calculated from a child's weight and height. BMI is a reliable indicator of body fatness for most children and teens, BMI is an inexpensive and easy to perform method of screening for weight categories that may lead to health problems.

For children and teens, BMI is age and sex specific and is often referred to as BMI for age.

Weight status category	Percentile Range
Underweight	Less than the 5th Percentile
Healthy weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	Equal to or greater than 95th percentile

*CDC2014

This was used to assess the BMI grades for all the 200 adolescents.

2. Clinical Examinations

Clinical examination helps to assess the levels of health status of individual and group of population in relation to food they consume. It is the simplest and a practical method. When two or more clinical signs are observed, it characterizes the presence of deficiency diseases.

Clinical examination was done for all the selected adolescents. Clinical assessment was carried out with the help of a medical practitioner using a clinical schedule (Annexure II) suggested by ICMR to identify the nutritional deficiency symptoms among the selected adolescents. The clinical examination includes general appearance, hair, nails, skin, eyes, and mouth and extremities of signs and deficiency of nutrient were observed

3. Dietary practices

A diet survey provides information about dietary intake patterns food s and estimated nutrition intakes. A dietary pattern has been a focus of studies that aimed to explore the complex relationship between diet and health outcomes. Food consumption is one of the important determinants of nutritional status; hence dietary assessment forms an integral part of nutritional survey. This method is used for obtaining qualitative details of diet and studying patterns of food consumption level of household (**Shetty 2002).**The frequency consumption of fruits and

vegetables has vary from each individual it may be daily, alternative days, weekly once and occasionally.

A 24 hour dietary recall method was adopted find out the type of diet, number of meals per day ,likes and dislikes of foods, consumption of fruits and vegetable of fruits and vegetables, favorite fruits and vegetables and quantity of fruits and vegetables consumed by the selected adolescents.

D. Nutrition education

Community based health and nutrition education and services and development may improve the overall health and nutritional knowledge and status of adolescents. A sub sample of 50 percent of the adolescents were selected form the total population of 200 by purpose sampling techniques for giving nutrition education based on their willingness and easy accessibility. A set of questionnaire given in AnnexerIII was formulated to test the nutritional knowledge of the adolescents before and after nutrition education. Nutrition education was given for half an hour to the group of selected adolescents for a period of one week. Nutrition education covers importance and role of fruits and vegetables for health, the daily recommended allowances of fruits and vegetables, effective cooking methods of vegetables to conserve the nutrients storage of fruits and vegetables, the difference between organic and inorganic foods and importance of kitchen garden. The impact of nutrition education was assessed with the help of same questionnaire and the knowledge was tested using scores.

E. Development of Community Garden

Development of community garden in the urban population is promoted to enhance the social engagement, and to improve the mental and physical health of urban population. Involvement in the kitchen gardening raises the physical activity, leads to increased self perceived quality of life and brings changes in eating behavior which results in happy healthy life. The community were supplied with plant seeds and guided to utilize the waste water to develop community garden and enjoy the fruitful outcome of plant foods produced by self effort. The interviewer visited each and every home of selected adolescents to know the presence of community garden and different produce of fruits and vegetables were also

recorded. The space utilized for produce was measured by tape where the kitchen garden was available. Adolescents were motivated especially those who do not have kitchen garden and they were started developing garden. The improvements is their development of community kitchen garden also recorded.

VEGETABLES

MINT

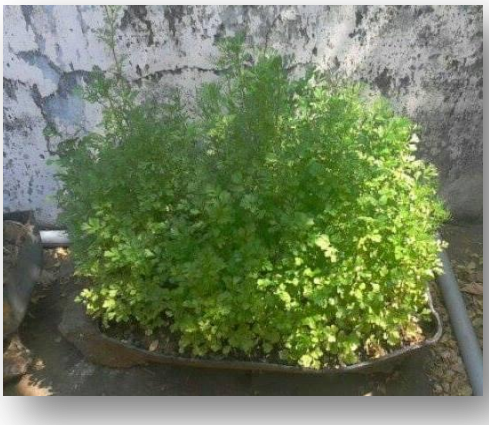

Figure I

CURRY LEAVES

Figure II

CLUSTER BEANS

Figure III

BROAD BEANS

Figure IV

BOTTLE GOURD

Figure V

BRINJAL

Figure VI

TOMATO

Figure VIII

FRUITS

POMEGRANATE

PAPAYA

PLANTAIN

IV. Result and Discussion

The results of the present study entitled "**Determinants of fruits and vegetables intake of adolescentsand development of community garden"**are discussed under the following headings:

A. Background information
B. Anthropometric measurements
C. Clinical signs and symptoms
D. Dietary pattern
E. Development of community garden

A. Background Information

Background information includes age, type of family, religion, family size, occupational status and income level of the parents are discussed below.

1. Age of the participants

Age wise distribution of the selected adolescent boys and girls are presented in Table I.

Table IAge wise Distribution of Adolescents

Age* (in years)	Boys		Girls	
	Number N=200	Percent	Number N=200	Percent
13-15	63	31	75	37
16-18	82	41	67	34
19-20	55	28	58	29

