Efficacy and Development of Premix as a Nutrigenomic Super Food for Lifestyle Related Diseases

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CANDIDATE'S DECLARATION

I, hereby declare that this doctoral work entitle "**Efficacy and Development of premix as a Nutrigenomic Super Food for Lifestyle Related Diseases**" submitted by complete regular basis for the degree of Doctor of Philosophy to the School of Home sciences, Babasaheb Bhimrao Ambedkar University, Lucknow, it is an outcome of my noble and original research work. I also declare that thesis or any part of thesis has not been previously submitted to any other degree or diploma to this or any other university and also undertakes that thesis is essentially free from all kind of plagiarism.

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CERTIFICATE

This is to certify that the entitle **"Efficacy and Development of Premix as a Nutrigenomic Super Food for Lifestyle Related Diseases"** submitted by Mr. Neeraj Kumar Tyagi is an original research work and has not been previously submitted in part or full for the award of any other degree or diploma to this or any other university.

The thesis submitted to Babasaheb Bhimrao Ambedkar University, Lucknow satisfies all the requirements as stipulated in ***Doctor of Philosophy (Ph.D.)*** regulation-1999 as amended in 2008/2010/2013 and it is fir for submission and evaluation for the award of the degree of **Doctor of Philosophy** of the university.

Date: **Supervisor**

Head of the Department

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ABSTRACT

Nutrigenomics is a new discipline within nutrition sciences that aims to understanding howfood components influence health status by affecting gene expression to eventually help maintaining health and prevent disease. Post human genome revelation observes the emergence of ‘Nutrigenomics’ as one of the exciting scientific advancement influencing mankind around the world. More precisely 'nutrition' has the major impact in defining the cause, response, interaction between nutrient (diet) and human health. In addition to substantial understanding of nutrition human health interaction. On the basis of 'nutrigenomic' development promote on advent in transcriptomics, genomics, proteomics and metabolomics as well as insight into food as health supplement. Interaction of selected nutrient with associated genes in specific organ or tissue necessary to understand that how individual's genetic structure (DNA transcribed into mRNA and then to proteins) respond to particular nutrient. It provided new opportunities to incorporate natural bioactive compounds into food for specific group of people with similar genotype. As inception of diabetes associated with change in gene expression of, proteinkinase B, insulin receptor, duodenal homeobox and glucokinase. Thus, targeting such proteins by modifying or improving the nutritional availability or uptake may help to devise novel food, supplements, or nutraceuticals.

In the present study investigated the survey on the population for checking the awareness for life style related diseases. It was found that the majority of populations have been suffered with different prospective due to their busy life schedule, due to also less awareness for nutrients which helps improvement their life. Through questionnaire checked the acceptance of the herbal product, they were very pleasant for using herbal product for consumption.

So, that product developed by using selection of pea, carrot, soybean, cabbage, ginger which have natural ingredients for making the nutrigenomic badi. In the lab it was tested that nutrient present in this product were vitamin A, zinc, folic acid etc. Previous study shows that these nutrients were helpful to overcome to life style related problem, because

herbal products were minimizing the health problems. It has been proven that nutrigenomic badi may be a betterment option for lowering the life style related problems.

Key words: -*Nutrigenomics, Nutrition and Health, Human genome, DNA transcription, nutrigenomic badi*

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ABBREVIATIONS

DNA	De-oxy ribonucleic acid
CHO	Chinese hamster ovary
FDA	Food and Drug Authorities
SGE	Stable gene expression
TGE	Transient gene expression
RDA	Recommended dietary allowance
mRNA	Messenger Ribonucleic Acid
MTHFR	Methylene-tetrahydro-folate reductase
BMI	Body mass Index
FTO	Fat mass and obesity-associated
APO B	Apolipoproteins B
SNPs	Single nucleotide polymorphisms
NCD	Non communicable diseases
CVD	Cardio vascular diseases
CHD	Coronary heart disease
T2DM	Type II diabetes Mellitus
ICMR	Indian council of medical research
WHO	World health organization
OGTT	Oral glucose tolerance test
IFG	Impaired fasting glucose
IGT	Impaired glucose tolerance
Mg/dl	Milligram per deciliter
CO_2	Carbon dioxide
H_2	Hydrogen
N_2	Nitrogen
CH_4	Methane
USDA	United States drug association

CHAPTER 1: INTRODUCTION

1.1 HISTORY OF NUTRIGENOMIC

Nearly Fifty-four years ago, Watson and Crick describe DNA as a double-helix configuration. The journal of the human genome in 2001 represents an innovator breakthrough in health and nutrition research and its market applications. Both nutrients and non-nutrient works of foods, diets and lifestyle can have an effect on every step in the flow of genetic information from gene expression to protein synthesis level. This transition may change metabolic function of our body in a very multifaceted ways. Like the pharmaceutical production, the food industry now has a chance to position food and nutritional bioactives to promote health and prevent disease based on knowledge of the genetic make-up of individual consumers. [Ghose et al. 2007].

Recombinant DNA technology

Recombinant DNA technology was first applied to protein production in mammalian cells in the early 1980s. This approach was facilitated by the development of transfection methods for the efficient delivery of plasmid DNA into cultivated mammalian cells.

Chinese hamster ovary (CHO) cells were the first mammalian host to be used for gene transfer, but many other cultured cell lines also proved to be acceptable hosts. The first recombinant proteins generated in CHO cells included β-interferon and tissue-type plasminogen activator (tPA) [Wurm FM 2004]. The latter became the first FDA-approved recombinant therapeutic protein from mammalian cells in 1986.

There are two main approaches, stable gene expression (SGE) and transient gene expression (TGE), to produce recombinant proteins in mammalian cells [Pham at el., 2006]. SGE refers to the fact that the foreign gene is stably integrated into the host cell genome.

The recombinant protein is usually constitutively expressed as the cell is cultivated, but it is also possible to put the transgene under the control of an

inducible promoter so that its expression can be temporally regulated. For TGE, in contrast, the foreign gene(s) is delivered into the cells and the recombinant protein is allowed to be produced during the subsequent days. Integration of the foreign DNA into the host genome is not required. Although both SGE and TGE are described in this article, the main focus will be placed on SGE since this is the method of choice for the large-scale production of therapeutic proteins in mammalian cells. The generation of recombinant cell lines for SGE is a multistep process that begins with the molecular cloning of the foreign gene in a mammalian expression vector. The plasmid is then introduced into cells via a chemical or physical gene delivery method along with a selectable gene to allow recombinant cells (those that have received the foreign DNA) to be discriminated from non-recombinant cells. Individual recombinant cells are then recovered for further cultivation and analysis of protein production. The most productive cell lines then undergo one or more rounds of cellular cloning to ensure that the cell line is genetically homogenous.

Genetic variation and dietary response in nutrigenomic:-

The interaction of genetics and environment, nature and nurture is the foundation for all health and disease [Simopoulos et al. 1990]. Nutrition is an environmental factor of major importance. Major advances have occurred over the past 15 years in the fields of both genetics and nutrition. Methodological advances in molecular biology and genetics have facilitated the study of inherited disease at the DNA level, and the study of nutrients at the molecular level. This has led to (i) the development of concepts and research on genetic variation and dietary response (i.e. individuals responding differently to the same diet by having different levels of, for example, serum cholesterol and blood pressure because of genetic variation); and (ii) studies on the evolutionary aspects of diet and the role of nutrients in gene expression (i.e. polyunsaturated fatty acids (PUFA) suppress fatty acid synthase (mRNA) gene expression). In addition to nutrients, non-nutritive dietary phytochemicals, for example phenolic compounds, are being studied for their effects on various aspects of human metabolism. Nutrigenomics could provide a framework for the development of novel foods that will be

genotype dependent for the promotion of health and prevention and management of chronic diseases. In the USA and other countries, general dietary guidelines have been issued for the prevention of chronic diseases. In the development of dietary recommendations, the effects of genetic variation on dietary response have not been considered, despite such evidence.[Simopoulos et al. 1995, Simopoulos, Nestel 1997]

Heritability:-

Coronary artery disease, hypertension, diabetes, cancer and other chronic diseases in adults tend to aggregate in families, and the risk of relatives is much higher than that in the general population [Scott 1987]. Because families share both genes and environment, similarity may result from either. Much research has been carried out to define the contribution of each, and their interaction in the development of the individual. Broadly defined, heritability is the proportion of the total variance that can be explained by genes [Suzuki 1989]. Studies in the USA have shown that 50% of the variance in plasma cholesterol concentration is genetically determined [Williams RR 1988]. Mongeau determined that 30–60% of the variance in blood pressure is genetically determined; 9 between 15 and 50% of the variance in fibrinogen, an independent risk factor for coronary artery disease, is genetically determined [Humphries et al.1987, Hamsten et al. 1987]. Fifteen per cent of the variance was found in the United Kingdom10 while 50% is the figure among the Swedish population, indicating significant differences between populations[Hamsten et al. 1987]. Morrison *et al.* in Australia showed that 75% of the variance in bone density is genetically determined [Morrison *et al*]. Calculations of heritability are relevant only to the specific population and environment from which information is gathered. Heritability may vary between populations if they differ in the prevalence of the types of genes affecting the disease entity under consideration. Populations therefore should not copy each other's dietary recommendations for the prevention of coronary artery disease or cancer, or any other disease for that matter.

Genetic variation and dietary response:-

Genetics deals with variation. A fundamental aspect of the genetics approach to disease is an appreciation of human variation: its nature and extent, its origin and maintenance, its distribution in families and populations, its interaction with environment, and its consequences for normal development and homeostasis [Bonne-Tamir 1992, Bowman-Murry 1990].

The genetic variation is depends on how it is measured. At the level of DNA genetic variation is considerable because in every 1000–2000 nucleotides there is a substitution leading to single nucleotide polymorphisms (SNP). Single nucleotide polymorphisms refer to alterations of single bases (adenine, guanine, cytosine or thymine) in the 1.83 m long string of bases that make up human DNA. At the level of protein diversity (that is, variation in the sequence of amino acids) genetic variation is much less. In human beings approximately 30% of loci have polymorphic variants, which are defined as two or more alleles with frequencies of at least 1% or more in the population.

Advances in human biochemical genetics have produced data that suggest considerable biochemical variability within and between human populations.1 Therefore the relevance of this genetic information for human nutrition is considerable. Variation in nutritional requirements and the interaction of certain nutrients with genetically determined biochemical and metabolic factors suggest different requirements for individuals. This variation (like sex differences) is inborn and needs to be differentiated from variations caused by the life cycle (growth, pregnancy, and old age). Using the tools of molecular biology and genetics, research is defining the mechanisms by which genes influence nutrient absorption, metabolism and excretion, taste perception, and degree of satiation; and the mechanisms by which nutrients influence gene expression. Furthermore, advances in molecular and recombinant DNA technology have led to exquisite studies in the field of genetics and the recognition in a much more specific way, through DNA sequencing, of how unique each one of us is, and the extent to which genetic variation occurs in human beings. The importance of the effects of genetic variation has been extensively studied and applied by pharmacologists in

drug development and evaluation of drug metabolism and adverse reactions to drugs[Gonzalez et al.1988, Wolf et al. 1990]. In the past two decades physicians, geneticists, and nutritionists began to study the effects of genetic variation, and gene–nutrient interactions in the management of chronic diseases [Simopoulos et al. 1990, Goldbourt et al.1994].

1.2 Nutrigenomics: -

The field of nutritional genomics, or its sub-discipline, nutrigenetics, provides the tools for genetic screening, either of specific areas of the genome or the whole genome, to better understand individual nutrient requirements. It depends upon the recognition that a 'one size fits all' approach to defining nutrient requirements is flawed. It has been known for some time that genetic variants in genes encoding key enzymes in nutrient absorption, metabolism and distribution will influence the dietary requirements for that nutrient.

The new paradigm for the interplay between the human genome and its environment is the genome food interactions. "Nutrition and food science are stepping into the genomic period, and it is suitable evident that nutrients and other food components are key factors in changing gene transcription, protein level and functions and the metabolome, which ultimately translates into a health or disease state on the basis of a given genome". [Rist et al.2006]

Thus, the nutrigenomics/nutrigenetics is an approach to nutrition and human health that takes into account and studies the effect of genetic differences in human responses to foods. Nutrigenomics is emerging at the same time as the efficient food industry, a movement that is working in the direction of foods that provide benefits beyond basic nutrition. [Diplock et al.1999]

Nutrigenomics is an emerging science with high consumer expectations, but the major concerns are whether the goal of matching foods to individual genotypes to improve the health of those persons can be attained, and personalised nutrigenomic foods enter the world's food markets, depends on many hurdles being overcome: some scientific in nature, some technical and others related to consumer, market or ethical issues.

In this review, leading paradigms of nutritional genomics are discussed as they relate to the functional food market. Emphasis is given on how genomics tools can be leveraged to produce better food to improve human nutrition and health and thereby bring societal and economic settlement.

Nutrigenetics and nutrigenomics are defined as the discipline of the effect of hereditary variation on dietary response and the role of nutrients and bioactive food compounds in gene expression, respectively [De Busk et al.2005]. Utilization of this genomic information along with high-throughout 'omic' technologies allow the attainment of new knowledge aimed at obtaining a better understanding of nutrient-gene relations depending on the genotype with the definitive goal of developing personalised nutrition strategies for optimal health and disease prevention [Corella et al. 2009]. There are three central factors that emphasize nutrigenetics and nutrigenomics as an important science. First there is great variety in the inherited genome between ethnic groups and individuals which affects nutrient bioavailability and metabolism. Second, people differ greatly in their food/nutrient accessibility and choices depending on cultural, economical, and geographical and taste awareness differences. Third malnutrition (deficiency or excess) itself can affect gene expression and genome permanence; the latter leading to mutations at the gene sequence or chromosomal level which may cause irregular gene dosage and gene expression leading to undesirable phenotypes during the various life stages.

Dietary reference values, e.g. recommended dietary allowance (RDA) or safe upper limits, which are designed for the general population and based on different metabolic outcomes, are not optimized for genetic subgroups which may differ seriously in the activity of transport proteins for a micronutrient and/or enzymes that require that micronutrient as a cofactor. The ultimate goal is to (i) match the nutriomes (i.e. nutrient intake combination) with the current genome status (i.e. inherited and acquired genome) so that genome maintenance, gene expression, metabolism and cell function can occur normally and in a homeostatically sustainable manner [Freguson et al. 2009, Ordovos et al. 2004], and (ii) provide better interpretation of data from epidemiological and clinical

intervention studies regarding health impacts of dietary factors that may help to revise recommendations for personalised nutrition.[Ordovas et al.2004]

Fundamental hypothesis has been drown on nutrigenetics and nutrigenomics are as follows-

Nutrition may exert its impact on health outcomes by directly affecting expression of genes in critical metabolic pathways and/or indirectly by affecting the incidence of genetic mutation at the base sequence or chromosomal level which in turn causes alterations in gene dosage and gene expression.

The health effects of nutrients and nutriomes (nutrient combinations) depend on inherited genetic variants that alter the uptake and metabolism of nutrients and/or the molecular interaction of enzymes with their nutrient cofactor and hence the activity of biochemical reactions.

Better health outcomes can be achieve if nutritional requirements are modified for each individual taking into concern both his/her inherited and acquired genetic characteristics depending on life stage, dietary preferences and health status.

It is important to note the difference between the terms nutrigenomics and nutrigenetics because although these terms are closely related they are not interchangeable. Nutrigenetics specifically investigates the modifying effects of inheritance (or acquired mutations in the case of cancer) in nutrition-related genes on micronutrient uptake and metabolism as well as dietary effects on health. We live in a period when it is becoming increasingly affordable to have one's genome determined providing information on a wide spectrum of critical mutations (e.g. single-nucleotide mutation, insertions deletions, block substitutions, inversions or copy number variants) in critical genes involved in nutrient metabolism and pathways requiring micronutrients as cofactors [Frazer et al. 2009]. Gender itself is a critical genetic variation that affects micronutrient requirements for health maintenance [Ordovas et al.2007]. The key challenge is to determine whether it is possible to utilize this information meaningfully to provide reliable and predictable personalised dietary recommendations for specific health outcomes.

BASICS OF NUTRIGENOMICS:-

- Common dietary chemicals follow up on the human genome, either specifically or in a roundabout way to modify the quality articulation or structure.
- Under certain conditions and in a few people, eating regimen can be a genuine hazard factor for various maladies.
- Some eat less carbohydrate directed quality are probably going to assume an imperative part in the beginning rate, movement or seriousness of endless sicknesses.
- The degree to which eating routine impacts the harmony amongst solid and disease states may rely upon a person's hereditary cosmetics.

TOOLS OF NUTRIGENOMICS:-

The genomics alludes to the aggregate advances used to investigate the parts, connections, and activities of the different kinds of particles that make up the cells of a life form. These advances envelop the accompanying four noteworthy fields of study-

1. Genomics: The investigation of genome that stores the data in a cell to anticipate what can happen.
2. Proteomics: The investigation of protein atoms that would show the practical parts of particles in cell work.
3. Metabolomics: The investigation of atoms associated with cell digestion that would inevitably portray the phenotype of a living being.
4. Transcriptomics: The investigation of mRNA or transcript that would portray what is truly occurring in a phone.

GENOMICS:-

Genomics might be depicted as the complete examination of DNA structure and practical and extensively allude to the investigation of the considerable number of qualities and transcripts included inside the genome. Understanding natural decent variety at the entire genome level will yield knowledge into the causes of individual attributes and illness weakness. The point

of genomics is to examine or think about the whole hereditary supplement of animal categories.

PROTEOMICS:-

Proteomics is the investigation of protein, including their area, structure, and capacity. Proteomics includes the precise stud of protein keeping in mind the end goal to give a far reaching perspective of the structure, capacity, and direction of natural frameworks. Albeit all proteins depend on mRNA forerunners, posttranslational adjustments and ecological connections make it difficult to anticipate the wealth of particular proteins in view of quality articulation investigation alone. As opposed to the genome, the proteomics is exceedingly factor over a period between cells composes and will change in light of its condition.

An investigation exhibited the value of proteomics for the revelation of novel pathways that might be associated with disease counteractive action by isoflavones. Rowell et.al utilized proteomic way to deal with examine the impacts of prepubertal introduction to genistein before artificially initiated mammary glands.

METABOLOMICS:-

The metabolome comprises of little particles that are associated with the vitality transmission in the cells by connecting with other organic atoms following metabolic pathway. In cells, the rate of enzymatic response is likewise controlled by metabolites. The metabolome is exceptionally factor and time ward and comprise of an extensive variety of compound structures. Metabolic phenotype are the side-effects that outcome from the cooperation between hereditary, condition, way of life, and different variables. Metabolomics, as a strategy to characterize the little particles assorted variety in the cell and to show contrasts in little atom plenitude, demonstrates numerous favorable circumstances as far as metabolic investigations. Metabolites are the utilitarian elements inside the cells, and their fixation levels shift as a result of hereditary or physiological changes. Because of mechanical advances information can be gathered on supplements,

metabolites and different mixes in different human biofluides. This way to deal with human appraisal can be either open-finished through aggregate information catch or profoundly focused on, for example, estimating the full range of lipids. The evaluation can likewise be both and this far reaching range of metabolites and supplements is known as the metabolomics.

TRANSCRIPTOMICS:-

The wealth of particular mRNA transcripts in an organic example is an impression of the size of the articulation levels of the relating qualities. Quality articulation profiling is the distinguishing proof and portrayal of the blend of mRNA that is available in an organic example. An essential use of quality articulation profiling is to relate contrast in mRNA blend beginning from various gatherings of people with phenotype contrasts between the gatherings. Rather than genotype, quality articulation profiling permits portrayal of the level of quality articulation. A quality articulation profiling gives a quantitative outline of them RNA transcripts that were available in an example at the season of accumulation. Along these lines, quality articulation profiling can be utilized to decide the qualities that are differentially communicated in infection conditions. These qualities would then fill in as infection biomarkers.

The ongoing examinations utilizing transcriptomics, proteomic and metabolomics high-throughput methods clearly show the possibility to portray the many-sided quality of the organic impacts of isoflavones and gives more far reaching knowledge into how isoflavones may add to forestall bosom and prostate diseases.

1.3 Preventive Health

Throughout the 20th century, nutritional science focused on finding vitamins and minerals, defining their use and preventing the deficiency diseases that they caused. As the nutrition associated health troubles of the developed world shifted to over nutrition, obesity and type two diabetes, the focus of modern medicine and of nutritional science changed accordingly.

To address the growing incidence of these diet-related-diseases, the function of diet and nutrition has been and continues to be comprehensively studied. To avoid the development of disease, nutrition research is investigate how nutrition can optimize and maintain cellular, tissue, organ and whole body homeostasis. This requires understanding how nutrients act at the molecular level. This involves a large amount of nutrient-related connections at the gene, protein and metabolic levels. As a result, nutrition research has shiftedfrom epidemiology and physiology to molecularbiology and genetics and nutrigenomics was born. The appearance and development of nutrigenomics has been probable due to powerful developments in genetic research. Inter-individual differences in genetics, or genetic variability, which have an effect on metabolism, and on phenotypes were standard early in nutrition research, and such phenotypes were described. With the improvement in genetics, biochemical disorders with a high nutritional relevance were linked to a genetic origin. Genetic disorders which cause pathological effects were described. Such genetic disorders consist of the polymorphism in the gene for the hormone Leptin which results in gross obesity. Other gene polymorphisms were described with cost for human nutrition. The folate metabolism is a good example, where common polymorphism (C677T and A1298C) exists for the gene that encodes the methylene-tetrahydro-folate reductase (MTHFR). [Christensen et al. 1999]

It was realized however, that there are probably thousands of other gene polymorphisms which may result in minor deviations in nutritional biochemistry, where only marginal or preservative effects would result from these deviations. The tools to study the physiological impact were not available at the time and are only now becoming available enabling the development of nutrigenomics. Such tools include those that measure the transcriptome - DNA microarray, Exon array, Tiling arrays, single nucleotide polymorphism arrays and genotyping. Tools that measure the proteome are less developed. These include methods based on gel electrophoresis, chromatography and mass spectrometry. Finally the tools that measure the metabolome are also less developed and include methods based

on nuclear magnetic resonance imaging and mass spectrometry often in combination with gas and liquid chromatography.

1.4Application of Nutrigenomics:-

1.4.1 Anti-aging

Aging of cells happen because of the addition of excess free radicals formed due to the need of proper nutrition to the cells and external factors like UV rays, pollution, stress, food, etc. DNA analysis is instrumental in identify the right mixture of nutrients needed to eradicate the excess free radicals present in the cell.

The science of nutrigenomics studies the dealings between dietary components of food and genes. Scientific advances have now made it achievable to apply nutrigenomics in the field of anti ageing and modify nutritional solutions in the form of supplements to meet the finest nutrition required by the body to prevent ageing of cells by the development of excess free radicals.

1.4.2 Obesity

Obesity is one of the most commonly studied topics in nutrigenomics. Due to genetic variations among persons, each person could respond to diet in a different way. By exploring the communication between dietary pattern and genetic factors, nutrigenomics aim to suggest prevention measures and or treatment to obesity via personal nutrition.

There are studies suggesting genetic factors account for a fair proportion of inter-individual BMI. Among different types of genetic variation between humans, SNPs are recommended to be the most important sign for the study of Nutrigenomics.

Multiple studies have found association between SNPs and obesity. One of the most well known obesity associating gene is the FTO gene. Among studied individuals, it was found that those with AA genotype show a higher BMI compared those with TT genotype when having high fat or low carbohydrate dietary intake.

The APO B SNP rs512535 is another obesity related variation. It was found that the A/G heterozygous genotype was found to have association with obesity (in terms of BMI and waist circumference). The same study also found that for individuals with habitual high fat diet (>35% of energy intake), individuals with GG homozygotes genotype showed higher BMI compared to AA allele carriers. However, this difference is not found in low fat consuming group (<35% of energy intaken).

1.4.3 Medical claims

One of the possible ethical concerns arise would be private companies providing unverified information regarding test results. For example, there are concerns on test-providing companies making unproven medical claims, as well as selling unnecessary or over-priced supplements. An interpretation on genetic test results needs to be handled very carefully. Misinterpretation could possibly mislead patients and hence false medical claims are made. Misleading and/or inaccurate information may as well undermine customers' ability to make informed decisions. [clubalthea.com]

1.2 Life style related diseases:-

Non-communicable diseases (NCDs) account for 80% of the disease burden globally (Haregu et al. 2015) and are one of the leading causes of death worldwide (Esteghamati et al. 2009). The four most common NCDs are cardiovascular diseases (CVD) accounting for most NCD deaths (17.5 million deaths annually), followed by cancer (8.2 million), respiratory diseases (4 million) and diabetes (1.5 million) (World Health Organization, 2015).

