DEVELOPMENT AND QUALITY ANALYSIS OF INSTANT SOUP MIX FOR DIABETICS

By
Kavyadevi. M
(20PFD015)

Thesis submitted to
Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore – 641043

In partial Fulfillment of the Requirements for the Degree of Master of Science in
FOOD SERVICE MANAGEMENT AND DIETETICS

May 2022

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Certified as a Bonafide Research work

Signature of the Supervisor

Signature of the Head of the Department

ACKNOWLEDGEMENT

First and the foremost, the investigator would like to given her utmost gratitude to the **Almighty God** for the blessings and divine grace he has showered upon her for giving her the understanding, capacity, knowledge, good health and the ability to complete her study successfully within time.

The investigator pays her deepest gratitude to **(Late) Dr.T.S. Avinashilingam** Founder, and First Chancellor, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for being a continuous source of motivation.

Reverential homage is paid to the Doyen of Nutrition Colonel and **(Late) Dr. (Mrs) Rajammal P. Devadas,** Former Chancellor, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for being a perennial source of inspiration.

I express my sincere gratitude to **Dr.Thiyagarajan,** D.Sc, M.D, Ph.D., Chancellor, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for providing an opportunity to conduct the study.

I owe deepest gratitude to **Dr. V. Bharathi Harishankar**, Vice Chancellor, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for granting permission to carry out the study in the University.

I am very much indebted to **Dr. (Mrs) S. Kowsalya,** M.Sc., M.Phil., Ph.D., Registrar, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for having extended all help for the smooth conduct of the study.

I am gratefully acknowledged heartfelt thanks to **Dr. (Mrs) N. Vasugi Raaja,** M.Sc., M. Phil, Ph.D., Dean school of Home Science, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for providing opportunity to conduct a study smoothly.

I wish to express my profound sense of gratitude and sincere thanks to **Dr. (Mrs) S. Uma Mageshwari,** M.Sc., M. Phil., Ph.D., Dean of Student affairs,

Professor, Former Head of the Department of Food Service Management and Deitetics, Avinashilingam institute of home science and higher education for women, Coimbatore, for her concern, valuable comments and suggestions, sustained and unsurpassed encouragement throughout the completion of study.

I express my sincere thanks and gratitude to **Dr. (Mrs).V.Premala Priyadharsini,** M.Sc., M. Phil., Ph.D., Professor and Head of the department, Department of food Service Management and Dietetics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore. Forher vital cooperation and help in ensuring the successful completion of my research.

I express sincere gratitude and reverence towards our beloved guide **Dr. (Mrs). R. Radha,** M.Sc., M.A (YHE)., M. Phil., Ph.D., Assistant Professor (SG),Department of Food Service Management and Dietetics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore. Her way of guidance and encouragement helps us to complete successful research. Her sincerity, kindness, support and interests all together aids to shape the research and makes it more valuable. She truly inspired us by her action and enlighten us with her knowledge.

I would like to thank all the women selected subjects who spent their valuable time to complete my part of study which also explores their knowledge too.

I record my gratitude and love towards all my seniors for their unparalleled support and timely help to complete my study.

I am also grateful to my family for their prayers, mental & moral support, monetary support and kindness which are really essential for me to full fill the study.

And I finally thank everyone who extends their support directly or indirectly throughout the completion of the study.

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I. INTRODUCTION

Your body is precious. It is our vehicle for awakening. Treat it with care

- *BUDDHA*

According to World Health Organisation (WHO), the premature mortality rate for diabetes mellitus was increased about 5% between 2000 and 2016. The majority of people, i.e., 422 million who belongs to low and middle income countries have diabetes mellitus. It is found that for past few decades, the rate of diabetes mellitus was increasing steadily in the developing countries (https://www.who.int/health-topics).

Felman (2015) stated that 'health is a state of complete emotional and physical well-being'. In these physical health has been the first and foremost one to lead a peaceful life. Health is not only without disease but regular exercise, balanced nutrition and adequate rest. Food is the main component for a healthy life.

In 2017, Maksimainen revealed the factors affecting good health. They were genetic factors where some inheritance might be occurred, environmental factors where some triggers might be occurred. The other factors were socio-economic status, physical environment, characteristics and behaviors.

According to the study conducted by Kandola (2014), health status was affected by communicable and non-communicable diseases. If a disease transmitted from one person to another person then it is said to be communicable disease. They were otherwise said as infectious or transmissible disease.

A study done by Peter *et.al*, (2015) stated that the pathogens such as bacteria, viruses, fungi etc., caused the infectious disease because of poor nutrition and poor sanitation. Some examples for communicable diseases are common cold, tuberculosis, influenza, polio, HIV, hepatitis, measles etc.,

Moris (2014) conducted a study to reveal the role of non-communicable diseases. They were not transmitted to one person to other person. Diabetes mellitus, cancer, chronic kidney diseases, kidney diseases are some of the examples of non-communicable diseases. Non communicable diseases were more serious than the

communicable diseases. 70% of the global death was due to non-communicable diseases.

According to the study reported by World Health Organisation (WHO) in 2000 Diabetes Mellitus was the serious non-communicable disease. About 171 million number cases around worldwide was found among young adults of age 20 years. The previous report was 154 million and it was increased to 11%.

In 2010, a study said that the number cases were 202 million and it was raised to 422 million in 2014. Among these 8.5% of mostly affected were adults aged 18 and above than the old age group of people (Bavadharini *et.al,* 2010).

Pouya opined that the prevalence of diabetes mellitus in urban is about 10.8% which is higher than the rural area about 7.2%. Also her study revealed that 50% of the people do not aware of having diabetes. (Ogurtsova *et.al,* 2019), (Paraskevi 2016)

Ogurtsova (2015) revealed that Diabetes mellitus occurs if the body is not able to take up the sugar into the cells and use it for energy. It is defined that, diabetes mellitus is the group of metabolic disorders which is characterized by a high blood sugar level over a prolonged period of time.

Ele *et.al* (2015) said that the digestion process includes breaking down the food you eat into various nutrient sources. The carbohydrates present in food break down into sugar. The glucose in bloodstream needs help or key to finish its final destination such as serving the cells with energy. This help or key is INSULIN.

Paraskevi (2016) highlighted that insulin is a hormone which regulates and controls blood sugar. Diabetes is a condition, characterized by hyperglycaemia; it is the raise in blood sugar level. The untreated cases may be lead to serious causes such as damage in nerve and blood vessels.

The study conducted by Klinische (2016) revealed that the production of insulin is seen but the body cells are not ready to make use of it, then it stays in the bloodstream and it raises the blood glucose levels. Glucose or sugar is a most essential source of energy for the cells. It comes from two main sources such as food and liver.

According to Kerner (2014), if the pancreas produces little or no insulin is said to be type 1 diabetes mellitus. It occurs because; the body attacks and kills its own insulin producing cells in the pancreas. Without insulin glucose builds up in the bloodstream. Type 1diabetes may occur at any age, also diagnosed during adulthood said to be latent autoimmune diabetes of adults (LADA).

Zendjabil (2016) developed a study to know the reason behind type 2 diabetes mellitus, that is the work of insulin is interrupted by body's own cells and won't allow glucose inside the cells and they remain in the bloodstream.

According to the study done by Ogurtsova (2019) type 2 diabetes mellitus is the most common, more than 95% of people with diabetes have type 2 diabetes. This is caused because the body does not use the produced insulin effectively. Thus it is also known as Non-Insulin Dependent Diabetes Mellitus.

A study reported by Suvi (2019), the other common type of diabetes which affects 9 million people is known as type 1 diabetes mellitus. It is the condition seen when the pancreas produce insufficient amount of insulin in the body. Thus it is commonly known as Insulin Dependent Diabetes Mellitus.

Ogurtsova (2019), stated that obesity or over-weight and physical inactivity are the two major reasons for causing type 2 diabetes mellitus. In most cases the symptoms were not seen in the earlier stage, it is diagnosed after the complications are raised.

According to Nigel (2017) the other type of diabetes which is common among pregnant women is known gestational diabetes mellitus. It is a condition when hyperglycaemia occurs during the pregnancy period due to the prevention of using insulin by the hormone produced by placenta. This process ends in the result of producing glucose in the blood.

According to the study done by Thomas (2019) during pregnancy hormones produced by the placenta are responsible for the resistance of insulin made by the body's cells. In such cases pancreas is not ready to make enough insulin to overcome the resistance.

According to International Diabetes Federation (IDF) Diabetes Atlas Committee, it is estimated that 7 out of every 100 pregnant women is suffered by gestational diabetes mellitus (http://idf.org).

A research done by Pouya (2019) reported that the common risk factors for all type of diabetes mellitus is mainly because of genetic factors that is, family history of diabetes mellitus which runs to the next generation, obesity or over-weight, physical inactivity or any injury to the pancreas such as infection, tumour or surgery, misleading process of auto-antibodies.

The complications of diabetes mellitus includes cardio-vascular issues, nerve damage, kidney damage, foot damage, erectile dysfunction, hearing loss, depression, dementia, dental problems. The commonly known complications are micro and macro vascular disease (Stephen, 2015).

Also Stephen (2015) stated the common complication seen in gestational diabetes mellitus is preeclampsia; it is rise in blood pressure, excess protein in urine. The main causes for the diabetic complication is mainly because of hyperglycaemia and hypertension, it triggers the micro and macro vascular activities. The other main ocular complications of diabetes mellitus are papillopathy, cataract, glaucoma and ocular surface disease.

According to the study done by Handajan (2018) dietary management and physical activity are the key factor for controlling and managing of diabetes mellitus. The diet plan for diabetes mellitus should have the balanced mix of protein rich, complex carbohydrate rich and fibre rich.

Jeannette (2013) reported that protein is the major functional and structural components of the body which reduces the complication occurs by diabetes mellitus such as obesity, over weight etc.,

Helbert (2017) opined that the diagnosis of diabetes mellitus is the measuring the level of glucose in the blood. It is done when the people have abnormal of glucose in the blood. Everyone has to screen the blood glucose level because the risk of diabetes has no symptoms in the initial stage.

A study done by Sarah *et.al,* (2014), different methods were used for the diagnosis of Diabetes mellitus. Most commonly used method is blood glucose measurement. In this diagnosis method, the blood sample of the patient has to take after a fasting of overnight.

Malik *et.al,* (2013) highlighted that globalization resulted in taking more high-fat or high-carbohydrate foods without energy expenditure. This has been resulted in the emerging of glucose metabolism disorders. The other reasons are lack of physical activity, improper diet, and stress contributes to the emerging diabetes.

A study done by Sylvia *et.al,* (2016), revealed that an unhealthy diet has been the most prominent reason for the rapid increase of Diabetes Mellitus. Also the study examined the role of diet in the prevention and management of Diabetes Mellitus. The fasting blood glucose will be decreased only if the diet has high fibre and protein. Intake of greens and vegetable will be helpful in the management of Diabetes.

A study reported by Allison (2015), there were 77 million diabetics in India; it is on the way to reach its height in future. However, diabetes has to be treated promptly. Ayurvedic remedies for DM offers a holistic approach with lifestyle changes and the use of Ayurvedic medicines that are safe and natural.

According to Modak (2017), the current situation differs from those; it reaches across the society and knows no class or race. In ancient times, diabetes mellitus was treated using various approaches such as diet modification that is changing the diet pattern, panchkarma to cleanse the system, herbal preparations to treat diabetes, yoga and breathing exercise.

Jeannette (2013) stated that during fixation of atmospheric carbon during photosynthesis is manage by the role of proteins. Due to prevailing environment condition and farming practices the level of protein content in the green leafy vegetable may be varied.

A study done by Devinder (2012) opined that dietary fibre is the constituent of plant cell wall. It is resistant to enzymatic digestion such as cellulose, non-cellulosic polysaccharides. It is classified as soluble dietary fibre and insoluble dietary fibre; they are collectively called as total dietary fibre.

Rae (2018) also reported that the high intake of dietary fibre deals with the decrease of glycemic index of foods, it can lead to a significant improvement in glycemic response (Devinder *et.al*, 2012), (Fernandez 2020).

According to the study undergone by Zhou (2016), beta-carotenes are mostly present in the green leafy vegetables. However, it is noted that around 50% of foliates are destroyed while cooking, so it is advisable to consume the water used during the cooking of green leafy vegetables.

The study conducted by Shaylika (2017) stated that the intake of omega 3 fatty acid in the daily diet was effective in reducing the triglyceride level in the body. Diabetic dyslipidaemia is a condition caused by high intervention of triglycerides is reduced by the intake of omega 3 fatty acid.

According to the study done by Hanish (2017), the precursor of omega 3 fatty acid is linolenic acid. It is found green leafy vegetables with huge health benefits. Hence it is known essential fatty acid, which is help to control various types of chronic diseases.

Also Handajan (2018) revealed that the addition of green leafy vegetables in the daily diet promotes the optimum blood sugar and also reduces the risk of type 2 diabetes mellitus and other complications of diabetes also. It is estimated that the risk of diabetes mellitus is reduced to about 14%.

According to American Diabetes Association (ADA), the intake of fruits and vegetables, lean proteins, low fat, low sugar diet helps in managing and preventing the risk of diabetes mellitus. Like fibre, vitamins and minerals also have low impact on the blood sugar level.

Ariviani (2017) opined that green leafy vegetables are rich sources of fibre as well as the vitamins and mineral, hence it is an essential ingredient which should be taken by the diabetics.

According to the American Academy of Nutrition and Dietetics (AAND) the recommended value for the intake of fibre is about 25 gram/day for women and 38 gram/day for men (Minesh 2020), (Handajan *et.al,* 2018).

A study done by Affandi (2019), stated that the green leafy vegetables are the best source of antioxidant and starch-digesting enzymes. The high glycemic index food are rapidly absorbed by the body whether the low glycemic index foods are digested slowly and delays the gastric emptying which can maintain the normal blood glucose level. Thus it is important to choose low glycemic foods (Ganesh 2018).

Affandi (2019) reported that the consumption of nitrate rich foods helps in reducing the blood pressure and also promotes the circulatory health. Combining all the food groups in the daily diet is the prominent way to maintain the blood sugar level in the body.

Pragya (2014) stated that the basic component present in the herb is gymnemic acid which lowers sweetness. The atomic arrangement of gymnemic acid molecules present in this herb is similar to that of glucose molecules. It is also called as 'sweet-killer' or 'destroyer of sugar' also having the therapeutic properties to reduce complications of diabetes.

The study conducted by Sankhari (2019), revealed that the cassia flower also has potent anti-microbial activity because of the presence of anti-oxidants such as terpenoids, saponin, tannins, flavonoids which also helps in lowering the blood sugar level.

According to the Parijat (2007) the cassia flowers also antagonise the metabolic aberrations by restoring the normal metabolism. It is achieved by tilting the balance from high lipids to high carbohydrate turnover.

Sidana (2017) stated that the basic active phyto-chemicals present in jamun seeds are jambosine and jamboline helps in lowering the release of sugar in blood. It also helps in increasing the insulin production. The seed helps in controlling diabetes mellitus (Parijat *et.al,* 2007), (Pragya *et.al,* 2014), (Gayathri *et.al,* 2018)

A study reported by Jovanov (2021), using culinary herbs and spices are the conventional and traditional way of treating diabetes mellitus since approximately 5000 BC. Because spices are the richest sources of antioxidants which are used for the treatment of diabetes mellitus. Also it has anti-inflammatory and anti-diabetic properties.

Also Jovanov (2021), opined that the bioactive components present in the spices are also used for the curative of degenerative human diseases. There are plenty of biochemical substances are present in herbs such as polyphenols, flavonoids, quinines, polypeptides, etc.

Another study revealed by Joseph (2017) revealed that the biochemical components are also act as the antioxidants. Oxidative rancidity, development of off-flavour, microbial growth in foods are lowering by the activity of such compounds present in herbs.

According to the study done by Jeyakumar (2015), almost 235 bio-active compounds are present in turmeric, which is potent spice for killing and destroying all the disease causing micro-organisms. Phenolic compounds and terpenoids are the primary compounds present in turmeric also it is used as main active compound.

A study reported by Murugan (2016), the bioactive component present in turmeric known as curcumin which is actively act against the complication of diabetes mellitus such as diabetic nephropathy. The components present in turmeric lowers the vascular endothelial growth and stimulate the activity of chaperone molecules.

According to Kuroda (2015), the hyperglycaemic level is reduced by the ethanolic extract of turmeric and also they enhance the optimum blood glucose level in the body.

Also a research undergone by Arun (2016) revealed the anti-hyperglycaemic properties of turmeric due to the presence of antioxidants in it. Turmeric also has adverse reaction in the diabetes complications and lowers the chances and risks of the complication.

Jang (2014), revealed that blood glucose level, Free Fatty Acids (FFAs), glycosylated haemoglobin are lowered by increasing the stimulation of hepatic glycokinase activity and plasma insulin points. These are done by the activity of curcumin present in turmeric.

According to the Bhanote (2021) garlic is also the most used and conventional spice that have been used since 4000 years. More than 200 varieties of biochemical

components are present in garlic. The most essential component present in garlic is allicin.

Other than that, so many additional compounds are present along with that. Also it is rich sources of flavonoids, vitamins, minerals and amino acids. The consumption of garlic in daily diet stimulates the hepatic glycogen which in turn reduces the blood glucose and triglyceride concentration. (Bhanote 2021)

In 2010, Boyles reported that the bioactive components present in garlic plays an important role in lowering the hyperglycaemic activity by increasing the insulin sensitivity.

Louise (2011) revealed that ginger is used as a curative spice for reducing blood sugar level in the blood. It is a rich source of protein and fibre. Also it is an essential source of volatile oils.

A study undergone by Akhani (2015) stated that the inhibition of serotonin and the stimulation of antioxidant capacity while consuming ginger. Thus it helps in the maintenance of normal blood sugar level in the body and it also reduces other cardiovascular diseases by the presence of active biochemical components.

According to Grover (2018) the component thymoquinone is vastly present in cumin, which has potent anti-diabetic effect in the body. Other biochemical compounds such as thymol, dithymoquinone are the excellent sources for the reduction of cardiovascular diseases, cancers, kidney disease etc.

A study done by Srinivasan (2009) revealed that cumin is mainly used as the curative drug for asthma in ancient days. Also cumin is an essential source of flavones which is helps in the lowering of blood glucose level (Asatha *et.al.,* 2016), (Mahima *et.al.,* 2019)

Islam (2019), reported that food analysis is done to ensure the safety and quality of the ingredients used in the instant soup mix. Also it defines the prominent characteristics of food is desirable and acceptable to consumers. The quality analysis can be done in physical, chemical or sensory attributes.

According to the study done by Ansari *et.al*, (2021) the quality of the product should be always consistent. All food products should need analysis at various stages from the selection of raw materials through production. It may also be done by the researcher for various reasons and needs.

A study reported by Zahurul (2017) stated the desirability and the quality of the developed food product is determined by interacting with the sensory organs of human being that is vision, taste, smell and feel. The flavour is determined by the way certain molecules in food interact with receptors such as mouth and nose by tasting and smelling the product.

Niamul (2018) denoted that, the physical attribute is found by analysing the spatial or sensory aspect of a technological outcome. It describes how the outcome looks and feels. The density and the moisture content will be observed. The parameters of physical attributes will also be determined.

Adegoke (2016) opined that the proximate analysis is the term refers to the quantitative analysis of the macromolecules present in food. Extraction is the technique used to determine the parameters of proximate analysis. Parameters of the proximate analysis will be analyzed.

Hradesh (2019) reported that the sensory evaluation will be performed using the scoring test; panellist will have to evaluate the sensory attributes of the developed food product. The panel members will be asking to give score for each component given in the sensory table.

Upadhyay (2017) highlighted that the total plate count will be given by microbial analysis which reveals the increase in total plate count during storage. Aluminium foil will be used for the storage of instant soup mix to avoid the intervention and spoilage by microorganisms.

Fridh (2014) stated that the moisture content of the developed instant soup mix is an essential factor knowing the presence of microorganism growth. Microorganism won’t able to grow when moisture content is below 8%.

Fahimdanesh (2017) revealed that physiochemical analysis is dealing with the aspect of chemistry where the interrelation between the composition and properties of the matter. In food analysis, physiochemical test will be revealed about the characteristics of the food products. It includes, water activity, total fat, fatty acid profile, acidity.

According to Thayer (2019), the nutritious liquid which enhances hydration and boosts the immune system is known soup. Consuming soup is the better way to improve appetite and also lowers dehydration in the body.

A study done by Diva (2011) reported that the preparation of soup does not take much time to prepare. Instant soup mixes are available for the welfare of consumers. Some of them are homemade and some of them are produced in large scale on an industrial purpose and treated in other various ways for preservation.

Also Diva (2011) stated the various types of instant soup mixes available in the local market. Among these the three types of soups are mainly consumed by the people. The types of soup mixes are commercial instant soups, canned instant soups and instant noodle soups.

According to Van (2019) instant soups mix are usually prepared by using dried or dehydrated ingredients, canned or treated the ingredients by freezing. Some of the dry instant soups mixes are prepared with thickening ingredients such as starch which function at low temperature. For thick consistency some additional seasonal ingredients are also used.

According to the survey conducted by Fernandez (2020) soups are perceived to be universal comfort foods. Despite the season, people will always reach out for a warm bowl of delicious soup.

In 2014 Bansal reported that most soups have lower sodium content and high flavour profiles. Thus removing the water from food prevents spoilage. This technique is more efficient in transportation, because it interrupts the total weight of the food, especially in fruits and the vegetables that are mostly water.

The vegetables are often used in soup mixes undergo freezing-drying that helps them retain their nutritional value, texture and flavour. By using this technique, the freeze dried foods retain their shape without shrinkage, and these foods rehydrate completely (Bansal, 2014).

Farzana (2017) opined that freeze drying is a recent method of dehydration which is restricted to high value foods due to its high cost associated with the process. Instant soups play an essential role in balancing the nutrients required for people to stay healthy. They are loaded with herbs and antioxidants it not only stimulates the immune system but also appetite.

In 2017 Suman conducted a research which revealed the soup mixes are marketed towards the urban consumer, the youth and homemakers or working women who are hard-pressed on time. They are also launching products with labels and claims such as ‘low cholesterol’, ‘no trans-fat’. These efforts have thus resulted in a steady increase in the consumption of these products.