***Age classification according to ICMR (2010)**

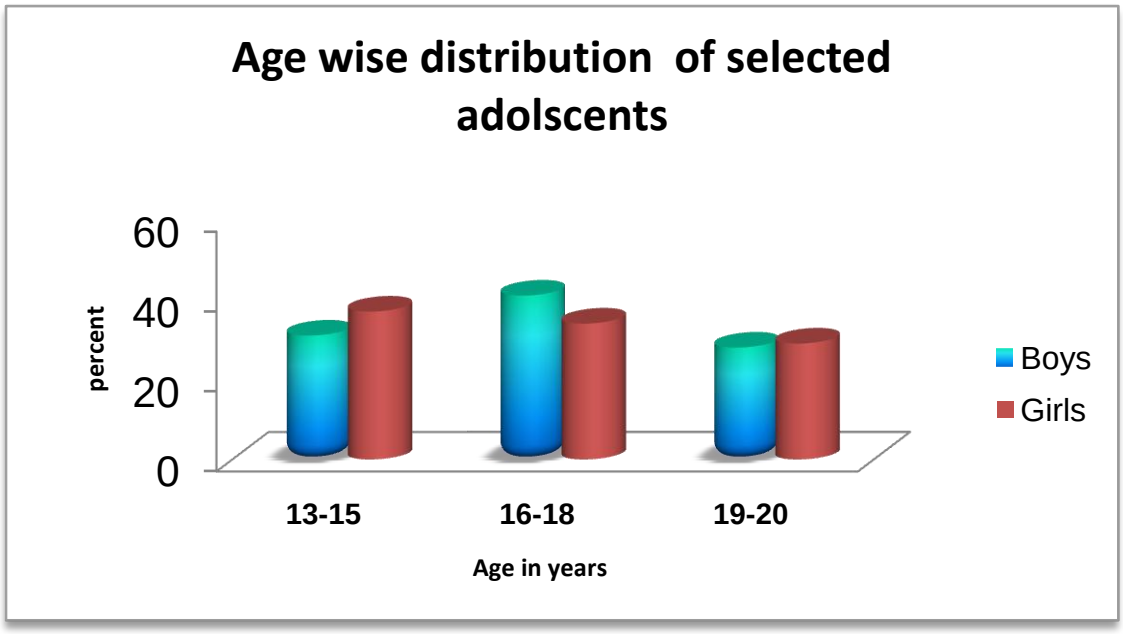

Figure I

It can be inferred that 41 percent of boys and 34 percent of girls were in the age range of 16 and 18 years followed by this 31 percent of boys and 37 percent of girls belonged to 13-15 years. Minimum of 28-29 percent of both the gender were in the age group of 19 -20 years. Since the participants were between the age group of 13 and 20 they are going to schools and colleges. So all the selected adolescents were educated.

2. Details of family

The information related to type of family, size of family, religion, occupation and the income of the family are shown in Table II.

Table II

Details of Family

S.No	Particulars	No of adolescents	
		no	%
1	**Type of family**	155	77
	Nuclear	45	22
	Joint		
	Family size	98	49
2	<4	102	51
	4-6		
	Religion		
3	Hindu	166	83
	Christian	21	10.5
	Muslim	13	6.5
	Occupation of family		
4	**Members**		
	Self employed	50	25
	Employed	140	70
	Presently not employed	10	5
	Retired	80	40
	House wife		
	Family income □		
5	<3000	70	35
	3000 -7000	84	42
	>10,000	46	23

***Hudco classification of income, 2007**

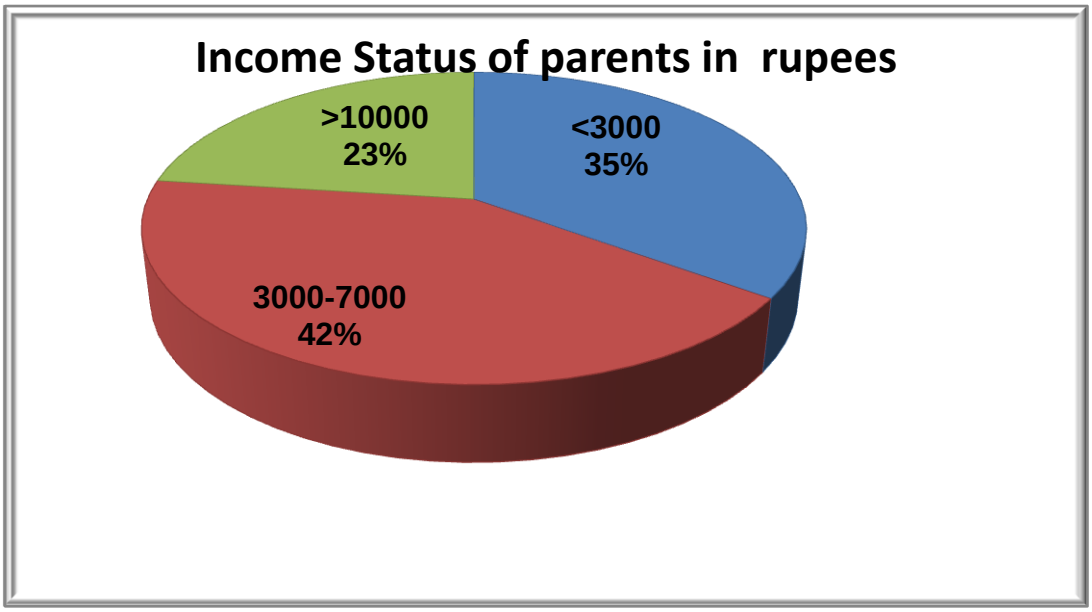

Figure II

Nuclear family system was predominant with the 77 percent of the adolescents, whereas only 22 percent of the adolescents were in joint family system, this indicated that the increasing trend towards the nuclear family. Among the selected adolescents 83 percent of families were Hindus,13 percent were Muslims and 10.5 percent families were Christians. A very minimum of 23 percent of their family income was crossed greater than □.10,000.Forty two adolescents had their family income within □.3000 to 7000 followed by less than□ 3000 which was seen in 35 percent of selected adolescents family.

Niranjan et al (1998) had revealed that over the years, nuclear families are predominantly in both rural and urban setting and even today it is continuing to be so in the family. As the nuclear family system is dominating, 49 percent of the families had less than four members. However, it isalso observed that 51 percent of the families had a family size of four to sixmembers. In the aspect of occupation majority of 70 percent were employed followed by 40 percent homemaker and only 25 percent were self-employed.

A.Anthropometric measurement

Information regarding Body Mass index of selected adolescents are given below.

1. Body Mass Index

Body mass index (BMI) was calculated by using the standard formula and shown in table III.