1.2.1 Diabetes Mellitus:

Diabetes mellitus is defined as a metabolic disorder characterized by chronic hyperglycemia resulting from defects in carbohydrate, lipid and protein metabolism resulting from defects in insulin secretion, insulin action, or both (American Diabetes Association, 2014), which results into an excessive amount of glucose (≥126 mg/dl) in the blood. Patients with fasting blood glucose ≥126

mg/dl are considered "hyperglycemic" (American Diabetes Association, 2014). Diabetes mellitus has multi-factorial etiology and includes genetic and environmental elements. Sedentary lifestyle, obesity and family history of diabetes are major risk factors for development of diabetes (Yajnik et al. 1995; Yajnik, 2001). Three main types of diabetes, such as type 1 diabetes mellitus, type 2 diabetes mellitus (T2DM) and gestational diabetes, have been identified. Type 1 diabetes is an autoimmune disease wherein the immune system attacks and destroys the β-cells in the pancreas resulting into lack of insulin. It develops most often in children and young adults. Around 5-10% diabetic patients are Type 1 diabetics (Maahs et al.2010). T2DM is characterized by insulin resistance, impaired insulin secretion or both (American Diabetes Association, 2012). In T2DM, pancreas usually produces enough insulin, but body cannot use the insulin effectively (a condition called insulin resistance). Subsequently, insulin production decreases resulting into high glucose levels in the blood. Among global diabetic population, 85-90% patients have T2DM (American Diabetes Association, 2009). Gestational diabetes develops late in pregnancy and is caused by the hormones of pregnancy or a shortage of insulin (Engelgau et al. 2012; American Diabetes Association, 2003). Women who have gestational diabetes have 40 to 60% risk of developing T2DM within next 5 to 10 years.

There are several methods used for the diagnosis of type 2 diabetes such as oral glucose tolerance test (OGTT), random plasma glucose and fasting plasma glucose (Table 1). In OGTT, blood glucose of 200 mg/dl at 2 hours post 75g oral glucose challenge or random plasma glucose of 200 mg/dl or fasting plasma glucose of ≥126 mg/dl is regarded as diagnostic of T2DM (Wingard et al. 1995). Out of these tests, the fasting plasma glucose test has been recommended globally for diagnosis of T2DM (American Diabetes Association, 2012). There are certain intermediate physiological states like impaired fasting glucose (IFG) and impaired glucose tolerance (IGT), which show higher levels of blood glucose but the levels are not high enough to diagnose T2DM (American Diabetes Association, 2009). Impaired fasting glucose (IFG) has fasting plasma glucose between 110 and 125 mg/dl (American Diabetes Association, 2009) while impaired glucose tolerance

(IGT) is characterized by 2-hr plasma glucose value of 140 or more and less than 200 mg/dl during an OGTT (American Diabetes Association, 1997).

Table 1.1: Criteria for Diagnosis of T2DM

	Fasting plasma glucose (mg/dl)	**Oral glucose tolerance test (mg/dl)**
Diabetes	≥ 126	≥ 200
Pre-Diabetes	110-125	140-199
Normal	≤ 99	≤ 139

Source: - American diabetes association 2009

1.2.2 Prevalence of Type 2 Diabetes Mellitus (T2DM):

National guidelines and standards of care for diabetes are now available in many countries in the world. Despite this, clinical management of patients with diabetes is a challenge and remains less than satisfactory in most countries.

1.2.3 World Scenario:

Diabetes is increasing rapidly all over the world (Whiting et al. 2011). T2DM accounts for approximately 85-90% of diabetes patients (Sicree et al. 2006) and is considered to be a major cause of morbidity and mortality (Joshi, 2003). Globally, total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030, most of which will be in developing countries (Wild et al. 2004). Asia, in particular, is experiencing a rapid diabetes epidemic (Yang, 2013). India, China and U.S are the top three countries with the highest number of estimated cases of diabetes for 2000 and 2030 (Wild et al. 2004) listed in Table 1.2.

Table no. 1.2 comparison in 2020 and 2030 of diabetes patients in world

Rank	Country/ Territory	People with diabetes in 2000 (millions)	Country/ Territory	Estimated people with diabetes in 2030 (millions)
1	India	31.7	*India*	79.4
2	*china*	20.8	*China*	42.3
3	*U.S.*	17.7	*U.S.*	30.3
4	*Indoneshia*	8.4	*Indonesia*	21.3
5	*Japan*	6.8	*Pakistan*	13.9
6	*Pakistan*	5.2	*Brazil*	11.3
7	*Russianfederation*	4.6	*Bangladesh*	11.1
8	*Brazil*	4.6	*Japan*	8.9
9	*Italy*	4.3	*Philippines*	7.8
10	*Bangladesh*	3.2	*Egypt*	6.7

Source: - American diabetes association 2009

The prevalence estimates were applied to population estimates for individual countries for 2000 and 2030, which were produced by the United Nations Population Division [www.un.org/esa/population/unpop.htm]. Conventional, albeit simplistic, definitions of developed countries (Europe including former socialist economies, North America, Japan, Australia, and New Zealand) and less developed countries (all other countries) were used. In keeping with previous estimates, prevalence of diabetes was assumed to be similar in urban and rural areas of developed countries [King et al. 1998]. For developing countries, urbanization was used as a proxy measure of the increased risk of diabetes associated with altered diet, obesity, decreased physical activity, and other factors such as stress, which are assumed to differ between urban and rural populations. For most developing countries, the prevalence of diabetes in rural areas was assumed to be one-half that of urban areas, based on the ratio observed in a number of population studies and as used in previous estimates [King et al.

1993]. For some populations in developing countries (small islands and populations for which prevalence data were derived from studies combining urban and rural populations), a single estimate of diabetes prevalence was used. In the current estimates, on the advice of local experts, the prevalence of diabetes in rural areas was assumed to be one-quarter that of urban areas for Bangladesh, Bhutan, India, the Maldives, Nepal, and Sri Lanka [Ramachandran et al. 1999].

The 10 countries estimated to have the highest numbers of people with diabetes in 2000 and 2030 are listed in Table 2. The "top three" countries are the same as those identified for 1995 [King et al. 1998] (India, China, and U.S.). Bangladesh, Brazil, Indonesia, Japan, and Pakistan also appear in the lists for both 2000 and 2030. The Russian Federation and Italy appear in the list for 2000 but are replaced by the Philippines and Egypt for 2030, reflecting anticipated changes in the population size and structure in these countries between the two time periods.

1.3 Cancer:-

Cancer is a major cause of morbidity and mortality in developing and developed countries a like [Ferlay et al. 2013]. In many low-income and middle-income countries, including India, most of the population does not have access to a well organized and well regulated cancer care system. A diagnosis of cancer often leads to catastrophic personal health expenditures [Engelgau et al. 2012]. Such expenditures can push entire families below the poverty line and may, especially when combined with an absence of what are seen as acceptable services, threaten social stability [Ramsey et al. 2013, Pramesh et al. 2014].

Population ageing is often assumed to be the main factor driving increases in cancer incidence, death rates, and health-care costs [Yancik et al. 2005] However, the actual picture is more complex. In high-income countries age-standardized cancer mortality is now typically decreasing in all age groups, although more than half of all cancer deaths are people older than 70 years. In India, despite the weakness of data in terms of population coverage, no evidence exists for a decrease in age-standardized cancer mortality rates, and most deaths

occur in individuals younger than 70 years [Ferlay et al. 2013]. These differences are only partly due to India having a relatively younger population compared with high-income countries. They are also a product of contrasting causal patterns, with infections and unique local patterns of tobacco use playing a much greater part in causing cancer in India than in richer countries. Poor access to screening and early-stage case-finding services also helps to explain the paradox of India's seemingly low cancer incidence rates but relatively high age-specific death rates.

1.3.1 Modern India's cancer burden

No national registry exists that provides comprehensive cancer incidence or mortality data for India. However, the National Cancer Registry Programme (NCRP, established by the Indian Council of Medical Research in 1981) provides population-based data from a selected network of 28 cancer registries located across the country [Rath et al. 2014]. Information from 12 registries deemed to provide reliable data was used to estimate the national statistics presented in relevant GLOBOCAN publications [Ferlay et al. 2013, Forman et al. 2013]. However, the resulting estimates have several limitations. They might, for example, be more representative of urban and south Indian populations than of those populations living in the rest of the country. Under-recording of cancer cases and deaths, especially among older people, is another problem that reduces accuracy. Nevertheless, the aggregated numbers reported through GLOBOCAN are the best available ongoing estimates of the cancer burden in India and are suitable, despite the caveats indicated, for use as the main basis for priority setting and planning of cancer management across the nation.

1.3.3 Cancer incidence and mortality

GLOBOCAN estimates that about 14 million new cancer cases were diagnosed worldwide in 2012 and slightly more than 8 million cancer deaths occurred. 1 million of these new cases and nearly 700000 of the deaths occurred in India, which is home to about 17% of the global population. Even in age-adjusted terms the recorded incidence for India is, at 94 per 100000 people, only slightly more than half of the world average of 182 per 100000, and about a third

of that recorded in the more developed countries (268 per 100 000). All cancers in Indian men other than oral, lung, stomach, colorectal, pharyneal, and oesophageal cancers have an incidence of five per 100000 men or less. This, according to US and EU definitions, makes such cancers orphan diseases. Women have an age-adjusted incidence rate of 104·5 per 100000 women. With the exceptions of breast, cervical, and colorectal cancers, all other cancers in Indian women also have a recorded incidence of less than five per 100000 women

1.4 Cardiovascular disease:-

The health care needs of the world's population are likely to undergo dramatic changes due to the ongoing demographic transition. Non-communicable diseases (NCDs), such as diabetes, cancer, depression and heart disease, are rapidly replacing infectious diseases and malnutrition as the leading causes of disability and premature death. Eighty per cent of total deaths due to non-communicable diseases occur in the low income countries. Men and women are equally affected. Cancer, cardiovascular diseases (CVD) and diabetes are becoming of serious concern, accounting for 52 percent of deaths and 38 per cent of disease burden in the WHO South East Asia Region (SEAR). With the current trends, the top five causes of disability adjusted life years (DALYs) lost in 2020 are likely to be ischaemic heart disease, unipolar major depression, road traffic injuries, cerebro-vascular diseases, and chronic obstructive lung disease. [Mahers et al.2002]. It has been estimated that a 2 per cent reduction in chronic diseases death rates per year globally could result in saving about 36 million premature deaths by the year2015. [preventing chronic disease (WHO,2005)]

While mortality due to communicable diseases is decreasing, that for non-communicable diseases is rising at a very rapid pace. The health policy makers are faced with the burden of providing resources for the control and prevention of both the existing communicable diseases, and the increasing number of non-communicable diseases. This becomes difficult since the programmes for prevention and control of communicable diseases drain the meager resources. It is, therefore, not surprising that India has faced a serious handicap while planning

and initiating programmes and activities to combat non-communicable diseases, including cardiovascular diseases.

Disease and risk factor surveillance involves a systematic collection, analysis and interpretation of data. Changes in population health behavior are also monitored over time. These data are used to inform the public and decision-makers for planning and evaluating prevention and control programmes and designing health policy and legislation. This paper discusses the need and scope of cardiovascular disease risk factor surveillance in India.

1.4.1 Cardiovascular diseases in India

Cardiovascular diseases account for high morbidity and mortality all over the world. Countries where the epidemic began early are showing a decline due to major public health interventions. On the other hand, cardiovascular diseases are contributing towards an ever-increasing proportion of the non-communicable diseases in the developing countries. [Unal et al.2004, NCD, a profile-New Delhi, WHO 2002, Reddy et at. 2005].

Cardiovascular diseases have assumed epidemic proportions in India as well. The Global Burden of Diseases (GBD) study reported the estimated mortality from coronary heart disease (CHD) in India at 1.6 million in the year 2000. [Kuulasmaa et al.2000]. A total of nearly 64 million cases of CVD are likely in the year 2015, of which nearly 61 million would be CHD cases (the remaining would include stroke, rheumatic heart disease and congenital heart diseases). Deaths from this group of diseases are likely to amount to be a staggering 3.4 million. [burden of disease in India 2005].

Coronary heart disease is more prevalent in Indian urban populations and there is a clear declining gradient in its prevalence from semi-urban to rural populations. Epidemiological studies show a sizeable burden of CHD in adult rural (3–5%) and urban (7–10%) populations. Thus, of the 30 million patients with CHD in India, there would be 14 million of whom are in urban and 16 million in rural areas. In India about 50 per cent of CHD-related deaths occur in people younger than 70 yr compared with only 22 per cent in the West. Extrapolation of these numbers

estimates the burden of CHD in India to be more than 32 million patients. [Gupta R. 2005].

The ICMR-WHO study on Burden of Disease reviewed literature till 2003 on NCDs.[ICMR 2006]. The weighted average prevalence for ischaemic heart disease was estimated to be 6.4 per cent in urban areas and 2.5 per cent in rural areas. The meta-analysis of eight studies carried out between 1995 and 2002 in urban areas gives a pooled prevalence rate of hypertension as 164 per thousand, and 157 per thousand in rural areas. The combined urban and rural pooled estimate of prevalence rate of hypertension among adults (>20 yr) was 159 per thousand. An increase of 17.5 per cent in the number of stroke cases in India occurred during the last one and a half decade. Mortality due to strokes has increased by 7.8 per cent from 1998 to 2004. Available evidence yielded that over 9 million stroke cases and about 6.4 million years have been lost due to disability during 2004. [Burden of disease in India, 2005].

Obesity is a common but often underestimated condition of clinical and public health importance in many countries around the world. Its general acceptance by many societies as a sign of well-being or a symbol of high social status, and the denial by health care professionals and the public alike that it is a disease in its own right, have contributed to its improper identification and management and the lack of effective public health strategies to combat its rise to epidemic proportions.

Obesity is defined as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health is impaired [Garrow JS.1988]. The amount of excess fat in absolute terms, and its distribution in the body - either around the waist and trunk (abdominal, central or android obesity) or peripherally around the body (gynoid obesity) - have important health implications.

In general, obesity is associated with a greater risk of disability or premature death due to type 2 diabetes mellitus (T2DM) and cardiovascular diseases (CVD) such as hypertension, stroke and coronary heart disease as well as gall bladder disease, certain cancers (endometrial, breast, prostate, colon) and

non-fatal conditions including gout, respiratory conditions, gastro-esophageal reflux disease, osteoarthritis and infertility. Obesity also carries serious implications for psychosocial health, mainly due to societal prejudice against fatness.

A central distribution of body fat is associated with a higher risk of morbidity and mortality than a more peripheral distribution [Kissebah et al. 1994]. Furthermore, individuals with CVD risk factors such as T2DM, hypertension and smoking are exposed to significant health risks at lower levels of obesity. It is therefore imperative to assess individuals who are overweight or obese not only to determine the extent of adiposity, but also for the body fat distribution and the presence of co-morbid factors.

The body mass index (BMI) is a simple and commonly used parameter for classifying various degrees of adiposity. It is derived from the weight of the individual in kilograms divided by the square of the height in metres (kg/m^2). By the current World Health Organisation (WHO) criteria, a BMI $<18.5kg/m^2$ is considered underweight, 18.5–24.9 kg/m^2 ideal weight and 25–$29.9kg/m^2$ overweight or pre-obese. The obese category is sub-divided into obese class I (30–$34.9kg/m^2$), obese class II (35–$39.9kg/m^2$) and obese class III ($\geq 40kg/m^2$) [WHO 2000]. A BMI greater than $28kg/m^2$ in adults is associated with a three to four-fold greater risk of morbidity due to T2DM and CVDs than in the general population [Van Itallie T. 1985].

Measurement of the waist circumference - measured at the midpoint between the lower border of the rib cage and the iliac crest [Han et al. 1997], or the waist:hip ratio (WHR) provide useful indices of abdominal fat accumulation and a better correlation with an increased risk of ill health and mortality than BMI alone [Kissebah et al. 1994]. An abdominal girth in excess of 108 cm (40 inches) for men and 98 cm (35 inches) for women or a WHR > 1.0 and 0.85 in men and women, respectively, are the currently accepted indicators of excessive abdominal fat accumulation which correlate with a substantially increased risk of metabolic complications.

Despite certain limitations with its use, there is general agreement with the applicability of BMI measurements for assessing underweight, overweight and obesity in adults. The case for children and adolescents is, however, different because unlike adults, BMI changes significantly with age during these stages of growth. In the late 1970's WHO recommended the use of a growth reference for young children developed by the United States National Centre for Health Statistics. The data from which this reference was derived is now old and, based on children from only the USA, cannot realistically be applied to all populations worldwide. The WHO has recently replaced this reference with a new one which draws data from a community-based, multi-country study of infants and young children from birth to 6 years in all of the world's major regions, including developed and developing countries. Ghana was one of the six participating countries in the new study [WHO 2004]. What is now awaited is a similar international growth reference for older children and adolescents. Until then, age and gender specific BMI charts derived from data sets from six different reference populations (Brazil, Great Britain, Hong Kong, the Netherlands, Singapore and the USA) could be used [Cole et al. 2000].

1.5 PEA:-

Sweet, delicious green peas, also trendy as garden peas, is one of the ancient cultivated vegetables grown for their delicious, nutritious green seeds. Peas most likely have originated in the sub-Himalayan plains of northwest India. Today, this adaptable legume is one of the major profitable crops grown all over the temperate and semi-tropical regions. Botanically, pea plant is a herbaceous plant. It belongs to the family of *Fabaceae,* in the genus: *Pisum*. Scientific name: **Pisum sativum.** Some of the common names include *English peas,* ***spring peas,*** *sweet peas,* ***garden peas****, peas*etc. growth. It flourishes in well-drained, grimy soil supplemented with plenty moisture and cold weather conditions. Short-stalked, green pods appear by late winter or early spring. Each pod measures about 2-3 inches long, swollen or compressed, straight or slightly curved, filled with a single row of 2-10, light-green, smooth edible seeds.

Fig. 1.1 fruiting body of Garden pea

In general, the pods harvest while just short of reaching maturity, at the point when their seeds are green, soft, sweet and edible raw. Allowing the pods to mature further would turn seeds dry, light-green to yellow, less sweet, and bitter to taste. Pea tendrils are also edible delicacies. They are fragile, tender top shoots of an immature pea plant. Pea tendrils have a flavor akin to peas. The tendrils and leafy shoots are one of special item in salads and cooking in many East and South-east Asian regions.

1.5.1 Health benefits of green peas

- Green peas are one of the most nutritious leguminous vegetables rich in health promoting phytonutrients, minerals, vitamins and antioxidants.
- New, tender peas are comparatively low in calories in comparison to beans and cowpeas. 100 g of green peas carry just 81 calories and no cholesterol. Nonetheless, they are good sources of protein, vitamins, and soluble as well as insoluble fiber.
- Fresh pea pods are very good sources of **folic acid**. 100 g provides 65 µg or 16% of suggested daily levels of folates. Folates are one of the B-complex vitamins necessary for DNA synthesis inside the cell. Studies propose that sufficient folate-rich foods when given to expectant mothers would help avoid neural tube defects in their newborn babies.
- Fresh green peas are good source of **ascorbic acid** (vitamin-C). 100 gm of fresh pods get 40 mg or 67% of daily necessity of vitamin-C. Vitamin-C is a powerful natural water-soluble antioxidant. Vegetables rich in this

vitamin would help the human body develop fighting against infectious agent and hunt harmful, pro-inflammatory free radical from the body.

- Peas contain phytosterols, especially **ß-sitosterol**. Studies suggest that vegetables like legumes, fruits, and cereals rich in plant sterols help lower cholesterol levels inside the human body.
- Garden peas are also good in **vitamin-K**. 100 gm of fresh seeds contain about 24.8 µg or about 21% of daily necessity of vitamin K-1 (phylloquinone). Vitamin-K has been found to have a potential role in bone mass building function (mineralization) through the promotion of osteoblastic activity inside the bone cells. It also has an established role in the cure of Alzheimer's disease patients by limiting neuronal damage in the brain.
- Fresh green peas also hold adequate amounts of antioxidants flavonoids such as carotenes, lutein, and zeaxanthin as well as **vitamin-A** (provide 765 IU or 25.5% of RDA per 100 g). Vitamin-A is a necessary nutrient required for maintaining healthy membranes, skin, and eyesight. Additionally, consumption of natural fruits/vegetables rich in flavonoids helps to protect from lung and oral cavity cancers.
- In adding together to folates, peas are also good quality in many other important B-complex vitamins such as pantothenic acid, niacin, thiamin, and pyridoxine. Furthermore, they are a wealthy source of many minerals such as calcium, iron, copper, zinc, and manganese. [www.nutrition-and-you.com]

1.5.2 Nutrient content of Pea (Pisum sativum)

Principle	Nutrient value	Percentage of RDA
Energy	81 Kcal	4%
Carbohydrate	14.45 g	11%
Protein	5.42 g	10%
Total fat	0.40 g	2%
Cholesterol	0 mg	0%
Dietary fiber	5.1 g	13%

Table no. 1.3 Nutrients of pea

1.1.5.3 Vitamins

Folates	65µg	16%
Niacin	2.090mg	13%
Pantothenic acid	0.104mg	2%
Pyridoxine	0.169mg	13%
Riboflavin	0.132mg	10%
Thiamin	0.266mg	22%
Vitamin A	765 IU	25.5%
Vitamin C	40mg	67%
Vitamin E	0.13mg	1%
Vitamin K	24.8µg	21%

Table no. 1.4 Vitamins of pea

1.5.4 Electrolyte, minerals and phytonutrients

Sodium	5mg	<1%
Potassium	244mg	5%
Calcium	25mg	2.5%
Copper	0.176mg	20%
Iron	1.47mg	18%
Magnesium	33mg	8%
Manganese	0.410mg	18%
Selenium	1.8µg	3%
Zinc	1.24mg	11%
Carotene-ß	449µg	--
Crypto-xanthin- ß	0 µg	--
Lutein-zeaxanthin	2477 µg	--

Table no. 1.5 Electrolytes and minerals of pea

1.6 CARROT

The carrot (*Daucus carota*) is root vegetables frequently claim to be the ideal health food. It is crunchy, tasty, and highly nutritious. Carrots are a mainly good source of beta carotene, fiber, vitamin K1, potassium, and antioxidants their carotene antioxidants have been associated to a reduced risk of cancer. Carrots are initiate in many colors, including yellow, white, orange, red, and purple. Orange carrots get their intense color from beta carotene, an antioxidant that your body synthesizes into vitamin A.

Fig. 1.2 Root of Carrot

Nutritional fact of raw carrot (100gm)

Calories: 41kcal

Water: 88%

Protein: 0.9gms

Carbohydrate: 4.7gms

Sugar: 4.7gms

Fiber: 2.8gms

Fat: 0.2gms

Beta carotene: 5423µg

Vitamin C: 6.22mg

Folate: 24mg

Carrots are mainly composed of water and carbohydrate. The carbohydrate consists of starch and sugars, such as sucrose and glucose. They are also a relatively good quality source of fiber, with one medium-sized carrot provided that 2 grams. Carrots regularly rank low on the glycemic index (GI), which was a measurement of how quickly foods elevate blood sugar after a meal. Their GI ranges from 16–60 lowest for raw carrots, a little higher for cooked ones, and highest in puréed. Eating low-glycemic foods is linked to numerous health benefits and considered particularly beneficial for people with diabetes.

1.6.1 Fiber:- Pectin is the main form of soluble fiber in carrots. Soluble fibers can lower blood sugar levels by slowing down your digestion of sugar and starch. They can also feed the friendly bacteria in your gut, which may lead to improved health and decreased risk of disease. Certain soluble fibers can impair the absorption of cholesterol from your digestive tract, lowering blood cholesterol. The main insoluble fibers in carrots are cellulose, hemicellulose, and lignin. Insoluble fibers may reduce your risk of constipation and promote regular bowel movements.

1.6.2 Vitamins and Minerals:-

Carrotsare a good source of several vitamins and minerals, especially biotin, potassium, and vitamins A (from beta carotene), K1 (phylloquinone), and B6.

1.6.3 Vitamin A: Carrots are rich in beta carotene, which your body converted into vitamin A. This nutrient promotes good vision and is significant for growth, development, and immune function.

1.6.4 Biotin: A B vitamin formerly known as vitamin H, biotin plays an significant role in fat and protein metabolism.

1.6.5 Vitamin K1: Also known as phylloquinone, vitamin K1 is significant for blood coagulation and can promote bone health.

- **Potassium:** An essential mineral, potassium is important for blood pressure control.
- **Vitamin B6:** A group of associated vitamins, B6 is involved in the conversion of food into energy.