Instant soup is power packed with nutrients and it has easy method of preparation. By considering the above facts the study was framed with the following objectives,

- To determine the consumption pattern, awareness and the market availability of Instant Soup Mix for diabetes mellitus.
- To develop a ready to drink soup mix for diabetics
- To perform quality analysis of the developed instant soup mix
- To create awareness on developed instant soup mix among selected diabetics

II. REVIEW OF LITERATURE

The review of literature pertaining to the study titled **'Development and Quality Analysis of Instant Soup Mix for Diabetics'** is presented under the following topics,

A. Global burden of diabetes mellitus and its complications
B. Therapeutic value, nutritional quality of greens and spices and quality analysis
C. Instant soup mix and its importance
D. Greens based Ready To Eat and Ready To Cook foods for diabetics

A. Global Prevalence of Diabetes Mellitus and its Complication:

According to World Health Organisation (WHO) between 2000 and 2016 there was 5% increase in premature mortality from diabetes. The number of cases of diabetes worldwide among adults 20 years of age is estimated to be 171 million. This figure is 11% higher than the previous estimate of 154 million.

The International Diabetes Federation (IDF), Diabetes Atlas 2000 used different and less stringent criteria for the inclusion of studies to estimate prevalence of diabetes for 20- to 79- year-old individuals in the 172 IDF member countries 90% of the population of the world. It was estimated that there were 151 million people with diabetes in this subpopulation in 2000.

The other study done by Simko (2005) estimated that the total population size and proportion of people 64 years of age having diabetes mellitus in 2000 have been reported were higher than the current one and therefore demographic changes cannot account for the discrepancy. Also there was constant increase in the cases of diabetes mellitus than the previous years.

According to the study conducted by Ginter (2013), despite methodological differences, the prevalence of diabetes mellitus was similar to the present estimate for a comparable population of 147 million. The IDF has subsequently released estimates of the numbers of people with diabetes for 2013 and forecasts for 2025 of 194 million and 334 million, respectively.

The study opined by Sarah (2014), the higher prevalence of diabetes mellitus in worldwide is more likely to be explained by a combination of the inclusion of surveys reporting that the higher prevalence of diabetes than was assumed previously and different data sources for some countries (Sarah *2014).*

Basith (2016) stated that, the prevalence of obesity remains stable until 2030, which seems unlikely, it is anticipated that the number of people with diabetes will be more than double as a consequence of population aging and urbanization.

In the light of the observed increase in prevalence of obesity in many countries of the world and the importance of obesity as a risk factor for diabetes, the number of cases of diabetes in 2030 may be considerably higher than stated here. Increasing evidence of effective interventions, including changes in diet and physical activity or pharmacological treatment to reduce prevalence of diabetes, provides an impetus for wider introduction of preventive approaches (Sarah *et.al,* 2014).

Furthermore, improved survival may contribute to increasing prevalence of diabetes in the future especially in developed countries. According to International Diabetes Federation (IDF) of 2019, 50% of world diabetes cases were undiagnosed. The burden of diabetes was rising especially in middle and low income countries, the prevalence of diabetes expected to shift from 4.7% to 5.2%.

According to International Diabetes Federation (IDF) atlas of 2021, one in two adults of 20 - 70 years with diabetes were unaware of their medical status, it is estimated about 44.7% i.e., 239.7 million. The highest undiagnosed cases were found in Africa about 53.6%, Western Pacific about 52.8% and South - East Asia regions about 51.3%. The lowest undiagnosed cases were found in North America and Caribbean is about 24.2%.

The study highlighted by Abhijeet *et.al,* (2014), around 62 million people diagnosed with diabetes mellitus. Also the study predicted that the rate will be increased up to 79.4 million. It is more important to find out the underlying cause for the sudden growth of diabetes mellitus to facilitate change.

Madaan *et.al,* (2014) stated that the epidemiology from communicable diseases to non-communicable disease is the underlying cause for the rural people to

be at high risk of diabetes mellitus in India. The prevalence among male and female are estimated as 19.36% and 16.98%. The commonly found age group is between 46-60 years.

Kapoor *et.al,* (2014) conducted a study among tribes, that how their lifestyles changes have relationship with increase in Diabetes Mellitus. They have concluded study with the estimation of about 9.2% of urban tribes and 6.7% of migrating tribes were affected by Diabetes Mellitus.

Ogurtsova (2015) revealed that Diabetes mellitus, commonly called as diabetes occurs if the body is not able to take up the sugar into the cells and use it for energy. It is defined as the group of metabolic disorders which is characterized by a high blood sugar level over a prolonged period of time. Glucose is an important source of energy for the cells which helps in making up the muscles and tissues. Also it plays as main source of fuel for brain cells.

According to Thomas (2019) the unused sugar remains in the bloodstream leads to diabetes. The untreatable condition can lead to serious issue; it may damage the body's organs and tissues - including heart, kidney, eyes and nerves.

Ele *et.al* (2015) highlighted that the digestion process includes breaking down the food you eat into various nutrient sources. The carbohydrates present in food break down into sugar. The glucose in bloodstream needs help or key to finish its final destination such as serving the cells with energy. This help or key is INSULIN.

The glucose entered in the blood stream of cells provides the fuel or energy to the tissues and organs need to properly function. The main cause for diabetes is the pancreas does not make any insulin or enough insulin for the function (Abdul, 2010).

The study conducted by Klinische (2016) revealed that the production of insulin is there but the body cells are not ready to make use of it, then it stays in the bloodstream and it raises the blood glucose levels.

According to the study done by Thomas (2019), the underlying cause is having too much glucose circulating in the bloodstream. Glucose or sugar is an

important source of energy for the cells. It comes from two main sources such as food and liver.

Ginter (2013) opined that the glucose obtained from food is absorbed into the bloodstream, where it enters cells with the help of insulin. When the glucose levels are low, the glucose obtained from liver breaks down stored glycogen into glucose to keep the glucose level within a normal range. There is no way cure diabetes, but we can control it and maintain it above normal. By the intake of hypoglycaemic drugs and lifestyle changes, the patient can live a long healthy life.

A study reported by Klinische (2016) highlighted that the symptoms of diabetes mellitus vary depending on the condition such as the amount of blood sugar is elevated in the bloodstream. People with pre-diabetes and type 2 diabetes mellitus may not have proper symptoms while the onset of condition. In type 1 diabetes the affected individual may have quick and more severe issues (Klinische 2016).

Elizabethe *et.al,* (2018) defined that the symptoms of diabetes mellitus may develop quickly within a week or month. It may also begins when the individual as a child, teen or young adult according to the seriousness of the causes. The other symptoms may include nausea, vomiting or stomach pain. Also the author classified the common symptoms of Diabetes Mellitus they are polyphagia, polydipsia and polyuria.

According to Kerner (2014) Type 1 diabetes mellitus is an immune system disease. It is because of the body attacks and destroys its own insulin producing cells in the pancreas. Without insulin glucose builds up in the bloodstream.

A study done by Bruckel (2014) highlighted that genes may also play an important role in some people. The majority of this type of diabetes is of an immune mediated nature, in which a T cell-mediated autoimmune attack leads to the loss of beta cells and thus insulin role. But the exact cause of the type diabetes mellitus is not clear. Type 1diabetes may occur at any age, also diagnosed during adulthood said to be Latent Autoimmune Diabetes of Adults (LADA).

Zendjabil (2016) developed a study to know the reason behind type 2 diabetes mellitus, that is the own body’s cells don’t allow insulin to work as it and won’t allow

glucose inside the cells and they remain in the bloodstream. The body's cells become resistant to insulin. And pancreas, they cannot keep up the level of insulin to overcome the resistance.

According to the study reported by Thomas (2019) during pregnancy hormones produced by the placenta are responsible for the resistance of insulin made by the body's cells. In such cases pancreas is not ready to make enough insulin to overcome the resistance. Thus the glucose is not able to enter the cells and remain builds up in the blood stream. This results in gestational diabetes.

In 2017, the study was done by Rachel, in that she stated some common risk factors for all type of diabetes mellitus are having family history of diabetes mellitus which runs to the next generation, obesity or over-weight, physical inactivity, injury to the pancreas such as infection, tumour or surgery, misleading process of auto-antibodies. (Rachael, 2017), (Lamb *et. al*, 2017)

Helbert (2017) revealed that the diagnosis of diabetes mellitus has been the measurement of blood glucose level. It is done when the people have abnormal of glucose in the blood. Everyone has to screen the blood glucose level because the risk of diabetes has no symptoms in the initial stage.

According to World Health Organisation 2006, the different diagnosis methods and the normal range for each method of diagnosis for diabetes mellitus were given in the summary of technical report and recommendations. (https://www.who.int/health-topics/diabetes)

A study done by Sarah *et.al,* (2014), different methods were used for the diagnosis of Diabetes mellitus. Most commonly used method is blood glucose measurement. In this diagnosis method, the blood sample of the patient has to take after a fasting of overnight. It is confirmed to be diabetes when the fasting blood glucose levels are higher than 125mg/dL (6.9 mmol/L) . It is also diagnosed if the random blood glucose level is higher than 199mg/dL (11.0 mmol/L) .

According to the study reported by Ogurtsova (2017), fasting blood glucose method was the prominent diagnostic test. The blood test will be taken after an overnight fasting. The average fasting blood sugar shoul less than 100mg/dl or 5.6

mmol/L is normal. If it is exceeds above the normal range it indicates that the person should have diabetes.

In 2019 Basith *et.al,* opined that oral glucose tolerance test is the other diagnostic method; it may be done in certain situations, like diagnosis of gestational diabetes or testing older people who have the symptoms of diabetes but normal glucose levels when fasting. It is not the common method because the test can be very cumbersome.

B. Therapeutic Value and Nutritional Quality of Greens and Spices:

Embuscado (2015) stated that herbs, greens and spices have various therapeutic and nutritional values. Most of the herbs and spices were used as dry ingredients. In addition to flavour and colour, they tend to have their own set of health-promoting properties.

A study done by Watson *et.al,* (2016) reported that consumption of herbs helps in the management and prevention of heart disease, cancer and diabetes mellitus. Also the study revealed that the herbs have provided anti-inflammatory and anti-tumor properties.

According to ancient texts of ayurveda, diabetes known as Prameha is defined as the disease affects the rich and the affluent. They might have the thought, that diabetes is only known for rich, elite society who live a life of abundance, gluttony, pleasure and rank physical inactivity borne out of laziness.

A research undergone by Modak (2017) revealed that the current situation differs from those; it reaches across the society and knows no class or race. In ancient times, diabetes mellitus was treated using various approaches such as diet modification, panchkarma to cleanse the system, herbal preparations, yoga and breathing exercise. Mainly used products for treating diabetes includes turmeric, bitter gourd.

Kooti (2016) opined that, next to cardiovascular disease and obesity, diabetes mellitus is in queue, it is arising because of poor lifestyle and food habits. The other

reasons are lack of physical activity, improper diet, and stress contributes to the emerging diabetes.

A study reported by Sylvia *et.al,* (2016), revealed that an unhealthy diet has been the most prominent reason for the rapid increase of Diabetes Mellitus. Also the study examined the role of diet in the prevention and management of Diabetes Mellitus.

In 2013, Malik *et.al,* highlighted that globalization resulted in taking more high-fat or high-carbohydrate foods without energy expenditure. This has been resulted in the emerging of glucose metabolism disorders.

According to the study held by Ley *et.al*, (2014) diet is only way to manage and control Diabetes Mellitus. The fasting blood glucose will be decreased only if the diet has high fibre and protein. Intake of greens and vegetable will be helpful in the management of Diabetes.

Carter (2010) stated that bitter gourd powder is marketed by garry and sun, used to lowers the blood and urine sugar levels. It has excellent medicinal values; it is used traditionally for the medicine of diabetes mellitus. It is reported to have hypoglycaemic activity.

A study conducted by Sapana (2017) explained the importance of Gurmar in the management of Diabetes. Gurmar, an anti-diabetic drug which is manufactured by garry and sun, which suppresses the intestinal absorption of sacharide that prevents the blood sugar fluctuations.

A study done by Allison (2015), there are 77 million diabetics in India; it is on the way to reach its height in future. However, diabetes has to be treated promptly. Ayurvedic remedies for DM offers a holistic approach with lifestyle changes and the use of Ayurvedic medicines that are safe and natural.

According to Ayurvedic terms, diabetes is called as Prameha which is known as urinary abnormality. This Ayurvedic treatments range from internal, herbal medications to purify Panchakarma procedures such as Vamana, Virechana, Vasti etc., depends upon the severity of the condition. These herbal remedies are intended to

enhance insulin sensitivity of type - 4 glucose receptors which reduces the insulin and also to enhance insulin secretion and regeneration of beta cells. (Allison *et.al*, 2015)

Therapeutic value of greens:

In 2016, the study conducted by Piyu-yu stated that the vegetables suitable for diabetes should have low glycemic index scale, rich in fibre or high in nitrates which helps in reduce the blood pressure. A person suffers from diabetes mellitus should include essential amounts of fibre and protein in the daily diet.

Green leafy vegetables are the rich sources of fibre, protein and other essential nutrients. Hence green leafy vegetables are one of the best supplements for diabetes mellitus especially for type 2 diabetes mellitus (Shah, 2017).

A study done by Shah (2019) green leafy vegetables are extremely important to manage diabetes. Vegetables like spinach, kale, cabbage, lettuce, broccoli, cauliflower and collard greens are extremely nutritious and are very low in calories (Modak 2017), (Ping-yu *et.al.*, 2016).

According to the study held by Macken (2017), the essentials components present in green leafy vegetables are extremely important to manage diabetes; because many dark leafy vegetables contain protein and potent antioxidants, which are also helpful in controlling and managing the diabetes complications. Diabetics should aim at eating well-balanced meals (Shah *et.al*, 2019).

Celia (2017) said that the sedentary lifestyle and abnormal dietary pattern leads to serious health issues. Also improper physical activity caused chain of disease among that diabetes is at higher risk. Intake of greens also increases the risk of diabetes among people.

The study conducted by Frederik (2021) that people suffering from type2diabetes should manage their blood sugar levels well. High blood sugar levels can have a negative impact on their health. A healthy lifestyle, weight management and regular physical activity will help diabetics maintain their blood sugar levels. A healthy lifestyle should include healthy eating habits and an active lifestyle.

According to the study done by Shah (2019), the healthy diet should include whole foods, foods rich in proteins, healthy fats, carbohydrates and fibre. These foods will help control blood sugar levels, make you feel full for longer and nourish your body as well.

Kooti (2016), reported that diabetics should aim at eating well-balanced meals. Also, they should avoid frozen and processed foods, canned and packaged juices. One particular food which is extremely beneficial for managing diabetes is leafy green vegetables.

In 2017, Sapana *et.al,* revealed that green leafy vegetables are extremely important to manage diabetes. Vegetables like spinach, kale, cabbage, lettuce, broccoli, cauliflower and collard greens are extremely nutritious and are very low in calories and carbohydrates.

Green leafy vegetables are an excellent source of several vitamins and minerals like vitamin C which is beneficial for controlling diabetes and high blood pressure as well. Rich in minerals and omega-3 fatty acids, they help improve the insulin secretion and regulate your blood sugar levels (Frederik *et.al*, 2021).

Loaded with fibre leafy greens can control ones hunger pangs and promote digestive health. Leafy greens also contain significant amounts of antioxidants which protect your eyes from cataract and macular degeneration and some other common complications linked to diabetes.

Macken (2017) reported that the antioxidant properties present in green leafy vegetables make them a common choice in many modern diets, irrespective of diabetes. Many dark leafy vegetables also contain protein, which is important for a diabetes diet. Like fibre, protein can also help you feel fuller for longer and prevent you from overeating in the next meal.

Shah (2017) stated that the antioxidant properties present in greens reduce the chances of snacking on unhealthy foods like chips, burger or pizza and eventually aid in weight loss. In addition, protein is a key nutrient that gives your body steady energy with little effect on blood sugar. One can add these leafy green vegetables in

your soups, salads, sandwiches, stews, green smoothie or eat them as a main dish. One has to avoid too much of cooking oil while preparing these vegetables.

Apart from these vegetables, one can also have other non-starchy vegetables like beans, peas, carrots, mushrooms, bell peppers, onions and asparagus. Even these will help in managing diabetes (Shah, 2017), (Kooti *et.al*, 2016).

According to the research done by Bamin (2019), it is important to note that the green leafy vegetables are rich source of beta carotene, iron, and vitamin C and also they are rich in dietary lutein. Vitamin C enhances non-heme iron absorption, lutein and zeaxanthin (xanthophylls carotenoid) may protect from age related macular disease (AMD). The nutrient composition of foods is an important factor in their utilisation.

The other study reported by Shah (2017), defined that the type and composition of nutritional and anti-nutritional factors vary among genera and species of different edible green leafy vegetables. There are different anti-nutritional factors present in green leafy vegetables such as nitrates, phytate, tannins, oxalates and cyanogenic glycosides also they are also implicated in various health-related issues. Hence it is called as protective foods in human diet due to their varied health benefits.

Carter (2015) found that the green leafy vegetables also contribute to the richness in vitamins, essential fatty acids, minerals, amino acids, and dietary fibre. Also includes health promoting plant secondary metabolites composed of antioxidants and phenolic compounds. By knowing the importance of green leafy vegetables American dietary guidelines recommend that one of the five servings of vegetable should be green leafy vegetable.

Green leafy vegetables are also rich in phyto chemicals, it will be referred to as nutritional factors and the health inhibiting or toxic phyto chemicals will be referred to as anti-nutritional factors. The significance of the phyto chemicals will be highlighted to reflect their importance or toxicity and/or inhibitory effects on human health and wellbeing (Bamin *et.al,* 2019).

Nutritional quality of the greens and spices:

1. Sirukurinjan (*gymnema sylvestre*) is a well known herbal remedy for diabetes mellitus having potent anti-diabetic properties. It is also called as 'sweet-killer' or 'destroyer of sugar' also having the therapeutic properties to reduce complications of diabetes such as obesity, hypertension etc., it helps in improving the blood sugar control in people with type 1 and type 2 diabetes mellitus (Parijat *et.al,* 2007).

   Pragya (2014) stated that the basic component present in the herb is gymnemic acid which lowers sweetness. The atomic arrangement of gymnemic acid molecules present in this herb is similar to that of glucose molecules. These molecules fill the receptor to prevent the activation of sugar molecules rapidly also curbing the sugar craving.

   Gymnema sylvestre is used in lowering high blood sugar level or high HbA1c. It also stimulates the insulin production thereby promoting the regeneration of insulin producing islet cells (Parijat *et.al,* 2007), (Pragya *et.al,* 2014).

2. Aavarampoo *(cassia auriculata)* is an essential herb used in the treatment of diabetes mellitus effectively. It increases the body's production of insulin mainly the flowers. Thus it has the hypoglycaemic activity (Latha, 2002).

   The study done by Sankhari (2019), revealed that the cassia flower also has potent anti-microbial activity because of the presence of anti-oxidants such as terpenoids, saponin, tannins, flavonoids which also helps in lowering the blood sugar level.

   According to the study conducted by Latha (2002), the aqueous extract obtained from the herb essentially has the anti-hyperglycemic activity and also enhanced the gluconeogenesis during diabetes is shifted to normal.

   Also Gayathri (2018) found that the components present in the aqueous solution enhanced the utilization of glucose through increased glycolysis. It also antagonises the metabolic metabolic aberrations by restoring the normal metabolism by tilting the balance from high lipids to high carbohydrate turnover (Sankhari, 2019), (Gayathri *et.al,* 2018).

3. Jamun seeds *(Eugenia jambolana)* has the component known as alkaloid, which converts the starch into energy and helps in reducing the symptoms of diabetes mellitus such as polydypsia (feeling thirsty) and polyuria (frequent urination). The seed helps in controlling diabetes mellitus (Ganesh 2018).

   Sidana 2017, stated that the basic active phytochemicals present in jamun seeds are jambosine and jamboline helps in lowering the release of sugar in blood. It also helps in increasing the insulin production. Also they are the rich source of fibre which reduces the gastric emptying thereby it promotes the insulin secretion and lowers the blood sugar level (Ganesh 2018), (Sidana *et.al*, 2017).

4. Pigeon pea *(Cajanus cajan)* - pigeon peas contains dietary fibre, potassium and helps to lower the cholesterol level which helps to maintain the cardiovascular health. Potassium lowers the strain on the heart by reducing the blood pressure. It helps to prevent atheroscelerosis thereby keeping the heart healthy (Fleming 2014).

   According to the study reported by Ariviani 2017, the pigeon pea has been able to reduce hyperglycaemia and hypercholesterolemia. Also it can improve the antioxidant activity. These are the rich source of phenolic compounds. Thus it has potent anti-diabetic activity.

5. Masoor dal *(Lens culinaris)* - the goodness of dietary fibre in masoor dal helps to diminish bad cholesterol (LDL) and total cholesterol levels in the body. This improves blood circulation and prevents the deposit of plaque in the blood vessels, thereby lowers the risk of atherosclerosis, optimise cardiac muscle functions and boost heart health (Amy 2012).

   A study done by Boomika (2015), highlighted that masoor dal is a rich source of antioxidants such as flavonoids which is used to improve the pancreatic activity by reducing the pancreatic damage and stimulates the control of blood sugar level in the body. Also it is rich in zinc, thus it has anti-inflammatory properties.

6. Turmeric *(Curcuma)* - the active compound present in turmeric having the potential to improve heart health and prevent against Alzheimer's and cancer.

It is a potent anti-inflammatory and antioxidant. It may also help improve symptoms of depression and arthritis. Also it is used for rheumatoid arthritis, skin cancer, urinary tract infections etc., (Gunnars 2014).

According to the study conducted by Natalie (2014) the active component present in turmeric is known as curcumin, which has the ability to control and prevent type 2 diabetes mellitus. Curcumin heps in lowering the blood sugar level.

7. Fenugreek or methi seeds *(Trigonella foenum-graecum)* - As the fenugreek seeds have high fibre it is used widely in treating diabetes mellitus. It regulates the blood sugar level (Warwick 2013).