TableIII Body Mass Index

Body Mass Index/percentile*	Boys-200		Girls-200	
	No	%	No	%
Underweight (<5)	58	29	35	17.5
Normal (5-85)	81	40.5	89	44.5
Overweight (85-45)	29	14.5	56	28
Obesity (>95)	32	16	20	10

Source: *CDC, 2014

It is observed from the data that among the selected group 40.5 percent and 44.5 percent of boys and girls had normal body mass indexrespectively. Underweight was noticed among 29 percent of boys whereas only 17.5 percent of girls were found to be underweight. Thus, girls are more predominantly overweight with 28 percent. Obesity was higher among boys with 16 percent than girls who were 10 percent.

Moreno,etal,(2010)stated that over nutrition, a form of malnutrition where macronutrients (carbohydrates, fats, proteins) are supplied in excess of the body's needs, can lead to obesity is a concern in industrialized nations.

C.Clinical examination of adolescents

ThetableIVshows the clinical signs and symptomsof nutritional deficiencies ofthe adolescents.

Table IVClinical signs and symptoms of adolescents

S.no	Clinical signs and symptoms		Boys		Girls		Total	
			No	%	no	%	no	%
1	General appearance-	Sunken or hollow cheeks	39	31	16	64	35	37
2	Hair	Easily pluckable hair	45	36	21	84	72	48
3	Skin	Dry and scaly	35	28	18	56	49	33
		Psoriasis from rash	16	13	8	32	24	16
4	Eyes-	Dimness of vision	34	27	23	72	52	47
5	Extremities	Bones / joint pain	44	35	20	60	56	31
5	Headache		48	38	15	92	71	39
6	Healthy and free from deficiency symptoms		36	29	16	80	57	88

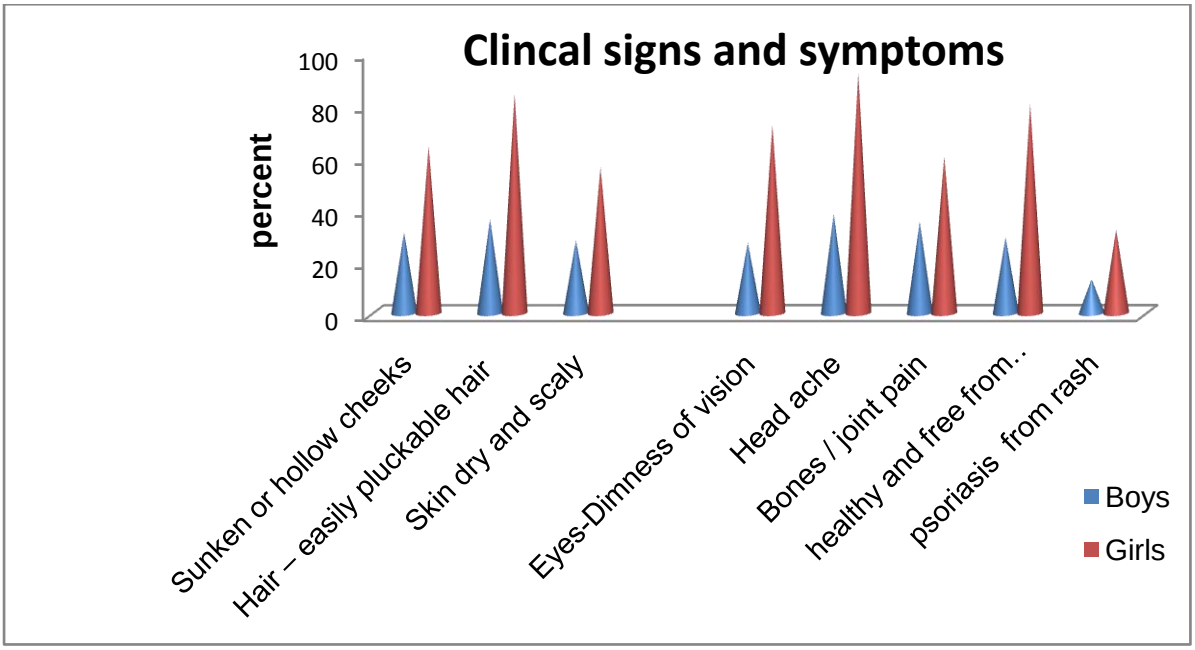

Figure III

The clinical examination was done for all the 200adolescents boys and girls to find out the clinical signs and nutritional deficiencies, prevailing among them. Itis clear that 88 percent of the adolescents were healthy. Thecommon symptoms observed were hair fall(48 percent),headache (39 percent) and dry skin (33 percent)and Scaly. Thirty seven percent of the adolescents had sunken and hollow cheeks (37 percent),and47 percent of the adolescents had dimness of vision.

Disease conditions of the family members

The disease conditions of the family members of selected adolescents are given in table V.

Table V

The disease conditions of the adolescent family members

Type of disease	Boys		Girls	
	No	%	no	%
Diabetes mellitus	47	48	35	35
Hypertension	59	59	47	47
Cardiovascular disease	35	35	29	29
None	12	12	12	15

It is observed from the above table that diabetes mellitus is the most prevalent disease among 48 percent boys' and 35 of percent of girls' family members.

Diabetes mellitus and hypertension are the risk factor of cardiovascular disease, it was more common among boysfamily members (35 percent) than girls family members (29 percent). A minimum of 12-15 percent of the family members of both the groups were free from health disorders.

D.Dietary practices

The philosophy of natural living dietetic righteousness, abstinence of non vegetarian and the importance of fresh fruits and vegetables were recognized from ancient times in India. However,over the years, people have developed their own food preferences in accordance with the society, culture, exposure to different foodstuffs, availability of food and rearing practices.

1.Type of meals

The type of diet, number of meals consumed and meals skipped by theadolescent boys and girls are givenin table VI

Table VI

Dietary practise of adolescents

Particulars	Meal pattern	Boys		Girls	
		No	%	No	%
Type of meal	Vegetarian	34	17	42	21
	Non-vegetarian	66	33	68	34
No of meals	<3	69	34.5	42	29.5
	2	41	20.5	59	21
	>3	–	–	–	–
Skipping of meals	Nil	82	41	86	43
	Breakfast	28	14	24	12
	Lunch	–	–	–	–
	Dinner	–	–	–	–

Irrespective of the gender, non- vegetarian was the most common among 33 percent and 34 percent of boys and girls respectively. Vegetarian type of diet was followed by 17 percent of boys and 21 percent of girls.