1.6.6 Other plant compounds:-

Carrots offer many plant compounds, including carotenoids. These are substances with powerful antioxidant action that have been linked to better immune function and reduced risk of many illnesses, together with heart disease, various degenerative ailments, and certain types of cancer.

Beta carotene, the major carotene in carrots, can be converted into vitamin A in your body. However, this alteration process may vary by individual. Eating fat with carrots can help you absorb extra of the beta carotene

The main plant compounds in carrots are:

1.6.7 Beta carotene: Orange carrots are highest in beta carotene. The assimilation is better (up to 6.5-fold) if the carrots are cooked.

- **Alpha-carotene:** An antioxidant that, like beta carotene, is partly changed into vitamin A in your body.
- **Lutein:** One of the most ordinary antioxidants in carrots, lutein is mainly found in yellow and orange carrots and is significant for eye health.
- **Lycopene:** A bright red antioxidant found in many red fruits and vegetables, with red and purple carrots, lycopene may decrease your risk of cancer and heart disease.
- **Polyacetylenes:** Current research has identified bioactive compounds in carrots that may help protect against leukemia and other cancers.
- **Anthocyanins:** These are powerful antioxidants found in dark-colored carrots.

1.6.8 Health benefits of carrots:-

Most of the research on carrots has focused on carotenoids.

1.6.8.1 Reduced risk of cancer

Foods rich in carotenoids may help protect against numerous types of cancer. This includes prostate, colon, and stomach cancers. Women with high circulating levels of carotenoids may also have a reduced risk of breast cancer.

1.6.8.2 Weight loss: - As a low calorie food, carrots can increase fullness and decease calorie intake in subsequent meals. For this reason, they may be a useful addition to an effective weight loss diet.

1.6.8.3 Eye health: -individuals with low vitamins levels are likely to experience night blindness, a condition that may diminish by eating carrots or other foods rich in vitamin AS or carotenoids. [www.healthline.com]

1.7 GINGER:-

Ginger has been used by traditional Chinese and Indian medicine for over 25 centuries. [Kathi J.et al. 1989]Ginger was brought to Mexico by the Spaniards and later introduced to Jamaica, the latter currently being one of the world's foremost producers of this species.[Bordia et al.1997] In recent times, ginger has been introduced into various tropical countries where diverse chemo types have been developed [Srivastava K.C. et al. 1984]. Ginger (Zingiberofficinale Roscoe) is a member of the Zingiberaceae family of plants. The English term 'ginger' originated from Sanskrit word 'Sringavera' which means horn-like. The underground stem (rhizome) is used for preparation of ginger. This rhizome can be processed into a powder, syrup, volatile oil, and oleoresin. The rhizome contains fats, carbohydrates, protein, fiber, water, and volatile oil. It has been a part of healing strategies in Asia, India, Europe, and the Middle East for centuries for treatment of such disorders as arthritis, stomach upset, asthma, diabetes, and menstrual irregularities, to name a few [Nutrition today 2010]. According to a 2010 study published in the "Journal of Microbiology and Antimicrobials", ginger proved to have higher antimicrobial power than conventional antibiotics against two strains of staph infections. Ginger is thought to have anti-inflammatory properties, sometimes used to treat arthritis. Ginger has been used for its herbal properties, which are especially helpful in easing stomach and motion sickness. This herb has been effective in controlling nausea and vomiting. It is hypothesized to work by changing serotonin receptors in the digestive tract. Ginger appears to work like ibuprofen for menstrual pain, according to one of the study [ozgali et al. 2009]. The main aim to write this review is to give insight on Zingiberofficinale about its valuable nutritional and pharmacological properties which will help students and researchers to get the overall information about its published nutritive and pharmacological properties for their further research.

Fig. 1.3 Tuber of Ginger

1.7.1 Nutritional Composition:-

Most of the food components including macro- and micro-nutrients play important role as a nutraceutical, and provides potential health benefits (Bernal et al 2010). Dietary fiber, polyunsaturated fatty acids (PUFA), proteins, amino acids, minerals, vitamins and other bioactive compounds are considered as beneficial nutrient components (And lauer and Fürst, 2002). Fresh ginger contains 80.9% moisture, 2.3% protein, 0.9% fat, 1.2% minerals, 2.4%fibre and 12.3% carbohydrates. The minerals present in ginger are iron, calcium and phosphorous. It also contains vitamins such as thiamine, riboflavin, niacin and vitamin C. The composition varies with the type, variety, agronomic conditions, curing methods, drying and storage conditions.

1.8 SOYBEAN:-

1.8.1 HITORY OF SOYBEAN:

Soybean begins with China and was entered into India by Himalayan routes. Near the beginning of 2853 BC, the sovereign Sheng-Nung of China named soybean is one of the five holy grains (Sing B.B.). This, soybean have grown within China used for more than 4000 years (Hymowitz, 1970).

The soyabean belongs to legume species inhabitant to East Asia. Soybean plant differs in development and height for the parameter of growth. The plant grows flat rather than developing in height greater than 7.8 inches, and vertical up to 6.5 feet in tallness. The parts of plant like pods, stems, and leaves were

trifoliate (occasionally 5 leaflets), but leaflets being 2-6 inches in length in addition to 1 to 3 inches broad. Leaves collapse prior to fully grown seed.

The undersized, ordinary, fertile flowers are present on the axil part of leaf, encloses colours like pale white otherwise lavender. The fruit of soybean are hairy pod which develops in group of three to five, by every pod 1to 3 inches in length furthermore typically be full of 2-4 seeds, 5-11 mm in diameter. Similar to corn, the previous yield have lengthy domestication, the connection in the present soybean towards wild growing species longer were draw by some level of assurance.

Nutrients of soy seeds in 100 grams

Calories	173.
Water	63%
Protein	16.6
Carbs	9.9
Sugar	3
Fiber	6
Fat	9

Soybean was enriching diversity through an especially huge quantity of cultivars. On the other hand, Soybean is identified as progenitor of the current soybean plant similar to vine plant which grows horizontal on the land.

In the common terminology and general scientific proceedings soybean is vocabularies as the oilseeds while the beans are grouped as pulses. The phrase soy is obtained as of the Japanese express shoyu (soy sauce/soya sauce).

Fig.1.4 Soya seeds

1.8.2 PHYSICAL CHARACTERISTICS:

Soy come about of different size, in which few are hulled with coating colours, contains black, brunette, navy, pale yellow and spotted. Mature soybean seed hull is rigid, water opposing, and care for the cotyledon plus hypocotyls as of harm. Seed germination will not happen if the coat is broken.

The blemish, able to be seen on top of the seed coat, is known as hilum (colours like black, brunette, off-white, grey and pale-yellow). On last part of soybean seed hilum there are the micropyles, or little aperture in the seed coat that could permit water absorption.

The amazing truth for the soybean seed that it high amount of protein, still go through drying condition but stay alive and then revitalize after absorption of water. Study of the continued existence of soybeans and corn, Carl Leopold proves that soluble sugars; carbohydrates protective the seed's cell feasibility. Patents have honoured to Carl in 1990s for the method of defending "biological membranes" in proteins within dried up condition.

1.8.3 CHEMICAL COMPOSITION OF SOYBEAN SEED:

The amount of oil along with protein both report nearly 60% of dry soybeans weight. From the total composition, the main biomolecules are protein accounts for 40% and oil amount accounts for 20%. The residual composition includes 35% carbohydrates and nearly 5% amount of ash. Soy cultivars involved about 8% hull part, cotyledons (90%) as well as hypocotyledon axis (2%).

The common protein present in soybean comparatively stable for heat. Because of heat stability due to protein of soybean allow soy foods needed more temperature for cooking, item like tofu, soymilk and textured vegetable protein (soy flour). The chief soluble sugars in fully grown soy were disaccharides sucrose, the trisaccharide raffinose made of single sucrose linked to one galactose, and stachyose formed by single sucrose associated with galactose of two molecules.

Moreover raffinose in addition to stachyose defend the capability on the soy seed as of dehydration these are not digestible sugars and for that reason add to flatulence and intestinal uneasiness in man. Oligosaccharides which are not digested are breaks into intestine by inhabitant bacteria producing gases like CO_2, H_2, N_2 and CH_4.

In spite of the benefits of eating soybean cause oligosaccharides like raffinose and stachyose, support native microbes of colon in opposition to putrefactive microbes. The insoluble sugars present in soybeans are complex polysaccharides cellulose, hemicelluloses, and pectin. The common of soy sugars put in the category of dietary fibre.

The soybean is most abundant source of isoflavones (up to 3 mg/g dry weight) in the nature. Soybean contains three types of isoflavone aglycone viz., daidzein, genistein and Glycitein; each of them present in three glycosidic forms in addition to their aglycone form. Daidzein, genistein and their glycosides contribute to majority of total isoflavone; whereas Glycitein and its glycoside are present as minor component, only [Kudou et al. 1991]. Isoflavones are structurally similar to mammalian estradiol and can bind to both a and p isoforms of estrogen receptor (ER), thus called phytoestrogens. Though, the isoflavones are not essential nutrients that are required to support life, still they exert many beneficial health effects, therefore, are of immense help for maintaining healthy life [Messina et al.1997]. Although soybeans are generally the major source of isoflavones, lately red clover plant has received increased attention for significant isoflavones content in its flowers. The total isoflavones content including genistein and

genistin, in red clover flowers is 2590 micro gram per gram, which is at par than those reported for soybeans and soy products [Chang et al. 2002].

1.9 Cabbage:-

You want to include cabbage as one of the cruciferous vegetables you eat on a regular basis, if you want to receive the fantastic health benefits provided by the cruciferous vegetable family. At a minimum, we recommend 3/4 cup of cruciferous vegetables on a daily basis. This amount is equivalent to approximately 5 cups per week. A more optimal intake amount would be 1-1/2 cups per day, or about 10 cups per week. You can use our veggie advisor for help in figuring out your best cruciferous vegetable options. Traditional methods of steaming or boiling make cabbage watery. To avoid this result and promote optimal flavor, we recommend Healthy Sautéing cabbage. Slice cabbage into 1/8-inch slices and let sit for 5 minutes to enhance its health-promoting benefits before cooking. For more details see the Nutrient-Rich Way of cooking cabbage. According to USDA national nutrient database, 1 half cup of shredded cooked cabbage (75gms) contains Energy 17 cal, Carbohydrate 4 grams, Protein 1gram.

Fig. 1.5 Fruiting body of Cabbage

Eating a half-cup of cooked cabbage would provide 30-35% of daily vitamin-C needs. It also provides 81.5 mg of vitamin k, 11mg magnesium, 22mg of folate and lesser amount of vitamin B-6, calcium potassium and thiamin. Cabbage

contains the antioxidants, beta-carotene, lutein and zeaxanthin as well as the flavonoids, quereitin and apigenin.

- There are literally hundreds of varieties of cabbage grown worldwide. But of special interest in recent research studies have been cabbage varieties that fall into the red-purple category. It is the anthocyanin antioxidants (and in particular, a subcategory of anthocyanins called cyanidins) that have been the focus of these research studies. Impressively, the anthocyanins in red cabbage are a major factor in the ability of this cruciferous vegetable to provide cardiovascular protection, including protection of red blood cells. Blood levels of beta-carotene, lutein, and total blood antioxidant capacity have been found to improve along with red cabbage intake, while oxidized LDL has been found to decrease. (This reduction in oxidized LDL is a good thing, since LDL—an abbreviation which stands for low-density lipoprotein—becomes a risk factor for blood vessel problems if excessively present in its oxidized form.

Cabbage turns out to be an especially good source of sinigrin. Sinigrin is one of cabbage's sulfur-containing glucosinolates that has received special attention in cancer prevention research. The sinigrin in cabbage can be also converted into allyl-isothiocyanate, or AITC. This isothiocyanate compound has shown unique cancer preventive properties with respect to bladder cancer, colon cancer, and prostate cancer. It's also worth noting here that a second glucosinolate found in cabbage—glucobrassicin—can be converted into two cancer-protective compounds. These two compounds are indole-3-carbinol (or I3C, an isothiocyanate) and diindolylmethane (or DIM). DIM is an interesting sulfur-containing compound that can be produced in the stomach from I3C if the stomach juices are sufficiently acidic. Like AITC and I3C, DIM has been shown to have cancer-preventive properties for the specific cancer types.

OBJECTIVE

1. To check the awareness about life style diseases and the nutrigenomic super foods
2. To standardized and develop premix of product
3. To develop products using standardized premix of product
4. To calculate nutritive value of the product.
5. Organoleptic evaluation of developed product.

CHAPTER-2: REVIEW OF LITERATURE

NUTRIGENOMIC:-

Genes are turned on and off according to metabolic signals that the nucleus receives from internal factors, e.g. hormones, and external factors, e.g. nutrients, which are among the most influential of environmental stimuli. **Harland 2005**

The expression of genetic information can be highly dependent on, and regulated by, nutrients, micronutrients, and phytochemicals found in food. **Kaput et al 2005**

All humans harbor 99.9% identical gene sequences; only 0.1% variation in gene sequence between individuals makes one individual unique from others with respect to their phenotype and individual susceptibility to disease or health and also their differing response to nutrients. These variations in gene sequence are called polymorphisms. **Grenett et al.2000**

The essential nutrients, such as carbohydrates, amino acids, fatty acids, calcium, zinc, selenium, folate, and vitamin A, C and E, there is a variety of nonessential bioactive components that seem to significantly influence health.**Corthésy Theulaz et al 2005,Trujillo et al 2006**

Dietary chemicals can affect gene expression directly or indirectly (). At the cellular level, nutrients may: 1) act directly as ligands for transcription factor receptors; 2) be metabolised by primary or secondary metabolic pathways, thereby altering concentrations of substrates or intermediates involved in gene regulation or cell signaling; or 3) alter signal transduction pathways and signaling.**Kaput et al 2004,**

Transcription factors are the main agents through which nutrients influence gene expression nutritional genomics, or nutrigenomics, is the study of how food and genes interact and aims to understand the effects of diet on an individual's genes and health. It attempts to study the genome wide influences of

nutrition and identify the genes that influence the risk of diet related diseases on a genome wide scale, and to understand the mechanisms that underlie these genetic predispositions.(**Müller& Kersten 2003**.

It is easy to see how the individualist position outlined here could apply in the context of nutrition, especially where food is viewed essentially instrumentally, i.e. as body 'fuel'. Some individuals will probably regard the new possibilities in this positive light, while others will be less keen. Also, there are clear resource implications over the provision of the testing facility. **Milunsky (2001**)

Nutrigenomics aims to determine the influence of common dietary ingredients on the genome, and attempts to relate the resulting different phenotypes to differences in the cellular and/or genetic response of the biological system. **Mutch et al 2005**

Other possible application of nutrigenomic and nutrigenetics might be in relation to 'functional foods'; but surely, it might be argued, all food is functional in some sense. This reasoning indicates the need to be more precise about what exactly is meant by 'functional'. Functional foods are those that have, or claim to have, a specific health-promoting or enhancing effect over and above their nutritional content. **Chadwick et al. 2003**

Dietary components can also modify the translation of RNA to proteins and the post translational events, which can affect protein activity. **Trujillo et al 2006**

Proteomics is the study of the proteome, and it addresses three categories of biological interest: protein expression, structure and function. **Kussmann et al 2006**

Currently, the most widely used technologies for proteomics are two dimensional (2D) gel electrophoresis to separate the proteins in a complex mixture isolated from cells or tissues, and specialised mass spectrometry

techniques as protein identification tool. This is a rapidly developing field, and new and improved techniques continue to emerge.(**Fuchs et al 2005**)

GREEN PEA: -

The ability of peas to improve CVD and promote weight loss may be attributable to their high protein content. **Abete et al. (2009)**

The negative physiological and nutritional effects of lectins and protease inhibitors in pulses are described, as are the potential nutraceutical effects of lectins, which include anticancer and immunomodulatory properties. **Roy et al. (2010)**

Hydrolysis of pea and other pulse proteins generates peptides with a variety of bioactivities in vitro, including angiotensin I-converting enzyme inhibitor activity, which has an antihypertensive effect, and antioxidant activity. **Roy et al. (2010)**

Peas contain other minor constituents which exhibit bioactivity and which may have positive benefits on human health, including saponins and phytates, which may exhibit hypocholesterolaemic and anticarcinogenic activities. **Compos-vega et al. (2010)**

Investigated the effect of fibre preparations made from pea cell wall fibre on cardiovascular health. Subjects placed on the pea fibre diet showed a trend for lower postprandial TAG responses compared with subjects on a low-fibre diet matched in macronutrient content. **Sandstrom et al**. (1994)

CARROT:-

Carrot is one of the important root vegetables rich in bioactive compounds like carotenoids and dietary fibers with appreciable level of several other functional components having significant health-promoting properties. The consumption of carrot and its products is increasing steadily due to its recognition

as an important source of natural antioxidants having anticancer activity beta carotene could profitably be utilized for the supplementation of the products like cake, bread, biscuits and preparation of several types of functional products. The present review highlights the nutritional composition, health promoting phytonutrients, functional properties, products development and by- products utilization of carrot and carrot pomace along with their potential application. **Kishan Datt Sharma et al (2012)**

The carrot (*Daucus carota*) is a root vegetable, usually orange, purple, red, white or yellow in color, with a crisp texture when fresh. It is a rich source of β-carotene and contains other vitamins, like thiamine, riboflavin, vitamin B-complex and minerals reported the consumption of carrot mainly as raw, juice, salads, cooked vegetable, sweet dishes etc. Fruit and vegetable juices have become important in recent years due to overall increase in natural consumption as an alternative to the traditional caffeine containing beverages such as coffee, tea, or carbonated soft drinks.. **Kaur et al. (2009)**

The studied shows that the Trans beta-carotene content in fresh carrots, blanched fresh carrots and carrots dehydrated by different processes. After steam blanching for 5 min the carrots were dried by conventional air-drying at 60, 70 and 80°C, by vacuum drying at 60 and 70°C and vacuum drying at the same temperature after N_2 purging. Results indicated major decrease in Trans beta-carotene content after conventional air-drying, losses being more pronounced at lower temperature and longer drying periods. The losses of Trans beta-carotene at 60, 70 and 80°C was 48, 40 and 38% in blanched carrots respectively. Only 21-22% losses in vacuum drying, 7% with purging also have been reported. **Pazarincevic and Baras (1970)**

Studied the kinetics of dehydrating vegetables and changes in the main chemical constituents (ascorbic acid, carotenes, essential oils, total sugars) due to drying process. It was recommended that diced carrots (cubes 5-8 13mm) should be dried

at 160°C. Carrots and onions were suggested to be used as basic ingredients of the snacks. **Ovchinnikov et al. (1973)**

The aim of this work was to determine antioxidant activity and some physical and chemical parameters influencing nutritive and biological value of orange, purple and yellow carrot cultivars. The two-year experiment was carried out in Warsaw Agricultural University in 2005 and 2006. Carrot was grown in the experimental field of the University. Six carrot cultivars, differed in storage roots colour and shape, were chosen for the experiment: 'Florida' F1, 'Interceptor' F1, 'Nebula' F1, 'Purple Haze' F1, 'Yellowstone', 'Mello Yello' F1. Immediately after harvest of carrots there were determined: dry matter, total sugars content, total phenolics, total carotenoids, antioxidant activity (DPPH), fractions of dietary fibre, pectines, pH, redox potential, electrical resistance. P-value, which is a combined parameter of some physical and chemical traits, was also calculated. Correlations between some of these quality parameters were determined. Dry mater content was the highest for 'Purple Haze' in 2005, but in 2006 for 'Nebula' similar dry matter content was found. Total sugars content in carrots in 2005 was the highest in 'Purple Haze' but in 2006 'Florida' showed higher sugars content. Total phenolics content was the highest in 'Purple Haze' roots. Total carotenoids content was greatly differentiated between cultivars and varied from below 1 mg·100 g–1 to above 14 mg·100 g–1. For cultivars of yellow storage roots the lowest level of carotenoids were found, and the highest for orange-coloured 'Florida', 'Interceptor' and 'Purple Haze'. In all cultivars, from fractions of total fibre, the highest amount was found in the case of cellulose and pectines. The highest antioxidant activity showed purple-coloured cultivar 'Purple Haze', and the lowest activity yellow-coloured cultivars 'Yellowstone' and 'Mello Yello'. Regression analysis showed that antioxidant activity of carrot storage roots was strictly related to carotenoids content (r=0.92) and phenolics content (r=0.87). **Marek Gajewskiet. al. (2007)**

The article compares kinetics of drying and properties of dried roots of purple carrot cultivars: Deep Purple F1 and Purple Haze F1 BejoZaden B.V., which

differ in coloring of the core section of roots. Sliced carrots were dried by convective drying (CD), microwave-convective drying (MCD), infrared-convective drying (IRCD), and freeze drying (FD). An enhancement of convective drying due to the application of infrared or microwave radiation considerably reduced drying time. The lowest values of apparent density were recorded for freeze-dried carrots, whereas these values for carrots dried by other methods were approximately four times higher. Roots of carrot cv. Deep Purple dried markedly faster than those of cv. Purple Haze. Rehydration of freeze-dried carrots was higher than that dried by other methods. This was clearly manifested particularly in the initial stage of rehydration. Kinetics of rehydration was comparable for carrot dried by other methods. Cultivars did not have a noticeable effect on the analyzed physical properties apparent density and reconstitution properties. Dried carrots of cv. Deep Purple were characterized by an approximately 2.5 times higher antioxidant capacity and higher contents of anthocyanins and polyphenols than dried carrots of cv. Purple Haze. **Dorota Witrowa-Rajchert et al. (2009)**

The aim of this research was to determine the influence of various forms, diverse doses, and dates of application of nitrogen fertilizers and foliar nutrition on the concentration of sugars, carotenoids and phenolic compound in carrot. Two field experiments (Experiment I in 2003–2005 and Experiment II in 2004–2005) with carrot 'Kazan F1' were conducted in Trzciana (508060N; 218850E) in Poland. Both experiments were arranged in a split-plot design with four replications. Two sub-blocks were identified in both experiments: sub-block (A) without foliar nutrition and sub-block (B) with plant foliar nutrition. In sub-block (B), plants were sprayed three-times with: 2% (w/v) urea, a 1% (v/v) solution of multi-component 'Supervit R' fertilizer, and again with 2% (w/v) urea. Combinations with diversified nitrogen fertilization were distinguished within both sub-blocks. In both experiments N-fertilization affected an increase in phenolic compound concentrations in comparison with the control. Experiment I revealed no significant effect of N-fertilization on carotenoid concentrations in

carrot, however in Experiment II the highest concentration of these compounds was characteristic for the control plants and carrot fertilized with ENTEC-26 35 + 35. The foliar nutrition applied in Experiment I caused a decline in sugar concentration and an elevated carotenoid concentration, however it had no influence on the phenolic compound concentrations in carrot. Yet the foliar nutrition in Experiment II led to a decrease in phenolic and carotenoid compound concentrations, but it did not affect sugar concentration in carrot. **Sylwester Smolen et. al. (2009)**

GINGER:-

This study was asked Ginger, the rhizome of *Zingiber officinalis,* one of the most widely used species of the ginger family is a common condiment for various foods and beverages. Ginger has a long history of medicinal use dating back 2500 years. Ginger has been traditionally use from time immemorial for varied human aliments in different part of the globe, to aid digestion and treat stomach upset, diarrhoea, nausea. Some pungent constituent present in ginger and other zingiberaceous plant have potent antioxidant and anti-inflammatory activities and some of them exhibit cancer preventive activity in experimental carcinogenesis. The anti cancer properties of ginger are attributed to the presence of certain pungent vallinoids, gingerol, paradol, as well as some other constituent like shogaols, zingerone etc. A number of mechanisms that may be involved in the chemo-preventive effects of ginger and its components have been reported from the laboratory studies in wide range of experiment models.**Yogeshwar Shukla, Madhulica Singh (2006)**

The chemical composition and antioxidant activity (in aqueous and solvent extract) of ginger root (zingiber officinale) were determined. Protein, fat and antioxidant components analysed were polyphenols, vitamin C, beta carotene, flavonoids and tannins. Antioxidant assays such as free radical scavenging activity, reducing power and total antioxidant activity were carried out for ethanol, methanol, acetone 80% methano000l and 80% ethanol extracts.