   In 2016, a study was done by Warwick, stated that the consumption of fenugreek powder in the daily helps in reducing the total and LDL cholesterol. Also improves the insulin sensitivity in the body.

8. Black pepper *(Piper nigrum)* - according to the study held by Sheehan (2018) the component called peperine present in pepper helps in the control of blood glucose level by decreasing the blood glucose spikes.

   A study done by john (2016) stated that the anti-oxidants present in the black pepper helps in absorbing the drugs effectively by the body. Also it helps in the proper digestion of foods. There by it helps in the glucose-insulin control (Buren *et.al,* 2019), (Farzana *et.al,* 2017).

9. Onion *(Allium cepa)* - Eldin *et.al,* (2010) conducted a study to know the anti-diabetic properties of Onion. The study revealed that there was a constant reduction in the fasting blood glucose in type 1 diabetes mellitus patients.

   According to the study done by Ulger (2017), the presence of flavonoids such as Quercetin and organosulfur compound such as s-allyl cystein were the active components in Onion responsible for the reduction of blood glucose level in the body.

10. Tomato *(Solanum lycopersicum)* - A study reported by Magen (2017) defined that the active components and flavonoids present in tomatoes not only helps in the management and control of Diabetes Mellitus but also reduce the complications of Diabetes Mellitus.

Nutritional factors present in greens:

1. Protein:

The American Diabetes Association (ADA) 2013, stated that the standards of care of an individualized approach to decision making with regard to the intake of protein supplements and also given the statement for dietary macronutrient composition.

Jeannette (2013), opined that protein is the major functional and structural component of the body which reduces the complication occurs by diabetes mellitus such as obesity, over weight etc.

Proteins are large and complex molecules composed of various compositions of amino acids. It plays an important role in cellular functions, structure and regulations of metabolic activities in all living organism. Green leafy vegetables are the best and cheapest sources of protein. It plays an important role in the fixation of atmospheric carbon during photosynthesis. The level of protein content in green leafy vegetables can vary with farming practices and prevailing environmental conditions. (Farzana *et.al,* 2012)

2. Dietary fibre:

Devinder (2012) stated that dietary fibre is the constituent of plant cell wall. It is resistant to enzymatic digestion such as cellulose, non-cellulosic polysaccharides. It is classified as soluble dietary fibre and insoluble dietary fibre; they are collectively called as total dietary fibre. A study reveals that the high consumption of green leafy vegetable fibre resulted in reduced risk of cardiovascular diseases and colon cancer. Also it helps as a curative of ailments such as constipation, diabetes, diverticulosis and obesity.

The high intake of dietary fibre deals with the decrease of glycemic index of foods, it can lead to a significant improvement in glycemic response. The reason behind it is, the dietary fibre can reduce the absorption of sugar and fat from food and it prevents the rapid increase of blood sugar in the blood and also reduces the inflammatory response to food. (Natalie 2014)

The study conducted by Ryan (2010), revealed that fibre is another essential component for the detoxification function in the body. The high fibre present in the diet leads to the elimination of waste products in the detoxification process. If the dietary fibre is low the toxins present in the waste product accumulates in the body and it can lead to serious causes (Rae *et.al,* 2018).

3. Vitamins:

According to the study held by Zhou (2016), green leafy vegetables are the great source of beta-carotene. In leaves, vitamin A is present in the form of pro - vitamin A carotenoids such as beta-carotene, beta-cryptoxanthin and non-provitamin as lutein, neoxanthin, violaxanthin. The study has revealed that commonly used green leafy vegetables for nutritional purpose confirm the presence of good amount of lutein and richness in various vitamins.

Also they are the rich source of foliates for human especially, where cereal grains and tuber are low source of foliate hence the green leafy vegetables are used. However, it is noted that around 50% of foliates are destroyed while cooking, so it is advisable to consume the water used during the cooking (Polizzi, 2016).

- **VITAMIN A** - Akbay *et.al,* (2015) stated the consumption of vitamin A in the regular diet reduces the risk of macro-vascular disease such as diabetic retinopathy. Also it improves the insulin sensitivity thereby it controls the normal blood sugar level.
- **THIAMINE** - According to the study conducted by polizzi *et.al,* (2016) the consumption of thiamine rich foods for five months decreased the DNA glycation in leukocytes from the patients with nephropathy. Also it reduces the blood glucose level in the body.
- **NIACIN** - The study conducted by Zhou *et.al,* (2015) revealed that the consumption of niacin is associated with the oxidative stress and insulin resistance. Also it has the negative impact on the development of complications by type 2 diabetes mellitus.

4. Essential fatty acids:

In 2017, Hanish revealed that omega - 3 fatty acids are essential for normal growth and development and play an important role in the prevention and treatment of coronary artery diseases, hypertension, diabetes, hypertension, diabetes, arthritis. Alpha linolenic acid is the precursor of omega 3 fatty acid. Also the study reported the various health benefits of green leafy vegetables. Hence it is known for essential fatty acid, which is help to control various chronic diseases.

The study conducted by Shaylika (2017) stated that the intake of omega 3 fatty acid in the daily diet was effective in reducing the triglyceride level in the body. Diabetic dyslipidaemia is a risk factor caused by high intervention of triglycerides is reduced by the intake of omega 3 fatty acid.

Omega 3 fatty acid is an important factor for the treatment of neurological disorders, inflammations, cancers. Also reduces the risk of coronary vascular disease (Hanish *et.al,* 2017).

Quality analysis:

Islam (2018) stated that food analysis is the study of revealing the properties of food and their constituents by analytical procedures. The analytical procedure includes different characteristics include composition, structure, physiochemical and sensory attributes.

The main aim of quality analysis is to confirm the quality and safety of the food; also it refers to the characteristics of food that is desirable and acceptable to consumers. The quality analysis can be done in physical, chemical or sensory attributes (Niamul 2018).

The quality of the product should be always consistent. All food products should need analysis at various stages from the selection of raw materials through production. It may also be done by the researcher for various reasons and needs (Fridh 2014).

The study conducted by Ansari (2021) opined that the quality analysis is a process having concerns to produce the final product that consistently has the overall

properties includes, appearance, texture, flavour and shelf life. The stability of the food is a measure to know the shelf life of the product by resists changes in its properties overtime. It may be occurred due to chemical, physical or biological origin.

Zahurul (2017) stated that the chemical stability is due to the changes in type of molecule present, physical stability is due to change in spatial distribution of molecules present in food, biological stability is refers to change in number of microorganism present. The flavour is determined by the way certain molecules in food interact with receptors such as mouth and nose by tasting and smelling the product.

Finally, the quality and desirability of the food product is determined by interacting with the sensory organs of human being such as vision, taste, smell, feel. The individual perceptions of sensory attributes are fairly subjective, influenced by factors such as current trends, nutritional education and climate. (Islam *et.al,* 2018), (Ansari, 2021)

i) ***Physical attributes of the instant soup mix:*** Physical attribute is a spatial or sensory aspect of a technological outcome. It describes how the outcome looks and feels. The density and the moisture content have been observed. The parameters of physical attributes include, water absorption capacity, bulk density, rehydration ratio, swelling index, hunter colour analysis (Niamul, 2018).

ii) ***Proximate analysis:*** Proximate analysis is the term refers to the quantitative analysis of the macromolecules present in food. Extraction is the technique used to determine the parameters of proximate analysis. Parameters of the proximate analysis include moisture, ash, crude protein; total carbohydrate and energy of the developed instant moringa soup mix have been analyzed (Adegoke *et.al,* 2016).

iii) ***Sensory attributes:*** The sensory evaluation will be performed using the scoring test; panellist will have to evaluate the sensory attributes of prepared instant soup mix. The panel members have been asked to give score for each component such as colour, appearance, odour, texture, taste and the overall acceptability will be evaluated (Hradesh and Jagbir, 2019).

iv) ***Total plate count:*** The total plate count will be given by microbial analysis which reveals the increase in total plate count during storage. Aluminium foils have been used for the storage of mushroom soup to avoid the intervention and spoilage by microorganisms (Upadhyay *et.al*, 2017).

v) ***Moisture content:*** The moisture content of the developed instant soup mix is an important factor knowing the microorganism growth. Microorganism cannot grow when moisture content is below 8% (Fridh, 2014).

vi) ***Physiochemical analysis:*** In simple words, physiochemical analysis is the field of chemistry dealing with the interrelation between the composition and properties of the matter. In food analysis, physiochemical test have been revealed about the characteristics of the food products. It includes, water activity, total fat, fatty acid profile, acidity (Fahimdanesh and Brahrami 2017).

C. Instant Soup Mix and its Importance:

Instant soup:

Thayer (2019), stated that **i**nstant soup is a category which is designed for fast and simple preparation. Some of them are homemade and some of them are produced in large scale on an industrial purpose and treated in various ways for preservation. A numerous variety of types, styles and flavours of instant soups exist. Commercial instant soups are usually dried or dehydrated, canned or treated by freezing.

Types of instant soup mix:

1. Commercial instant soup:

Commercial instant soups are developed in several forms. They consist of a packet of dry soup stock. These types are prepared by adding water and heating the product for a short time, or by directly adding hot water (Tiwari, 2017).

2. Canned instant soup:

Canned instant soup is a type which has liquid soup that is prepared by heating their contents. Some of them are condensed, and require additional water to bring them to their intended strength, while others are canned in a ready to eat (Mohammed, 2011).

3. Instant noodle soups:

Instant noodle soups contain dehydrated vegetable and seasonings which are prepared by adding hot water. Some of them provided with seasoning packet which is added to the soup at the time of preparation (Thayer 2019), (Diva *et.al*, 2011).

Manufacture process of instant soup:

According to Van (2019), instant soups are usually prepared by dried or dehydrated, canned or treated by freezing. Some of the dry instant soups are prepared with thickening ingredients such as starch which function at low temperature. For thick consistency additional ingredients are also used.

Also Van (2019) stated that the ingredients used in some variety of dry instant soups are ground to fragments, which enables them to be dissolved when water is added. They are sometimes prepared by using freeze drying and puff drying.

Farzana (2017) opined that freeze drying is a recent method of dehydration which is restricted to high value foods due to the high cost associated with the process. By using the freeze drying, we can retain the overall quality and nutritional value of the food through a process called sublimation, where water is removed from food in its frozen state without transition through the liquid state.

Thus removing the water from food prevents spoilage. This technique is more efficient in transportation, because it reduces the total weight of the food, especially in fruits and vegetables that are mostly water (Mona, 2012).

In 2014 Bansal reported that the vegetables are often used in soup mixes undergo freezing-drying that helps them retain their nutritional value, texture and flavour. By using this technique, the freeze dried foods retain their shape without shrinkage, and these foods rehydrate completely. The onset of urbanisation and globalisation has brought new changes. A noticeable change was identified in people's food and dietary trends.

According to the survey conducted by Fernandez (2020), soups are perceived to be universal comfort foods. Despite the season, people will always reach out for a warm bowl of delicious soup. Most soups have lower sodium content and high flavour

profiles. This makes it an instant favourite among the masses. Designed for fast and instant preparation, dry soup mixes are becoming increasingly popular in the market.

One of the most crucial selling points of instant soups is their portability and long shelf life. Their innovative and convenient packaging, followed by their easy accessibility, makes them readily available, affordable options for those searching for a quick and gratifying meal. These mixes are simple to use and easy to prepare (Farzana *et.al*, 2017).

Van (2019) also revealed the consumer's view in his research article, instant soup mixes offer consumers mixtures of several substances such as dehydrated foods, spices, dries herbs, and raw ingredients like vegetables, meat, herbs and aromatics. The dehydrated food present in the dry soup mix protects them from enzymatic and oxidative spoilage ensuring flavour stability at room temperature over long period.

Instant soups play an important role in balancing the nutrients required for people to stay healthy. They are loaded with herbs and antioxidants it not only stimulates the immune system but also appetite (Safa, 2012).

In (2017) Suman conducted a research which revealed the soup mixes are marketed towards the urban consumer, the youth and homemakers or working women who are hard-pressed on time. They have also been adopted by healthy enthusiasts who are opting for nutritious product offerings to include in their diet.

As a result manufacturers are amping up their aims to provide high nutrition to the consumers without compromising their health and well-being. They are also launching products with labels and claims such as 'low cholesterol', 'no trans-fat'. These efforts have thus resulted in a steady increase in the consumption of these products (Hussein, 2015).

It's alarming to note that, for balancing the amount of micronutrients which is required for people to stay healthy, the role of instant soup is essential. Because, easy to prepare and time consuming (Suman 2017).

A study reported by Safa 2012, stated that nowadays, the instant soup mixes have been developed with new formulations, tasty, practical and high-quality variants of

ready to cook packaged soups and instant soup mixes are all the rage in the mainstream. Because of balancing nutrients and easy preparation, the instant soup mixes are popular picks in the markets drawing vast consumer attention and support (Salma, 2013).

According to a report published by bonafide research in 2021, titled 'India Instant Noodle, Pasta, Soup market-outlook 2026', the market revenue is going to hit 13 crore by year 2025. This emerging development is due to globalisation, rising income and hectic lifestyles. There is a huge hike in the base population of consumers characterized by experimental and young eaters looking forward to try out the western food flavoured with desi tadka (Trissa *et.al*, 2017).

D. Greens Based Ready to Eat and Ready to Cook Foods for Diabetics:

A study conducted by Nidhi (2019) revealed that only 1 in 10 people gets enough micronutrients through fruits, vegetables and green leafy vegetables, which means many of us are fail to take the essential micronutrients such as vitamins, minerals, fibre.

According to the study done by Ariane (2020) the importance and uses of soup mixes are widely expressed, the instant soup mixes are needed now-a-days because of industrialization and urbanization, changes in culture and social modifications, the food habits and cooking methods are largely changes in last few years. Hence the people looking for time consuming cooking techniques with energy load.

Kiran (2017) stated that the market for ready to eat/cook food products in India stood at 261 million in 2017 and it is believed that it will be increased to 641 million 2023. Many of the people have run behind ready to eat, ready to cook products because various varieties are available in market which are fresh and ease to prepare. Ready to eat foods products are the comprised packed food products which do not need any cooking, where ready to cook need some precooking like heating, boiling.

Nowadays ready to eat, ready to cook products need large food market as it is the closest for the regular food. Therefore all the people are move towards ready to eat or cook foods rather than the traditional cooking methods (Thomas, 2014).

It is important to note that the study done by Harpreet (2018) which helps to promote health based foods they are using different types of convenience food are made from cereal, pulses and millet etc., these types of foods are loaded with rich sources of instant energy and nutrient where its main purpose is partially satisfying hunger. They are highly acceptable and consumed due to their ease of preparation, storage and consumption.

The main ingredients used are dry soup stock or powder, dehydrated vegetables and meats, preservatives; various standard soup ingredients are used in prepared canned varieties (Harpreet *et.al*, 2018).

Brand: Bixo Herbal

It is a normal tasty soup powder in addition with few of the traditional natural ingredients which are used for the control of diabetes mellitus. Also stimulates the endocrine glands to function properly. The diabetic victims can take this soup twice a day for the management of diabetes, helps to self-regulate the blood sugar level. The ingredients used in the preparation of soup powders are the selective herbs controlling blood sugar level. (https://bixo.co.in)

Brand: Vedantika Herbals Diabetic Soup Powder

It is ideal soup mix for the people having diabetes mellitus. The ingredients are the rich source of vitamin B complex, zinc, manganese. Bitter gourd is the main ingredient, shows improved glucose tolerance and lowers sugar levels in blood and urine. The soup is low in calorie, mainly for the consumption of diabetic victims (https://www.vedantikaherbals.com).

Brand: DIA HERB

It is herbal soup powder available in the market for diabetes mellitus. It helps in regulating the blood sugar level of the body and restores the lost energy. Also reduces the complications of diabetes mellitus. Various soup mixes are available with different ingredients such as bitter gourd mix, jamun seeds mix, amla mix etc., (https://www.diaherbs.co.in)

Brand: VEDAMRITA

It is the anti-diabetic soup mix, combination of bitter gourd and jamun seeds, which are the best source of controlling and regulating blood sugar level. It has low calorie with high nutritional qualities hence it is an excellent product for everyone and for those with diabetes mellitus. (https://www.vedamrita.com)

Brand: BIOMED

The product manufactured in this unit is sirukurinjan soup mix. It helps in lower the blood sugar level and controls blood pressure. Increases insulin protection and improves good cholesterol. (http://www.biomed.co.in)

III. METHODOLOGY

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. The methodology of the present study titled **'Development and Quality Analysis of Instant Soup Mix for Diabetics'** is discussed under the following phases.

PHASE 1: Determination of consumption pattern, awareness and the market availability of Instant Soup Mix for diabetes mellitus.

PHASE 2: Process of developing and quality analysis of the instant soup mix

PHASE 3: Creation of awareness to the selected diabetics about the developed instant soup mix

The prevalence of diabetes is increasing multi-fold. Though allopathic medicines are effective in the management of diabetes, their prolonged consumption have set of effects which affects ones health in some from or the other. Our traditional medicine (AYUSH) recommends herbal remedies which are capable of giving the same result without side effects.

These herbal remedies can also be incorporated in our day to day diet towards the management of diabetes mellitus. One of the constraints with herbs is their availability, accessibility and preparation etc.

Hence incorporating the herbs into an instant food would be handy and saves time for the diabetics.

A detailed market survey was done to determine the availability of such herbal soup mix.

PHASE 1: Determination of consumption pattern, awareness and the market availability of Instant Soup Mix for diabetes mellitus

Sixty diabetic subjects in the age group of 40-80 were selected from in and around Coimbatore city. The selected subjects were briefed about the study. Apart from the survey on existing instant soup mix products in the market, also the usage of herbs, soup, what are the herbs commonly used by the selected subjects,

what are the ingredients used for the homemade soup recipes, how often they use herbs, what are all the forms they have taken were collected from the selected subjects.

The study protocol was approved by the institutional human ethical committee and the certificate is enclosed as Appendix I.

Coimbatore has been selected as the area for research since it was a convenient place for researcher. The subjects from the age group of 40 - 80 were selected by purposive random sampling technique. The following inclusion and exclusion criteria were considered while selecting the subjects.

Inclusion criteria:

- Diabetic Subjects in the age group of 40-80
- Those who are willing to participate in the study and free from complications

Exclusion criteria:

- Non diabetic subjects
- Those who have complications

A questionnaire was framed to elicit information on the types of instant soup mix available in the market, what are the herbal products known by the subjects, how many of them using the known herbal products available in the market. How far they were aware of using herbal remedies for diabetes and for other disease, disorders etc.

A well-structured e - questionnaire was prepared to know the existing herbal products for diabetes mellitus. The e - questionnaire was circulated to the selected diabetics. The information was collected through the Google form. The e - questionnaire consisted of 3 parts. The first part deals with the background information of the participants such as age, gender, educational qualification, monthly income and type of family.

The second part is to know the dietary pattern of the participants. And the final part is deals with the history and management of diabetes. Also the intake of

herbal products and market availability of instant soup mix is also presented. The e - questionnaire is enclosed (Appendix II).

The questionnaires were distributed to the diabetics. The data collected was coded. Microsoft excel 10 and SPSS was used to analyse the data.

PHASE 2: Process of Developing and Quality analysis of Instant Soup Mix

A. Selection of Ingredients:

The following ingredients were selected based on its therapeutic and nutritional value.

PULSES:

The importance of pulses in the management of diabetes of mellitus is well known. Consumption of pulses helps in the regulation and reduction of body weight, improves glycemic control. Also it reduces the risk of cardiovascular diseases.

1. Moong dal: *(Vigna radiata)*

   Moong dal has low glycemic index, it is the mostly preferred dal among various dal items. (Ariviani 2017)

2. Red gram dal: *(Cajanus cajan)*

   Urad dal has essential minerals such as magnesium, iron, potassium, phosphorus and calcium. Hence it has the adverse action in the diabetic complication. Also it has the ability to prevent drops and hikes in the blood sugar level (Boomika 2015).

SPICES:

1. Onion: *(Allium cepa)*

   The anti-diabetic properties of Onion have a constant reduction in the level of fasting blood glucose level in type 1 diabetes mellitus patients (Corleone 2017).

   The presence of flavonoids such as Quercetin and organosulfur compound such as s-allyl cystein was the active components in Onion responsible for the reduction of blood glucose level in the body (Eldin *et.al*, 2010).

2. Turmeric: *(Curcuma longa)*

The active component present in turmeric is known as curcumin, which has the ability to control and prevent type 2 diabetes mellitus. Curcumin helps in lowering the blood sugar level (Natalie 2014).

3. Cumin: *(Cuminum cyminum)*

   Cumin is mainly used as the curative drug for asthma in ancient days. Also cumin is an essential source of flavones which is helps in the lowering of blood glucose level (Jafari 2017).

   The above given herbs, spices and pulses having potent anti-diabetic properties are selected for the development of instant soup mix for diabetics (Ganesh 2018).

4. Black pepper: *(Pepper nigrum)*

   The component called peperine present in pepper helps in the control of blood glucose level by decreasing the blood glucose spikes (Atal 2012).

The anti-oxidants present in the black pepper helps in absorbing the drugs effectively by the body. Also it helps in the proper digestion of foods. There by it helps in the glucose-insulin control (Sheehan 2018).

HERBS:

1. Sirukurinjan *(Gymnema sylvestre)*

   The link between gymnemic acids present in the herb *Gymnema sylvestre* and diabetes are vastly known. Also it has adverse action against obesity and it stimulates the pancreas to produce insulin (Pragya 2014).

2. Aavarampoo *(Cassia auriculata)*

   The flowers of *cassia auriculata* extract acts against diabetes. It stimulates the production of plasma insulin by lowers the elevated blood sugar in the body. Also it has anti-hyperlipidemic activity (Sankhari 2019).

3. Jamun seeds *(Eugenia jambolana* seeds)

   The hypoglycaemic activity of *Eugenia jambolana* seeds helps against diabetes mellitus. The presence of alkaloids, glycosides and flavonoids are the main components helps in maintaining the blood sugar level (Sidana *et.al,* 2017).