The regular three-meal pattern was adhered by 34.5 percent of boys and 29.5 percent of girls. Two meal pattern was noted among 21percent of each boys and girls. Totally 84 percent of both boys and girls have not skipped any meals but the adolescents who skipped breakfast were 14 percent of boys and 12 percent of girls.

Neumar and Steiner, (2000) as the adolescents were in a hurry to go out for educational purpose all of them could not find time to have breakfast in the morning.An adolescent may rush off to school without eating breakfast. Breakfast is the most important meal in the dietary plan of an adolescent.Teenagers, as well as being exposed to periodic food fads and slimming trends, tend to skip meals and develop irregular eating habits. One of the most frequently missed meals is breakfast. That breakfast plays an important role in providing needed energy and nutrients after an overnight fast and can aid in concentration and performance at school.During adolescence, there is a high incidence of nutritional

deficiencies and poor eating habits. Adolescence is a period when peer pressure can affect teenage eating behaviour and they may start skipping meals or possibly under-eating or over-eating.

2. Likes and dislikes of food by adolescents

Adolescents have certain preferences in choosing foods. The following Table VII shows the following likes and dislikes of foods by adolescents

TABLE VII

Likes and dislikes of foods by adolescents

Foods	Boys n0 =100		Girls no=100	
	Liked	disliked	liked	Disliked
	No (%)	No (%)	No (%)	No (%)
Fruits	82	24	76	24
Vegetables	57	43	67	70
Fleshy foods	42	58	70	44
Milk and milk products	86	14	56	37
Snacks	96	4	37	65
Spicy foods	53	47	65	67

It is observed that majority of 96 percent of the boys liked snacks followed by milk and milk products, and fruits by 86 and 82 percent respectively .Among the girls fruits and fleshy foods were given higher priority by 76 percent and 70 percent respectively.

Renzaho, (2006)was found that the eating patterns and behaviours of adolescents are influenced by many factors, including peer influences, parental modelling, food availability, food preferences, cost, convenience, personal and cultural beliefs, mass media, and body image. Personal factors that influence eating behaviour include attitudes, beliefs, food preferences,self-efficacy and biological changes.

3.Consumption of fruits and vegetables by the adolescents

The consumption of fruits and vegetables by the adolescent for a period of 24 hours are given in table VIII

Table VIII

Consumption of fruits and vegetables by the adolescents

Fruits and vegetable	Boys No=100		GirlsNo=100	
	No	%	no	%
Vegetables				
Roots and tubers	39	39	48	48
Green leafy vegetables	33	33	36	36
Other vegetables	65	65	72	72
Fruits	77	77	44	44

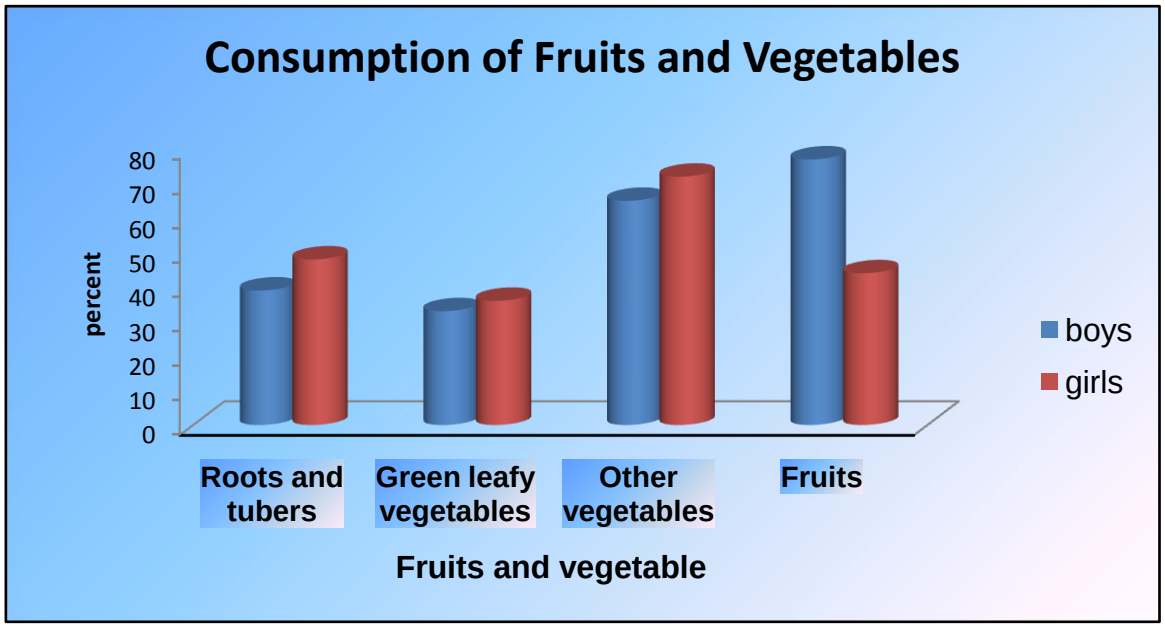

Figure V

Table VIII and figure V revealed that the percent of consumption of roots and tubers and other vegetables were more in girls that is 48 percent and 72 percent respectively. The fruit consumption was very high among boys (77 percent) than girls(44 percent).Fruits and vegetables are rich sources of fiber, vitamins and minerals. Adolescents need more iron and this could be met by consumption of green leafy vegetables in their diet.