Antioxidant components (polyphenols, flavonoids and total tannin) were higher in hot water (100^0 C) extract than other solvent extracts and 30^0 C water extract. Antioxidant activity by 3 different methods showed higher activity in solvent extract than water extract. Oder of antioxidant activity by reducing power and free radical DPPH was as follows, 80% methanolic > 80%ethanolic > methanolic >ethanolic> 30^0C water> 100^0C water> acetonic extract.**Shirin Adel P.R. and Jamuna Prakash (2010)**

SOYBEAN:-

In this study, Acceptance of soya bean seems to increase, proves to the most popular beans to relief from protein calorie malnutrition (PCM) as protein from animals is beyond to cost many people can afford. To bridge the widening gap between protein requirement and availability is expected to constitute the main source of protein for the future. Although a lot has been achieved, a lot still has to be done in processing. The relatively recent discovery that soya bean may prevent a number of disease may result in increased acceptance of soya bean if there is adequate awareness. Many authors have reported that nutrition value of soyabean. The quality of soyabean has actually been underestimated until recently. It is now concluded that the quality soybean protein is comparable to that of animal protein source such as milk and beef. Soyabean produces high quality oil about 20% of its content and protein about 40% of the bean. Its protein content is superior, substantial levels of most essential amino acids. Consumption of food containing soyabean and soyabean products has been associated with improve heart disease risk factors, reduces osteoporosis, alleviation menopausal symptoms, reduced cancer risk and in a limited number of studies reduced diabetes and help people to stay lead and has no cholesterol. The degree of milling soyabean influences the palatability and digestibility. High protein yield is ensured at the end of processing as well as maintenance of texture. There is the need for increased utilization and awareness about its health benefit. **Fabiyi (2006)**

Legumes play an important role in the traditional diets of many regions throughout the world. In contrast in Western countries beans tend to play only a minor dietary role despite the fact that they are low in fat and are excellent sources of protein, dietary fiber, and a variety of micronutrients and phytochemicals. Soybeans are unique among the legumes because they are a concentrated source of isoflavones. Isoflavones have weak estrogenic properties and the isoflavone genistein influences signal transduction. Soy foods and isoflavones have received considerable attention for their potential role in preventing and treating cancer and osteoporosis. The low breast cancer mortality rates in Asian countries and the putative anti-estrogenic effects of isoflavones have fuelled speculation that soy food intake reduces breast cancer risk. The available epidemiologic data are limited and only weakly supportive of this hypothesis, however, particularly for postmenopausal breast cancer. The data suggesting that soy or isoflavones may reduce the risk of prostate cancer are more encouraging. The weak estrogenic effects of isoflavones and the similarity in chemical structure between soybean isoflavones and the synthetic isoflavoneipriflavone, which was shown to increase bone mineral density in postmenopausal women, suggest that soy or isoflavones may reduce the risk of osteoporosis. Rodent studies tend to support this hypothesis, as do the limited preliminary data from humans. Given the nutrient profile and phytochemicals contribution of beans, nutritionists should make a concerted effort to encourage the public to consume more beans in general and more soy foods in particular. **Mark J. Messina 1999.**

CABBAGE:-

Cabbage (Brassica oleracea L. var. capitata) is one of the most important vegetables grown worldwide. It belongs to the family Cruciferae, which includes broccoli, cauliflower, and kale. The different cultivated types of cabbage show great variation in respect of size, shape and color of leaves as well as the texture of the head (**Singh et al., 2006).**

Due to its antioxidant, anti-inflammatory and antibacterial properties, cabbage has widespread use in traditional medicine, in alleviation of symptoms associated with gastrointestinal disorders (gastritis, peptic and duodenal ulcers, irritable bowel syndrome) as well as in treatment of minor cuts and wounds and mastitis. Fresh cabbage juice, prepared either separately or mixed with other vegetables such as carrot and celery, is often included in many commercial weight-loss diets **(Samec, 2011).**

Clinical research has shown positive effects of cabbage consumption in healing peptic ulcers, and facilitating the reduction of serum LDL levels (Chemical components analysis has shown that the main constituents of cabbage are carbohydrates, comprising nearly 90% of the dry weight, where approximately one third is dietary fiber and two thirds are low-molecular weight carbohydrates (LMWC) (**Samec et al. 2011**).

CHAPTER 3: METHODOLOGIES

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. The various steps adopted by the researcher in studying the research problem along with the logic behind them were thoroughly elaborated. It is necessary for a researcher to know about the uses of different methods and tools, measurements as well as the methodology used behind these, and clearly understand the applicability. "Thus, research methodology do not only comprise of the research methods but also consider the logic behind the methods used in the context of not only the study but also explain why a particular method or technique is used and why the others are not being used so that research results are capable of being evaluated either by researcher himself or by others" (Kothari and Garg, 2014).

The methodology adopted in carrying out the present research is elaborated under the following heads-

3.1 Research design

3.2 Locale of the study

3.3 Sampling procedure

3.4 Variables of the study

3.5 Phase wise plan

3.6 Conceptual model of the study

3.7 Methods of data collection

3.8 Processing of data

3.9 Statistical analysis

3.1 RESEARCH DESIGN The research design is the arrangement of conditions for collection and the analysis of data in a manner that aims to combine relevance to the research purpose with in procedure. In fact the research design is the conceptual structure with in which research is conducted. It constitutes the blue print for the collection, measurement and analysis of data. Research design is a master plan specifying the methods and procedures guiding research (Kothari and Garg 2014).

The present study was conducted by using cross sectional research design. Cross sectional research deals in study of different groups of people who differ in the variable of interest but share other characteristics, such as socioeconomic status, background and ethnicity. Cross-sectional research studies are based on observations that take place in different groups at one time. The present study entitled "**Efficacy and Development of Premix as a Nutrigenomics Super Food for Lifestyle Related Diseases",** was carried out among the employed, non employed and house wife. They are late adult among age has been crossed 40 years.

3.2 LOCALE OF THE STUDY

The present study was carried out at Lucknow city, Uttar Pradesh, India. Lucknow city is the state capital of Uttar Pradesh and famous for its Chikankari work around the whole country as well as World, other than it being a capital city of a state, it attracts a lot of industrial and infrastructural development. The infrastructural development of the city offers lot of job opportunities to the people in different sectors. Hence, they have a busy schedule for their daily routine due to with them will be prone for life style related problems. That's why the researcher felt, Lucknow district, appropriate for conducting the research.

3.3 SAMPLING PROCEDURE

The process of selecting a sample of appropriate size from the target population is termed as the sampling method.

Sample Selection- Multistage random sampling technique was adopted to select the sample for the present study, different stages adopted for the research are as discussed below-

Stage 1-The municipal corporation of Lucknow was approached and list of wards and areas existing in Lucknow was obtained.

Stage 2- Out of the existing six Zones, fifth zone were selected randomly by using simple random sampling.

Table No.3.1 List of wards of the fifth Zone in Lucknow district-

Zone-5			
S. No.	Wards	S. No.	Wards
1.	Kharika ward	10.	Ram Ji Lal Ward
2.	Sarojani Nagar Ward I	11.	Geeta Palli
3.	**Raja BijiliPasi Ward**	12.	VidyaWati Ward
4.	Ibrahim pur Ward	13.	Om Nagar Ward
5.	Sarojani Nagar Ward	14.	Vidya Wati Ward
6.	Hind Nagar Ward	15.	ChitraGupt Nagar Ward
7.	Sarda Nagar Ward	16.	Gurunanak Nagar Ward
8.	Kasari Khera Ward	17.	Jankipuram Ward
9.	Guru Govind singh Ward		

Stage-3- From among the wards existing in fifth zone, Raja BijiliPasi Ward, Sarda Nagar Ward were selected and from sixth zone, Balagang, Mallahi Tola, Jankipuram Ward IST were selected by using simple random sampling technique.

Table No. 3.2 List of Mohallas in Raja BijliPasi Ward-

Raja BijliPasi Ward	S. No.	Mohallas	S.No.	Mohallas
	1.	**Ashiaana M**	11.	Kila gaon
	2.	**Ashiaana N**	12.	Kila Mohammadi Nagar
	3.	Ashiaana M-1	13.	Gudora
	4.	Ashiaana N-1	14.	Bagli
	5.	**LDA colony sector F-Extention**	15.	Aurangabad Jageer
	6.	Rahimabad	16.	**Aurangabad Khalsa**
	7.	New Rahimabad	17.	Mirjapur
	8.	Behsa	18.	Chuwara Kheda
	9.	Munshi Khera	19.	Swaroop Chandra Khera
	10.	T.P. Nagar	20.	Birhana Kheda

Stage -4 Selection of Mohallas- From each ward, mohallas were selected purposively. From Raja Bijli Pasi Ward four mohallas (Ashiyana M, Ashiyana N, LDA colony sec. F extension, Aurangabad Khalsa), from Sarda Nagar Ward, two Mohallas (Bijnour and Raibareli road yojna), From Balaganj Ward, two Mohallas (Barawan kala and Dubagga) and one Mohalla each from Mallahi Tola Ward (Hussainabad Trust Road), and Jankipuram Ward IST, (Maniyao Gaon), were purposively selected because all these mohallas covers the sufficient number of construction workers, Employed, Institutions, business personnel and house wife the identified sectors from which the sample has to be drawn and studied.

Stage -5- Selection of sector-

People belonging to four sectors were involved as sample for present research, where in persons belonging to three sectors (employed, Business and House wife) were identified based on the literature review, where in researchers reported acute stress among them. They were more prone to be ailing any diseases or stress. These are very important sector for selection for sampling in Lucknow city.

Stage -6- Selection of respondent:-

Late adult at the age between 40 years above and below 70 years were selected randomly from different areas of Lucknow city base on their education and knowledge. They provide their personal and dietary related information. Stratified random sampling procedure was adopted for the selection of respondent which were further sub grouped in to age group 40-45, 46-50, 51-55, 56-60, 61-above.

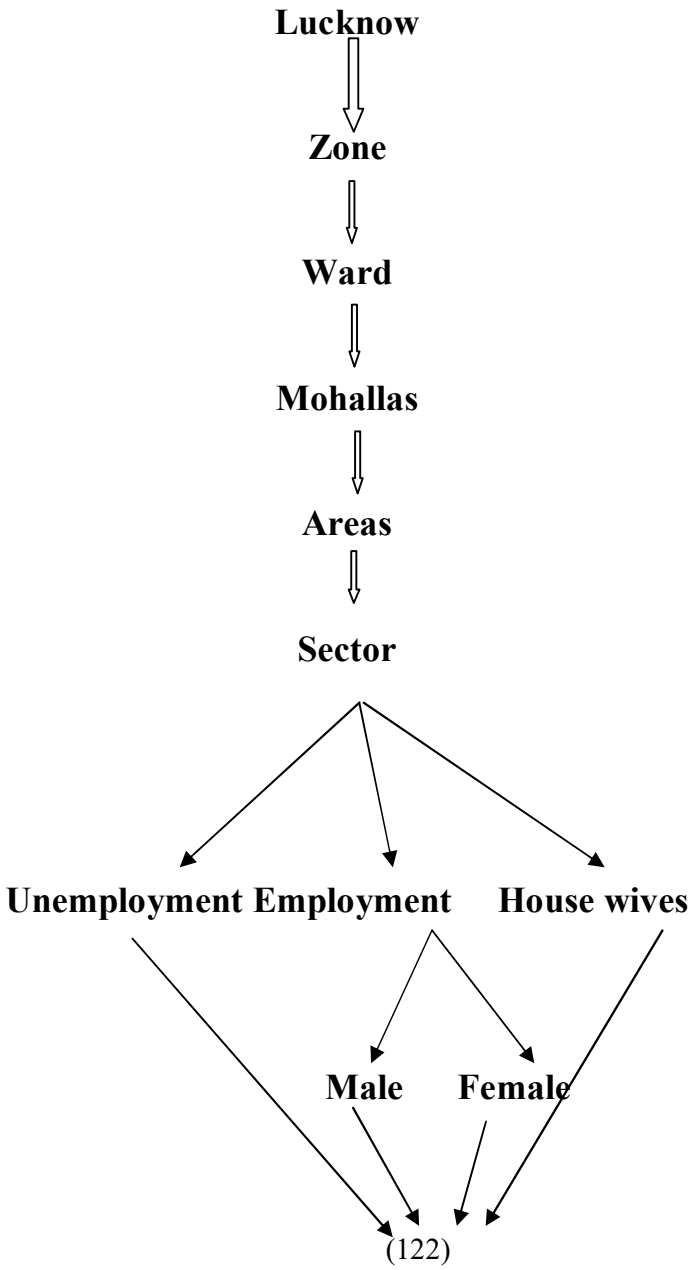


Fig 3.1 sampling procedure of data collection

Methods of enquiry and data collection:-

Survey methods were adopted in order to collect data from selected respondents with the help of a pre tested schedule questionnaire via interview and

observation technique. The schedule included the aspects which let us to fulfill the objectives.

Schedule:-

The detailed schedule questionnaire included the following information:

- General information
- Awareness on life style related diseases
- Awareness on functional foods and Nutraceuticals
- Likert- scale agreement level for the herbal product acceptance
- Dietary information

General information:-

Information regarding socio-economic status, demographic status, education and occupation was asked. The scale used for the assessment of socio- economic status is given in Appendix.

Awareness on life style related diseases:-

Awareness about disease related information of the respondent and their family history, role of minerals, vitamins and hormones in their life style. The scale was used on the awareness on life style related diseases in Appendix.

Awareness on functional foods and Nutraceuticals:-

Awareness about functional foods and Nutraceuticals was checked through questionnaire to the respondent. The scale was used on the awareness on functional foods and nutraceuticals in Appendix.

Like- scale agreement level for the herbal product acceptance:-

3.4 VARIABLES OF THE STUDY & OPERATIONAL DEFINITIONS

A concept which can take on different quantitative values is called a variable. As such the concepts like height, income are all examples of variables. Qualitative phenomena (attributes) are also quantified on the basis of the presence or absence of the concerning attributes. The variables were selected according to the objectives of the study. The selected variables were categorized into two

categories namely independent variables and dependent variables. The present study was conducted to study the relationship between identified independent and dependent variables.

3.4.1 Independent variables-Independent variables are those variables which are varied in nature and will affect other dependent variables, like age, income, where researcher has no control over these variables. The independent variables considered in the present study were categorized into personal variables and situational variables. These variables are measured with different measurement scale as discussed below-

3.4.1.1 Personal variables:-

3.4.1.1 Personal variables:-

(A) Variables measured in Nominal scale and coded as-

Gender	**Code**
Male	**1**
Female	**2**
Transgender	**3**

B) **Categorical and scale data**

a) Age:-Computed years of age at the time of study were considered as age of the respondents. It was assumed that the age of the sample workers may influence the efficiency of the workers. The age of the respondent was recorded directly and it was re-coded in to different groups whenever it is required as per the requirement of statistical tools.

b) Education:-This refers to the level of systematic and formal education which the respondents achieved in a school/institution. Educated persons are prone to change and easily grasp the messages. They are likely to comprehend more and retain more knowledge as compared to an illiterate person, hence educational status of the respondent was also taken as one of the variables.

Education	**Scoring**
Post Graduation	4
Graduation	3

Intermediate 2

High school 1

c) Income per month: - It refers to total income in rupees earned by the respondents from all sources in a particular month. The income is recorded as scale data which was converted in to categorical data as per requirement during analysis.

3.4.2. Dependent Variables:-A dependent variable is what you measure in the experiment and what is affected during the experiment. The dependent variable responds to the independent variable. It is called dependent because it "depends" on the independent variable. In a scientific experiment, you cannot have a dependent variable without an independent variable.

“Physical and psychological well being” were taken as the dependent variables and other variables like age, income gender, sectors were independent variables for the study.

Fig.3.2 Pictures during Data Collection

3.5 PHASE WISE PLAN OF WORK

The present research was carried out in the following phases-

Phase-I- In the first phase, a pilot study was conducted to finalize the process of study and identify the problems in conducting the study so that the real measurement process can be carried out smoothly.

Phase-II-In this second phase the sampling method was finalized in order to select the sample for the purpose of data collection from the targeted population that identified in different areas of the city.

Phase-III- In the third phase for the purpose of data collection regarding the socioeconomic status, physical well being, knowledge about functional foods and diets, the scheduled interview of the respondent at different selected sites was carried out by the researcher.

Phase-IV- In this phase the collected data was analysed by using various statistical tools, fit in proper construction table and summary and conclusion was drawn.

Phase-V- In this last phase product was developed by using different methods and materials. Nutrients of product was analysed like protein, carbohydrate, fat, zinc, etc.

To guide and maintain the validity and research outcome this section deals with the following steps:-

3.4.1 Locale of the study

3.4.2 Sample size

3.4.3 Sampling design

3.4.4 Sampling procedure

3.1 Locale of the study:-

The experiment was carried out in the research laboratory of the Department of Food and Nutrition, School for Home Sciences, Babasaheb Bhimrao Ambedkar University Lucknow. The different materials used in the experiments and technique are outlined in this chapter. The whole research was divided into phases and each work was done in different phases one after the other in a planned way.

3.2. Sample size:-

The required sample for the experiment is carrot (2kg), soya bean (2kg), cabbage (1/2kg), ginger (250gram), peas (1 kg).

3.3 Study design:-

The approach for this study was purposively one.

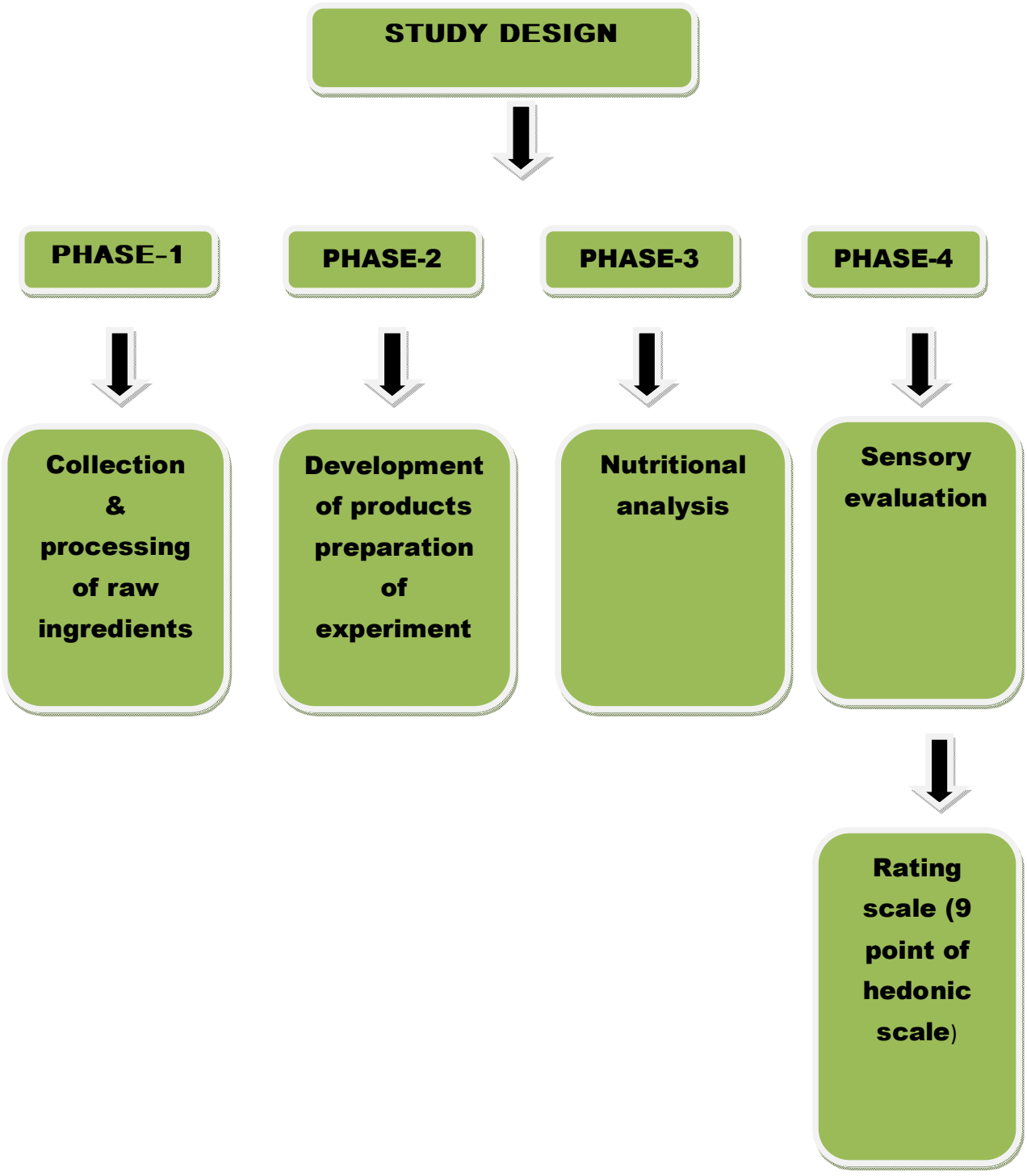


Fig. 3.3 Flow chart of Study design

3.4 Sampling procedure:-

3.4.1 Sampling size:-

The sample size of the study was restricted up to 4 products.

3.4.1.1 Sampling preparation

3.4.1.2 Sampling design

3.4.1.3 Sampling methodology

3.4.1.1 Sampling preparation

The procedure has been described as under in the following heads-

3.4.1.1.1 Procurement of material

3.4.1.1.2 Processing of raw material

3.4.1.1.3 Development of premix

3.4.1.1.4 Development of premix based products

3.4.1.1.5 Sensory evaluation

3.4.1.1.6 Calculation of nutritive value of products

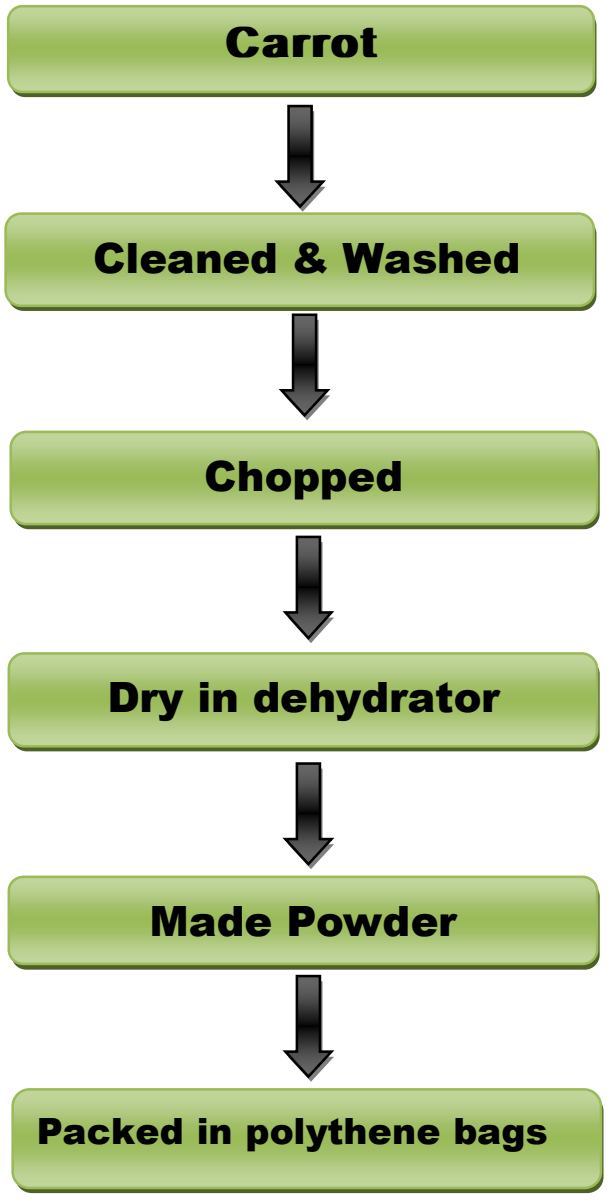
PHASE -1

3.4.1.1.1 Procurement of material

For the present investigation materials i.e. carrot, cabbage, peas, ginger, soyabean were procured from the local market of the Lucknow city. The procuring was done in single a lot to avoid variation and compositional differences so that quality differences could rule out.