B. Cleaning, drying and powdering of the ingredients

Cleaning

The selected and procured ingredients such as pulses, spices and herbs were measured and taken in the predetermined quantities such as pulses 30g, spices 10g and herbs 10g. These measurements were varied for all the variations. The collected ingredients were subsequently washed thoroughly with distilled water for the removal of dust particle. Then the washed ingredients were made to dry.

Drying:

The main purpose of drying is to improve and retain the properties present in the ingredients by removing the moisture content from the ingredients. It is also a efficient method for preserving and storing the ingredients i.e., it is used to improve the shelf life of the products.

Drying is practiced for the inhibition of quality decay and microbial development. Also it prevents browning reaction at the time of storage.

1. Tray dryer:

This method is used to dry the perishable ingredients such as onion, tomato, garlic and ginger. A tray dryer is conventional drying equipment has insulated chambers and trays are placed on the top of the trolley. Tray dryer works by passing air over the surface that is spread over trays arranged in the trolley. Thereby tray drying reduces the moisture content of the selected ingredients for safe storage and further processing.

Dry Roasting:

It is the process of heating the dried ingredients such as red gram dal, coriander seeds, cumin seeds and red chilli without the use of oil or water as a carrier. The roasting process will change the protein chemistry also it ensures the flavour, scent and taste of the ingredients.

Pulverizing:

It is the process of grinding or pounding the particles by manual or mechanical method. Here all the dried and roasted ingredients were pulverized separately by using a mixer. All ingredients were ground to fine powder. The ground powders were collected for the further process.

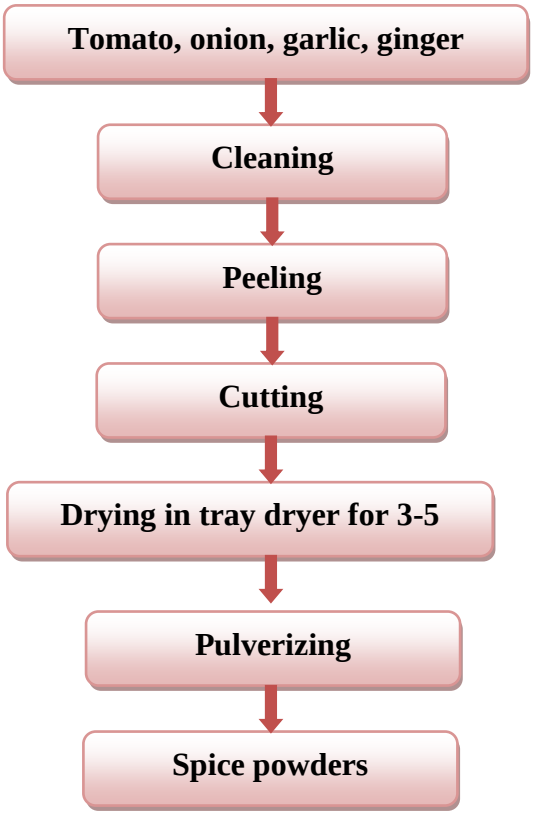
DEVELOPMENT OF INSTANT SOUP MIX:

Perishable Products:

Tomato (*Solanum lycopersicum*) | **Onion** (*Allium cepa*) | **Garlic** (*Allium sativum*) | **Ginger** (*Zingiber officinale*)

FIGURE I

PERISHABLE PRODUCTS USED IN THE DEVELOPMENT OF INSTANT SOUP MIX



FLOW CHART 1

PROCESSING OF PERISHABLE PRODUCTS FOR THE DEVELOPEMNT OF INSTANT SOUP MIX

All the selected ingredients were categorized to perishable and non-perishable products for processing. The perishable products were cleaned and peeled if needed. Tomato, onion, garlic and ginger were cut to thin slices and dried in a tray dryer for 3-5 hours. Onion and garlic were dried in 1-2 hours but tomato and ginger were taken time to dry. The dried ingredients were collected separately in a vessel and ground to fine powder.

Non-Perishable Products:


Red gram dhal (*Cajanus cajan)*


Coriander seeds *(Coriandrum sativum)*


Cumin seeds *(Cuminum cyminum)*


Red chilli *(Capsicum annum)*


Black pepper *(Piper nigrum)*

FIGURE II

NON-PERISHABLE PRODUCTS USED IN THE DEVELOPMENT OF INSTANT SOUP MIX

FLOW CHART 2

PROCESSING OF NON-PERISHABLE PRODUCTS FOR THE DEVELOPEMNT OF INSTANT SOUP MIX

The selected non-perishable products were cleaned. Then they were dry roasted for 15-30 minutes. Once they were cooled they were ground to fine powder.

HERBS:

Sirukurinjan
(Gymnema sylvestre)

Aavarampoo
(Cassia auriculata)

Jambo seeds
(Eugenia jambolona)

FIGURE III

HERBS USED IN THE DEVELOPMENT OF INSTANT SOUP MIX

FLOW CHART 3

PROCESSING OF HERBS FOR THE DEVELOPMENT OF INSTANT SOUP MIX

The selected herbs such as sirukurinjan, aavarampoo and jambo seeds were cleaned with fresh water and cut them into slices. Then the herbs were dried in shade for 8-12 hours in noon. The dried leaves were ground to fine powder.

Development of Instant Soup Powder:

Sirukurinjan powder

Aavarampoo powder

Jambo seeds

Tomato powder

Onion powder

Garlic powder

Redgram dhal powder

Coriander powder

Ginger powder

Cumin seed powder

Black pepper powder

Red chilli powder

Pulse powder, Spices powder, Herbs powder

INSTANT SOUP MIX

COMPOSITION TABLE OF DEVELOPED INSTANT SOUP MIX

S.No	Ingredients	Variation I	Variation II	Variation III
1.	Sirukurinjan powder *(Gymnema sylvestre)*	10g	5g	2g
2.	Aavarampoo powder *(Cassia auriculata)*	10g	5g	2g
3.	Jambo seed powder *(Eugenia jambolona seeds)*	10g	5g	2g
4.	Small onion powder *(Allium cepa)*	20g	20g	20g
5.	Tomato *(Solanum lycopersicum)*	20g	20g	20g
6.	Garlic powder *(Allium sativum)*	10g	10g	10g
7.	Ginger powder *(Zingiber officinale)*	10g	10g	10g
8.	Turmeric powder *(Curcuma longa)*	2g	2g	2g
9.	Black pepper powder *(Piper nigrum)*	5g	5g	5g
10.	Red gram dal powder *(Cajanus cajan)*	30g	30g	60g
11.	Corn flour	5g	5g	5g
12.	Red chilli powder *(Capsicum frutescens)*	10g	10g	10g
13.	Coriander seed powder *(Coriander sativum)*	5g	5g	5g
14.	Salt	5g	10g	10g

All the ingredients as powder were mixed at different ratios to make better variation. All ingredients were added in standard amount except for the herbs powder and red gram dal powder. Three different variations were made.

VARIATIONS OF STANDARDIZED INSTANT SOUP MIX:

VARIATION III A	**3g instant soup mix + 100 ml of hot water**
VARIATION III B	**5g instant soup mix + 100 ml of hot water**
VARIATION III C	**7g instant soup mix + 100 ml of hot water**

The developed instant soup mix powder was used to prepare 3 variants with different combinations.

Variation III A, 3g of developed instant soup powder was added to 150 ml of water to make soup. The taste and flavour were acceptable.

Variation III B was made with 5g of developed instant soup powder with 150 ml of water. The flavour was good, but the taste was not good.

Variation III C, 7g of developed instant soup mix was added to 150 ml of water. The flavour and taste were not accepted by anyone because of its bitter taste.

All the three variations were tasted by the panel members. Very small amount such as 3g is accepted since the instant soup powder has bitter taste.

A. Quality Analysis:

The developed instant soup mix was taken up for quality analysis.

Monirul Islam 2019, stated that the quality of food analysis is done to ensure the safety and quality of the ingredients used in the instant soup mix. Also it refers to know the characteristics of food that is, the desirability and acceptability were evaluated for the welfare of consumers. The quality analysis can be done in physical, chemical or sensory attributes.

The quality analysis is a process having concerns to produce the final product that consistently has the overall properties of the developed food includes, appearance, texture, flavour and shelf life (Faruk Ansari, 2021).

Six type of quality analysis was done with the developed instant soup mix of variation III A. The method of the tests was discussed below.

1. **Physical Attributes**:

   The physical attributes reveals the physical appearance of the developed soup. It is the sensory or spatial of technological outcome of the product made. The parameters of the physical attributes will be evaluated (Niamul, 2018).

   - **Water absorption capacity** - it is the value determined by the ratio of water absorbed by a material in saturated state over the weight of the dry material (Parijat *et.al*, 2007).

     The gain in mass of the mixture (powder plus water) determines the water absorption capacity of the soup sample. The volume difference gave the volume of water absorbed by 1g of the test sample. Absorption capacity is expressed in grams of water absorbed per gram of sample.
   - **Bulk density** - bulk density is also known as volumetric density. It is determined as the mass of the materials by the total volume they occupy. The total volume includes particle volume and inter-particle volume (Latha, 2002).

     A graduated cylinder (10 ml) was gently filled with the soup mix sample. The bottom of the cylinder was then tapped gently on a laboratory bench several times. This continues until no further diminution of the test soup powder in the cylinder after filling to mark, was observed.
   - **Rehydration ratio** - it is defined as the mass of rehydrated and drained food to the mass of the original material. Normally the dehydrated products require equal parts of water to food (Gayathri 2018).
   - **Swelling index** - is estimated by volume in ml taken up by the swelling of 1g of the developed instant soup mix (Latha, 2002).

     A known weight (5 g) of the product was cooked in a glass beaker with 20 times its quantity of boiling water (100 ml) for 10 minutes over a water bath maintained at 100 ºC. After cooking, the water was strained out and the cooked vermicelli was dried to remove surface moisture using filter paper and the cooked sample was weighed and dried it on oven at 105c.

     Swelling index was calculated as: Swelling index: W2-W1

Where, W1 = Weight of cooked product (soup mix) after dried in gm. W2 = Weight of cooked product (soup mix) after cooking in gm.

- **Hunter colour analysis** - it is the filter colorimeter separates the components of reflected colour into a three dimensional colour scale (Sidana *et.al,* 2017).

2. Proximate analysis:

Proximate analysis is the term refers to the quantitative analysis of the macromolecules present in food. The parameters of the proximate analysis will be evaluated (Adegoke *et.al,* 2016).

- **Moisture** - it is the amount of water present in the product. Karl Fischer test will be used to determine the moisture content (Ganesh 2018).

  Moisture is an important factor in drying leaves (herbs). It can be analysed in hot air oven drying method by using AACC-44-15a method (AACC, 2005) based on the loss in weight after drying the sample for 3 hours at 105°C and it is expressed in percentage.

  5g of the developed instant soup powder was taken in a pre-weighed aluminium dish and hot air oven maintained at 130°C for 1 hour. The dried samples were cooled in desiccators to room temperature and the loss in weight was reported in percentage.

- **Ash** - it is part of proximate analysis which determines the inorganic residue remaining after ignition of the food sample. Incineration at 500-550*C for 2 hours in a muffle furnace (Ariviani 2017).

  5g of the developed instant soup powder was weighed in a pre-weighed silica crucible. The crucible was incinerated over a burner till charring was complete. Then it was transferred to a muffle furnace maintained at 500 - 600°C grey ash resulted and it was cooled in a desiccators (AACC, 2005)

- **Crude protein** - kjeldhal method is used for the estimation of crude protein. In this method, the strong acid is used for the release of nitrogen. From the nitrogen concentration the amount of protein is determined (Boomika 2015).

  1g of the developed food product was weighed in a Kjeldahl flask. 2g of digestion mixture, 15 ml of concentrated sulphuric acid and 3 beads were added to the flask. The flask is kept for digestion and removed when the liquid is clear. The flask is allowed to cool, diluted and transferred to

100ml volumetric flask. 2% boric acid and 3 drops of indicator was added to it. After the procedure, the percentage of protein was calculated (Chandramouli *et.al*, 2012).

- **Total carbohydrate** - to determine the carbohydrate content present in the food sample various methods have been used. Here benedict's test will be used for the determination of total carbohydrate (Zahurul 2017).

3. Sensory evaluation:

Sensory evaluation is a scientific method used to analyse and interpret consumer acceptability perception towards a newly developed product through five senses of sight, smell, touch, taste and hearing. (Svensson 2012)

Sensory evaluation of the developed instant soup mix was done with a five point hedonic scale. 5 point hedonic scales indicates that

1 = dislike very much

2 = dislike slightly

3 = neither like nor dislike

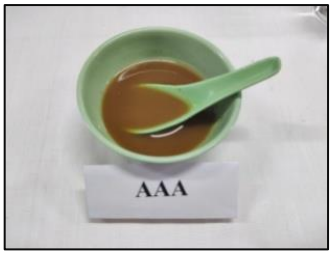
4 = like slightly

5 = like very much

A group of 10 member, post graduate students of Food Service Management and Dietetics Department were considered as panellist.

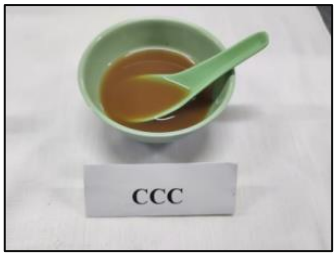
The samples were evaluated by the panellists for the sensory characters like flavour, texture, colour, taste, appearance and overall acceptability.

While evaluating the samples, the sensory practices were followed according to the procedure recommended by International Food Technologist (IFT, 2017). Instruction was given to the panellists that they have to rinse their mouth with water between tasting of each recipe to remove the taste of the previous food.



VARIATION I
3g of developed instant soup mix + 100 ml of hot water

VARIATION II
5g of developed instant soup mix + 100 ml of hot water



VARIATION III
7g of developed instant soup mix + 100 ml of hot water

FIGURE IV
SENSORY EVALUATION OF THE DEVELOPED INSTANT SOUP MIX

4. Total plate count:

The standard plate count or total plate count is used to determine the invasion of microorganism. It is used to estimate the amount of microorganism such as yeast, mold and bacteria, present in the developed soup mix. (Upadhyay *et.al,* 2017)

1g of the developed instant soup mix was added to 9ml of buffer solution and mixed well. From that dilution 1 ml is added to 9 ml of the buffer solution. This process was repeated until the series of dilution was made. Then 0.1ml of the dilution is pipette into a agar surface and spread using sterile glass rod. The prepared glass rods were left for incubation as much as interval we need. After the incubation period, the colonies present in the sample were calculated (Herrmann 2003).

5. Physiochemical analysis:

It defines the inter-relation between the composition and properties of the matter - developed instant soup mix. The determination of physical and chemical changes observed in the developed food product (Fahimdanesh and brahrami 2017).

a. Hydrogen ion concentration - It will be assessed by using pH meter. (Islam et.al, 2018)

SCOPE:

- To determine the pH by electrometric method.

STANDARDS:

- The pH of the standard solution should be 4, 7 and 10.

PROCEDURE:

Instrument Calibration:

- Calibrate the pH meter with the buffer solutions of the required pH

- If the pH meter value and the pH of the buffer solution didn't match each other, adjust the pH meter to show the value matching with that of the buffer.

pH Measurements:

- Remove, clean and dry the electrode after calibration.
- Take sample, 1% solution in a beaker and measure the pH directly with the pH meter.
- After measurement remove, clean and dry the electrode, and deep it in storage solution.

b. Total dissolved solids:

- The gravimetric method described by AOAC (1990) was used.
- **Procedure:**

  A measured weight of the sample in g was dissolved in required qty of water and it was filtered. Filtrate was taken into a previously weighed bottle. It was first evaporated to dryness over a steam-bath and was dried in a oven at 105c for 3h. It was cooled in a desiccator and weighed.

  The weighed sample was returned to the oven for final drying. Thereafter, it was cooled and weighed at an hourly interval until no further difference in the weight was observed (this is, constant weight is observed). The dried residue weight was taken in g. (John 2011)

  Calculation:

  The formula below was used.

  % Total dissolved solid= (Weight of the dried residue/Total sample weight taken) x 100

6. Phyto-chemical:

- **Tannin -** The tannins were determined by Folin - Ciocalteu method. About 0.1g of the sample was added to a volumetric flask (10 ml) containing 7.5 ml of distilled water and 0.5 ml of Folin-Ciocalteuphenol reagent, 1 ml of 35 % Na2CO3 solution and dilute to 10 ml with distilled water.

  The mixture was shaken well and kept at room temperature for 30 min. A set of reference standard solutions of Tannic acid (20, 40, 60, 80 and 100 µg/ml)

were prepared in the same manner as described earlier. Absorbance for test and standard solutions were measured against the blank at 725 nm with an UV/Visible spectrophotometer. The tannin content was expressed in terms of mg of Tannic acid /g. (Karuna *et.al,* 2014)

- **Flavonoids -** Flavonoids content was measured by the aluminium chloride colorimetric assay. The reaction mixture consists of 1 mg of sample and 4 ml of distilled water was taken in a 10 ml volumetric flask. To the flask, 0.30 ml of 5 % sodium nitrite was treated and after 5 minutes, 0.3 ml of 10 % aluminium chloride was mixed. After 5 minutes, 2 ml of 1M Sodium hydroxide was treated and diluted to 10 ml with distilled water.

  A set of reference standard solutions of quercetin/Kaempferol/ epigal-locatechin/catechin/(20, 40, 60, 80 and 100 µg/ml) were prepared separately in the same manner as described earlier. The absorbance for test and standard solutions were determined against the reagent blank at 510 nm with an UV/Visible spectrophotometer. The flavonoids content was expressed separately for each standard (Bamidele 2015).

- **Phenolic content -** The concentration of phenolics in plant sample was determined using spectrophotometric method. Folin-Ciocalteu assay method was used for the determination of the total phenol content. The reaction mixture consists of 1 ml of alcoholic extract and 9 ml of distilled water was taken in a volumetric flask (25 ml). One millilitre of Folin-Ciocalteu phenol reagent was treated to the mixture and shaken well. After 5 minutes, 10 ml of 7 % Sodium carbonate (Na2CO3) solution was treated to the mixture. The volume was made up to 25 ml.

  A set of standard solutions of gallic acid (20, 40, 40, 60, 80 and 100 µg/ml) were prepared in the same manner as described earlier. Incubated for 90 min at room temperature and the absorbance for test and standard solutions were determined against the reagent blank at 550 nm with an Ultraviolet (UV) /Visible spectrophotometer. Total phenol content was expressed as mg of GAE/g (Karuna *et.al,* 2014).

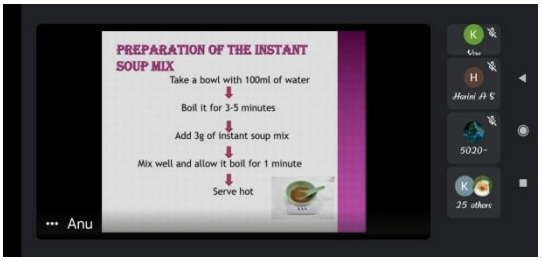
PHASE III: Creation of awareness to the selected diabetics about the developed instant soup mix

As a part of the study, awareness was given to the selected diabetics in the age group of 40-80 years. Diabetes mellitus is a chronic metabolic disorder which leads to many serious complications also. Though allopathic medicines are available for the treatment and management of diabetes, most of us were not aware about the herbal remedies which have been used for the treatment of diabetes without any side effects.

Thus the role of the herbal remedies and their uses were briefly given in the awareness session. Along with that the importance of soup were also discussed. The awareness material is enclosed as appendix III.

Analysis and Interpretation of Data

The collected data from all the phases were analysed and interpreted. The interpretation was done by using SPSS software. Different analysis methods like frequency chisquare and correlation to find association between the variables were used according to the nature of data.



IV. RESULT AND DISCUSSION

The results pertaining to the study titled **"Development and Quality Analysis of Instant Soup Mix for Diabetics"** is discussed under the following headings,

I. Awareness on instant soup mix and Market survey to know the existing instant soup mix products available in market

a. Background information of the selected subjects
b. Diet and consumption pattern of the selected subjects
c. Management of diabetes by the selected subjects
d. Known herbal products used by the selected subjects
e. Existing herbal products including soup mix in the market

II. Quality analysis of developed instant soup mix

I. Awareness on Instant Soup Mix and Market Survey to Know the Existing Instant Soup Mix Products Available in Market

Market survey was conducted to know the consumption pattern, awareness and availability of Instant Soup Mix in the market. The collected data is discussed below,

Demographic profile of the Selected Selected subjects:

The selected subjects (n=60) in the age group of 40-80 were. The selected subjects were from Coimbatore city. The demographics of the study selected subjects were presented in the table I.

TABLE I

DEMOGRAPHIC PROFILE OF THE SELECTED SUBJECTS

Demography	Percent	Frequency
1. Age		
40 – 45	20.0	12
46 – 50	15.0	9
51 – 55	15.0	9
56 – 60	16.7	10
61 – 65	15.0	9
66 – 70	10.3	6
71 – 75	5.0	3
76 – 80	3.3	2
2. Gender		
Female	68.3	41
Male	31.7	19
3. Educational Qualification		
High school	46.7	28
Higher secondary	23.3	14
Bachelor	11.7	7
Master	8.3	5
Professional	3.3	2
Others	6.7	4
4. Occupation		
Home maker	50.0	30
Farmer	11.7	7
Business	23.3	14
Driver	5.0	3
Teacher	6.7	4
Engineer	3.3	2
5. Monthly Income		
1000-10000	41.7	25
11000-20000	36.7	28
21000-30000	13.3	2
More than 30000	--	--
6. Activity		
Sedentary	26.7	16
Moderate	71.7	43
Heavy	1.7	1
7. Type of Family		
Joint	45.0	27
Nuclear	55.0	33

Table I depicts, majority of the subjects i.e., 20% belonged to the age group of 40-45. Age group of 46-50 and 51-55 each had 15% subjects. The age group of 56-60 had the second highest percentage of points. The age group of 76-80 had the least number of selected subjects at 3.3%.

Among the selected 60 subjects, 41 were females and 19 were male. In terms of qualification, a majority of 46.7% subjects were educated till high school only. 23.3% of subjects had done higher secondary schooling. Only 2% of the subjects had a professional degree.