4. Favourite fruits and vegetables

There are certain fruits and vegetables, which are very favourable for theadolescentgroups which are shown in table IX

TableIX

Favourite fruits and vegetable

Favourite items	Percent of adolescents			
	Boys		Girls	
	no	%	No	%
Mango	54	54	46	46
Apple	58	58	42	42
All fruits	62	62	38	38
Ladies finger	35	35	65	65
Potato	19	19	81	81
Carrot and beans	40	40	60	60
Other vegetables	72	72	28	28

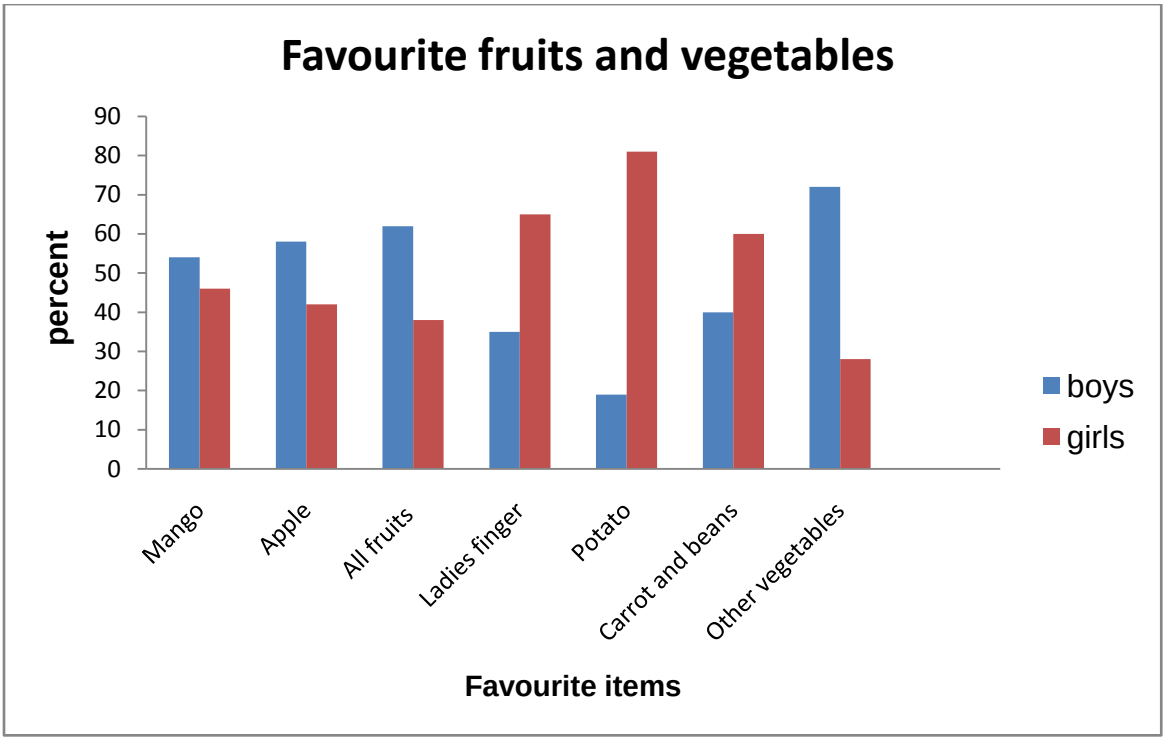

Figure VI

From theTableIX and Figure VI it has been identified that 54 percent of boys and 46 percent ofgirls showed more priority to mango and followed by this 58 percent and 42 percent of boys and girls respectively liked apple. With regard to vegetables 35 percent of boys preferred potato whereas 65 percent of girls preferred ladies finger.Carrot and beans were highly preferred by 40 percent of boys and 60 percent of girls. The priority for other vegetables were noted 72 percent of boys and 28 percent girls except other vegetables .

According to **Krolner et al,(2011)** vegetables are eaten in a variety of ways, as a part of main meals and as snacks. The nutritional content of fruits and vegetables varies considerably; though generally it contains little protein or fat and varying proportions of vitamins, dietary fiber minerals, antioxidant and carbohydrates.Consumption of fruits is also very important in the diet.Vegetables are important part of healthy eating and provide a source of the many nutrients, including potassium, fiber, folate (folic acid) and vitamins A, E and C. It is like broccoli, spinach, tomatoes, and garlic provides additional benefits, making them a food.

5.Daily consumption of fruits and vegetables

The daily consumption of fruits and vegetables should followed by the adolescents are given in a table X

Table X

Daily consumption of fruits and vegetables

Foods	**Boys**		**Girls**	
	No	**%**	**no**	**%**
Fruits				
Three serving	32	32	44	44
One to two serving	48	48	36	36
Two serving	30	30	20	20
Vegetables				
Three serving	98	98	98	98
One to two serving	66	66	86	86
Two serving	94	94	94	94

The maximum consumption of one to two serving of fruits was noted among 48 percent of boys followed by three serving of fruits by 44 percent of girls.

The vegetable consumption was the maximum;three serving of vegetables was included by maximum of 98 percent each boys and girls. Similarly, two serving vegetables were noted among 94 percent of both the groups.

6.Knowledge of fruits and vegetables

Table XII describes the nutrition knowledge of selected participants

Table XII Knowledge on fruits and vegetables

Foods	Before nutrition education	After nutrition education
	scores	scores
Fruits	62	96
vegetables	78	94