3.4.1.1.2 Processing of raw material

3.4.1.1.2.1 Technique -



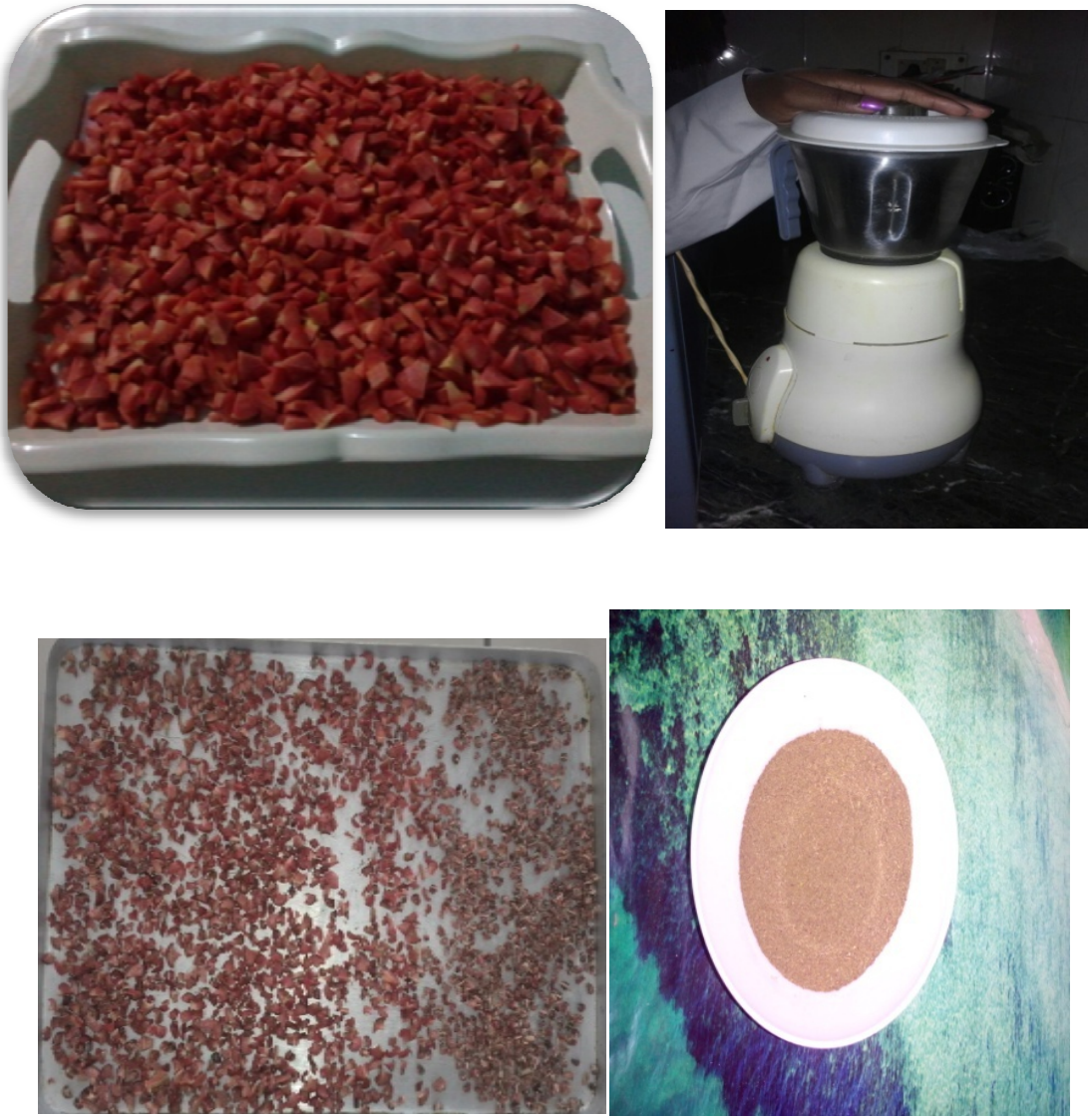
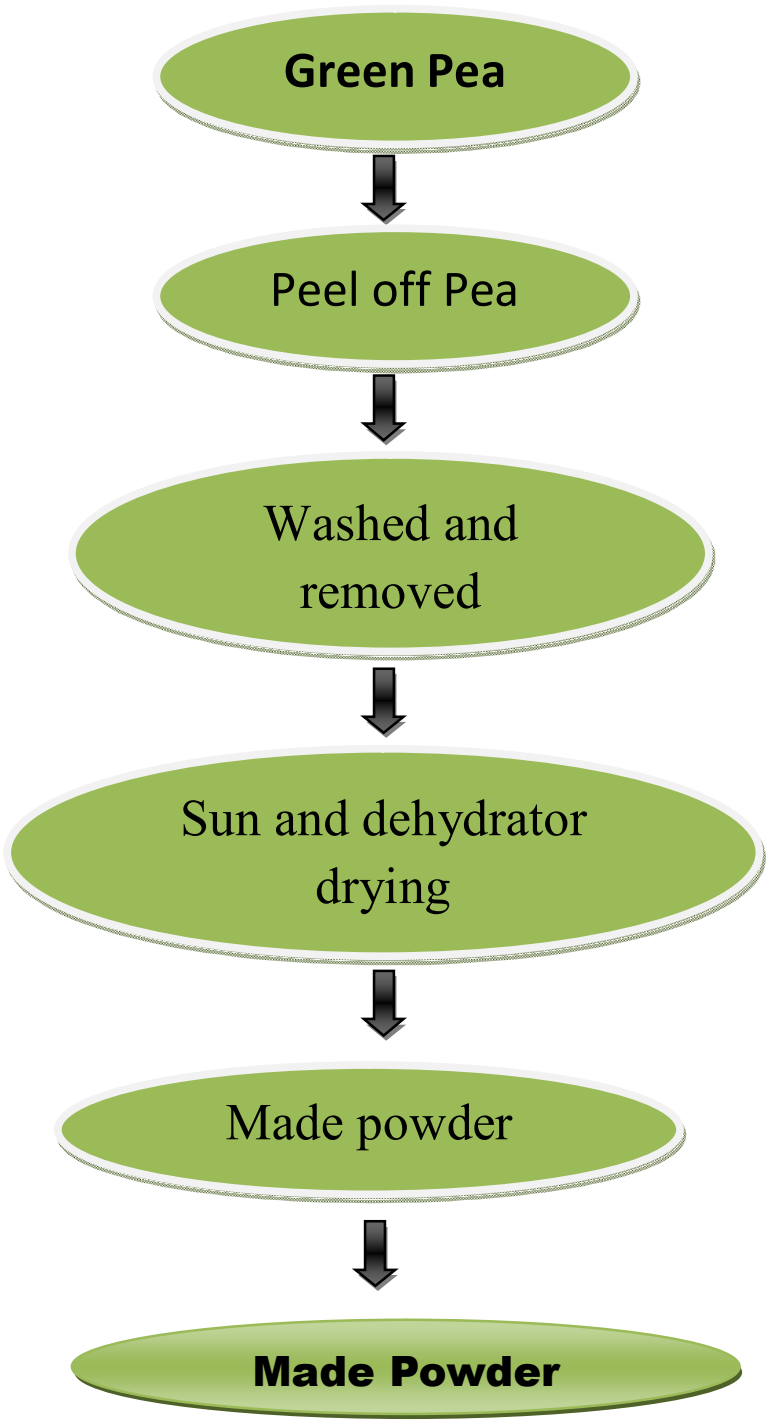


Fig:3.4 Processing of carrot

Carrot was taken from the local place and then it cleaned and washed removed dust particle in it then it chopped into small piecesand put it into the dehydrator for 1-3 days and checked it in between time to time when it purely dried form, grinded it to make powder form premix for the preparation of nutrigenomic badi.


Green Pea
Peel off Pea
Washed and removed
Sun and dehydrator drying
Made powder
Made Powder

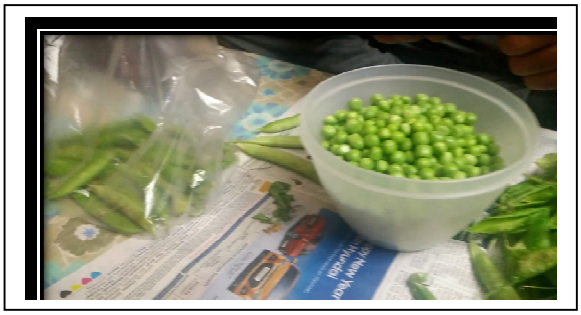


Fig 3.5 Processing of Pea

It purchased from the local place in bulk quantity. Peel off the pea and washed with Luke warm water due to does not grow fungus in it. Then put it in one day for sun drying method then kept it into dehydrator for complete dryness for 1-2 days the make it powder form by using grinder.

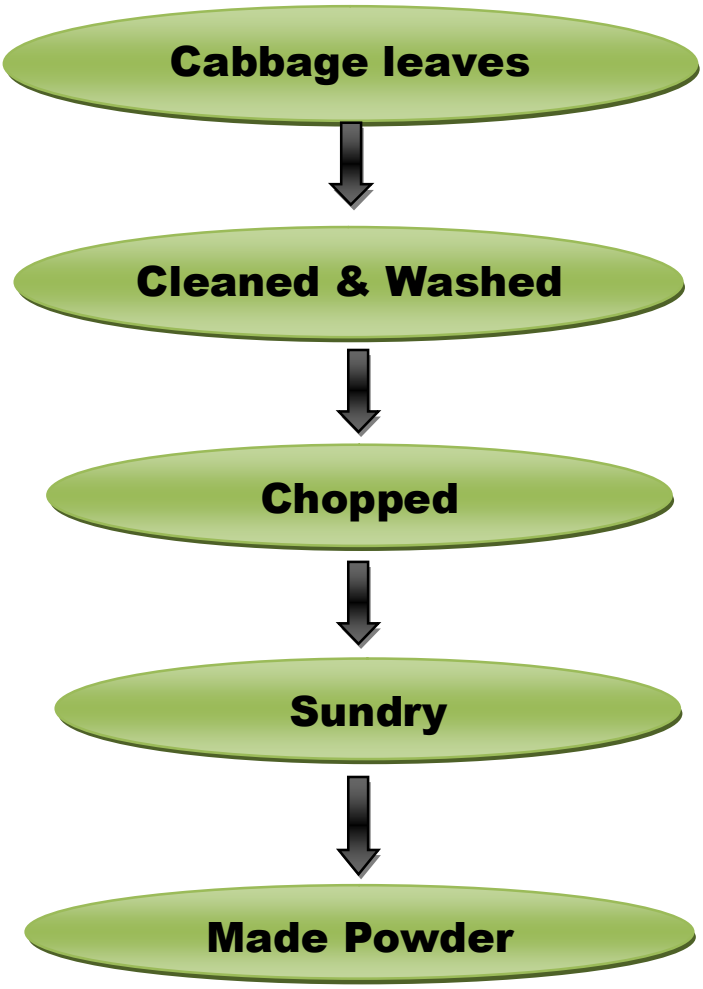

Cabbage leaves
Cleaned & Washed
Chopped
Sundry
Made Powder

Fig. 3.6 Processing of Cabbage

Cabbage were taken from the local market then removed leaves from the upper portion of the cabbage then chopped it into small slices and cleaned with luke warm water due to fungus will not grown. Then put it for sun drying method for 3 days. When it dried in pure form grind it and makes the powder.

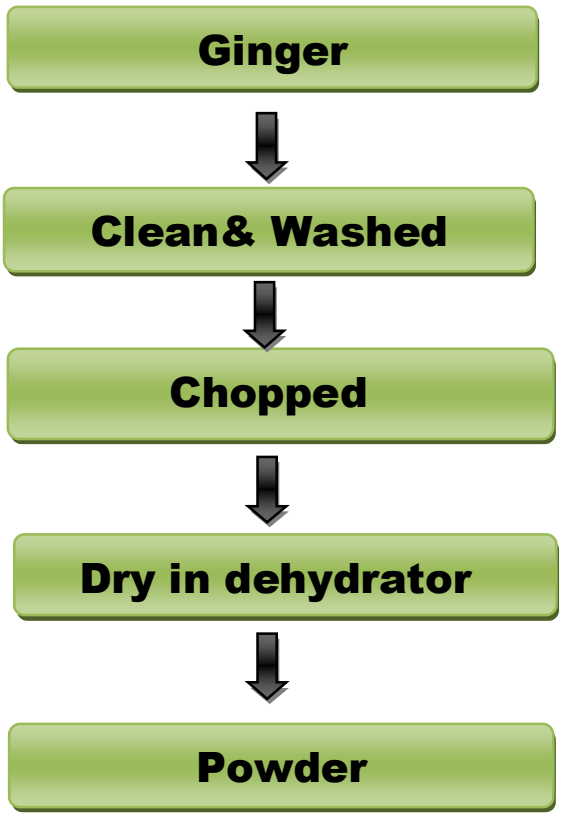


Fig. 3.7 processing of Ginger

Ginger was taken from the market then it was cleaned and remove th peel and chopped into small pieces due to help in drying easily then put it first in sun drying then into dehydrator for 3 days. When it was completely dry grinde it makes it powdered form.

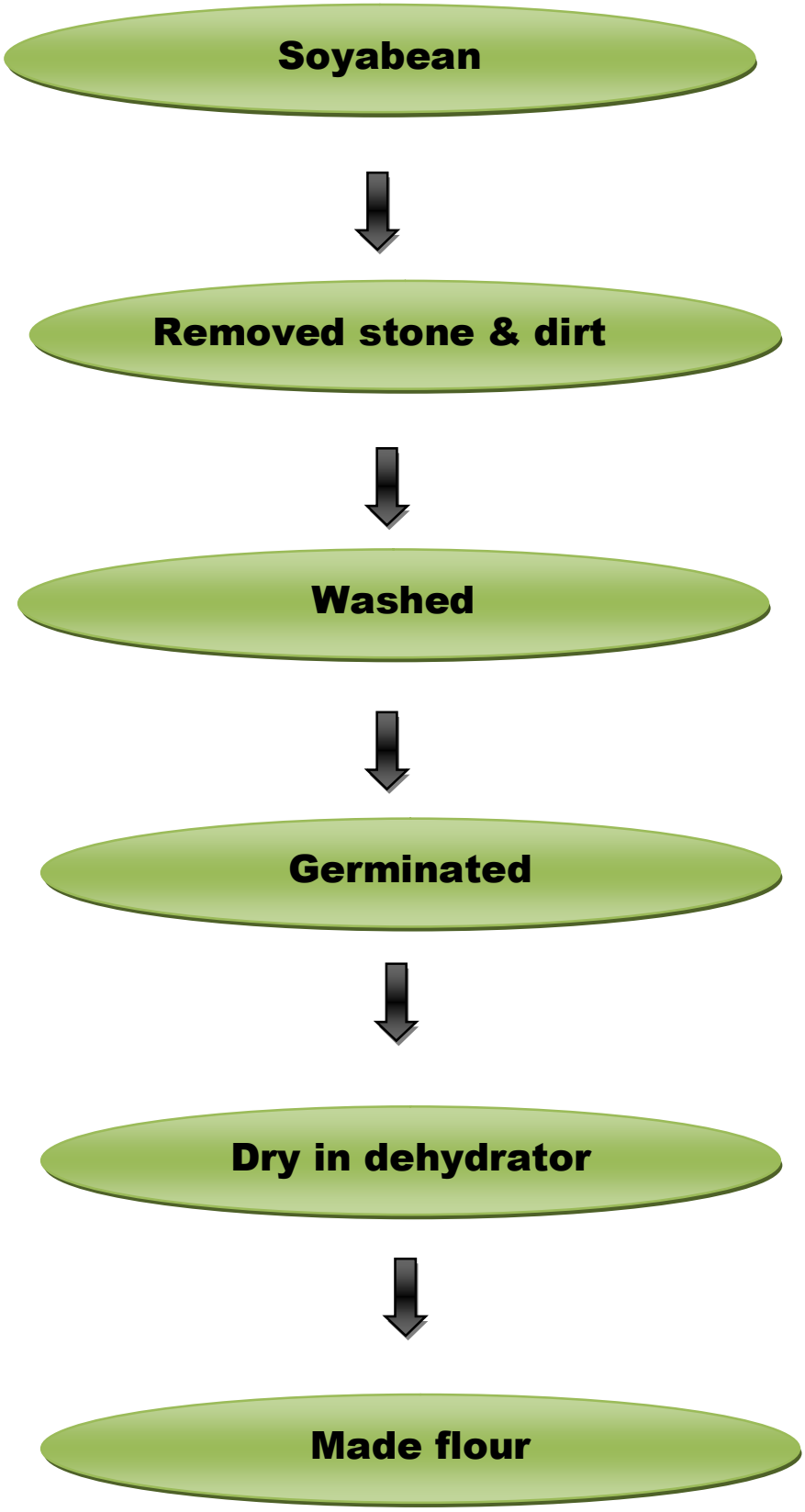

Soyabean
Removed stone & dirt
Washed
Germinated
Dry in dehydrator
Made flour

Fig 3.8 Processing of Raw Soyabean

Soy bean was taken from the store then checked it stone particle removed and washed it then soaked for the germination process for a night when it was germinated then put it into dehydrator for the drying 3 days. It was completely dry then grinds it to make powder for premix form the preparation of nutrigenomic product.

3.4.1.1.2.2 Tools –Following tools used during processing of raw material-

Fig.3.9 Dehydrator Machine

Fig. 3.10 Grinder machine

PHASE-2

3.4.1.1.4 PRODUCT DEVELOPMENT-

This phase involved the whole idea of development of nutrigenomic health food products by using different ratio of premix powders value added products.

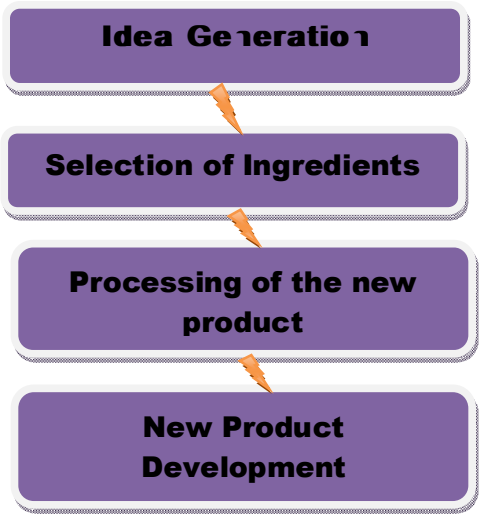


Fig 3.11 Development of new product (flow chart)

Table 3.3 Distribution of Ingredients

Sample no.	Ingredient	Amount
Sample-1	Pea powder	300g
	Cabbage powder	50g
	Carrot	200g
	Soyabean	300g
	Ginger	10g
	Salt	Acc. Taste
Sample -2	Pea powder	300g
	Cabbage powder	100g
	Carrot	150g
	Soyabean	250g
	Ginger	10g

	Salt	15g
Sample -3	Besan	100g
	Pea powder	300g
	Cabbage powder	150g
	Carrot	200g
	Soyabean	250g
	Ginger	10g
	Salt	Acc. Taste

3.4.1.1.4 Development of premix based products

Preparation of the badi (product-1) and addition of premix powders

In this phase involved the preparation of badi and added the premix powders of carrot, peanut powder, ginger, and soybean.

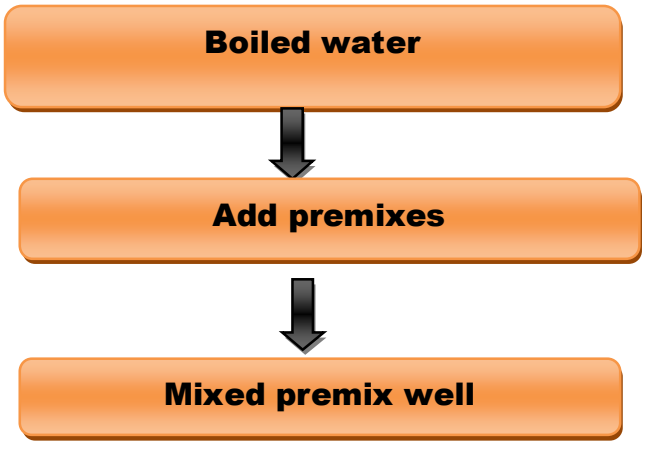
Used ingredients

Boiled water and add premix powders (carrot, cabbage, ginger, and soybean, pea).

Used tools

During making badi many appliance used such as tava, spatula, cooker, holder, plates etc.

Technique



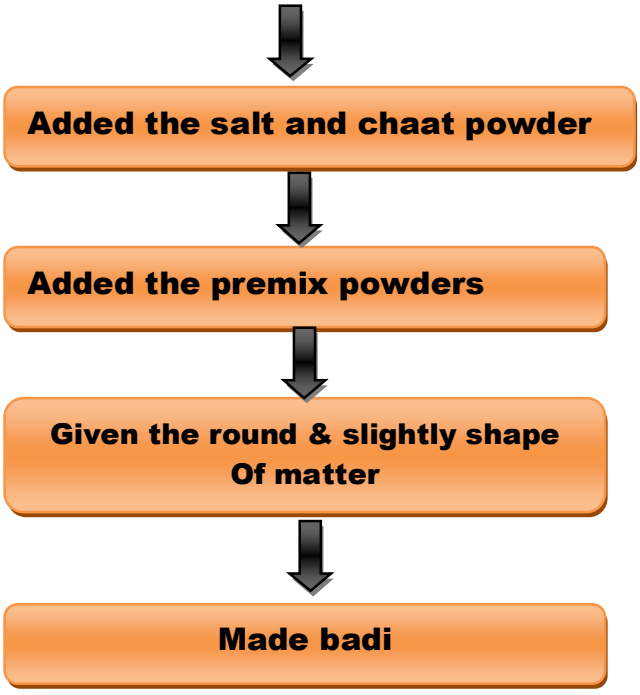


Fig 3.12 Preparation of product 1

Take one liter of water then it was putting on the burner of gas and boiled it when it was reached at boiling point then added the premixes which was pre-prepared mixed it well cooked till these premixes well mixed and cooked, then added salt, chat masala and black pepper mix it well. Then burner off kept it some time for cooling the make badi in rounded shape and it was kept in dehydrator for drying.

Preparation of nutrigenomic badi (product 2) and added premix powders

Ingredients

Besan, soybean flour, peanut flour, carrot powder, cabbage powder, black pepper, chaat masala, salt.

Used tools

In the preparation of nutrigenomic badi tools are usedsuch as big bowl, spatula

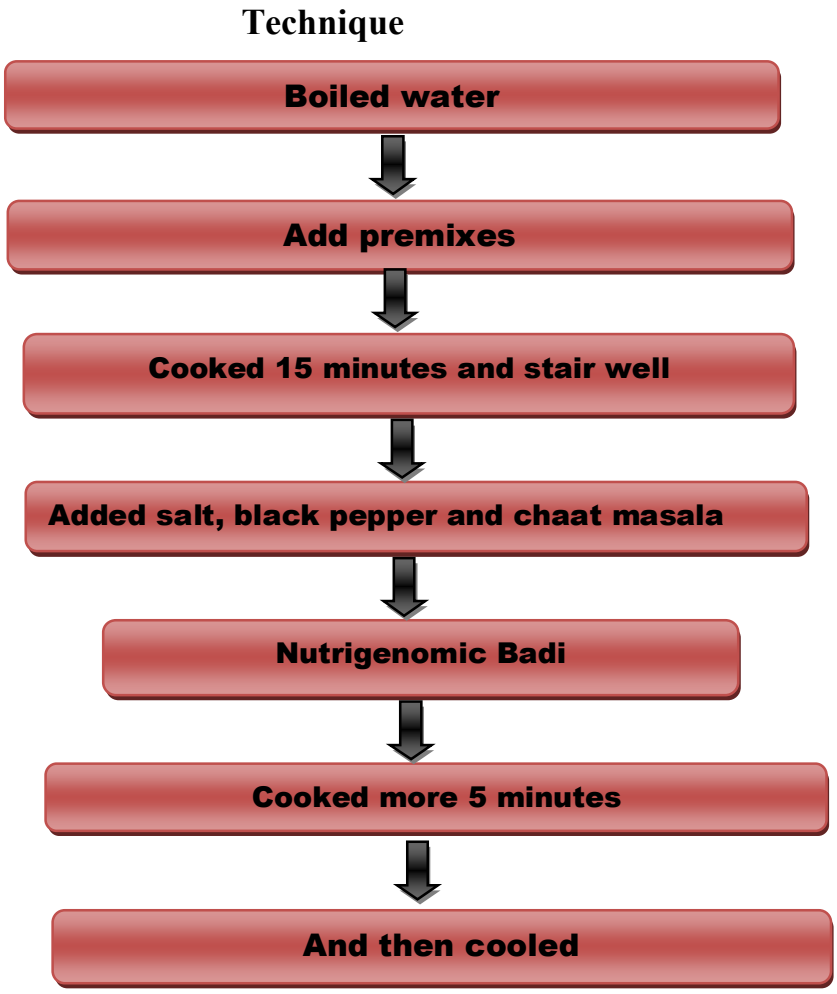


Fig. 3.13 Flow Chart of Final Product

One liter water was taken in a big bowl put it on burner of gas the it was heating then water reached at the boiling point after that all ingredients premixes which was weight in different amount prepared added into the water and stair continuously and added salt, chat masala and black pepper according to taste cooked at 15 minutes then prepared nutrigenomic badi.