With regards to occupation, 30 subjects (50%) were housewives, 14 subjects were into business and two were engineers. On the activity front majority of 72% were involved in moderate activity level and only one subject was involved in heavy activity level.

In terms of monthly income, 41.7% of subjects earned monthly income of 1000-10000, 36.7% earned 11000-20000 and 13.3% of the selected subjects earned 21000-30000. None of the selected subjects earned above 30000.

Majority of the subjects i.e., 55% lived in nuclear family and the other 45% were lived as joint family.

Figure I depict the frequency of meal consumed by the selected subjects.

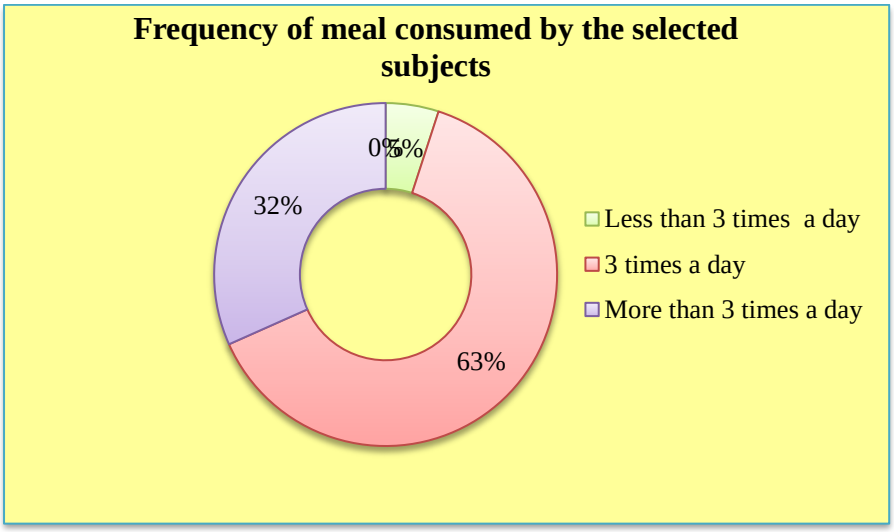


FIGURE I

FREQUENCY OF MEAL CONSUMED BY THE SELECTED SUBJECTS

Figure 1 show that majority of the selected subjects i.e. 63% were eating 3 times a day, 32% were eating more than 3 times a day and the remaining 5% of selected subjects were eating less than 3 times a day.

Blacker et.al (2014) stated that among the selected subjects between the age of 40-80 in India, 60% of them took 3 times meal per day, 20% of them consumed more than 3 meals per day and 10% of them took less than 3 meals per day. Table II shows the association between dietary fibre consumption and diabetes mellitus.

Table II highlights the association between dietary fiber consumption and diabetes mellitus.

TABLE II

THE ASSOCIATION BETWEEN DIETARY FIBER CONSUMPTION AND DIABETES MELLITUS

		Diabetes mellitus				**Total**	**P value**	**Chi square value**
		6 months - 2 yrs	**2-5 yrs**	**5-10 yrs**	**More than 10 yrs**			
Dietary fiber consumption	No	3	26	10	0	39	0.003	3.190
	Yes	1	11	8	1	21		
Total		**4**	**37**	**18**	**1**	**60**		

Maximum numbers of 37 subjects were diabetic between 2-5 years. Out of that 26 were not aware of dietary fiber. As many as 18 out of 60 subjects had Diabetes Mellitus for more than 10 years and out of these 18, about 10 subjects were not aware of dietary fiber. A total of 21 out of 60 subjects were aware of dietary fiber.

Figure II depicts the diet pattern followed by the selected subjects

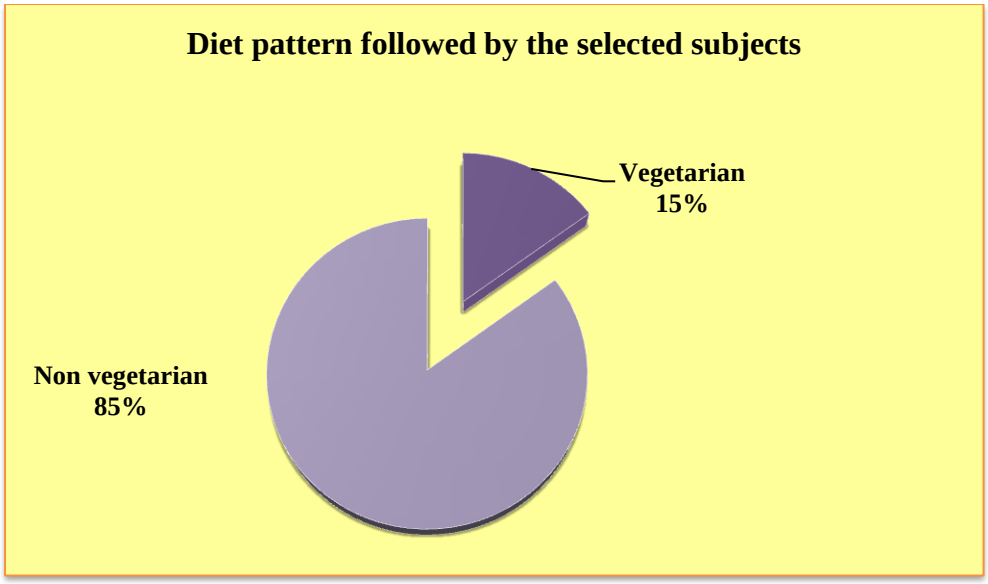


FIGURE II

DIET PATTERN FOLLOWED BY THE SELECTED SUBJECTS

Figure II represent that most of the selected subjects were non-vegetarian i.e., 85% and 15% were vegetarian. None of the selected subjects were ova-vegetarian.

Paslakis *et.al*, (2020), reported that among 126 selected subjects 53 were non-vegetarian, 42 were vegetarian, 15 were ova-vegetarian and 16 of them followed vegan diet.

Table III, Highlights the association between the awareness on dietary fibre and type of diabetes mellitus

TABLE III

ASSOCIATION BETWEEN AWARENESS ON DIETARY FIBRE AND TYPE OF DIABETES MELLITUS

		Type		Total	P value	Chi square value
		type 1	type 2			
Dietary fiber awareness	no	8	31	39	0.002	4.018
	yes	4	17	21		
Total		12	48	60		

Table III depicts that there was statistically significant ($p<0.05$) association between awareness of dietary fibre and type of diabetes mellitus. It was clear that most of the people did not know about the dietary fibre and hence they were not so conscious about it. A majority of 39 out of 60 subjects were not aware of the dietary fibre.

A study done by Mainous *et.al*, (2012) stated that most of the selected subjects did not know about dietary fibre and hence they were not consuming them in their daily diet and suffered from type 2 diabetes mellitus.

Figure III depict the cooking method followed by the selected subjects

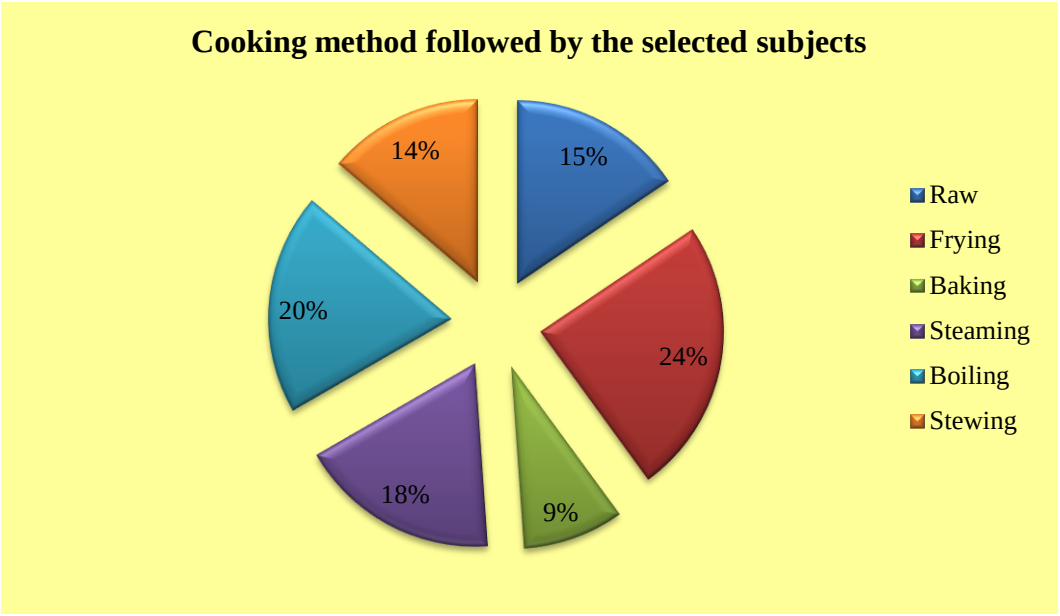


FIGURE III

COOKING METHOD FOLLOWED BY THE SELECTED SUBJECTS

Figure III indicates that 15% selected subjects were consuming raw food items. 24% selected subjects used frying as a cooking method. 9% selected subject preferred baking method. 18% selected subjects used steaming method. 20% used boiling method. 14% favoured stewing method of cooking.

Table IV indicates the association between the duration of diabetes mellitus and dietary fibre.

TABLE IV

THE ASSOCIATION BETWEEN DURATION OF DIABETES MELLITUS AND AWARENESS ON DIETARY FIBRE

	r_p value	P value	N
Duration of diabetes vs Awareness on dietary fibre	0.17	0.005	60

r_p – Spearman's Correlation, **Correlation significant at the level of 0.05

Table IV represents the positively significant ($p < 0.05$) association between dietary fibre and type of diabetes mellitus. It indicates that 17 out of 60 selected subjects were well aware of the role of dietary fibre but they had diabetes mellitus.

Szucs 2017 reported that most of the people were well aware about dietary fibre but due to lifestyle changes and poor eating habits they were not consuming dietary fibre and suffered from most of the diseases.

Figure IV represent the type of beverages consumed by the selected subjects

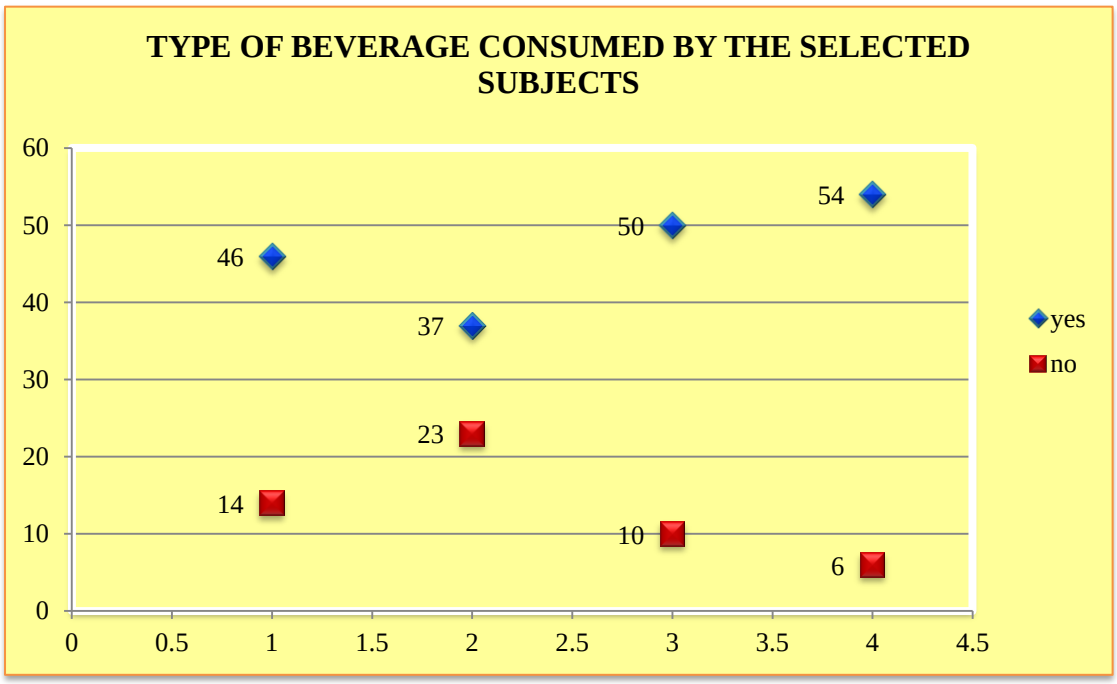


FIGURE IV

TYPE OF BEVERAGES CONSUMED BY THE SELECTED SUBJECTS

Figure IV shows, 46 selected subjects consumed tea and the remaining 14 selected subjects did not consume tea. 37 consumed coffee and the 23 did not consume coffee. A majority of the selected subjects, i.e., 54 of them consumed other health drinks.

Table V the association between the type of family and family history of the selected subjects

TABLE V

ASSOCIATION BETWEEN TYPE OF FAMILY AND FAMILY MEMBERS HAVING DIABETES MELLITUS

	r_p value	**P value**	**N**
Type of family vs family members having diabetes mellitus	0.01*	0.007	60

r_p – Spearman's Correlation, **Correlation is significant at the 0.01 level

The chances of passing on Diabetes Mellitus as a hereditary gift are high. This is justified by high incidence of family members turning to be diabetic if their father or mother or forefathers had it.

Figure V present the symptoms experienced by the selected diabetics.

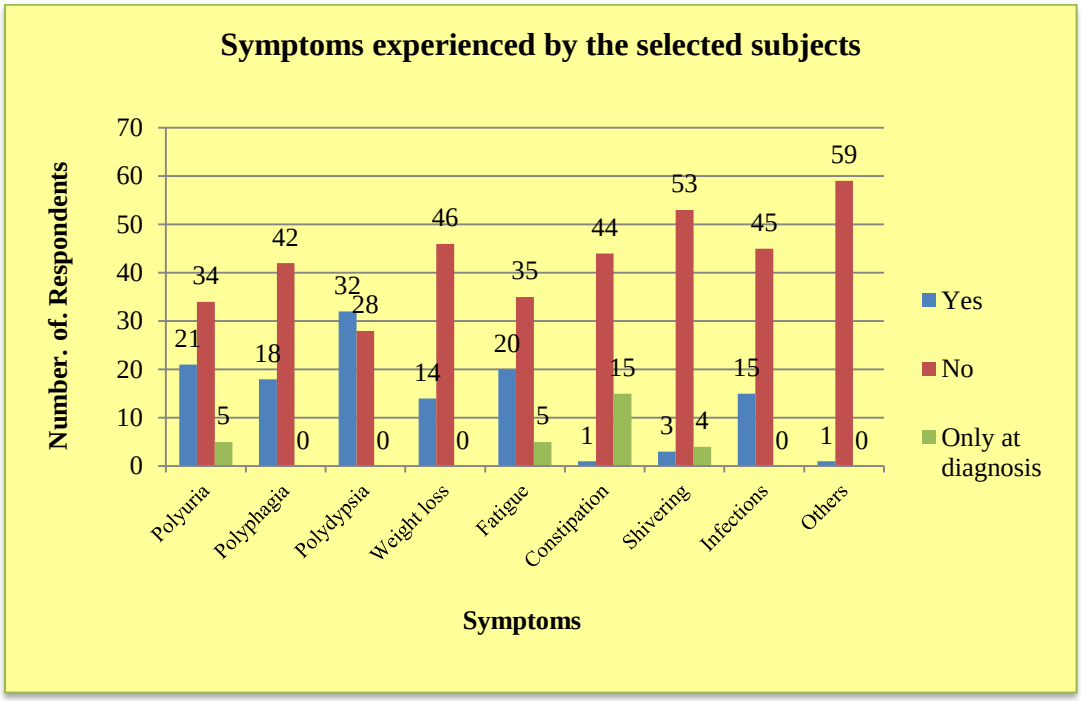


FIGURE V

SYMPTOMS EXPERIENCED BY THE SELECTED SUBJECTS

Figure V indicates that, 21 selected subjects were having polyuria, 5 of them found out that they were having only during diagnosis and the remaining 34 of them did not have polyuria. 18 subjects had polyphagia and the remaining 42 of them did not have that symptom. None of the selected subjects revealed polyphagia at diagnosis.

In terms of polydypsia, half of the selected subjects i.e., 32 subjects had polydypsia and the remaining subjects did not have the symptom. Majority of the selected subjects such as 45 of them did not have the symptom of weight loss but the remaining 14 of them had weight loss. None of the selected subjects had polydipsia and weight loss at the time of diagnosis.

In case of fatigue, 35 of the selected subjects did not have the symptom, 20 subjects had fatigue and the remaining 5 of them recognized having fatigue only at diagnosis. 44 of the selected subjects did not have the symptom, constipation, only one subject had constipation and the remaining 15 of them had only at diagnosis.

With respect to constipation and shivering, they were not more common among the selected subjects, 53 of them did not have the symptom and only 3 of them had shivering and the remaining 4 of them found out during diagnosis.

Table VI depicts the association between the type of diabetes mellitus and the relationship of family members having diabetes mellitus.

TABLE VI

ASSOCIATION BETWEEN THE TYPE OF DIABETES MELLITUS AND THE RELATIONSHIP OF FAMILY MEMBERS HAVING DIABETES MELLITUS

	r_p value	**P value**	**N**
Type of diabetes vs relationship of family members having diabetes mellitus	0.13	0.003	60

r_p – Spearman's Correlation, Correlation is significant at the 0.05 level.

Table VI indicates the positively significant ($p<0.05$) association between type of diabetes and relationship of the family having diabetes mellitus. It indicates that 13% of the selected selected subjects who are having diabetes mellitus, the type of diabetes mellitus is interlinked with the relationship of family members having diabetes mellitus.

Figure VI depicts the complications experienced by the selected diabetics.

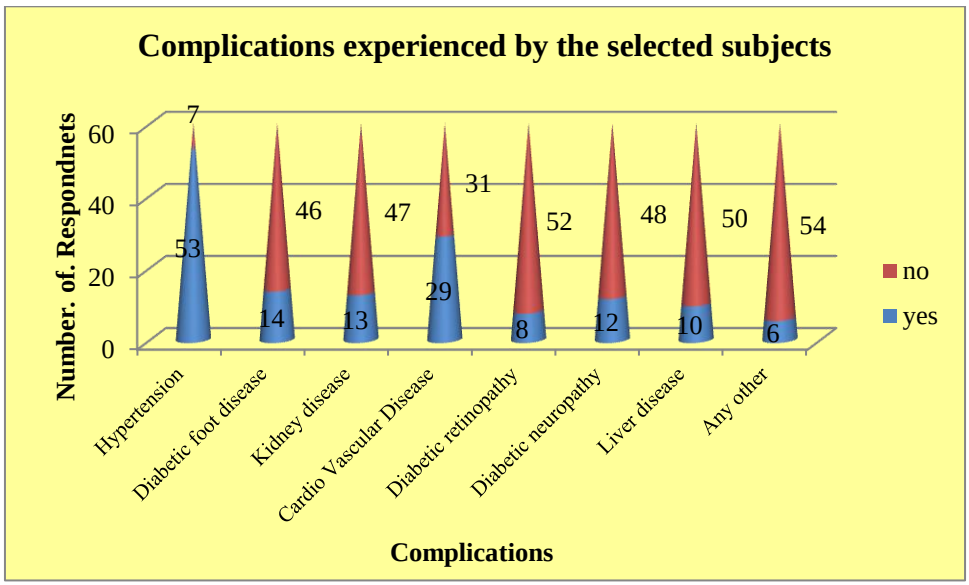


FIGURE VI

COMPLICATIONS EXPERIENCED BY THE SELECTED SUBJECTS

Figure VI highlights, 53 selected subjects were affected by hypertension. 14 of the selected subjects had diabetic foot disease, 13 of them had kidney disease, 29 subjects had Cardio Vascular Disease, 8 selected subjects had diabetic retinopathy, and 12 of the participants had diabetic neuropathy. Hypertension was most prevalent among the diabetics.

Figure VII indicates the special dietary guidelines followed by the selected subjects

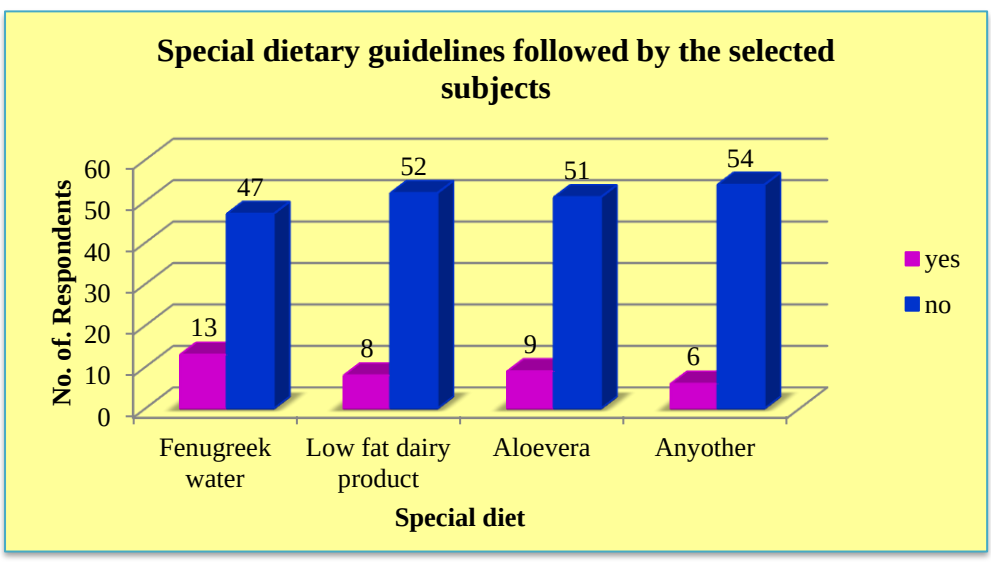


FIGURE VII

SPECIAL DIETARY GUIDELINES FOLLOWED BY THE SELECTED SUBJECTS

Figure VII denotes that, 13 selected subjects consumed fenugreek water; the other 47 selected subjects did not follow any special dietary guidelines. 7 selected subjects consumed low fat dairy products and 53 were not consuming the low fat dairy products. 9 selected subjects had taken aloevera and 6 selected subjects were taken other special dietary guidelines.