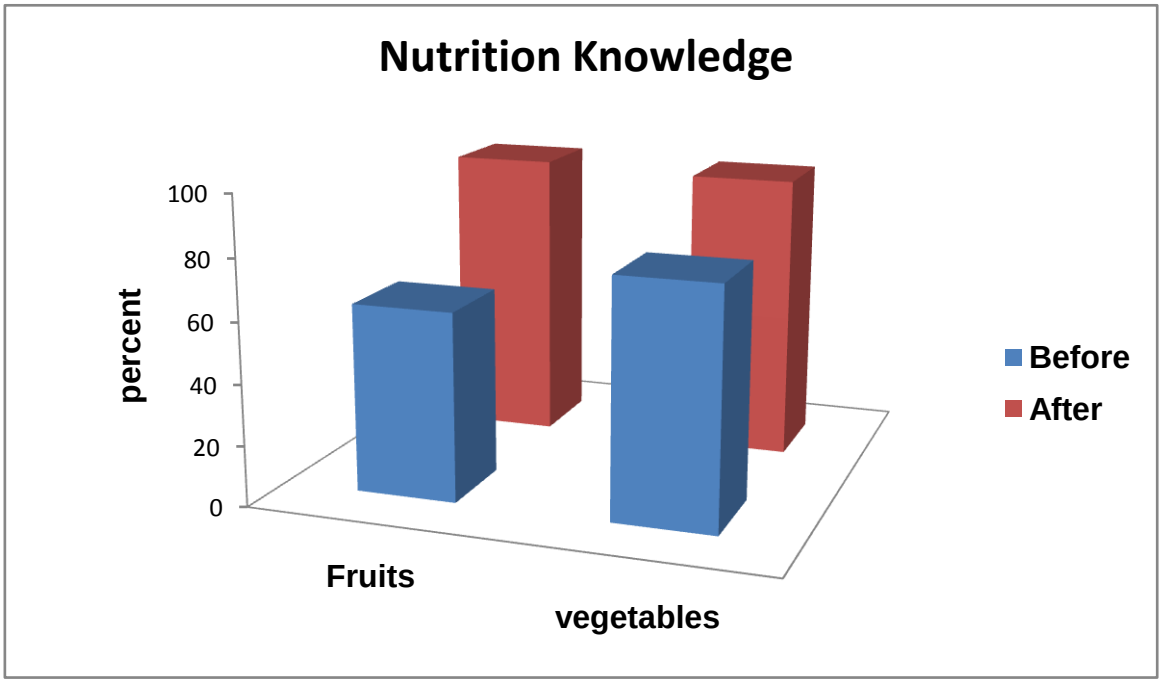

Figure VIII

Before adopting nutrition education the scores of knowledge on fruits was 62 after the education it was improved up to 96 scores. The knowledge of vegetables, includes proper cooking methods,role of vegetables and others was 78 score. It was higher than the knowledge on fruit. After the education the scores was increased to 94 score.

Community based adolescents health and nutrition education and services and economic development may improve the overall health and nutritional knowledge and status of adolescents. Knowledge directly impacts on nutrition, often surroundings for better sustainability.

F. Development of community garden.

A community garden is any piece of land gardened by a group of people,Utilizing th individual or shared plots on private or public landto produce the fresh fruits and vegetables garden. Among all the selected adolescents,only 40 percent (80 adolescents) were ha community kitchen garden and they were producing different kinds of fruits and vegetables.

1. Different produce inthe community kitchen garden

Different produce in the community kitchen gardenamong boys and girls are given in the table XIII

Table XIII Foods produced in the kitchen garden

Foods produced	Boys No =40		Girls No =40		Overall No= 80	
	No	%	No	%	No	%
Vegetables						
Brinjal	25	31.5	23	57.5	48	60
Broad beans	15	37.5	17	42.5	32	40
Lemon	20	50	26	65	46	57.5
Drumstick	21	52.5	21	52.5	42	52.5
Mint	32	80	26	65	58	72.5
Tomato	35	87.5	33	82.5	68	85
Onion	30	75	36	90	66	82.5
Ginger	36	90	40	100	76	95
Snake gourd	24	60	10	25	34	42.5
Ridge gourd	16	40	26	10	42	52.5
Fruits						
Amla	33	82.5	21	35	54	67.5
Mango	14	14	10	25	24	30
Guava	25	25	35	87.5	60	75
Pomegranate	10	10	12	30	22	27.5

Table XIII denotes that irrespective of all the girls' and 90 percent of the boys' family had the highest produce of ginger. The second common produce was onion which was produced by 90 percent of the girls while tomato was produced by 87.5 percent of boys and 82.5 percent of girls. The produce like broad beans, mango and pomegranate were at minimum level.Highest production of ginger, tomato and onion produce were the highest among both gender95 percent, 85 percent and 82.5 percent of both the gender respectively.

According to **Williamson andErin, (2002)**community kitchen garden provides for growing food that is locally available, organic, and affordable and provides scope of availability of season fruits and vegetables. Community gardens improve users' health through increased fresh vegetable consumption and providing a venue for exercise. The gardens also combat two forms of alienation that plague modern urban life, by bringing urban gardeners closer in touch with the source of their food, and by breaking down isolation by creating a social community.

2. Space utilized for kitchen garden

Space utilized forthe kitchen garden are shown in tableXIII

Table XIII

Space utilized for kitchen garden

Area size	Boys No=40		Girls no=40	
	no	%	No	%
90 ×90cm	12	30	9	22.5
<90cm	25	62.5	29	72.5
>90cm	3	7.5	2	5

Table XIIIrevealed that majority of the adolescents had kitchen garden within 90 cm of the space,especially 72.5 percent were girls and 62.5 percent were boys.A very minimum of eight percent boys and five percent girlsfamilies were using more than 90 cm of space for seven point five the purposeof kitchen garden.

3. Awareness on the development of community garden

Awareness on the development of community garden produce is shown in table XIV

Table XIV

Awareness on the development of community garden

Foods produced	Initial no =200		Final no =200		Over all	
	Produced		Produced		Produced	
	No	%	No	%	no	%
Vegetables						
Brinjal	48	24	60	29.5	108	54
Broad beans	32	16	46	23	78	39
Lemon	46	23	57	28.5	102	51
Drumstick	42	21	68	34	110	55
Mint	58	29	82	41	135	67.5
Tomato	68	34	51	25.5	120	60
Onion	66	33	41	26.5	107	53.5
Ginger	76	38	69	34.5	96	48
Snake gourd	34	17	56	28	90	45
Ridge gourd	42	21	68	34	103	51.5
Fruits						
Amla	54	27	25	14.5	80	40
Mango	24	12	35	17.5	58	29
Guva	60	30	36	18	96	48
Pomegranate	22	11	45	22.5	67	33.5

Table XIV revealed that among the selected adolescents the majority adolescents the major vegetables and fruits produced in the community garden initially were ginger (38 percent),tomato (34 percent), onion (33 percent), guava (30 percent), mint (29 percent) and amla (27 percent).The other vegetables and fruits like broad beans ,snake gourd, ridge gourd, mango and pomegranate were very minimum.