Fig 3.14 Final product of nutrigenomic chunks

Phase-3

In this phase nutrient analysis were done by different methods. These nutrients were vitamin A, folic acid, protein, carbohydrate, fat and zinc.

Protein: -The Kjeldahl's method is utilized to estimate the measure of nitrogen present in an obscure sample. Traditionally, this technique is utilized to measure the protein substance of the food and measure of nitrogen. Nourishment is processed with a strong acid so it discharges nitrogen which can be controlled by an appropriate titration procedure. The measure of protein present is then determined from the nitrogen centralization of the nourishment.

Digestion

The food sample to be analyzed is weighed into a *digestion flask* and then digested by heating it in the presence of sulfuric acid (an oxidizing agent which digests the food), anhydrous sodium sulfate (to speed up the reaction by raising the boiling point) and a catalyst, such as copper, selenium, titanium, or mercury (to speed up the reaction). Digestion converts any nitrogen in the food (other than that which is in the form of nitrates or nitrites)into ammonia, and other organic matter to C02 and H20. Ammonia gas is not liberated in an acid solution because the ammonia is in the form of the ammonium ion (NH4+) which binds to the sulfate ion (SO42-) and thus remains in solution:

N(food) (NH4)2SO4 (1)

Neutralization:-

After the digestion has been completed the digestion flask is connected to a *recieving flask* by a tube. The solution in the digestion flask is then made alkaline by addition of sodium hydroxide, which converts the ammonium sulfate into ammonia gas:

(NH4)2SO4 + 2 NaOH → 2NH3 + 2H2O + Na2SO4 (2)

The ammonia gas that is formed is liberated from the solution and moves out of the digestion flask and into the receiving flask - which contains an excess of boric acid. The low pH of the solution in the receiving flask converts the ammonia gas into the ammonium ion, and simultaneously converts the boric acid to the borate ion:

NH3 + H3BO3 (boric acid) → NH4+ + H2BO3- (borate ion) (3)

Titration:-

The nitrogen content is then estimated by titration of the ammonium borate formed with standard sulfuric or hydrochloric acid, using a suitable indicator to determine the end-point of the reaction.

H2BO3- + H+ ® H3BO3 (4)

The concentration of hydrogen ions (in moles) required to reach the end-point is equivalent to the concentration of nitrogen that was in the original food (Equation

3). The following equation can be used to determine the nitrogen concentration of a sample that weighs *m* grams using a*x*M HCl acid solution for the titration:

$$\%N = \frac{x \text{ moles}}{1000 \text{ cm}^3} \times \frac{(v_s - v_b) \text{ cm}^3}{m \text{ g}} \times \frac{14 \text{ g}}{\text{moles}} \times 100 \quad (5)$$

Where v_s and v_b are the titration volumes of the sample and blank, and 14g is the molecular weight of nitrogen N. A blank sample is usually ran at the same time as the material being analyzed to take into account any residual nitrogen which may be in the reagents used to carry out the analysis. Once the nitrogen content has been determined it is converted to a protein content using the appropriate conversion factor: %Protein = F%N.

Carbohydrate: - The total saccharides moiety in an example can be assessed by the anthrone strategy which is a simple calorimetric technique with relative lack of care to impedances from the other cell mixes. The initial phase in all out starch estimation is to hydrolyze the polysaccharides and to hydrate the monomers (assimilation with sulfuric acid expansion and heat treatment). The 5-carbon (pentose) and 6-carbon (hexose) sugars are changed over to furfural and hydroxyl methyl furfural, individually. Whenever anthrone (a fragrant compound), it responds with these absorption items to give hued compound. The measure of absolute starches in the example is then evaluated by means of perusing the absorbance of the subsequent arrangement against a glucose standard curve.

Fat: - Fat is estimated as crude ether extract of the dry material. The dry sample (5-10g) is weight accurately into a thimble and plugged with cotton. The thimble is then placed in a Soxhlet apparatus and extract with anhydrous ether about 16 hours. The ether extract is filtered into a weighed conical flask. The flask containing the ether extract is washed 4-5times with small quantities of ether and the washings are transferred. The ether is then removed by evaporation and the flask with the residue dried in an oven at 80-100°c cooled in a desiccators and weight.

PRINCIPLE – SOXHLET EXTRACTION METHODPRINCIPLE METHOD

Lipid in food present in various forms like mono-glycerides, diglycerides, triglycerides and sterol and free fatty acid and phospho-lipid and carotenoids and fat-soluble vitamins. Lipid is soluble in organic solvent and insoluble in water, because of this, organic solvents like hexane, petroleum ether have the ability to solubilize fat and fat is extracted from food in combination with the solvent. Later the fat is collected by evaporating the solvent. Almost all traced the solvent is distilled off and can be reused.

PREPARING THE SAMPLE:

First of all, we have to dry the product and remove moisture in order to facilitate entry of the organic solvent, be-cause moisture restricts the entry of organic solvent. Then size reduction is there to increase the surface area and due to it, there is larger exposed surface. After this, we go for acidic hydrolysis which helps in breaking of protein fat emulsion and increases the availability of fat for the solvent. Furthermore, we can collect the solvent by distillation.

REQUIREMENTS:

- Weighing balance
- Soxhlet apparatus
- Drying oven
- Thimble
- Heating mantle
- Glass rod
- Desiccator with silica gel
- Petroleum ether (Boiling temperature 60°-80°c)
- Cotton plugs

PROCEDURE:

1. First of all, rinse all the glass apparatus by petroleum ether and dry it in the oven at 102°c and after removing it keep in the desiccator.
2. Weigh 5 gram of grounded and dried sample and place it in the thimble.
3. Place the thimble in the soxhlet extractor.
4. Take a 150ml round bottom □ask and clean it and □ll the □ask with 90 ml petroleum ether.
5. Place the whole setting on a heating mantle and allow the petroleum ether to boil.
6. Continue the extraction process for several hours, almost 6 hours.
7. Remove the condensing unit from extraction unit and allow the sample to cool down. Finally, it removes all the lipid.
8. Collect almost all the solvent after distillation.
9. Place the sample in the oven and after removing it place in the desiccator.
10. Take the weight of the sample.
11. As a result, we get a defat sample.

CALCULATION:

Empty thimble= w1

Thimble with sample= w2

Weight of sample= p

Then crude fat percentage ig= $(w2-w1)/p \times 100$

This method is an encient method to extract all the fat present in the food. Hence it is used in oil extraction units for better recovery of oil. This method is also applied to the deoiled cake which is collected from screw impellers rather than high-pressure expression. It is also used in the analysis of fat present in the sample.

Vitamin-A: - Vitamin-A estimated by spectroscopic technique. The absorption at 460 nm and the difference in absorption at 328 nm before and after irradiation

with UV light; using the alcoholic reagent KOH, by procedure extraction and saponification.

Principle of the method

All three vitamins are determined with the aid of saponification. The material under investigation is saponified with aqueous ethanolic potassium hydroxide solution and the vitamins thus released are extracted using petroleum ether. After concentration of the extract, the residue is dissolved in methanol and the contents of vitamin A, E and ß-carotene are determined using HPLC-UV/VIS.

This method is based on the norm methods DIN EN 12823-1, DIN EN 12823-2 and DIN EN 12822. The following modifications are applied:

- All 3 norm methods are summarized to one single method. The 3 vitamins are determined from one sample preparation.
- For 13-cis retinol, -carotene and - tocopherol no calibration is performed
- No correction factor for HPLC is derived from purity assessment.
- Saponification is performed by 3 h incubation at 50 °C in a water bath and incubation at room temperature over night.
- The extraction is performed just once and with 150 ml petrol ether
- The neutralization is performed just once and with approx. 400 ml water
- A defined aliquot of the extract is evaporated on a drying device at 48 °C with nitrogen
- Only a single determination is performed. The determination is only repeated if there are deviations from the expected value or mistakes during sample preparation are suspected.
- **Equipment**
- Laboratory mill
- Analytical scales, precision ± 0.1mg
- Brown glass flat-bottomed flask, 250 ml
- Stir bar
- Magnetic stirrer

- Dispenser (50 ml, 100 ml)
- Graduated cylinder
- Water bath with reflux condenser
- Conical separating funnel, brown glass, 500 ml, with PTFE stopcock
- Mechanical shaker
- Volumetric flask, narrow neck, 50 ml, 100 ml
- Glass funnel
- Phase separation folding filters
- Pipette
- Brown glass vials, 6 ml
- Drying device with nitrogen (evaporation system)
- Brown glass vials, 1 ml
- Vial clamp
- HPLC equipment composed of a pump, injector with sample loop (20-100 l), UV-VIS
- detector, analytical software
- HPLC columns: Vitamin A/E: e.g. LiChrosorb RP18, 7 m (250 x 4.0 mm)

  ß-carotene: e.g. Spherisorb ODS 2, 5 m, (100 mm x 4.6 mm)

  e.g. Vydac 201TP54 (RP18), 5 m (250 x 4.6 mm)
- UV-VIS spectrophotometer suitable for the measurement of the absorption capacity at predetermined wavelengths with suitable quartz cuvettes, e.g. 1 cm layer thickness

Chemicals

- Purified water
- L-ascorbic acid
- Ethanol, denatured, ω~ 95 %
- Ethanol, absolute, ω = 99 %
- Potassium hydroxide p.a.
- Nitrogen, oxygen-free, = 99.1 %

- Petroleum ether (boiling range 40-60 °C)
- Methanol for the liquid chromatography
- Dichloromethane for the liquid chromatography
- Acetonitrile for the liquid chromatography
- Ammonium acetate
- Triethylamine
- Buthyl hydroxyl toluene

Folic acid: - Techniques for the assurance of folate by best fluid chromatography progressively accessible and permit separation between folate forms, yet these still experience the ill effects of poor affectability, variable reaction to a mixture of folates, interconversion of folate frames amid extraction and obstruction from other nourishment frameworks. While partition of the polyglutamate folate forms by HPLC is conceivable, the subsequent chromatograms are unpredictable and hard to decipher and deconjugation is normally completed to rearrange the assurance.

Zinc: - Estimation of trace mineral zinc was investigated by atomic absorption spectrophotometer (AAS). In AAS, a light radiation from a particular wave length from a hallow cathode light (HCL-cathode made of explicit metal to be examined) goes through the fire to the detector. The fiery remains arrangement is suctioned into the fire. The sample is in the ground state, ingest vitality from the honor cathode light radiation and go to the energized state. The measure of radiation vitality consumed by the component is extent to its centralization of metal under examine. Instrument parameters, for example, resonant wavelength, cut width and air-acetylene stream rate that are fitting for every component were chosen (AOAC, 2000). The instrument was set up and adjusted according to the rules in the manual given by the producer. A calibration curve (concentration versus absorbance) for every mineral to be resolved was readied utilizing a scope of working norms. The fire parameters were advanced as per the instrument maker's directions. The standard arrangements were perused when each gathering of the 6-12 tests. The burner was flushed with water among tests and zero was restored

each time. Appropriate dilution of the solution arrangements were made to peruse the substance of the minerals in the fiery debris arrangement.

MATERIALS AND METHODS

The stock solution of Zn (II) was prepared from Zinc chloride. The stock solution was standardized gravimetrically by Zn pyrophosphte.

A digital pH meter, with a combined glass and calomel electrode and UV 2100 spectrophotometer (Shimadzu) with glass cells of path length 1 cm was used.

Synthesis of 1-phenyl-1-hydrazonyl-2-oximino propane – 1,2 – dione (HPHOPD) reagent:

The reagent HPHOPD was synthesized [18] by carrying out a reaction between *iso*-nitrosopropiophenone and 85 %

hydrazine hydrate. The purity of the product was checked by melting point and GC-MS technique.

Extraction Procedure:

An aqueous solution (10.0 cm3) containing 0.1 mg Zn (II) metal and 0.005 M of 1-phenyl-1-hydrazonyl-2-oximino propane -1,2- dione reagent in n-butanol, after adjusting the pH = 8.5 was equilibrated with 10.0 cm3 of n-butanol for 1 min. After separation of the phases, the absorbance of the Zn (II) : HPHOPD complex in organic phase was directly measured at 415 nm.

Preparation of Pharmaceutical samples :

For determination of Zn (II) from Samples

To a 20.0 cm3 of injectible liquid or 40.0 –50.0 cm3 Multivitamin Syrup or a 5 gm of tablet powder, 1.0 cm3 of concentrated HCl : HNO3 (1:1) was added and evaporated to dryness. It was treated with 5.0 cm3 of 30 % H2O2 until solution became colorless. The colour less solution was then treated with dil. HCl and evaporated to dryness. The residue was dissolved in 10.0 cm3 of distilled water and an aliquot of this was used for further analysis.


Fig 3.15 During nutrients analysis of the product

Sensory evaluation: -Sensory evaluation is a scientific discipline that analyses and measures human responses to the composition of food and drink, e.g. appearance, touch, odour, texture, temperature and taste. In schools it provides an ideal opportunity for students to evaluate and give feedback on their dishes, test products and experimental designs.

Sensory evaluation can be used to:

- compare similarities/differences in a range of dishes/products;
- evaluate a range of existing dishes/food products;
- analyze food samples for improvements;
- gauge responses to a dish/product, e.g. acceptable v unacceptable;
- explore specific characteristics of an ingredient or dish/food product;

In this study the sensory evaluation is done on the targeted population where survey was conducted to checked awareness, and the technique of sensory evaluation was 9- point Hedonic Scale.

Point Hedonic Scale- The hedonic scale is based on equal interval, which is important in the assignment of numerical values to the response choices (from 1= ―dislike extremely‖ to 9=―like extremely‖) and to the use of parametric statistics in analysis of the data. The 9- point hedonic scale, also known as degree of liking scale, is the most common hedonic scale for measuring product liking by

consumer. The most widely used hedonic scale is 9- point scale, in which the person rates their preferences for food, ranging from “extremely dislikeǁ” to “extremely likeǁ”. To assess the flavour, body and texture, colour and appearance and overall acceptability of the product, the products were subjected to sensory evaluation by adopting a 9- point hedonic scale. Differently coded samples presented to panel members one at a time and they were asked to rate their hedonic response on the scale.

Tool: - sensory evaluation card is used as a tool for scoring and evaluation.

Rating	Appearance/colour	Taste/Flavour	Smell/Odour	Texture/Mouthfeel	Aroma	Overall Acceptance
Like extremely	-	-	-	-	-	-
Like very much	-	-	-	-	-	-
Like moderately	54	04	_	26	_	20
Like slightly	20	64	22	58	46	50
Neither like nor dislike	18	22	58	06	30	14
Dislike slightly	_	10	10	10	16	16
Dislike moderately	_	_	_	_	_	_
Dislike very much	_	_	_	_	_	_
Dislike extremely	_	_	_	_	_	_

Table 3.4 Hedonic rating scale

CHAPTER 4: RESULTS AND DISCUSSION

The growth and prosperity of a nation depend heavily on the nutritional status and development of late adults as they not only constitute one tenth of its population but also influence the growth of the remaining population. The nutritional status and development of late adults were integrated related to their nutritional requirements, dietary intake, dietary practices, cultural traditions and meal patterns. Diets of Indian adults especially in rural and urban areas were inadequate both in terms of quality and quantity. They mainly consume cereal based food but grossly deficient in legumes, animal foods and green leafy vegetables. In poor communities adults were often last to be given food even when they required energy intake increases for their nutritional needs. In addition, while staple food items (i.e. rice, pulse, bread, etc.) were distributed fairly equally, side dishes usually containing a higher proportion of micronutrients (i.e. vegetables, meat, yogurt, ghee, etc.) are often preferentially allocated to valued household members, including adult males and small children.

Factors that tend to reduce macro and micro nutrient intake of adults may be unequal intra-familial distribution of food, adverse and harmful dietary practices including dieting, specific food taboos and dietary restrictions. In general adults were the worst sufferers of the ravages of various forms of malnutrition (viz. protein energy malnutrition, iron, iodine, calcium, vitamin A and other specific nutrient deficiencies) because of their increased nutritional needs but decreased intake. At the same time low literacy level, lack of nutrition related knowledge and lack of awareness about their nutritional requirements further aggravate this dismal situation.

This information was prerequisite for designing and implementing effective nutritional interventions including nutrition education programme for adults. In fact scope of programme for improvement of knowledge and skills of adult in health, nutrition and uplifting self confidence and self image is tremendous and its benefits not only remain confined to adult period but extend to entire life span.

This chapter deals with the analysis of the data and discussion of the findings. This chapter deals with the results incurred on different aspects of the study. The findings have been interpreted/ discussed in the light of the facts and previous findings under the following subheads.

4.1Demographic profile of the respondents

4.2 Awareness on life style related diseases

4.3 Awareness on functional foods and nutraceuticals

4.4 Likert- scale agreement level for the herbal product acceptance

4.5 Dietary information

4.6 Nutrients of the product

4.6 Product acceptance

4.1Demographic profile of the respondents

Table no. 4.1 Demographic Profile of the Respondent

Demographic	Total No.	Percentage
N	122	-
Gender		
Male	79	64.8
Female	43	35.2
Transgender	0	-
Age		
40-45	24	19.7
46-50	41	33.6
51-55	19	15.6
56-60	24	19.7
61-above	14	11.5
Occupation		
Employed	73	59.8
Non-employed	13	10.7
House wives	29	23.8
Students	2	1.6
Retired	5	4.1
Level of education		
High school	40	32.8
Intermediate	34	27.9
Graduation	23	18.9
Post graduation	25	20.5
Others	0	

In this table shows that number of male and female participated in survey were 79 male (64.8%) and female 43 (35.2%) and number of respondent by age group 40-45 years 24(19.7%), 46-50 years 41(33.6%), 51-55 years 19(15.6%), 56-60 years 24 (19.7%), 61 and above were 14 (11.5%). Total no. of respondent was 122 individuals participated in this survey. This table also shows that status of the respondents. Employed person were more than any other category, employed 73 (59.8%), students 2 (1.6%), unemployed 13 (10.7%), retired 5 (4.1%), house wife 29 (23.8). represent education qualification of the respondent. This was categorized on the basis of lower to higher education. High school passed were 40 (32.8%), intermediate 34 (27.9%), graduation 23 (18.9), post graduation 25 (20.5%).

4.2 Awareness on life style related diseases

Table no.4.2.1 Diagnosed of the following disease from the respondent

		diagnosed of following disease from the respondent								Total
		Hypertension	diabetes mellitus	diabetes mellitus	cardiac complication	obesity	arthritis	digestive disorder	none	
age of the respondents	40-45	7	0	4	0	0	4	2	7	24
		5.7%	0.0%	3.3%	0.0%	0.0 %	3.3%	1.6%	5.7%	19.7%
	46-50	2	2	11	0	0	0	4	22	41
		1.6%	1.6%	9.0%	0.0%	0.0 %	0.0%	3.3%	18.0%	33.6%
	51-55	2	0	2	0	11	0	2	2	19
		1.6%	0.0%	1.6%	0.0%	9.0 %	0.0%	1.6%	1.6%	15.6%
	56-60	0	0	2	9	2	0	0	11	24
		0.0%	0.0%	1.6%	7.4%	1.6 %	0.0%	0.0%	9.0%	19.7%
	61 & above	5	0	0	0	0	7	0	2	14
		4.1%	0.0%	0.0%	0.0%	0.0 %	5.7%	0.0%	1.6%	11.5%
Total		16	2	19	9	13	11	8	44	122
		13.1%	1.6%	15.6%	7.4%	10.7 %	9.0%	6.6%	36.1%	100.0%

In the above table diagnosed of respondent from different disease at different age group like at the age 40-45 no. of people suffered from hypertension 7 (5.7%), diabetes type II 4(3.3%), arthritis 4(3.3%), digestive disorder 2(1.6%) and 7(5.7%) was not suffered any disease. Total no. of respondent at this age was 24(19.7). At the age of 46-50 hypertension 2(1.6%), diabetes type I 2(1.6%), obesity 11(9%), arthritis 4(3.3%), digestive disorder 4(3.3%), 22(18%) not suffered any disease at this age and total respondent was at this 41(33.6%). At the age 51-55 hypertension 2 (1.6%), diabetes type II 2(1.6%), arthritis 11(9%), digestive disorder 2(1.6%) was suffered and total no. of population at this age were 19(15.6%). At the age of 56-60 diabetes type II 2(1.6%), cardiac complication 9(7.4%), obesity 2(1.6%), no. of population were not suffered from any disease 11(9%) and total no. of population at this age was 24 (19.7%). 61-above aged persons was suffered hypertension 5(4.1%), arthritis 7(5.7%), not suffered with any disease 2(1.6%) total no. of persons in this was 14(11.5%). Total no. of population suffered with different disease was hypertension 16(13.1%), diabetes type I 2(1.6%), diabetes type II 15(15.6%), cardiac complication 9(7.4%), obesity 13(10.7%), arthritis 11(9%), digestive disorder 8(6.6%) and not any disease 44(36.1%). The chi-square test value (159.879^{3}), degree of freedom 28 and significant value less than ($P<0.05$) that means $H_1 0$ was rejected. There was o association between age and life style diseases.

The majority of studies found that South Asian participants lacked understanding of the relationship between lifestyle and disease. Those diagnosed with a lifestyle-related condition were often unconvinced of the impact their lifestyle choices had on health. Personal disease risk and cause were often instead attributed to a range of external influences commonly stress, heredity, pollution, and too much sugar or fried food in their diet as influential factors on health. A shared assertion by those with Diabetes or CHD was not being sure or understanding the root cause of their disease [Choudhury et al. 2009, Farooki et al. 2000, Ludwing 2011].

Table no. 4.2.2 Respondent suffered with blood pressure related complication

		any respondent suffered with blood pressure related complication		Total
		Yes	N	
age of the respondent	40-45	17(13.9%)	7(5.7%)	24(19.7%)
	46-50	6(4.9%)	35(28.7%)	41(33.6%)
	51-55	11(9.0%)	8(6.6%)	19(15.6%)
	56-60	2(1.6%)	22(18.0%)	24(19.7%)
	61 & above	5(4.1%)	9(7.4%)	14(11.5%)
Total		41(33.6%)	81(66.4%)	122(100%)

Blood pressure related complication of respondent at the age of 40-45, 17(13.9%) population yes and 7(5.7%) NO and total no. of population in this age 24(19.7%). At the age 46-50 population responds 6(4.9%) yes and 35(28.7%) NO, total no. of population 41(33.6%). In the age 51-55 11(9%) respond yes and 8(6.6%) NO, total no. of respond in this age 19(15.6%). At the age of 56-60, 2(1.6%) respond yes and 22(18%) NO, total no. of respond in this age 24(19.7%). At the age of 61-above, 5(4.1%) respond yes and 9(7.4%) NO, total no. of respond in this age 14(11.5%). Total no. of population responded from blood pressure related complication was 41(33.6%) yes and 81(66.4%) NO. The chi-square test value (33.442^3), degree of freedom 4 and significant value less than ($P<0.05$) that means H01 was rejected. There was o association between age and life style diseases.

Table no.4.2.3 Respondent who suffered with insomnia

			Respondent suffered with insomnia		Total
			yes	No	
age of the respondents	40-45	Count	6	18	24
		% of Total	4.9%	14.8%	19.7%
	46-50	Count	6	35	41
		% of Total	4.9%	28.7%	33.6%
	51-55	Count	2	17	19
		% of Total	1.6%	13.9%	15.6%
	56-60	Count	0	24	24
		% of Total	0.0%	19.7%	19.7%
	61 & above	Count	12	2	14
		% of Total	9.8%	1.6%	11.5%
Total		Count	26	96	122
		% of Total	21.3%	78.7%	100.0%

In this table response of respondent who suffered with insomnia at the age of 40-45, 6(4.9%) population yes and 18(14.8%) NO and total no. of population in this age 24(19.7%). At the age 46-50 population responds 6(4.9%) yes and 35(28.7%) NO, total no. of population 41(33.6%). In the age 51-55, 2(1.6%) respond yes and 17(13.9%) NO, total no. of respond in this age 19(15.6%). At the age of 56-60, 0(0.0%) respond yes and 24(19.7%) NO, total no. of respond in this age 24(19.7%). At the age of 61-above, 12(9.8%) respond yes and 2(1.6%) NO, total no. of respond in this age 14(11.5%). Total no. of population responded from insomnia disease was 26(21.3%) yes and 96(78.7%) NO. The chi-square test value (43.730), degree of freedom 4 and significant value less than ($P<0.05$) that means H_10 was rejected. There was association between age and insomnia.