Figure VIII represent the forms of herbs consumed by the selected subjects

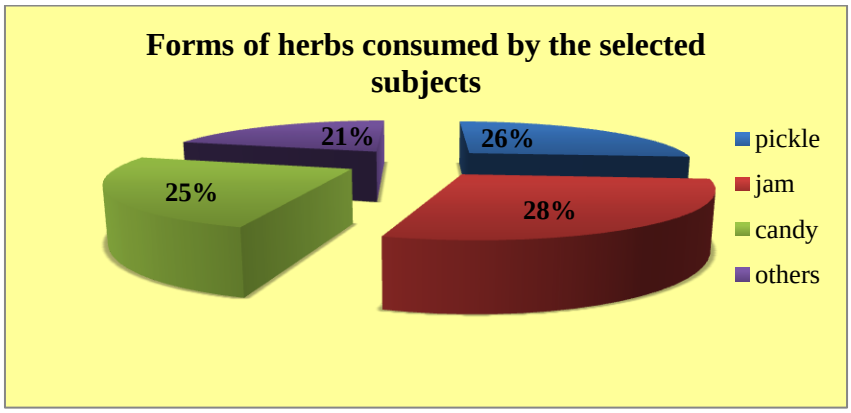


FIGURE VIII

FORMS OF HERBS CONSUMED BY THE SELECTED SUBJECTS

Figure VIII depicts that 28% of selected subjects consumed herbs in pickle form, 26% subjects were taking in the form of jam and the 25% took herbs in the form of candy and the remaining 21% were eating other form of herbs.

Figure IX highlights the herbs known by the selected subjects

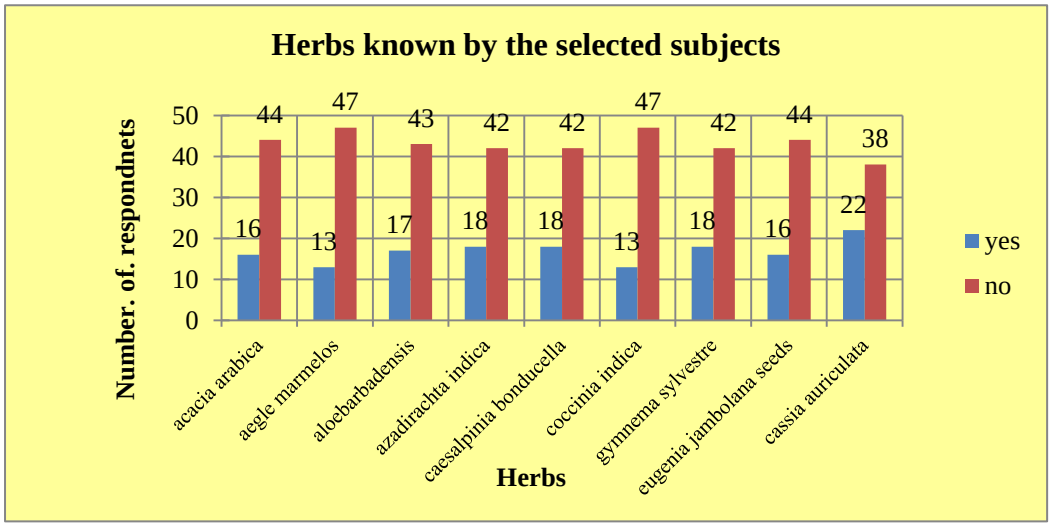


FIGURE IX

HERBS KNOWN BY THE SELECTED SUBJECTS

Figure IX denotes that 16 selected subjects knew about Acacia Arabica, 13 of the subjects knew about Aegle marmelos, 17 of the selected participants knew Aloe barbadensis, 18 selected subjects knew about Azadirachta indica, 18 of the selected knew about Gymnema sylvestre, 16 participants knew about Eugenia Jambolona. It is evident that less than 50% subjects only were aware about all of the herbs.

Figure X denotes the herbal products known by the selected subjects.

FIGURE X

HERBAL PRODUCTS KNOWN BY THE SELECTED SUBJECTS

Figure X reveals that only 8 of the selected subjects were aware about vedamrita product and the remaining 52 of them did not know about it. Like vedamrita product, 3v herbal product also was not known to many of the selected subjects where only 12 of them knew about the product.

Majority of the selected subjects did not know about most of the herbal products except patanjali. 48 of the selected subjects were familiar with patanjali product and only 12 subjects were did not know about it.

FOOD FREQUENCY

Figure XI represents the frequency of cereals consumed by the selected subjects

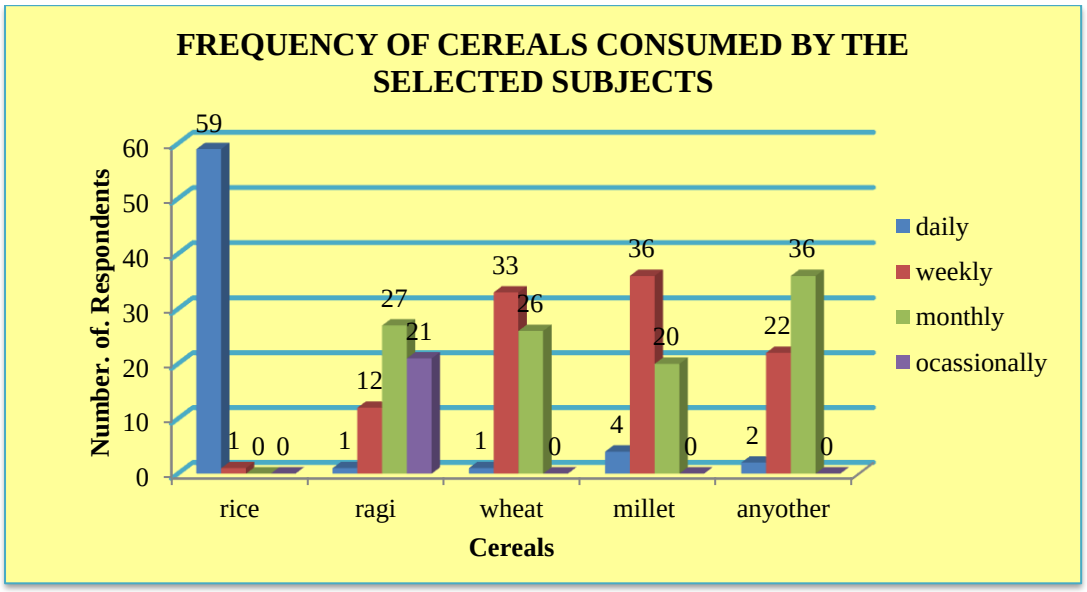


FIGURE XI

FREQUENCY OF CEREALS CONSUMED BY THE SELECTED SUBJECTS

Figure XI shows that 59 persons were consuming rice on a daily basis; wheat and ragi were consumed by 35 of them on a weekly basis.

In terms of millet, 36 selected subjects were taking it weekly, 20 subjects consumed millets at least monthly and the remaining 4 of them took daily. 36 of them were taking another cereal variety in monthly basis. Out of the subjects 22 of them consumed other cereals on a weekly basis.

Figure XII depicts the frequency of pulses consumed by the selected subjects

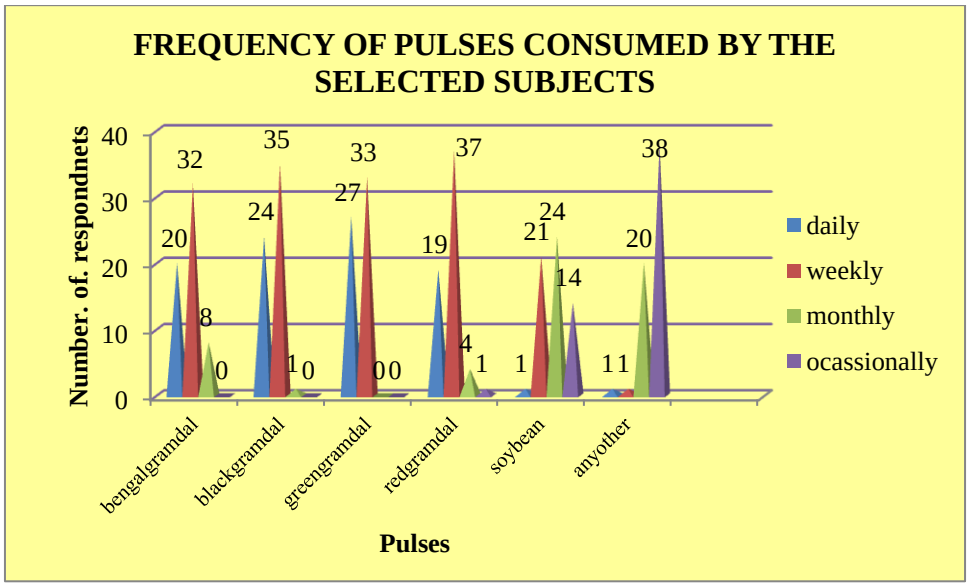


FIGURE XII

FREQUENCY OF PULSES CONSUMED BY THE SELECTED SUBJECTS

Figure XII represent that 20 of them were taking Bengal gram dal daily, 32 respondent consumed weekly and the remaining 8 consumed once in a month. With respect to black gram dal 24 subjects consumed it daily, another 35 participants took it weekly. Only one participant took black gram dal once in a month.

In terms of green gram dal, it was consumed daily by 27 selected subjects and 33 consumed it weekly. None of the selected subjects took it monthly or occasionally. Only one respondent took soybean daily, 21 of them consumed soybean once a week, it was consumed once in a month by 24 subjects and the remaining 14 subjects partook occasionally.

According to the study done by Gulati (2019) in India, among the 100 selected subjects 35% were consumed Bengal gram dal daily, 25% of them consumed red gram dal daily, green gram dal was taken by 20% selected subjects, 15% took soy bean and the remaining 5% were taking any other type of pulses on a daily basis.

Figure XIII, represents the frequency of green leafy vegetables consumed by the selected subjects

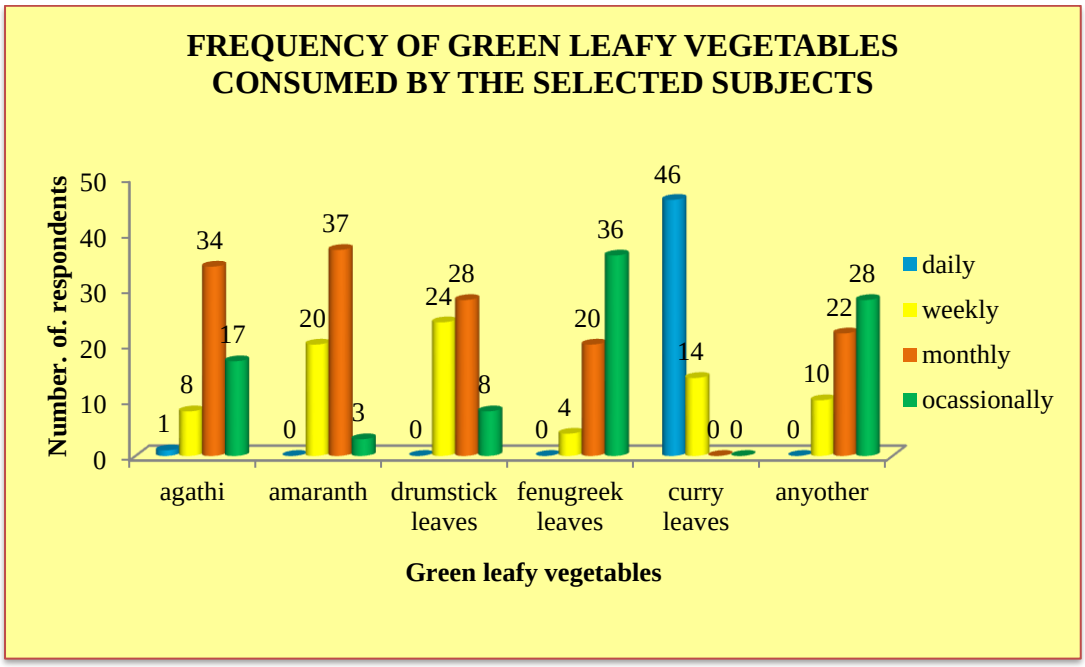


FIGURE XIII

FREQUENCY OF GREEN LEAFY VEGETABLE BY THE SELECTED SUBJECTS

Figure XIII indicates that only one subject took agathi daily, 8 of them were consuming weekly, it was consumed monthly by 34 subjects, remaining 17 were

taking it occasionally. Except agathi, none of the other green leafy vegetables were consumed on a daily basis.

In terms of amaranth 20 subjects were consumed weekly, it was taken monthly by 37 selected subjects and 3 of them took it occasionally. With respect to drumstick leaves, 24 selected subjects were taking it weekly, 28 of them were eating monthly and the remaining 8 subjects were eating occasionally.

Curry leaves were consumed by total of 46 selected subjects out of which 14 of them were using it weekly and remaining on a monthly basis. The other green leafy vegetables were consumed weekly by 10 participants, 22 of the selected subjects were taking monthly.

Figure XIV indicates the frequency of vegetables consumed by the selected subjects

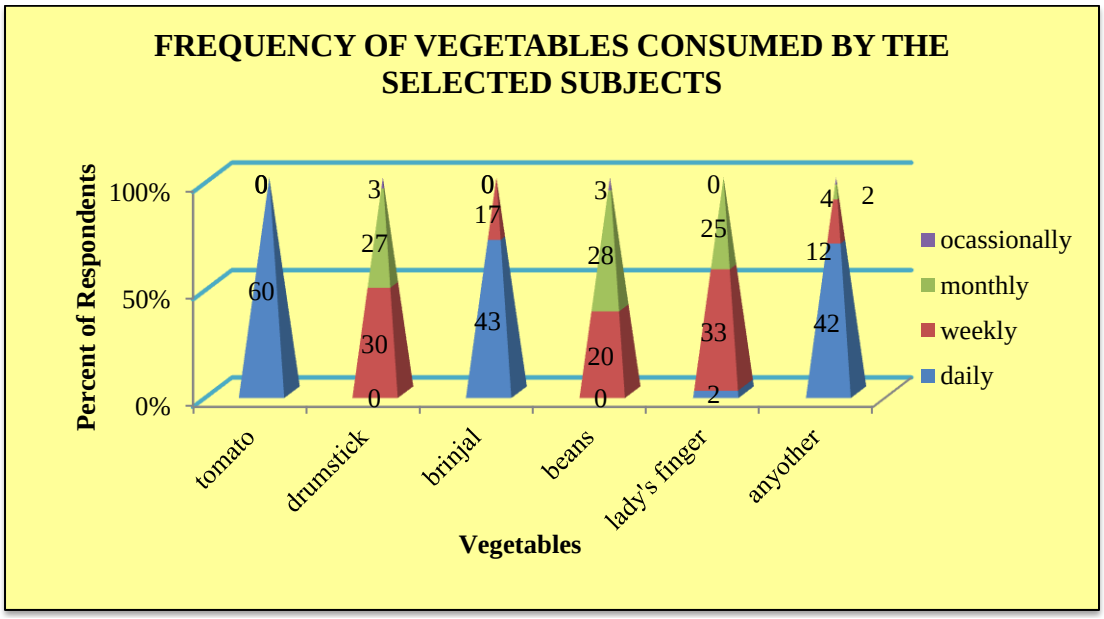


FIGURE XIV

THE FREQUENCY OF VEGETABLES CONSUMED BY THE SELECTED SUBJECTS

Figure XIV denotes that all the 60 subjects consumed tomato. With respect to drumstick none of the selected subjects were consuming it daily, 30 selected subjects partook weekly and 3 of them were eating it occasionally.

In terms of brinjal, 43 of the subjects consumed daily and the remaining 17 participants took brinjal weekly. None of the selected subjects were consuming beans daily, about 20 subjects used beans weekly and 28 of them took beans monthly.

Lady's finger was consumed daily by only 2 selected subjects; majority of the subjects i.e., 33 of them took it weekly and the remaining were eating lady's finger at least once a month.

A study reported by Peter *et.al*, (2008) revealed that 30-35% of the selected subjects were not taking any vegetables in the daily basis. Tomato and onion were the most commonly used vegetable and 40-44% of the selected subjects were consuming them on a daily basis. 42% of the subjects were consuming all other vegetables occasionally.

Figure XV depicts the frequency of roots and tubers consumed by the selected subjects

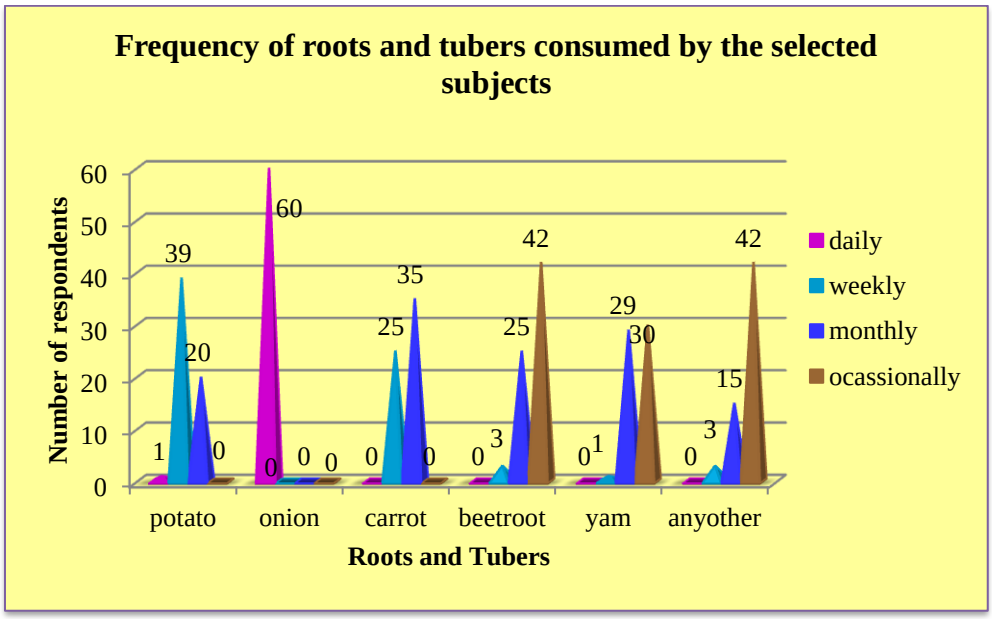


FIGURE XV

THE FREQUENCY OF ROOTS AND TUBERS CONSUMED BY THE SELECTED SUBJECTS

Figure XV represents that only one participant used potato daily, 39 of them consumed potato weekly and the remaining 20 took monthly. Onion was the most commonly used root by all the selected subjects.

None of the selected subjects used any roots and tubers on a daily basis. In terms of carrot 25 of the subjects used weekly and the remaining 35 took monthly. 3 of them consumed beetroot weekly, beetroot was consumed monthly by 25 selected subjects and the majority of the subjects were consuming it occasionally.

With respect to yam only one subject consumed it weekly, 29 selected subjects took monthly and half of the selected subjects used occasionally.

Figure XVI represents frequency of nuts and oil seeds consumed by the selected subjects

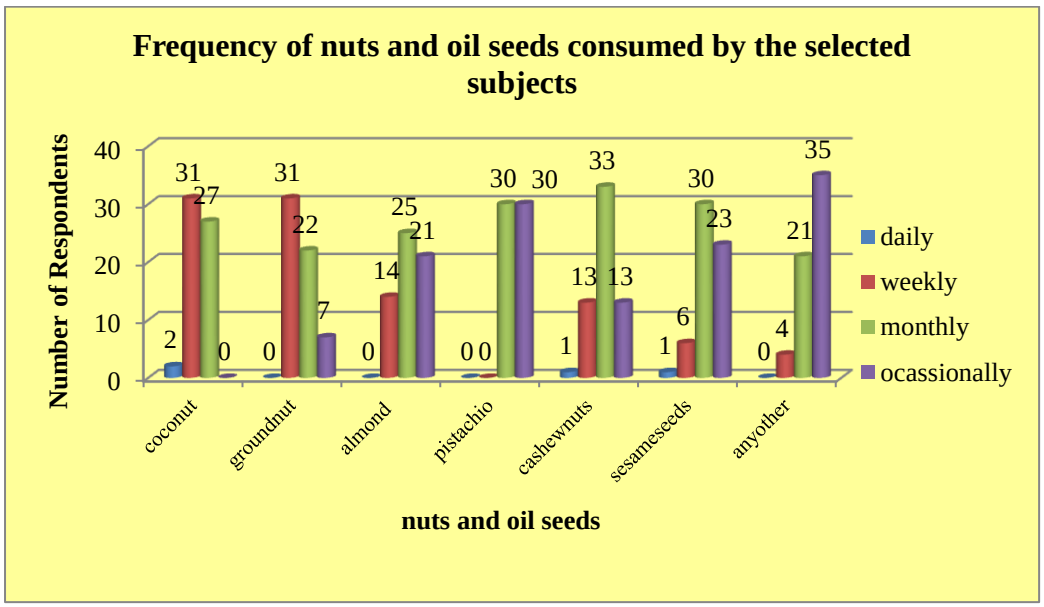


FIGURE XVI

THE FREQUENCY OF NUTS AND OILS CONSUMED BY THE SELECTED SUBJECTS

Figure XVI denotes that only 2 selected subjects were using coconut daily, nearly half of the selected subjects that is 31 of them used weekly and the remaining 27 took monthly.

Most of the selected subjects did not use nuts and oil seeds daily. In terms of groundnut, 31 subjects consumed it weekly, 22 of the selected subjects monthly and the remaining 7 of the participants used occasionally.

14 of the selected subjects used almonds once a week, 25 of them were consuming monthly and the remaining 21 took almonds occasionally. As to pistachio, half of the selected subjects were used weekly and the remaining half of them was used monthly.

Only one respondent took cashewnut daily. 13 of the subjects consumed it once a week. Half of the selected subjects used cashewnut monthly once and the other 13 participants were consuming occasionally.

In terms of sesame seeds, half of the selected subjects were eating monthly, only one subject used daily, 6 of the selected subjects consumed weekly and the remaining participants consumed occasionally.