The adolescents were motivated to get the benefits from the kitchen garden. So they were started keeping planting fruits and vegetables. There was a much improvement in their gardening depending upon the availability of space especially mint leaves (67.5 percent),tomato (60 percent),drumstick (54 percent) and onion (53.5 percent). Fruits like amla and guava production alsowere increasedfrom 27 percent and 30 percent to 40 percent and 48 percent respectively.

According to**Tranel and Handlin, (2004)**is stated theCommunity gardens belong to a system linked to the larger urban context of food production and distribution. Community gardens join urban commercial farms, market gardens, and private gardens in this category which offers the opportunity for the programs of thecommunity building. Worldwide, 80 percent of wealth is held by a handful of countries and those highly developed countries, such as the United States, consume more natural resources than the rest of the world combined.

V SUMMARY AND CONCLUSION

Adolescents are a nutritionally vulnerable age group because of their increased nutritional needs, eating patterns, life styles and susceptibility to environment influences. Fruit and vegetable intake is an important part of a healthy diet and is associated with numerous positive health outcomes. These outcomes include reduced risk for chronic diseases and benefits to weight management and an essential source of vital nutrients for the body's micronutrient requirements. Fruit and vegetable intake by adolescents is low, with roughly 80 per cent consuming less than the recommended daily intake. Community gardens are important opportunities to partner with public health initiatives aimed at improving nutrition related outcomes through the development of nutritional knowledge, attitudes and dietary intake.

Hence the study entitled "**Determinants of fruits and vegetables intake of adolescents and development of community garden**" with the specific objectives are to study the background information of the selected adolescents, assess the nutritional status of adolescents and identify the fruit and vegetable intake, associate the nutritional status and food consumption pattern of the adolescents and develop community garden in the selected urban area.

The area selected for the study was Coimbatore city. A total of 200 adolescents both boys and girls in the age group of 18 to 20 years were selected by random sampling method. The background information of the adolescents such as age, gender, education, occupation, type of family and income of their family were collected by using a questionnaire method. Nutritional status of the adolescents were assessed by anthropometric measurement in relation to Body Mass Index , clinical examination and a 24 hours dietary recall method. Nutrition education was given to the sub-sample of 50 adolescents. A set of questionnaire was given before and after the education to find out the impact of education. Availability of community kitchen garden and area used for producing fruits and vegetables by the selected adolescents were recorded and they were motivated by explaining importance of fruits and vegetables intake, utilization of empty land, kitchen wastes and water.

The silent findings of the study are summarized below

- Majority of 41 percent of boys were in the age range of 16 and 18 years and 37 percent girls belonged to 13 and 15 years.
- Nuclear family system was predominant with the 77 percent of the subjects, where as only 22 percent of the subjects were in joint family.
- Among the selected adolescents 83 percent of families were Hindus,10.5 percent of families were Christians and the rest 6.5 percent were Muslims.
- A very minimum of 23 percent of the family income of adolescents was crossed greater than □.10,000. Fourty two adolescents had their family income within □.3000 which was seen in 35 percent of selected families of adolescents.
- Body mass index shows that 40.5 percent of boys and 44.5 percent of girls had normal weight. Underweight was noticed among 29 percent of boys and while was 28 percent of girls were affected by overweight
- Clinical examination results revealed that 88 percent of the adolescents were healthy and the other common symptoms observed were hair fall (48 percent), (33 percent), dry skin and dermatitis (33 percent) and 47 percent of the adolescents had dimness of vision.
- Diabetes mellitus is the most prevalent disease among 78 percent of boys and 65 percent of girls' family members. Cardiovascular disease was common among boys' family members (35 percent) than girls' family members (29 percent). There was a minimum of 12-15 percent of the family members of both the groups were free from health disorders
- Irrespective of the gender, non- vegetarian type of diet was the most common among 33 percent and 34 percent of boys and girls respectively. The rest 17 percent of boys and 21 percent of girls were vegetarians.
- The regular three-meal pattern was adhered by 34.5 percent of boys and 29.5 percent of girls. Two-meal pattern was noted among 21percent of each boys and girls. Totally 84 percent of both boys and girls have not skipped any meals but the adolescents who skipped breakfast were 14 percent of boys and 12 percent of girls.
- Majority of 96 percent of the boys liked snacks followed by milk and milk products, and fruits by 86 and 82 percent respectively. Among the girls fruits and fleshy foods were given higher priority by 76 percent and 70 percent respectively.

- Consumption of roots and tubers and other vegetables were more in girls 48 percent and 72 percent respectively. The fruit consumption was very higher among boys (77 percent than girls (44 percent).
- Fifty four percent of boys and 46 percent of girls showed more priority to mango followed by this 58 percent and 42 percent of boys and girls respectively liked apple.
- The maximum consumption of one to two serving of fruits was noted among 48 percent of boys followed by three serving of fruits by 44 percent of girls. Three serving of vegetables was included by maximum of 98 percent each boys and girls. Similarly two serving vegetables were noted among 94 percent of both the groups.
- Irrespective of all the girls and 90 percent of the boys family had the highest produce of ginger. The second common produce was onion which was produced by 90 percent of the girls. The produce like broad beans, mango and pomegranate were at minimum level. Overall picture showed that ginger, tomato and onion produce were the highest among both gender, 95 percent, 85 percent and 82.5 percent respectively.
- Majority of the adolescents who had kitchen garden within 90 cm of the area were 72.5 percent girls and 62.5 percent boys. A very minimum of seven point five percent boys and five percent girls families were using more than 90 cm of space for the purpose of kitchen garden.
- Among the selected adolescents the major vegetables and fruits produced in the community garden initially were ginger (38 percent),tomato (34 percent, onion (33 percent), guava (30 percent), mint (29 percent) and amla (27 percent). The adolescents were motivated to get the benefits from the kitchen garden. So they were started keeping plants of fruits and vegetables. Improvements in their gardening practices were noted depending upon the availability of space especially mint leaves (67.5 percent), tomato (60 percent),drumstick (54 percent) and onion (53.5percent). Fruits like amla and guava produce also increased from 27 percent and 30 percent to 40 percent and 48 percent respectively.
- Before adopting nutrition education the scores of knowledge on fruits was 62 after the education they got 96 scores. With regard to the knowledge of vegetables, like proper cooking methods and role of vegetables the gain in score was 94 as against 78.