Table no.4.2.4 Regular medication or treatment for any health problem

			Regular medication or treatment for any health problem		
			yes	No	Total
age of the respondent	40-45	Count	10	14	24
		% of Total	8.2%	11.5%	19.7%
	46-50	Count	17	24	41
		% of Total	13.9%	19.7%	33.6%
	51-55	Count	9	10	19
		% of Total	7.4%	8.2%	15.6%
	56-60	Count	13	11	24
		% of Total	10.7%	9.0%	19.7%
	61 & above	Count	12	2	14
		% of Total	9.8%	1.6%	11.5%
Total		Count	61	61	122
		% of Total	50.0%	50.0%	100.0%

In this table response of respondent who has been taken Regular medication or treatment for any health problem at the age of 40-45, 10(8.2%) population yes and 14(11.5%) NO and total no. of population in this age 24(19.7%). At the age 46-50 population responds 17(13.9%) yes and 24(19.7%) NO, total no. of population 41(33.6%). In the age 51-55, 9(7.4%) respond yes and 10(8.2%) NO, total no. of respond in this age 19(15.6%). At the age of 56-60, 13(10.7%) respond yes and 11(9.0%) NO, total no. of respond in this age 24(19.7%). At the age of 61-above, 12(9.8%) respond yes and 2(1.6%) NO, total no. of respond in this age 14(11.5%). Total no. of population responded from regular medication or treatment for any health problem insomnia disease was 61(50%) yes and 61(50%) NO. The chi-square test value (9.224), degree of freedom 4 and significant value 0.056 ($P < 0.05$) that means H01 was accepted. There was o association between age and life style diseases.

Table no.4.2.5 suffering any degenerative disease related from bone health

			Suffering any degenerative disease related from bone health		Total
			yes	No	
age of the respondent	40-45	Count	4	20	24
		% of Total	3.3%	16.4%	19.7%
	46-50	Count	8	33	41
		% of Total	6.6%	27.0%	33.6%
	51-55	Count	7	12	19
		% of Total	5.7%	9.8%	15.6%
	56-60	Count	2	22	24
		% of Total	1.6%	18.0%	19.7%
	61 & above	Count	7	7	14
		% of Total	5.7%	5.7%	11.5%
Total		Count	28	94	122
		% of Total	23.0%	77.0%	100.0%

In this table response of respondent who were suffering any degenerative disease related from bone health problem at the age of 40-45, 4(3.3%) population yes and 20(16.4%) NO and total no. of population in this age 24(19.7%). At the age 46-50 population responds 8(6.6%) yes and 33(27.0%) NO, total no. of population 41(33.6%). In the age 51-55, 7(5.7%) respond yes and 12(9.8%) NO, total no. of respond in this age 19(15.6%). At the age of 56-60, 2(1.6%) respond yes and 22(18.0%) NO, total no. of respond in this age 24(19.7%). At the age of 61-above, 7(5.7%) respond yes and 7(5.7%) NO, total no. of respond in this age 14(11.5%). Total no. of population responded from suffering any degenerative disease related from bone health was 28(23%) yes and 94(77%) NO. The chi-square test value (11.576), degree of freedom 4 and significant value 0.021 ($P < 0.05$) that means H01 was rejected. There was association between age and life style diseases.

Table no.4.2.6 Respondent ailing with health problem

			respondent ailing with health problem			
			for few month	for few years	None	Total
age of the respondent	40-45	Count	4	13	7	24
		% of Total	3.3%	10.7%	5.7%	19.7%
	46-50	Count	4	29	8	41
		% of Total	3.3%	23.8%	6.6%	33.6%
	51-55	Count	2	9	8	19
		% of Total	1.6%	7.4%	6.6%	15.6%
	56-60	Count	4	11	9	24
		% of Total	3.3%	9.0%	7.4%	19.7%
	61 & above	Count	12	0	2	14
		% of Total	9.8%	0.0%	1.6%	11.5%
Total		Count	26	62	34	122
		% of Total	21.3%	50.8%	27.9%	100.0%

In this table response of respondent who were ailing with health problem at the age of 40-45, 4(3.3%) population from few months and 13(10.7%) from few years, 7(5.7%) were not suffer any disease and total no. of population in this age 24(19.7%). At the age 46-50 population responds 4(3.3%) few months and 29(23.8%) from few years, and 8(6.6%) were not any disease, total no. of population 41(33.6%). In the age 51-55, 2(1.6%) responds from few months, 9(7.4%) from few years and 8(6.6%), were not any disease, total no. of respond in this age 19(15.6%). At the age of 56-60, 4(3.3%) responds from few months, 11(9.0%) from few years and 9 (7.4%) not suffered, total no. of respond in this age 24 (19.7%). At the age of 61-above, 12 (9.8%) responds from few months, 0% from few years and 2(1.6%) were not suffered with any problems, total no. of respond in this age 14 (11.5%). Total no. of population respondent ailing with health problem was 26 (21.3%) from few months, 62 (50.8%) from few years and

34 (27.9%) were not ailing with any disease. The chi-square test value (46.017), degree of freedom 8 and significant value 0.000 (P <0.05) that means $H_1 0$ was accepted. There was association between age and life style diseases.

Gender of respondent * diagnosed of following disease from the respondent

Table no.4.2.7 Diagnosed of different disease from the respondent

			diagnosed of following disease from the respondent								Total
			hypertension	diabetes mellitus	diabetes mellitus	cardiac complication	obesity	arthritis	digestive disorder	none	
gender of respondent	Male	Count	16	2	10	9	4	0	6	32	79
		% of Total	13.1%	1.6%	8.2%	7.4%	3.3%	0.0%	4.9%	26.2%	64.8%
	Female	Count	0	0	9	0	9	11	2	12	43
		% of Total	0.0%	0.0%	7.4%	0.0%	7.4%	9.0%	1.6%	9.8%	35.2%
Total		Count	16	2	19	9	13	11	8	44	122
		% of Total	13.1%	1.6%	15.6%	7.4%	10.7%	9.0%	6.6%	36.1%	100.0%

In the above table diagnosed of respondent from different disease by gender like male were suffering from hypertension 16(13.1%), diabetes type I 2(1.6%), diabetes type II 10(8.2%), cardiac complication 9(7.4%), obesity 4(3.3%), arthritis (0%), digestive disorder 6 (4.9%) and 32 (26.2%) were not suffering from any disease. In case of female respondent from hypertension (0%), diabetes type I (0%), diabetes type II 9(7.2%), cardiac complication (0%), obesity 9(7.4%), arthritis 11(9.0%), digestive disorder 2 (1.6%) and 12 (9.8%) were not suffering from any diagnosed from disease. The chi-square test value (44.301),

degree of freedom 7 and significant value 0.000 (P <0.05) that means H02 was rejected. There was association between gender and life style diseases.

Gender of respondent * any respondent sufferer with blood pressure related complication

Table no. 4.2.8 Respondent suffer with blood pressure related complication

			any respondent suffer with blood pressure related complication		Total
			yes	No	
gender of respondent	male	Count	16	63	79
		% of Total	13.1%	51.6%	64.8%
	female	Count	25	18	43
		% of Total	20.5%	14.8%	35.2%
Total		Count	41	81	122
		% of Total	33.6%	66.4%	100.0%

In this table shows that gender with any respondent suffer with blood pressure related complication male were suffering 16(13.1%) responds yes and 63(51.6%) responds NO. In case of female respondent 25(20.5%) yes and 18 (14.8%) NO. Total no. of respondent of yes was 41(33.6%) and 81(66.4%) responds NO. The chi-square test value (17.912), degree of freedom 1 and significant value 0.000 (P <0.05) that means H02 was accepted. There was association between gender and life style diseases.

Gender of respondent * respondent suffered with insomnia

Table no. 4.2.9 Respondent suffered with insomnia

			respondent suffered with insomnia		Total
			yes	No	
gender of respondent	male	Count	7	72	79
		% of Total	5.7%	59.0%	64.8%
	female	Count	19	24	43
		% of Total	15.6%	19.7%	35.2%
Total		Count	26	96	122
		% of Total	21.3%	78.7%	100.0%

In this table shows that gender with any respondent suffer with insomnia related complication male were suffering 7(5.7%) responds yes and 72(59.0%) responds NO. In case of female respondent 19(15.6%) yes and 24 (19.7%) NO. Total no. of respondent of yes was 26(21.3%) and 96(78.7%) responds NO. The chi-square test value (20.720), degree of freedom 1 and significant value 0.000 (P <0.05) that means H_20 was accepted. There was association between gender and life style diseases.

Gender of respondent * Regular medication or treatment for any health problem

Table no.4.2.10 Regular medication or treatment for any health problem

			Regular medication or treatment for any health problem		Total
			yes	No	
gender of	male	Count	26	53	79

respondent		% of Total	21.3%	43.4%	64.8%
	female	Count	35	8	43
		% of Total	28.7%	6.6%	35.2%
Total		Count	61	61	122
		% of Total	50.0%	50.0%	100.0%

In this table shows that gender with regular medication or treatment for any health problem male were suffering 26(21.3%) responds yes and 53(43.4%) responds NO. In case of female respondent 35(28.7%) yes and 8(6.6%) NO. Total no. of respondent of yes was 61(50.0%) and 61(50.0%) responds NO. The chi-square test value (26.181), degree of freedom 1 and significant value 0.000 (P <0.05) that means H_20 was accepted. There was association between gender and life style diseases.

Gender of respondent * Suffering any degenerative disease related from bone health

Table no. 4.2.11 suffering any degenerative disease related from bone health

			Suffering any degenerative disease related from bone health		Total
			yes	No	
gender of respondent	male	Count	6	73	79
		% of Total	4.9%	59.8%	64.8%
	female	Count	22	21	43
		% of Total	18.0%	17.2%	35.2%
Total		Count	28	94	122
		% of Total	23.0%	77.0%	100.0%

In this table shows that gender with suffering any degenerative disease related from bone health male were suffering 6(4.9%) responds yes and 73(59.8%) responds NO. In case of female respondent 22(18.0%) yes and 21(17.2%) NO. Total no. of respondent of yes was 28(23.0%) and 94(77.0%) responds NO. The chi-square test value (29.888), degree of freedom 1 and significant value 0.000 (P <0.05) that means H_20 was accepted. There was association between gender and life style diseases.

Gender of respondent * respondent ailing with health problem

Table no. 4.2.12 Respondent ailing with health problem from how many days

			Respondent ailing with health problem			
			for few month	for few years	none	Total
gender of respondent	male	Count	19	30	30	79
		% of Total	15.6%	24.6%	24.6%	64.8%
	female	Count	7	32	4	43
		% of Total	5.7%	26.2%	3.3%	35.2%
Total		Count	26	62	34	122
		% of	21.3%	50.8%	27.9%	100.0%

In this table response of respondent who were ailing with health problem at the gender wise, male 19(15.6%) population from few months and 30(24.6%) from few years, 30(24.6%) were not suffer any disease and total no. of population in this gender 79(64.8%). In case of female population responds 7(5.7%) few months and 32(26.2%) from few years, and 4(3.3%) were not any disease, total no. of population 43(35.2%). Total no. of population respondent ailing with health problem was 26(21.3%) from few months, 62(50.8%) from few years and 34(27.9%) were not ailing with any disease. The chi-square test value (44.301), degree of freedom 7 and significant value 0.000 (P <0.05) that means H_20 was accepted. There was association between gender and life style diseases.

Age of the respondent * any history of disease in your family

Table no. 4.2.13 Any history of diseases in your family according to age

			any history of disease in your family						
			high or low BP	Cardiac complication	diabetes type 2	arthritis	digestive disorder	other	Total
age of the responders	40-45	Count	6	5	7	4	2	0	24
		% of Total	4.9%	4.1%	5.7%	3.3%	1.6%	0.0%	19.7%
	46-50	Count	8	7	10	2	2	12	41
		% of Total	6.6%	5.7%	8.2%	1.6%	1.6%	9.8%	33.6%
	51-55	Count	0	0	2	7	0	10	19
		% of Total	0.0%	0.0%	1.6%	5.7%	0.0%	8.2%	15.6%
	56-60	Count	6	2	2	0	0	14	24
		% of Total	4.9%	1.6%	1.6%	0.0%	0.0%	11.5%	19.7%
	61 & above	Count	12	0	0	0	2	0	14
		% of Total	9.8%	0.0%	0.0%	0.0%	1.6%	0.0%	11.5%
Total		Count	32	14	21	13	6	36	122
		% of Total	26.2%	11.5%	17.2%	10.7%	4.9%	29.5%	100.0%

In the above table diagnosed of respondent from different disease in their family history at different age group like at the age 40-45 no. of people suffered from high or low blood pressure 6 (4.9%), cardiac complication 5(4.1%), diabetes type II 7(5.7%), arthritis 4(3.3%), digestive disorder 2(1.6%). Total no. of respondent at this age was 24(19.7). At the age of 46-50 high or low blood pressure 8(6.6%), cardiac complication 7(5.7%), diabetes type II 10(8.2%), arthritis 2(1.6%), digestive disorder 2(1.6%), 12(18%) not suffered any disease at this age and total respondent was at this 41(33.6%). At the age 51-55 high or low blood pressure (0%), diabetes type II 2(1.6%), arthritis 7(5.7%), digestive disorder not found and total no. of population at this age were 10(8.2%). At the

age of 56-60 high or low blood pressure 6(4.9%) diabetes type II 2(1.6%), cardiac complication 2(1.6%), arthritis and digestive order were not found, no. of population were not suffered from any disease 14(11.5%) and total no. of population at this age was 24 (19.7%). 61- above aged persons was suffered with high or low blood pressure 12(9.8%), arthritis, cardiac complication, diabetes type II were not found, digestive disorder 2(1.6%) not suffered with any disease not found. Total no. of persons in this was 14(11.5%). Total no. of population suffered with different disease was high or low blood pressure 32(26.2%), cardiac complication 14(11.5%), diabetes type II 21(17.2%), arthritis 13(10.7%), digestive disorder 6(4.9%) and not any disease 36(29.5%).

Gender of respondent * any history of disease in your family

Table no. 4.2.14 Any history of disease in your family according to gender

			any history of disease in your family						
			high or low BP	Cardiac complication	diabetes type 2	arthritis	digestive disorder	other	Total
gender of respondent	male	Count	23	5	17	2	0	32	79
		% of Total	18.9 %	4.1%	13.9%	1.6%	0.0%	26.2 %	64.8 %
	female	Count	9	9	4	11	6	4	43
		% of Total	7.4%	7.4%	3.3%	9.0%	4.9%	3.3%	35.2 %
Total		Count	32	14	21	13	6	36	122
		% of Total	26.2 %	11.5%	17.2%	10.7%	4.9%	29.5 %	100.0 %

In this table shows that family history of the disease respondent male were 23 (18.9%), and female were 9 (7.4%) with the high blood pressure or low blood pressure. Cardiac complication male 5(4.1%) and female were 9 (7.4%) has the family history. Diabetes type II 17(13.9%) were male suffered in their family and female were 4 (3.3%) diabetes history. 2(1.6%) were suffered with Arthritis and female were 11(9%) suffered with their family history. With disease of digestive

disorder their no family history in male and female were suffered with 4(3.3%). Other type of disease complication were found in male that 32 (26.2%) and female was found 4(3.3%).

Age of the respondent * you prefer any regular exercise

Table no. 4.2.15 Preference any regular exercise according to age

			you prefer any regular exercise		
			yes	No	Total
age of the respondent	40-45	Count	7	17	24
		% of Total	5.7%	13.9%	19.7%
	46-50	Count	25	16	41
		% of Total	20.5%	13.1%	33.6%
	51-55	Count	2	17	19
		% of Total	1.6%	13.9%	15.6%
	56-60	Count	16	8	24
		% of Total	13.1%	6.6%	19.7%
	61 & above	Count	2	12	14
		% of Total	1.6%	9.8%	11.5%
Total		Count	52	70	122
		% of Total	42.6%	57.4%	100.0%

In this table response of respondent who were prefer any regular exercise at the age of 40-45, 7(5.7%) population yes and 17(13.9%) NO and total no. of population in this age 24(19.7%). At the age 46-50 population responds 25(20.5%) yes and 16(13.1%) NO, total no. of population 41(33.6%). In the age 51-55, 2(1.6%) respond yes and 17(13.9%) NO, total no. of respond in this age 19(15.6%). At the age of 56-60, 16(13.1%) respond yes and 8(6.6%) NO, total no. of respond in this age 24(19.7%). At the age of 61-above, 2(1.6%) respond yes and 12(9.8%) NO, total no. of respond in this age 14(11.5%). Total no. of population responded were prefer any regular exercise was 52(42.6%) yes and 70(57.4%) NO. The chi-square test value (25.698), degree of freedom 4 and significant value 0.000 ($P < 0.05$) that means H_20 was accepted. There was association between gender and life style diseases.

Age of the respondent * yourself in terms of alcohol intake

Table no. 4.2.16 Preference of alcohol intake according to age

			yourself in terms of alcohol intake			
			occasionally	regular	not at all	Total
age of the respondent	40-45	Count	7	0	17	24
		% of Total	5.7%	0.0%	13.9%	19.7%
	46-50	Count	18	4	19	41
		% of Total	14.8%	3.3%	15.6%	33.6%
	51-55	Count	4	2	13	19
		% of Total	3.3%	1.6%	10.7%	15.6%
	56-60	Count	6	0	18	24
		% of Total	4.9%	0.0%	14.8%	19.7%
	61 & above	Count	0	0	14	14
		% of Total	0.0%	0.0%	11.5%	11.5%
Total		Count	35	6	81	122
		% of Total	28.7%	4.9%	66.4%	100.0%

In this table response of respondent who were yourself in terms of alcohol intake at the age of 40-45, 7(5.7%) population occasionally, regular intake of alcohol were not found and 17(13.9%) were not taken in any case and total no. of population in this age 24(19.7%). At the age 46-50 population responds 18(14.8 %) was taking occasionally and 4(3.3%) were taking regular point of view, 19(15.6%) were respondent not at all. Total no. of population 41(33.6%). In the age 51-55, 4(3.3%) respond occasionally, 2(1.6%) on the regular basis and 13(10.7%) were responds never, total no. of respond in this age 19(15.6%). At the age of 56-60, 6(4.9%) respond occasionally, not found on the regular basis and 18(14.8%) responds not at all, total no. of respond in this age 24(19.7%). At the age of 61-above, record were not found on basis of occasionally and regular base. Total no. of respond in this age 14(11.5%) responds NO consumption of alcohol. Total no. of population responded were yourself in terms of alcohol intake was 35(28.7%) occasionally, 6 (4.9%) on regular basis and 81(66.4%) were never consuming alcohol. The chi-square test value (19.257), degree of freedom 8 and

significant value 0.014 (P <0.05) that means H_20 was accepted. There was association between gender and alcohol consumption.

Age of the respondent * which hormone metabolism affect diabetes

Table no. 4.2.17 information about diabetes from respondent by age

			which hormone metabolism affect diabetes				
			Insulin	pepsin	melanin	oxytocin	Total
age of the respondent	40-45	Count	20	0	4	0	24
		% of Total	16.4%	0.0%	3.3%	0.0%	19.7%
	46-50	Count	32	7	0	2	41
		% of Total	26.2%	5.7%	0.0%	1.6%	33.6%
	51-55	Count	19	0	0	0	19
		% of Total	15.6%	0.0%	0.0%	0.0%	15.6%
	56-60	Count	16	2	0	6	24
		% of Total	13.1%	1.6%	0.0%	4.9%	19.7%
	61 & above	Count	12	0	2	0	14
		% of Total	9.8%	0.0%	1.6%	0.0%	11.5%
Total		Count	99	9	6	8	122
		% of Total	81.1%	7.4%	4.9%	6.6%	100.0%

This table showing that which hormone is responsible for the diabetes at the age of 40-45, 20(16.4%) population responded correct answer and 4(3.3%) answered wrong and total no. of population in this age 24(19.7%). At the age 46-50 population responds 32(26.2%) correct answer and 9(7.3%) were respondent

wrong, total no. of population 41(33.6%). In the age 51-55, 19(15.6%) respond correct and wrong answer were not found, total no. of respond in this age 19(15.6%). At the age of 56-60, 16(13.1%) responds were correct and 8(6.5%), were wrong, total no. of respond in this age 24(19.7%). At the age of 61-above, 12(9.8%) respond right answer and 2(1.6%) wrong, total no. of respond in this age 14(11.5%). Total no. of population responded for hormone responsible for diabetes was 99(81.1%) correct and 23(18.9%) were wrong. The chi-square test value (40.739), degree of freedom 12 and significant value 0.000 ($P < 0.05$) that means H_10 was accepted. There was association between age and diabetes information.

Age of the respondent * response of respondent not for hypertension

Table no. 4.2.18 This table shows that not cause of hypertension

			response of respondent				
			Smoke	obesity	too much salt in the diet	balance diet	Total
age of the respondent	40-45	Count	0	4	0	20	24
		% of Total	0.0%	3.3%	0.0%	16.4%	19.7%
	46-50	Count	0	9	0	32	41
		% of Total	0.0%	7.4%	0.0%	26.2%	33.6%
	51-55	Count	4	0	7	8	19
		% of Total	3.3%	0.0%	5.7%	6.6%	15.6%
	56-60	Count	0	2	0	22	24
		% of Total	0.0%	1.6%	0.0%	18.0%	19.7%
	61 & above	Count	0	0	0	14	14
		% of Total	0.0%	0.0%	0.0%	11.5%	11.5%
Total		Count	4	15	7	96	122
		% of Total	3.3%	12.3%	5.7%	78.7%	100.0%

In this table check the awareness of the respondent for not cause of the hypertension according to their age, at the age of 40-45, 20(16.4%) population responded correct answer and 4(3.3%) answered wrong and total no. of population in this age 24(19.7%). At the age 46-50 population responds

32(26.2%) correct answer and 9(7.3%) were respondent wrong, total no. of population 41(33.6%). In the age 51-55, 19(15.6%) respond correct and wrong answer were not found, total no. of respond in this age 19(15.6%). At the age of 56-60, 16(13.1%) responds were correct and 8(6.5%), were wrong, total no. of respond in this age 24(19.7%). At the age of 61-above, 12(9.8%) respond right answer and 2(1.6%) wrong, total no. of respond in this age 14(11.5%). Total no. of population responded for hormone responsible for diabetes was 99(81.1%) correct and 23(18.9%) were wrong.

Age of the respondent * type of fat responsible for CVD

Table no. 4.2.19 Types of fat responsible CVD

			type of fat responsible for CVD			Total
			saturated	Unsaturated	trans fat	
age of the respondent	40-45	Count	9	13	2	24
		% of Total	7.4%	10.7%	1.6%	19.7%
	46-50	Count	15	16	10	41
		% of Total	12.3%	13.1%	8.2%	33.6%
	51-55	Count	9	6	4	19
		% of Total	7.4%	4.9%	3.3%	15.6%
	56-60	Count	8	0	16	24
		% of Total	4.9%	0.0%	13.1%	19.7%
	61 & above	Count	0	14	0	14
		% of Total	0.0%	11.5%	0.0%	11.5%
Total		Count	39	49	32	122
		% of Total	32.0%	40.2%	26.2%	100.0%

In this table checked awareness of the respondent type of fat responsible for CVD according by age of 40-45, 9(7.4%) population responded correct answer and 13(10.7%), 2(1.6%) unsaturated and trans fat respectively which was wrong answered and total no. of population in this age 24(19.7%). At the age 46-50 population responds 15(12.3%) correct answer and 26(21.3%) were respondent

wrong, total no. of population 41(33.6%). In the age 51-55, 9(7.4%) respond correct and 10(8.2%) wrong answer, total no. of respond in this age 19(15.6%). At the age of 56-60, 8(4.9%) responds were correct and 16(13.1%), were wrong, total no. of respond in this age 24(19.7%). At the age of 61-above, respond right answer were not found and 14(11.5%) wrong, total no. of respond in this age 14(11.5%). Total no. of population responded for hormone responsible for diabetes was 41(31.6%) correct and 81(66.4%) were wrong.

Gender of respondent * you prefer any regular exercise

Table no. 4.2.20 Preference of exercise of the respondent by age

			you prefer any regular exercise		Total
			yes	No	
gender of respondent	male	Count	35	44	79
		% of Total	28.7%	36.1%	64.8%
	female	Count	17	26	43
		% of Total	13.9%	21.3%	35.2%
Total		Count	52	70	122
		% of Total	42.6%	57.4%	100.0%

In this table shows that gender with regular prefer any regular exercise. Male were performing regular exercise 35(28.7%) responds yes and 44(36.1%) responds NO, total no. of population in male were 79(64.8%). In case of female respondent 17(13.9%) yes and 26(21.3%) NO, total no. of population in case of female was 43(35.2%). Total no. of respondent of yes was 52(42.6%) and 70(57.4%) responds NO.