Figure XVII indicates the frequency of fruits consumed by the selected subjects

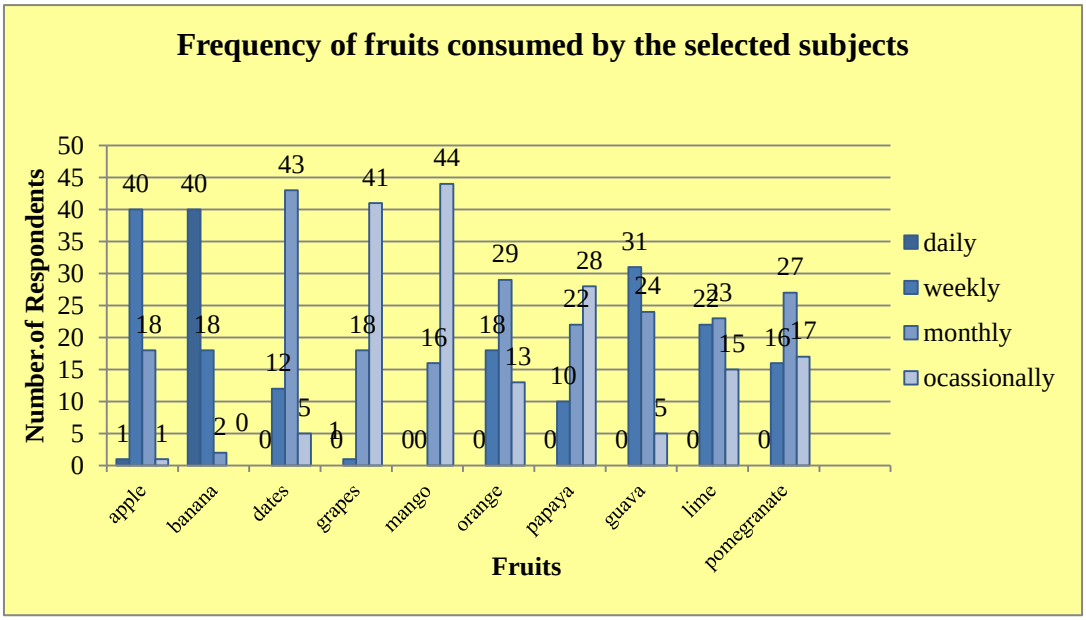


FIGURE XVII

THE FREQUENCY OF FRUITS CONSUMED BY THE SELECTED SUBJECTS

Figure XVII represent, majority of the selected subjects did not take any fruits except banana daily. Only one subject took apple daily, majority of the selected subjects were consuming apple on a weekly basis and the remaining 18 of them were consuming apple monthly.

Most of the selected subjects were consuming banana daily, 12 of them took weekly and the remaining 2 subjects took monthly. In terms of dates, majority of the selected subjects consumed occasionally, only 12 participants consumed dates monthly.

Like dates, grapes and mango were consumed by majority of the subjects occasionally, 18 of the selected subjects took grapes monthly once and 16 of the selected subjects took mango on a weekly basis during its season.

With respect to orange a majority of the selected subjects consumed monthly, 29 of them took weekly and the remaining 13 subjects used occasionally. Papaya was consumed weekly by 10 selected subjects, 22 of them consumed monthly and the remaining 28 subjects took occasionally.

Figure XVIII depicts frequency of milk and milk products consumed by the selected subjects

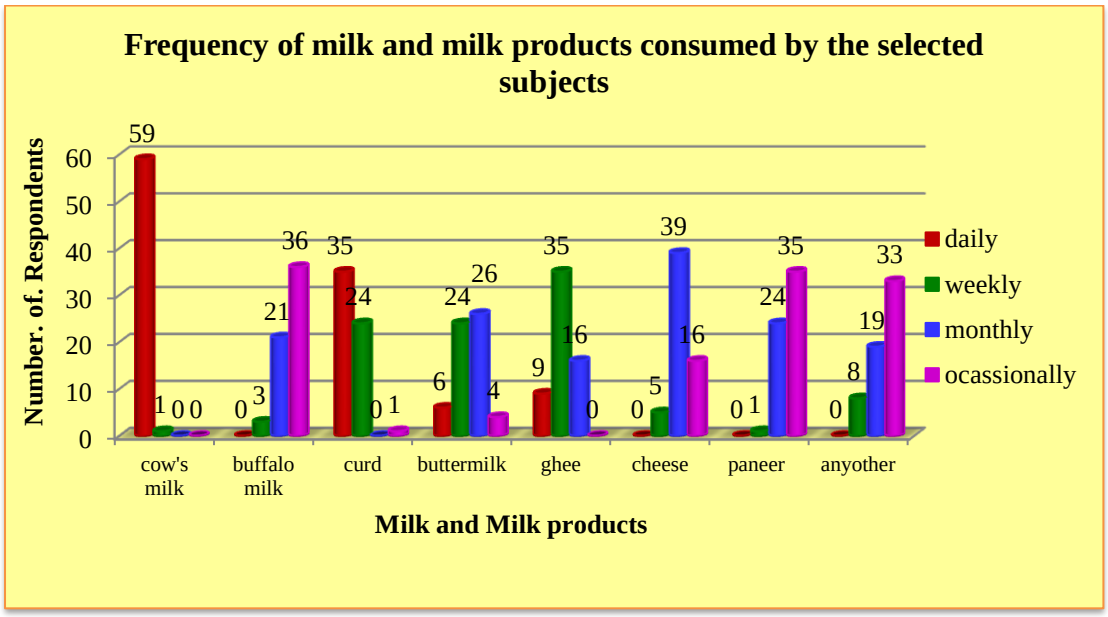


FIGURE XVIII

THE FREQUENCY OF MILK AND MILK PRODUCTS CONSUMED BY THE SELECTED SUBJECTS

From figure XVIII, it is noticed that 59 of them consumed cow's milk on a daily basis. Except milk and curd none of the other products were used daily by the selected subjects. Only one subject used milk once a week.

Majority of the selected subjects were using buffalo's milk occasionally. 21 of them consumed it monthly and only 3 subjects used it weekly. Next to milk, most of the selected subjects used curd daily and 24 of the participants were consuming it weekly.

In terms of buttermilk, nearly half of the selected subjects were consuming once a month and the other half of them used it weekly. Only 4 selected subjects used buttermilk occasionally. With respect to cheese, 39 of the subjects were consuming it monthly, 16 of them used occasionally and the remaining 5 selected subjects took cheese weekly.

Like cheese, paneer was also used occasionally by half of the selected subjects and 24 of the selected subjects were used paneer monthly and only one subject consumed paneer weekly.

Figure XIX indicates the frequency of sugar products consumed by the selected subjects

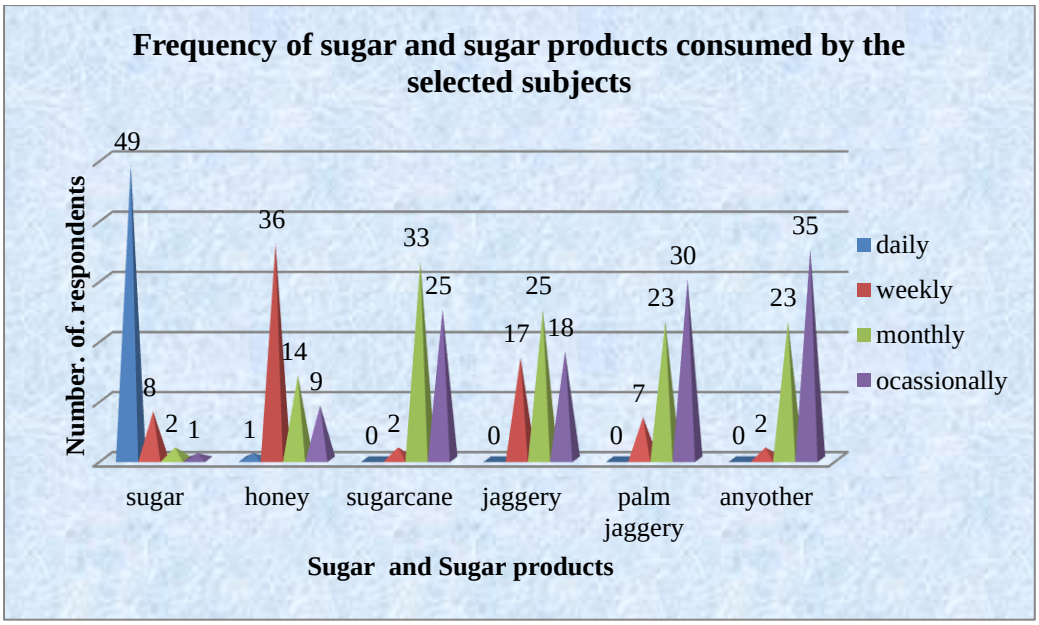


FIGURE XIX

THE FREQUENCY OF SUGAR PRODUCTS CONSUMED BY THE SELECTED SUBJECTS

Figure XVIII reveals that most of the selected subjects as many as 49 used sugar daily, 8 of them used weekly and only one respondent used it occasionally. As far as honey, majority of the selected subjects were consuming it weekly, 14 of them used monthly and only 9 of them were consuming honey occasionally.

In terms of sugarcane, most of the selected subjects, such as 33 took monthly, only 2 of them were used weekly and the remaining 25 subjects were consumed it

occasionally. None of the selected subjects used jaggery daily, 17 selected subjects were used it weekly, 25 of them were consumed it monthly and the remaining 18 used it occasionally.

Like jaggery, palm jaggery also did not find use by the selected subjects daily, only 7 of the subjects were consuming it weekly, majority of the participants took palm jaggery occasionally.

Figure XX depicts the frequency of Non-Vegetarian foods consumed by the selected subjects

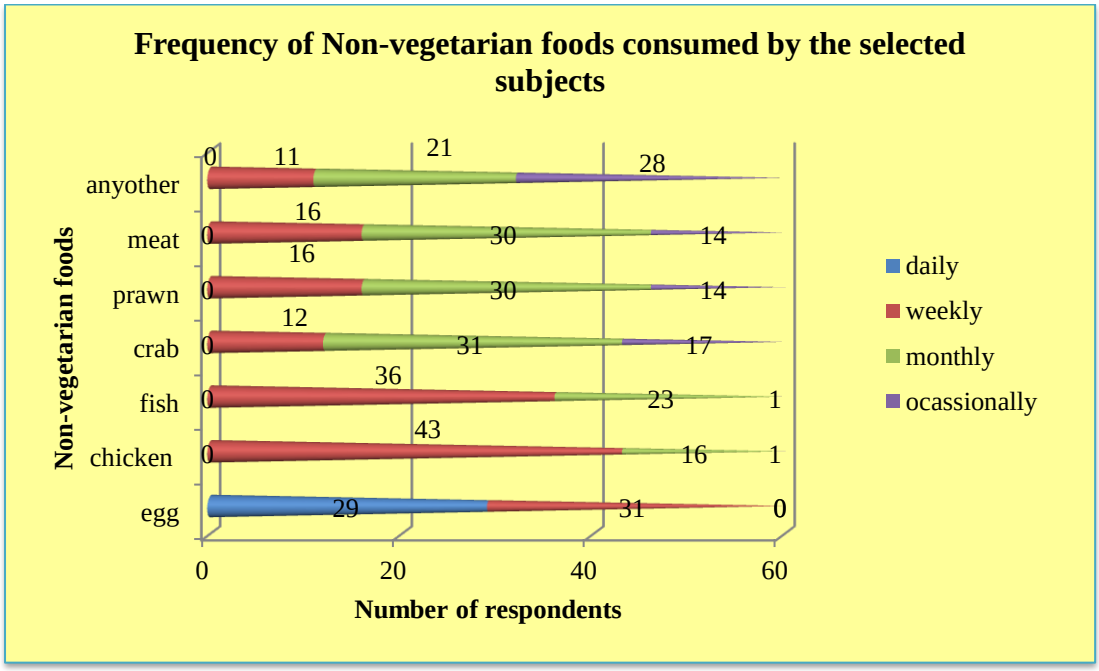


FIGURE XX

FREQUENCY OF NON-VEGETARIAN FOODS CONSUMED BY THE SELECTED SUBJECTS

Figure XX represent that except egg none of the animal sources were consumed daily by any of the selected subjects. 29 of the selected subjects took egg daily and the remaining 31 subjects used weekly.

Most of the selected subjects consumed chicken and fish once a week than any other animal sources. Majority of the subjects were consuming chicken weekly and the remaining 16 of the selected subjects were eating chicken monthly. 36 selected subjects took fish weekly and the remaining 23 were consuming fish monthly.

Other than fish and chicken, other animal sources were consumed mostly monthly by majority of the selected subjects. Half of the selected subjects were consuming crab, prawn and meat monthly.

QUALITY ANALYSIS OF INSTANT SOUP POWDER:

Table VII depicts the physical attributes of the developed instant soup mix

TABLE VII

THE PHYSICAL ATTRIBUTES OF THE DEVELOPED INTANT SOUP MIX

S.No	Nameof the Test	Result
1.	Appearance	Free flowing powder
2.	Colour	Pale orange colour
3.	Odour	Agreeable
4.	Water Absorption Capacity	270ml/100g
5.	Bulk Density	0.63g/ml
6.	Rehydration Ratio	4.85g/ml
7.	Swelling Index	1.60

From the table VII, it is clear that the appearance of the instant soup powder is free flowing that is without any minute particles and lump in it. Colour is one of the most efficient qualities of the instant soup powder. The colour of developed instant soup powder was pale orange colour. Though the herbs were green, the proportion of pulses and spices dominate the colour of herbs which makes it more palatable.

Odour of the instant soup powder was agreeable because of the proportion of pulses and spices. The water absorption capacity is an important factor for the quality analysis. It was found to be at that 270ml/100g. The bulk density depends on how the soup powder has to be handled by the consumer. It was found that the developed instant soup mix has 0.63g/ml. The rehydration ratio of the developed instant soup mix was found as 4.85g/ml.

Table VIII indicates the proximate analysis of the developed instant soup mix

TABLE VIII

THE PROXIMATE ANALYSIS OF THE DEVELOPED INSTANT SOUP MIX

S.No	Parameters	Results
1.	Moisture	3.62%
2.	Ash	7.32%
3.	Carbohydrate	61.52%
4.	Protein	17.18%
5.	Fat	4.16%
6.	Crude fibre	3.55%
7.	Calcium	71.71 mg
8.	Potassium	999.01 mg
9.	Iron	12.81mg
10.	Zinc	6.5mg
11.	Lead	0.1mg
12.	Cadmium	0.1 mg

We can figure out from the table VIII, the moisture content of the developed instant soup powder was 3.62%. The ash content was found as 7.32 percent. From the table it was clear that the carbohydrate content of the developed instant soup mix was 61.52 percent. The protein content was 17.18%. The developed instant soup powder had a fat content of 4.16%. The crude fibre was found as 3.55%.

Also, the table VIII depicts the mineral content of the developed instant soup powder. The calcium was found as 71.71 mg and potassium was 999.01mg in 100g of developed instant soup mix. The developed instant soup powder has 6.2mg of iron content.

It is clear from the table VIII, the presence of heavy metals such as lead and cadmium in the developed instant soup powder was well below the lower limit specified by FSSAI, determining it fit for consumption.

Table IX depicts the phyto-chemical analysis of the developed instant soup mix

TABLE IX

THE PHYTO-CHEMICAL ANALYSIS OF THE DEVELOPED INSTANT SOUP MIX

S.No	Parameters	Results
1.	Tannin	1.5mgTannic acid/g
2.	Flavonoids	3.2mgQuercetin/g
3.	Phenols	5.6mgGallic acid/g

From table IX, it was found that the amount of tannin present in the developed instant soup powder is 1.5mg/g or 150mg/100g. The amount of flavonoids present is 3.2mg/g or 320mg/100g. Also, it was clear that the presence of phenols in 100g of developed instant soup mix was 560mg.

Table X denotes the physio-chemical analysis of the developed instant soup mix

TABLE X

THE PHYSIOCHEMICAL ANALYSIS OF THE DEVELOPED INSTANT SOUP MIX

S.No	Parameters	Results
1.	Ph	6.5
2.	Total dissolved solids	52%

From table X, it was clear that the pH of developed instant soup mix was 6.5. The Total Dissolved Solids (TDS) was about 52%.

Table XI indicates the shelf life analysis of the developed instant soup mix

TABLE XI

THE SHELF LIFE ANALYSIS OF THE DEVELOPED INSTANT SOUP MIX

S.No	Parameters	Results
1.	Total plate count	350 CFU/g
2.	Yeast	270 CFU/g
3.	Mould	250 CFU/g

From the table XI, it was found that the total plate count present in the developed instant soup powder has 350 CFU/g. 270 CFU/g of yeast has been found in the instant soup mix. The content of mould was estimated at 250 CFU/g.

The instant soup mix was evaluated for its sensory characteristics and the data are presented in table XII.

TABLE XII

SENSORY EVALUATION OF DEVELOPED INSTANT SOUP MIX

Instant Soup Mix	Variation I	Variation II	Variation III
Colour	4.6±0.6	4.0 ± 0.6^{a}*	3.5 ± 0.5^{ab}**
Appearance	4.8±0.4	4.0 ± 0.0^{a}*	3.1 ± 0.3^{ab}*
Flavour	5.0±0.0	4.3 ± 0.7^{a}*	3.0 ± 0.0^{ab}*
Texture	5.0±0.0	3.8 ± 0.4^{a}**	3.3 ± 0.4^{ab}**
Taste	5.0±0.0	3.8 ± 0.4^{a}**	3.3 ± 0.4^{ab}**
Overall acceptability	5.0±0.0	3.9 ± 0.3^{a}**	3.0 ± 0.0^{ab}*

Values are Mean ± SD of Variation I, Variation II, and Variation III of developed instant soup mix. ANOVA test was done for comparison; ‘a’ denotes the significant difference at 5% level between Variation I, Variation II and Variation III, ‘b’ denotes the significant difference at 5% level between Variation II and Variation III. ‘**’shows p value <0.01.

Table XII highlights that among the three variations of instant soup mix, Variation I has good colour, good appearance, good taste, good flavour and good texture compared to the other variations such as Variation II and Variation III. Also the overall acceptability was good in Variation I.

V. SUMMARY AND CONCLUSION

The study titled "**Development and Quality Analysis of Instant Soup Mix for Diabetics"** was conducted to develop an instant soup mix for diabetics using pulses, spices and herbs. And its quality analysis was done.

Diabetes mellitus, commonly called as diabetes occurs if the human body is not able to take up the sugar into the body cells and use it for energy as further. It is defined as the combination of metabolic disorders which is characterized by elevation in the blood sugar level over a prolonged period of time. Glucose is an important source of energy for the cells which helps in making up the muscles and tissues. Also it plays as main component of fuel for brain cells.

Pulses, herbs and spices have various therapeutic and nutritional values was analysed and those having anti-diabetic properties were used in the development of instant soup mix. The diabetic should take a well balanced meal, thus an instant and handy ready to cook soup mix was developed. The diabetics can use the instant soup mix wherever and wherever they want.

The intake of fruits and vegetables, lean proteins, low fat, low sugar diet helps in managing and preventing the risk of diabetes mellitus. Like fibre, vitamins and minerals also have low impact on the blood sugar level. The green leafy vegetables are rich source of fibre as well as the vitamins and mineral, hence it is an essential ingredient which should be taken by the diabetics.

The bioactive components present in the spices are also used for their curative property for degenerative human diseases. There are plenty of biochemical substances are present in herbs such as polyphenols, flavonoids, quinines, polypeptides, etc.

Pulses, spices and herbs which are having anti-diabetic properties were searched and selected. Cost effective, easily available ingredients were used in the preparation of instant soup mix.

The nutritious liquid which enhances hydration and boosts the immune system is known soup. Consuming soup is the better way to improve appetite and also lowers dehydration in the body. This technique is more efficient in transportation, because it

interrupted the total weight of the food, especially in fruits and vegetables that are mostly water.

Diabetics should take utmost care in their daily diet, even a change in small ingredients make big issue. Thus it is important to choose wise diet; the ingredients used in the instant soup mix are highly nutritious and handy. It has good nutritive value at the same it quench the thirst.

The findings of the study are summarized as follows:

I. Development of Instant Soup Mix

- In phase I of the study, 60 diabetic selected subjects were selected based on purposive sampling method.
- Coimbatore was selected as study area due to the ease of investigator.
- A survey was conducted to collect information on consumption pattern, awareness and market availability of instant soup mix.
- A well-structured E - questionnaire was prepared to know the existing herbal products for diabetes mellitus. The E - questionnaire was circulated to the selected diabetics. The information was collected through the Google form.
- The e- Questionnaire consisted of demographic profile, dietary pattern and market availability of instant soup mix.
- The data collected was coded. Microsoft excel 10 and SPSS was used to analyse the data.
- From the collected data, it was found that only few of the selected subjects were taking special dietary guidelines for Diabetes Mellitus. 13 subjects took fenugreek water, 7 of them followed low fat dairy product and 9 subjects were taking aloevera.
- 28% of the selected subjects consumed herbs in the form of pickle, 26% of subjects consumed herbs in the form of jam, and 25% of subjects in the form of candy.
- Like herbs, 70% of the subjects did not know about the herbal products available in the market and did not use those products.

- Also the food frequency pattern for cereals, pulses, vegetables, roots and tubers, milk and milk products, fruits of the selected diabetics were collected and analysed.
- The ingredients such as pulses, spices and herbs having anti-diabetic properties were selected for the development of instant soup mix.
- The selected and procured ingredients such as pulses, spices and herbs were measured and taken in the predetermined quantities
- The soup powder was developed by the selected ingredients. The process involved includes cleaning, drying, roasting and pulverizing.
- Proper guidelines were followed while developing the Instant Soup Mix.
- Different variations were formulated to identify the standardized recipe. With that standardized soup mix three different variations were made in the food laboratory of Food Service Management and Dietetics department.