Recommendations for the future study

- Training of adolescents to keep kitchen garden
- Associate the intake of fruits and vegetables and their health status.
- Calculate the five M (money, man power, method, material, minute) and the outcome of developed kitchen garden.
- Government should initiate to provide necessary support to develop community garden to promote eco friendly environment as well as improve the health status.
- Development of modules and conduct the training for the development of kitchen garden among government and non-government organisation.

CONCLUSION

Fruits and vegetables are rich in fiber, antioxidants and phytochemical, vitamins and minerals. So Fruit and vegetable intake is an important part of a healthy diet and is associated with numerous positive health outcomes. Eating patterns and behaviours of adolescents are influenced by many factors, including peer influences, parental modeling, food availability, food preferences, cost, convenience, personal and cultural beliefs, mass media, and body image. Nutritional health during adolescents is important for supporting the growing body and for future health problem. Community kitchen gardens are the easiest way of growing desirable fruits and vegetables at the desirable place .Among the selected adolescents' majority of them had normal BMI, the clinical signs and symptoms also revealed minimum nutritional deficiencies. The mean intake of foods was very minimum when compared to ICMR standards. The intake of fruits and vegetables were more in boys than girls. The improvement of knowledge on fruits and vegetables by motivating the selected adolescents could improve the intake of fresh organic fruits and vegetables in their diet. This may facilitate to prevent the risk of incidence of non-communicable diseases like diabetes mellitus, hypertension and cardiovascular diseases and also promote the safe green environment as much as possible.

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Annexure I

QUESTIONNAIRE

DETERMINANTS OF FRUITS AND VEGETABLES INTAKE OF ADOLESCENT AND COMMUNITY GARDEN

BACKGROUND INFORMATION

1. Name of the participants: :

2. Age

□ 13-15 years □ 16-18 years □ 19-20 years

3. Gender

□Male □ Female

4. Education :

□ 8th standard □ 9th standard □ 10th standard

□ 11th standard □ 12th standard □ Undergraduate

5.Number of siblings :

□ 1-3 □ 4-6 □ 7-9

6.Type of family :

□ Nuclear □ Joint

8. Parents Occupation :

□ Teacher □ Driver □ Government Service

□ Doctor □ Engineer □ Others

9. Monthly Income (Rs.) :

□ >3,000 □ 3,000-7,000 □ 7,000-10,000 □ >10,000

➢ **ANTHROPOMETRIC MEASUREMENTS**

- Height _____ in cms
- Weight _____ in kgs
- Desirable Body Weight _____ in kgs
- Body Mass Index _____

➢ **CLINICAL EXAMINATION**

Clinical assessment	Signs and symptoms	Deficiency

General appearance	Loss of subcutaneous Fat unken or hollow checks	Calories Calories , fluid
Hair	Easily plucked hair, Dry , brittle hair Corkscrew hairs	Protein Protein, biotin Vitamin c
Nails	Spooning Transverse	Iron Protein
Skin	epigmentation Dry and scaly flaky pain Pallor	Vitamin A,zinc Iron, vitamin b Vitamin k, or c
Eyes	Easy burning Night blindness	Vitamin A, zinc Vitamin A,
Mouth	Xerosis Glossits Bleeding gums	Iron, riboflavin, folic acid Vitamin c Niacin, riboflavin
Extremities	Angular stomatitis Oedema Bone tenderness Bone joint pain Joint swelling Irritability, fretfulness, and pathy Most hungry but some are horectic Muscles are week	Protein Vitamin d Vitamin c Vitamin c Protein energy alnutrition (PEM)

➢ Development of community gareden

1.Do you like gardening?

a) Not at all b) little bit c) a fair bit d) a lot

2.Do you have kitchen gardening?

b) Yes b) no

If yes,

List the items produced

Name of the item	Quantity (g)	Frequency produced
Fruits : Vegetables:		

3. Do you have space for kitchen garden?

c) Yes b) no

4. What do you grow in your garden?

a)fruits b) vegetables c) herbs

5. Do you feel community gardening has any health benefit?

a)Yes b) no

If yes what are they health benefits?

d) Improved nutrition
e) Increase physical activity
f) Increase mental health
g) Better access to food

KNOWLEDGE CHECK LIST

1. Do you know the importance of fruits and vegetables in our diet?

a. Yes b. No

2. Are you aware that the fruit and vegetable colours are related with the nutrients they posses?

a. Yes b. No

3. Organic fruits and vegetables are also available in the market. Do you know this information?

a. Yes b. No

4. Do you wash fruits and vegetables before consumption?

a. Yes b. No

5. Do you store your fruits in a cool and shady place?

a. Yes b. No

6. A person who eats all vegetables and fruits is free from diseases?

a. Yes b. No

7. Do you know how many servings of fruits and vegetable should we consume according to the Food guide pyramid?

a. Yes b. No

8. Consumption of yellow and orange coloured fruits leads to glowing and healthy skin?

a. Yes b. No

9. Do you know green leafy vegetables are sources of iron?

a. Yes b. No

10. Are you aware that there are cooking methods that conserve the nutrients of the vegetables?

a. Yes b. No

11. Do you know what a kitchen garden is

a. Yes b. No

12. Do you know the importance of it

a. Yes b. No

13. Do you have a role in maintaining a kitchen garden

a. Yes b. No

14. Will you put extra efforts in starting a kitchen garden

a. Yes b. No

15. Do you know lack of fruits and vegetables in the diet will lead to micro deficiency disease?

a. Yes b. No

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