II. Quality Analysis of the Developed Instant Soup Mix

- Quality analysis was done with the developed instant soup mix.
- Quality parameters such as physical attributes, proximate analysis, physio-chemical, phyto-chemical, total plate count and shelf-life analysis was done.
- The results of quality analysis was tabulated and described.
- The developed Instant Soup Mix was evaluated for its sensory characters by a group of ten panel members. Among the variations, the overall acceptability score was high in Variation III A which has 3g of Instant Soup Mix.

III. Creation of Awareness to the selected diabetics with the Developed Instant Soup Mix

- With the help of developed instant soup mix awareness was created to the selected diabetics
- Diabetes mellitus is a chronic metabolic disorder which leads to many serious complications also. Though allopathic medicines are available for the treatment and management of diabetes, most of us were not aware about the herbal remedies which have been used for the treatment of diabetes without any side effects.

- Thus the role of the herbal remedies and their uses were briefly given in the awareness session.
- Also the use of developed instant soup mix was well explained.

Conclusion:

An instant soup mix was developed and its quality was analysed to help the diabetics. The developed instant soup mix powder is low in glycemic value and it regulates the blood sugar level. It is a balanced food, as it gives all the required nutrients to the body at the same time it quench the thirst of the diabetics. The instant soup mix is handy and no pre-preparation is needed. And it is suitable for working diabetics as it is ready to cook. Also an awareness program was conducted about the developed instant soup mix and it uses.

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APPENDIX I

Institutional Human Ethics Committee

INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam

Institute for Home Science and Higher Education for Women
(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956) Re-accredited with 'A++' Grade by NAAC.
Recognised by UGC Under Section 12 B
Coimbatore-641 043, Tamil Nadu, India

Chairman
Dr.Sudha Ramalingam
Director-Research & Innovation,
Professor-Community Medicine,
PSG Institute of Medical Sciences & Research, Coimbatore

Member Secretary
Dr.S.Uma Mageshwari
Professor and Head,
Department of Food Service Management & Dietetics

Members
Mr.K.Arunmoli (Legal Expert)
Dr.Subhashini K. Sripathi
Dr.A.Saraswathy (Medical Officer)
Ms.D.Kavitha
Dr.A.R.SudamaniRamasamy
Dr.G.Victoria Naomi
Dr. Judith Justin
Dr.AnithaSubash

26th March 2022

To
Ms.Kavyadevi.M
Department of Food Service Management and Dietetics
Avinashilingam Institute for Home Science and
Higher Education for Women
Coimbatore – 641 043

Dear Kavyadevi.M,

Ref: Your proposal No. IHEC/21-22/FSMD-15 entitled "Development and Quality Analysis of Instant Soup Mix for Diabetics "resubmitted for approval to IHEC on 18.03.2021.

The Institutional Human Ethics Committee of our University hereby grants approval to your research proposal No. IHEC/21-22/ FSMD-15 entitled "Development and Quality Analysis of Instant Soup Mix for Diabetics"resubmitted by you. The Approval number for the same is AUW/IHEC/FSMD-21-22/XPD-15.

We wish you all the best in your research endeavours.

Regards,

Dr.S.Uma Mageshwari
Member Secretary

Institutional Human Ethics Committee

APPENDIX II

e- Questionnaire to Collect Data on Consumption Pattern, Awareness and Market Availability of Instant Soup Mix Available in the Market

1. Name of the respondent :
2. Age :
3. Gender :
4. Address :
5. Phone number :
6. e- Mail :
7. Educational qualification :

   ☐ High school ☐ Higher secondary

   ☐ Bachelor degree ☐ Master degree

   ☐ Diploma ☐ Professional course ☐ Others
8. Occupation / profession
9. Activity

   ☐ Sedentary ☐ Moderate ☐ Heavy
10. Monthly income
11. Type of family

    ☐ Joint family ☐ Nuclear family
12. Total family income
13. Are you a

    ☐ Vegetarian ☐ Non - vegetarian ☐ Ova vegetarian
14. How many meals do you consume per day?

    ☐ Below 3 ☐ 3 ☐ Above 3
15. Describe briefly about your daily food intake (early morning to bed time)
16. Frequency of consuming

    ☐ Cereals - rice, ragi, wheat, millets, any other

    ☐ Daily ☐ Weekly

    ☐ Monthly ☐ Occasionally ☐ Not at all
17. Pulses - Bengal gram dal, black gram dal, green gram dal, red gram dal, soybean, any other

    ☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally ☐ Not at all

18. Green leafy vegetables - agathi, amaranth, drumstick leaves, fenugreek leaves, curry leaves, any other

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally ☐ Not at all

19. Other vegetables - tomato, drumstick, brinjal, beans, ladies finger, bitter gourd, bottle gourd, any other

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally ☐ Not at all

20. Roots and tubers - potato, onion, carrot, beetroot, yam, any other

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally ☐ Not at all

21. Nuts and oil seeds - daily, weekly, monthly, occasionally, not at all

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally ☐ Not at all

22. Fruits - apple, banana, dates, grapes, mango, orange, papaya, guava, lime, pomegranate, any other

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally ☐ Not at all

23. Milk and milk products - cow’s milk, buffalo’s milk, curd, butter milk, ghee, cheese, paneer, any other

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally ☐ Not at all

24. Sugar and sugar products

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally ☐ Not at all

25. Animal products - egg, chicken, fish, crab, prawn, meat, any other

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally ☐ Not at all

26. Cooking methods used in various food preparations

☐ Raw ☐ Frying

☐ Baking ☐ Steaming

☐ Boiling ☐ Stewing

27. Do you know about dietary fibre?

28. If yes what do you know, give example for fibre rich foods

29. Do you drink

☐ Tea ☐ Coffee

☐ Health drinks ☐ Any other

30. Number of cups per day

☐ 2 cups ☐ Less than 2 cups ☐ More than 2 cups

31. How long do you have diabetes mellitus?

☐ Less than 6 months ☐ 6 months - 2years

☐ 2 - 5 years ☐ 5 - 10 years ☐ More than 10 years

32. Are you

☐ Type 1 diabetic ☐ Type 2 diabetic

33. Whether your family members suffered by diabetes mellitus

34. If yes, relationship

☐ Parents ☐ One of the parents

☐ Grand parents ☐ Relatives

35. Treatment undergoing at present

☐ Naturopathy ☐ Ayurvedic

☐ Homeopathy ☐ Siddha

☐ Unani ☐ Allopathy ☐ None

36. What are the symptoms you have?

☐ Polyuria ☐ Polyphagia

☐ Polydipsia ☐ Weight loss

☐ Poor wound healing ☐ Fatigue

☐ Constipation ☐ Visual disturbance

☐ Insomnia ☐ Shivering

☐ Infections ☐ Any other

37. Do you have any following complications?

☐ Hypertension ☐ Diabetic foot disease

☐ Kidney disease ☐ CVD

☐ Diabetic retinopathy ☐ Diabetic nephropathy

☐ Liver disease ☐ Hypertension + diabetic retinopathy

☐ Hypertension + kidney disease ☐ CVD + liver disease

☐ Any other

38. Do you follow any special dietary guidelines for the management of diabetes?
39. If yes, kindly mention ☐ Drinking fenugreek water

☐ Low fat dairy products ☐ Aloevera products

☐ Others

40. Are you aware of herbal plants?
41. If yes, what do you know?
42. What are the benefits of consuming herbs?
43. Do you know the form in which herbs can be consumed?
44. List few herbs used for common ailments
45. Do you use any herbs for any ailments in your daily life?
46. Do you know which herbs help to manage blood glucose level?
47. Do you take any herbal medicine for the management of diabetes mellitus?
48. Do you take any herbs in the following form?
49. Do you aware of herbs for the management of diabetes, which are given below?

☐ Acacia Arabica

☐ Aegle marmelos ☐ Aloe barbadenesis

☐ Azadirachta indica ☐ Caesalpinia bonducella

☐ Capparis deciduas ☐ Coccinia indica

☐ Gymnema sylvestre ☐ Eugenia jambolana seeds

☐ Cassia auriculata

50. Do you any other herbs other than the above given?
51. If yes, kindly mention
52. In what form can the herbs be added in cooking / culinary preparations?
53. Which form of herbs is easy to consume?
54. What are the herbs incorporated recipes that are taken by your family members?
55. What are they ready to eat / ready to cook herbal products that are consumed by your family members?

56. Do you consume soup?

57. How often do you consume soup?

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally

58. In what quantity do you consume soup (in ml)

☐ Less than 150 ml ☐ 150 ml ☐ More than 150 ml

59. What are the common soups that are consumed by your family members?

60. What is the reason for consuming soup?

61. What are the common ingredients do you use in the soup preparation?

62. Do you know the medicinal value or health benefits of herbal soups?

63. Do you take herbal soup?

64. Do you like freshly made soup or instant soup mix? Give reason

65. How often do you take herbal soup?

☐ Daily ☐ Weekly

☐ Monthly ☐ Occasionally

☐ Haven't tried

66. What type of soup mix do you want to buy?

☐ Instant soup mix ☐ Self made ☐ Others

67. What are the ingredients do you use in self made herbal soup?

68. Can you give a one line statement for using those ingredients?

69. Where did you get the recipe?

☐ Books ☐ Friends or neighbours

☐ Health workers ☐ Others

70. What is the purpose of taking herbal soup?

☐ Taste ☐ Price

☐ Health benefits ☐ Convenience ☐ Others

71. Did you come across any side effects while using the herbal products?
72. If yes, what are the side effects?
73. Are you aware of any daily used pulses, vegetables or spices having anti-diabetic properties?
74. If yes, kindly mention the ingredients
75. In what form do you use the above ingredients
76. Would you prefer instant soup mix available in market for diabetes mellitus?
77. Do you have any idea about the soup mix readily available in the market which is given below?

☐ Vedamrita anti-diabetic products ☐ 3v herbal products

☐ Bixo herbal products ☐ Vedantika herbal soup powder

☐ Two brothers ☐ Patanjali

☐ Society daily premix ☐ Fabindia products

☐ Annai aravind herbals

78. Do you know any other herbal soup powder brand name other than the above given?
79. If yes kindly mention
80. Is it possible for you to make soup powder at home?
81. Have you ever tried of making instant soup powder at home?
82. Will you encourage your family members to take soup on a regular basis?

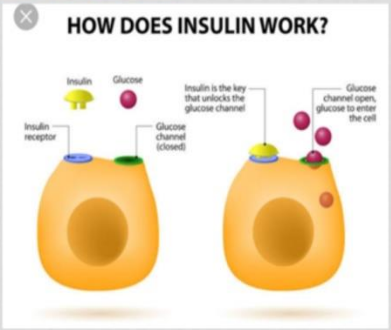
APPENDIX III

Education Material to Create Awareness on Developed Instant Soup Mix for Diabetics to the Selected Diabetics

DIABETES MELLITUS

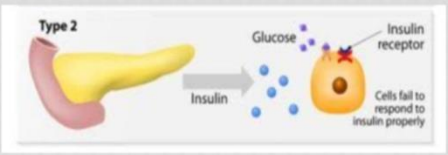
- Diabetes mellitus, commonly known as diabetes is chronic metabolic disorder characterized by high blood sugar level (hyper-glycaemia) over a long period of time.
- Diabetes is due to either the pancreas not producing enough insulin, or the cells of the body not responding properly to the insulin produced.

ROLE OF INSULIN



1. Type 1 diabetes mellitus:
   It results from failure of the pancreas to produce enough insulin due to loss of beta cells.

2. Type 2 diabetes mellitus:
It begins with insulin resistance, a condition in which cells fail to respond to insulin properly.



3. Gestational diabetes:
It is the third main form, and occurs when pregnant women without a previous history of diabetes develop high blood sugar levels.
In women with gestational diabetes, blood sugar usually return to normal soon after delivery.

SYMPTOMS

COMPLICATION

RISK FACTORS

GLYCEMIC INDEX

- The glycemic index is a system of assigning a number to carbohydrate-containing foods according to how much each food increases blood sugar.
- The glycemic index itself is not a diet plan but one of various tools - such as calorie counting or carbohydrate counting for guiding food choices.

GLYCEMIC INDEX CHART

Low Glycemic (55 or Below) High Glycemic (70 or Higher)

SNACKS	G.I.	STARCH	G.I.	VEGETABLES	G.I.	FRUITS	G.I.	DAIRY	G.I.
Pizza	33	Bagel, Plain	33	Broccoli	10	Cherries	22	Yogurt, Plain	14
Chocolate Bar	49	White Rice	38	Pepper	10	Apple	38	Yogurt, Low Fat	14
Pound Cake	54	White Spaghetti	38	Lettuce	10	Orange	43	Whole Milk	30
Popcorn	55	Sweet Potato	44	Mushrooms	10	Grapes	46	Soy Milk	31
Energy Bar	58	White Bread	49	Onions	10	Kiwi	52	Skim Milk	32
Soda	72	Brown Rice	55	Green Peas	48	Banana	56	Chocolate Milk	35
Doughnut	76	Pancakes	67	Carrots	49	Pineapple	66	Yogurt, Fruit	36

GLYCEMIC INDEX FOR THE SELECTED INGREDIENTS

INGREDIENTS	GLYCEMIC INDEX
RED GRAM DAL	8
ONION	10
TOMATO	15
GARLIC	10
GINGER	1
CUMIN SEEDS	0. 17
BLACK PEPPER	44
CORIANDER SEEDS	32
RED CHILLI	1

INSTANT SOUP MIX FOR DIABETICS

HERBS:

Sirukurinjan (*Gymnema sylvestre*)

Aavarampoo (*Cassia auriculata*)

Jambo seeds (*Eugenia jambolona*)

PERISHABLE PRODUCTS:

Tomato (*Solanum lycopersicum*)

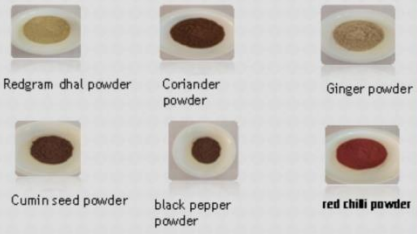
Onion (*Allium cepa*)

Garlic (*Allium sativum*)

Ginger (*Zingiber officinale*)

NON-PERISHABLE PRODUCTS:

PULVERIZED PRODUCTS



Pulse powder, Spices powder, Herbs powder

INSTANT SOUP MIX

PREPARATION OF THE INSTANT SOUP MIX

Take a bowl with 100ml of water

↓

Boil it for 3-5 minutes

↓

Add 3g of instant soup mix

↓

Mix well and allow it boil for 1 minute

↓

Serve hot

EASY METHOD OF PREPARATION

Take 100 ml of hot water

↓

Add 3g of Instant Soup Mix

↓

Mix well

↓

Serve hot

BENEFITS OF INSTANT SOUP MIX

- Handy (hot water is enough)
- Less time consuming - preparation time is reduced
- Getting nutrients in right way
- No storing, buying or planning of ingredients
- Can hardly get any leftovers
- Easy to prepare

CONCLUSION

- Affordable and cleverly marketed, instant soup mixes are becoming increasingly popular in urban India.
- Consumers should believe that they are healthy and nutritious. They can give a try on developed instant soup mix.

PLAGIARISM REPORT

INTRODUCTION

ORIGINALITY REPORT

7%	5%	3%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	en.wikipedia.org Internet Source	1%
2	journals.ansfoundation.org Internet Source	1%
3	Submitted to Federal University of Agriculture, Abeokuta Student Paper	<1%
4	fjps.springeropen.com Internet Source	<1%
5	www.biochemistry4all.com Internet Source	<1%
6	Submitted to London School of Commerce Student Paper	<1%
7	academicjournals.org Internet Source	<1%
8	www.worldscientificnews.com Internet Source	<1%
9	ijirset.com Internet Source	<1%

LAB REPORT

SPECIALIZED TESTING SERVICES

(AN ISO 9001 CERTIFIED MULTI DISCIPLINARY TESTING LABORATORY)

No.14, Amburose Street, MTP Road, Kavundampalayam, Coimbatore - 641 030.
Phone : +91 422 4980402. E-mail : stslabcbe@gmail.com, Web : www.stslab.in

REPORT NUMBER: STS/RE/2021-22/2467

DATE: 26.03.2022

TEST REPORT

Issued To : **MS.M.KAVYA DEVI,**
IInd, M.SC FOODS SERVICE MANAGEMENT AND DIETETICS, AVINASHILINGAM UNIVERSITY, COIMBATORE.

Sample Description	:	**SOUP POWDER**
Sample Quantity Received	:	150g (approx.)
Date of Receipt of Sample	:	23.03.2022
Date of Start of Analysis	:	23.03.2022
Date of Completion of Analysis	:	26.03.2022
Sampling Done by	:	Customer

CHEMICAL ANALYSIS

S.NO	NAME OF THE TEST	RESULT	TEST METHOD
1.	**Physical Attributes**		
	i. Appearance	Free flowing powder	FSSAI Manual of methods/UV-VIS Spectrophotometric/BIS
	ii. Colour	Pale orange colour	
	iii. Odour	Agreeable	
a.	Water absorption capacity	270ml/100g	
b.	Bulk density	0.63g/ml	
c.	Rehydration ratio	4.85	
d.	Swelling index	1.60	
2.	**Phyto-Chemical Analysis**		
a.	Tannin	1.5mgTannic acid/g	
b.	Flavonoids	3.2mgQuercetin/g	
c.	Phenols	5.6mgGallic acid/g	
3.	**Physico-Chemical analysis**		
a.	pH	6.5	
b.	Total dissolved solids	52%	

Analyzed By: Abirami.A

Important Note:

**The given results reflect our findings of the submitted sample only. Reports shall not be reproduced except in full without the written permission from the laboratory.*

**The report/results should not be used as evidence in the court cases and also forbidden to use for any kind of advertisements.*

**If you have any queries on this report please contact us within 15days from the report date. Strictly we won't entertain any queries received after 15days from the report date.*

For SPECIALIZED TESTING SERVICES

Authorized Signatory

SRI SHAKTHI
FOOD TESTING LABORATORY

43-B, Mettupalayam Road, Vellakinar Pirivu, Thudiyalur, Coimbatore - 641 034.
Mob : +91 72220 96666, +91 89030 26999, E-mail : srishakthiftl@gmail.com

Accredited by NABL

Approved by Ministry of Food Processing Industries & Certified by ISO / IEC 17025 : 2017

TEST REPORT

Test Report No:2022/03/23/SSFTL/21-22/NN-383-001	Issue Date:02.04.2022	Page 1 of 2

CUSTOMER DETAILS	
Customer Name & Address	Ms.Kavyadevi.M Bharathi Park road, Saibabacolony, Coimbatore
Customer Reference	Test Request dt 23.03.2022

SAMPLE DETAILS			
Product Category	Food and Agriculture products	Sample Code	SSFTL/21-22/NN-383-001
Sample Name	Soup Powder	Sample Conditions at Receipt	Good
Sample Description	Sample in Plastic Pouch	Sample Received on	23.03.2022
Sample Quantity	250 g	Test Commenced on	26.03.2022
Sampled by	Drawn by customer	Test Completed on	31.03.2022
Sampling Procedure	-----	Testing performed at	Sri Shakthi Food Testing Laboratory, Coimbatore

TEST RESULTS – CHEMICAL PARAMETERS

Sl. No.	PARAMETERS	TEST METHOD	UNIT	RESULTS
1	Moisture	Sec 4.1 of FSSAI Manual of method of analysis of fruits and vegetables	%	3.62
2	Ash	Sec 17.3 of FSSAI Manual of method of analysis of fruits and vegetables	%	7.32
3	Protein	AOAC 20th EDN 920.87	%	17.18
4	Fat	AOAC 20th EDN 2003.03:2006(Hexane Extraction), all foods	%	4.16
5	Crude Fibre(on dry Basis)	IS 10226 : Part I	%	3.55
6	Calcium	Inhouse method by ICP OES	mg/kg	71.71
7	Potassium	Inhouse method by ICP OES	mg/kg	999.01

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TEST REPORT

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CUSTOMER DETAILS	
Customer Name & Address	Ms.Kavyadevi.M Bharathi Park road, Saibabacolony, Coimbatore
Customer Reference	Test Request dt 23.03.2022

TEST RESULTS – CHEMICAL PARAMETERS

Sl. No.	PARAMETERS	TEST METHOD	UNIT	RESULTS
8	Iron	Inhouse method by ICP OES	mg/kg	12.81
9	Zinc	Inhouse method by ICP OES	mg/kg	6.50
10	Lead	Inhouse method by ICP OES	mg/kg	BLQ(LOQ:0.1)
11	Cadmium	Inhouse method by ICP OES	mg/kg	BLQ(LOQ:0.1)

Remarks:

- Result Related Only to the Sample Tested
- Instrument used : ICP - OES

End of Report

Checked by
Name : Sathesh Kumar.C
Designation : Chemist

Sri Shakthi Food Testing Laboratory Coimbatore

Authorized Signatory
Name : Revathi.S
Designation : Technical Manager - Chemical

SRI SHAKTHI
FOOD TESTING LABORATORY

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Test Report No:2022/03/21/SSFTL/21-22/NN-383-001	Issue Date:02.04.2022	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	Ms.Kavyadevi.M Bharathi Park road, Saibabacolony, Coimbatore
Customer Reference	Test Request dt 23.03.2022

SAMPLE DETAILS			
Product Category	Food and Agriculture products	Sample Code	SSFTL/21-22/NN-383-001
Sample Name	Soup Powder	Sample Conditions at Receipt	Good
Sample Description	Packed in Sterile Pack	Sample Received on	23.03.2022
Sample Quantity	250 g	Test Commenced on	24.03.2022
Sampled by	Drawn by customer	Test Completed on	29.03.2022
Sampling Procedure	---	Testing performed at	Sri Shakthi Food Testing Laboratory, Coimbatore

TEST RESULTS – BIOLOGICAL PARAMETERS

Sl. No.	PARAMETERS	TEST METHOD	UNIT	RESULTS
1	Total Plate Count	IS 5402 (Part1) : 2021	CFU/gm	3500
2	Yeast and Mould	IS 5403 : 1999	CFU/gm	2700

Remarks:

- Result Related Only to the Sample Tested.
- P/A – Present / Absent

End of Report

M. Karthikeyan
Authorized Signatory

Name : M. Karthikeyan
Designation : Microbiologist

Sri Shakthi Food Testing Laboratory ★ Coimbatore