Table no.4.2.21 Information about nutrient which causes anemia

Anemia			
		Frequency	Percent
Valid	zinc	25	20.5
	iron	95	77.9
	cobalt	2	1.6
	Total	**122**	**100.0**

In the above table check awareness about the anemia in population 95(77.9%) respondent were correct answered and 27(22.1%) were responds wrong that means they were not aware about the anemia.

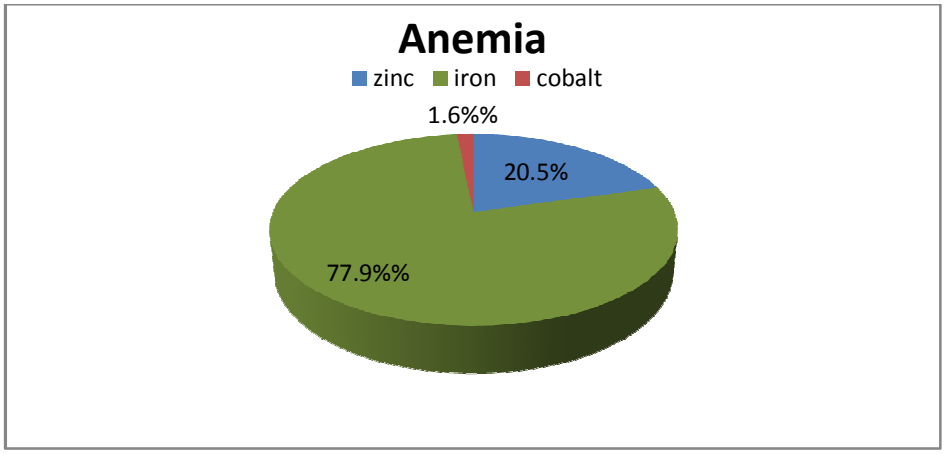


Fig. 4.1 Pi -Chart Graph of Anemia

Table no. 4.2.22Information about nutrient which causes Goiter

Goiter			
		Frequency	Percent
Respondent	Iodine	76	62.3
	Sodium	46	37.7
	Total	122	100.0

In the above table check awareness about the goiter in population 76(62.3%) respondent were correct answered and 46(37.70%) were responds wrong i. e. they were not aware about the goiter.

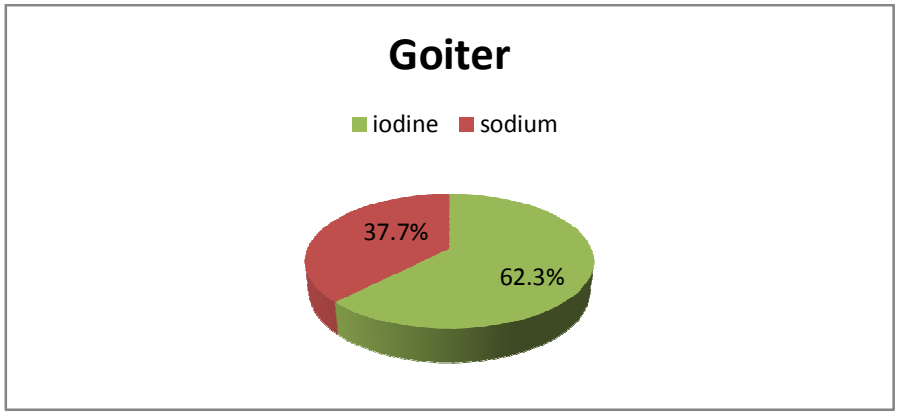


Fig. 4.2Pi-chart graph of Goiter

Table no. 4.2.23 Information about bone disease caused by which nutrient

Bone Disease			
		Frequency	Percent
Respondent	vitamin A	4	3.3
	vitamin D	93	76.2
	vitamin C	10	8.2
	vitamin B	15	12.3
	Total	122	100.0

In the above table check awareness about the bone disease in population 93(76.2%) respondent were correct answered and 29(23.8%) were responds different answered wrong i. e. they were not aware about the bone disease.

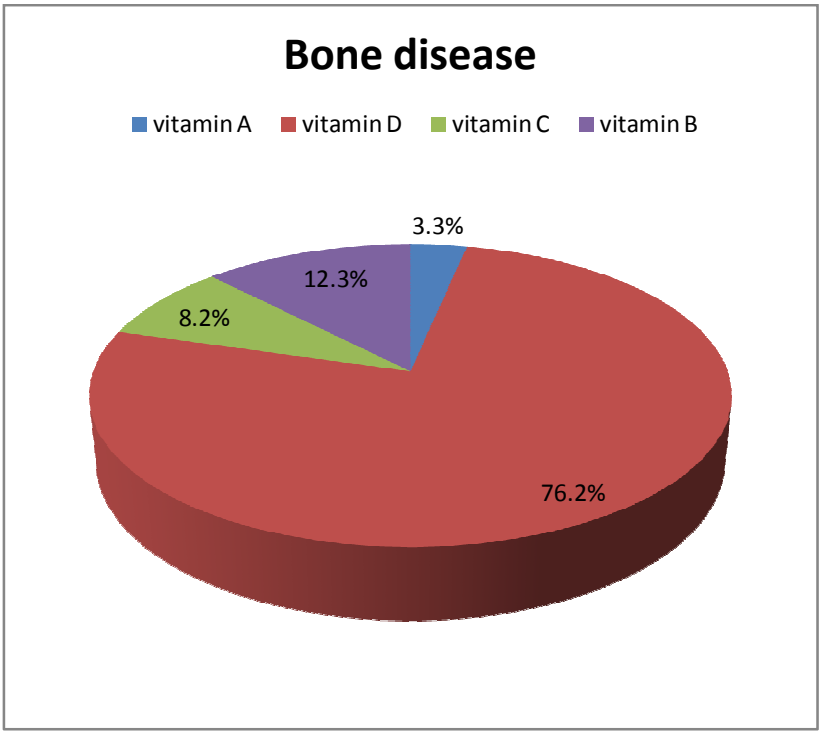


Fig. 4.3 Pi- chart presentation of Bone disease

Table no. 4.2.24 Nutrient responsible for night blindness

Night Blindness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Respondent	vitamin B	31	25.4	25.4	25.4
	vitamin C	18	14.8	14.8	40.2
	vitamin A	73	59.8	59.8	100.0
	Total	122	100.0	100.0	

In the above table check awareness about the anemia in population 73(59.8%) respondent were correct answered and 49(30.2%) were responds different answered wrong i. e. they were not aware about the night blindness or role vitamin A.

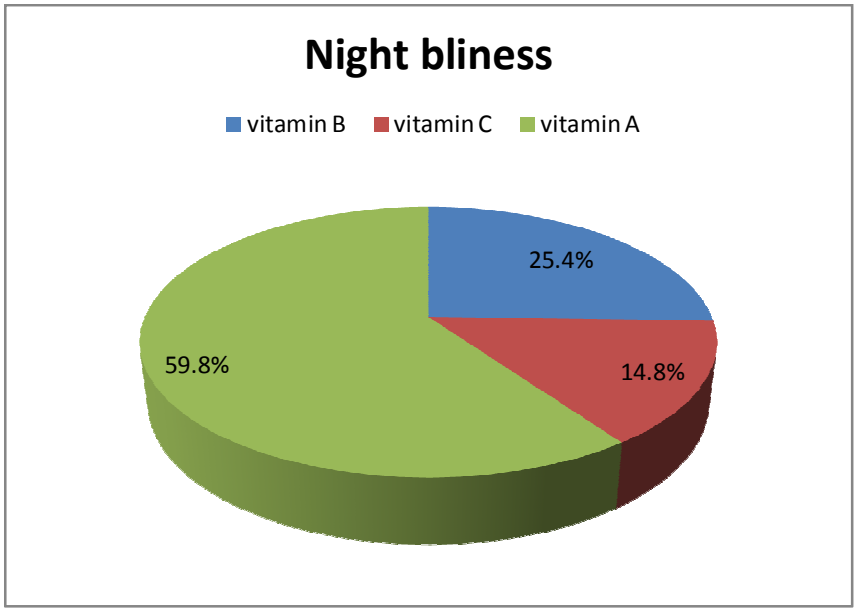


Fig. 4.4 Pi- chart graph on night blindness

4.3 Awareness on functional foods and nutraceuticals

Table no. 4.3.1 food consumed daily with medicinal property

Foods you consume daily have any medical properties			
		Frequency	Percent
Respondent	yes	97	79.5
	no	25	20.5
	Total	122	100.0

In this table we were checking the awareness of the respondent that foods they consume it has the medicinal properties then response of 97(79.5%) yes and 25(20.5%) NO. That means that population consuming good food.

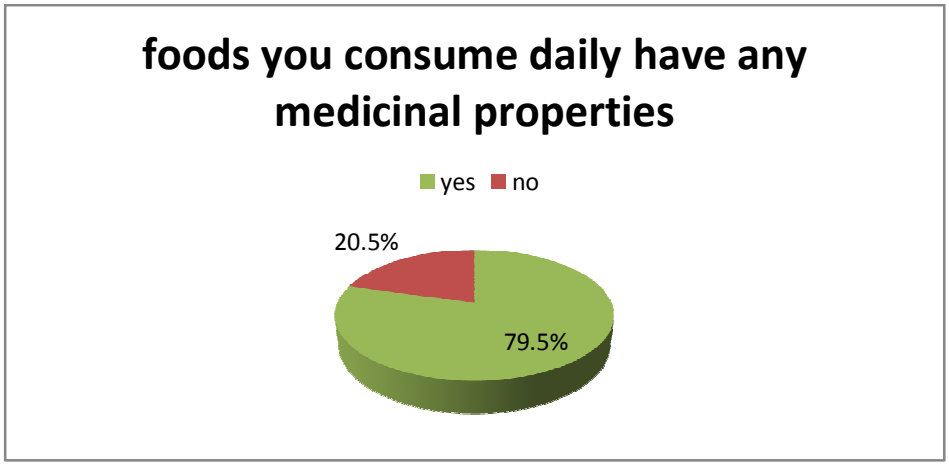


Fig.4.5 Consumption of food with medicinal properties

Table no.4.3.2 you come across the word functional food

you come across the word functional food			
		Frequency	Percent
Respondent	yes	19	15.6
	no	103	84.4
	Total	122	100.0

In this table we were checking the awareness of the respondent that you come across the word functional food it has the medicinal properties then response of 19(15.6%) yes and 103(84.4%) NO. That means that populations were not come across the word functional food.

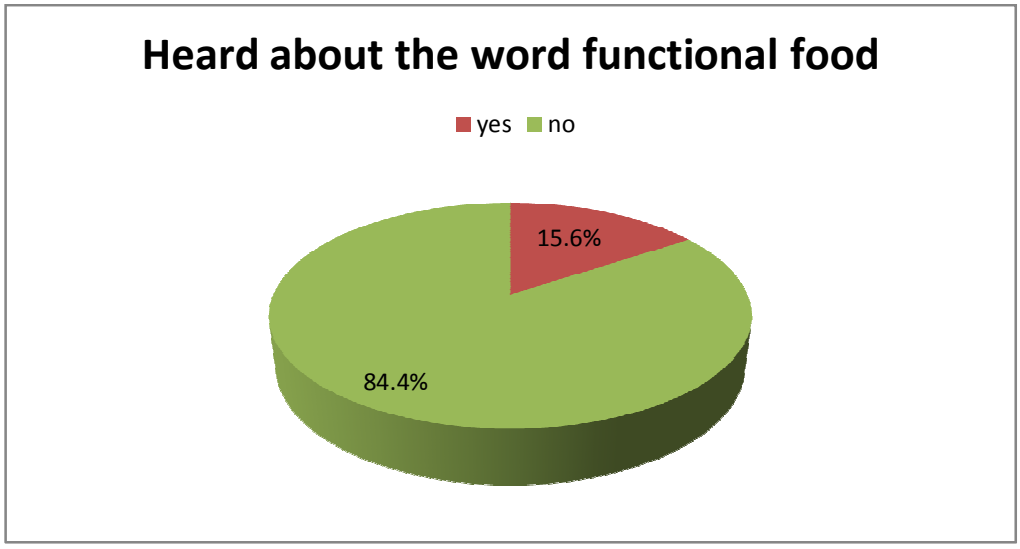


Fig. 4.6 Heard about the word functional food

Table no. 4.3.3 What are the functional food

The functional food			
		Frequency	Percent
Respondent	foods having health benefits beyond their nutritive content	37	30.3
	food for specific body function	17	13.9
	isolated or purified bioactive ingredients in foods	16	13.1
	None	52	42.6
	Total	122	100.0

In this table we know from the respondent what is the functional foods and how does it work for your health. Three specific question were asked, foods having health benefits beyond their nutritive content 37 (30.3%) population this idea, foods for specific body function 17 (13.9%) population agree with this, isolated or purified bioactive ingredients in foods 16(13.1%) population respond with idea but majority of the population 52 (42.6%) they do not know about the what are the functional foods and how does this work for their health system.

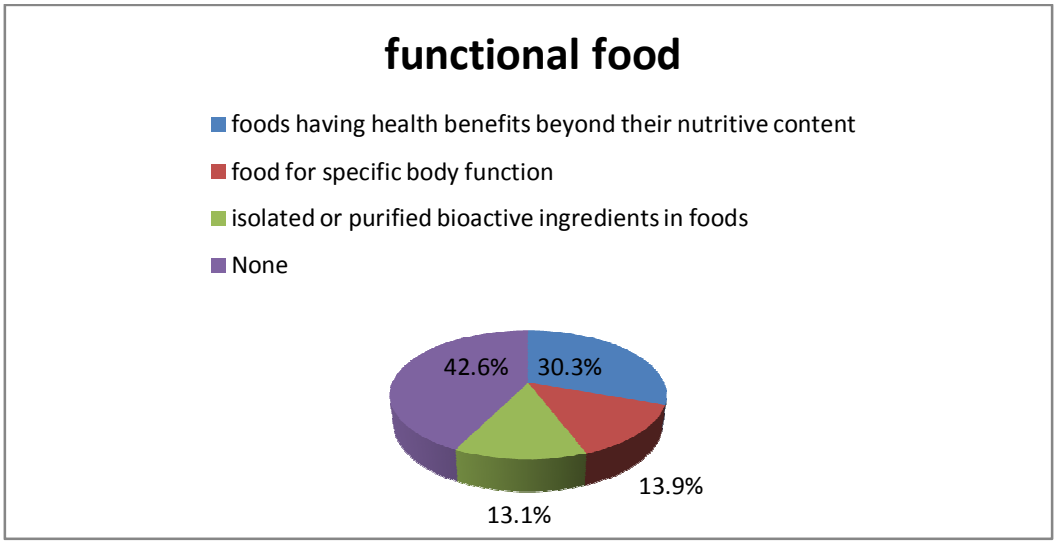


Fig. 4.7 Knowledge about functional food

Table no. 4.3.4 Have you about the word Nutraceutical

Know about the word Nutraceutical			
		Frequency	Percent
Respondent	yes	21	17.2
	no	101	82.8
	Total	122	100.0

In this table we were checking the awareness of the respondent on nutraceuticals then response of 21(17.2%) yes and 101(82.8%) NO. That means that population was not known about the nutraceutical.

Fig. 4.8 Knowledge about the nutraceutical

Table no. 4.3.5 An active component named allyl sulfur is present

An active component named allyl sulfur is present in			
		Frequency	Percent
Respondent	Apple	4	3.3
	sprouted pulses	81	66.4
	onion and garlic	37	30.3
	Total	122	100.0

In this table we were try to know an active compound allyl sulfur present in which foods they were given option like apple 4(3.3%) person respond for this, sprouted pulses 81 (66.4%) population responded with it, onion and garlic 37 (30.3%) population answered with right option.

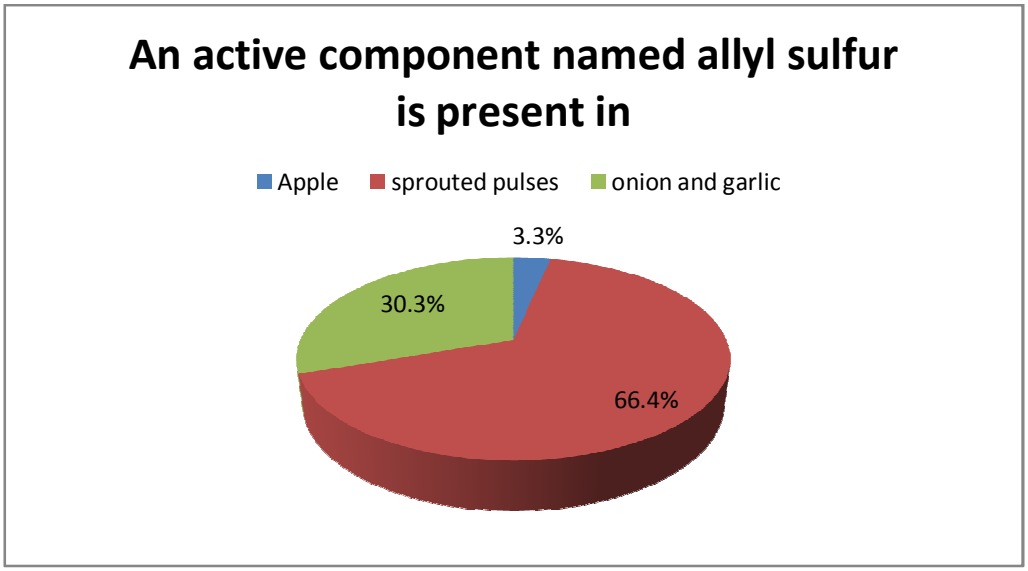


Fig. 4.9 Foods with active Sulfur contains

Table no. 4.3.6 What are the dietary fiber

The dietary fiber			
		Frequency	Percent
Respondent	complex foods	54	44.3
	Mineral	10	8.2
	indigestible polysaccharides	32	26.2
	Vitamins	6	4.9
	all above	20	16.4
	Total	122	100.0

In this table we were know that what was the dietary fiber present in the foods, gives them different option like complex foods 54 (44.3%) , mineral 10 (8.2%), indigestible polysaccharides 32 (26.2%), vitamins 6(4.9%), all above 20(16.4%) these were response of the respondent for different ingredients.

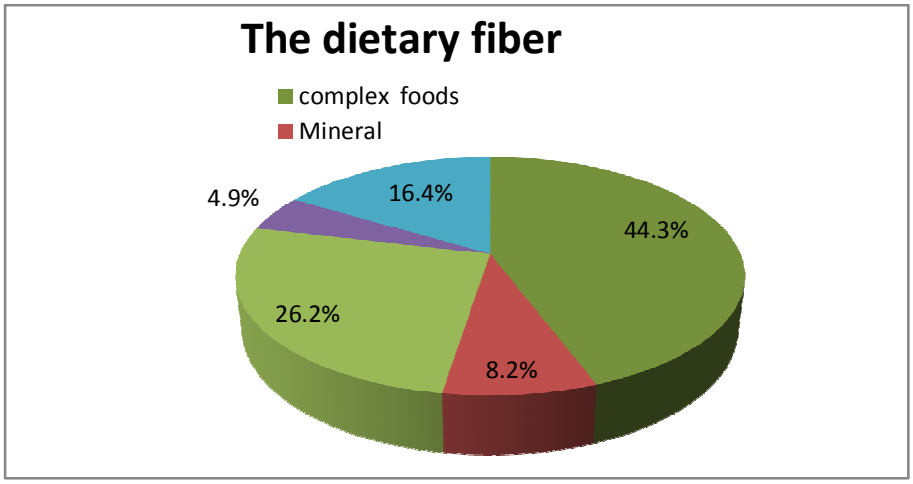


Fig. 4.10 What are the dietary fiber

Table no. 4.3.7 Fibers are present

Fibers are present in			
		Frequency	Percent
Respondent	fruits and vegetables	45	36.9
	whole cereals and pulses	47	38.5
	Both	30	24.6
	Total	122	100.0

In this table try to know that fiber present in which food items fruits and vegetables 45 (36.9%) response for this, whole cereals and pulses 47 (38.5%) and given both option then response was 30 (24.6%).

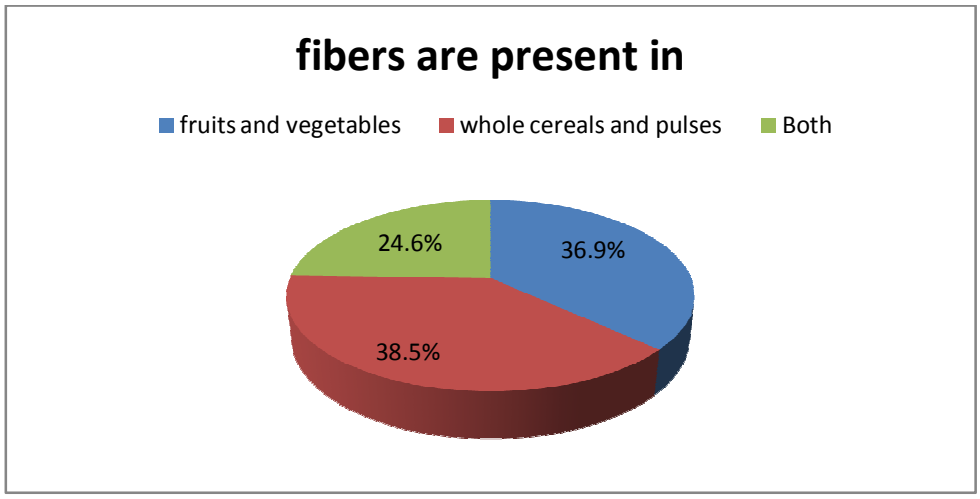


Fig. 4.11 Fiber representation in foods

Table no. 4.3.8 Isoflavones are found

isoflavones are found in			
		Frequency	Percent
Respondent	soy bean	11	9.0
	runner bean	15	12.3
	kidney bean	14	11.5
	all of the above	16	13.1
	don't know	66	54.1
	Total	122	100.0

Isoflavones a compound found in different types of beans in different quantity. The response of the population recorded as follows soy bean 11 (9%), runner bean 15 (12.3%), kidney bean 14 (11.5%), all above 16 (13.1%), do not know 66 (54.1%). The majority of the respondents do not know about the isoflavones

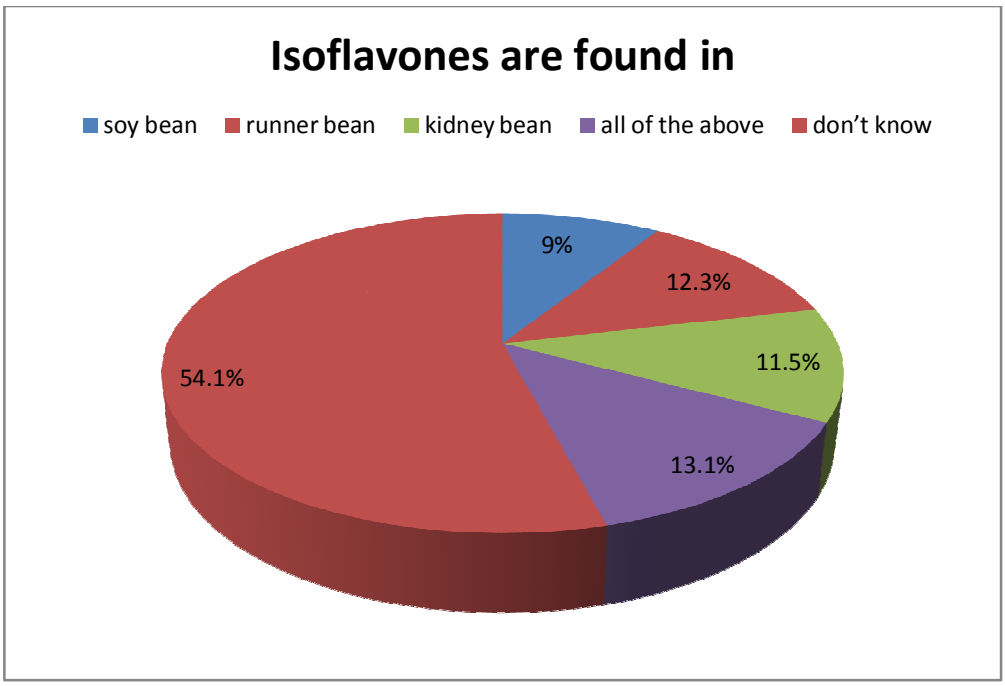


Fig.4.12 Isoflavones present in different foods

Table no.4.3.9 What is the colour of soybean

The colour of soybean			
		Frequency	Percent
Respondent	yellow	65	53.3
	red	11	9.0
	white	46	37.7
	Total	122	100.0

In this table question was putted just for the information that population knows or not the colour of soy bean. In this question three option were given yellow 65 (53.3%), red 11 (9%), white 46 (37.7%). These were the answer of respondent.

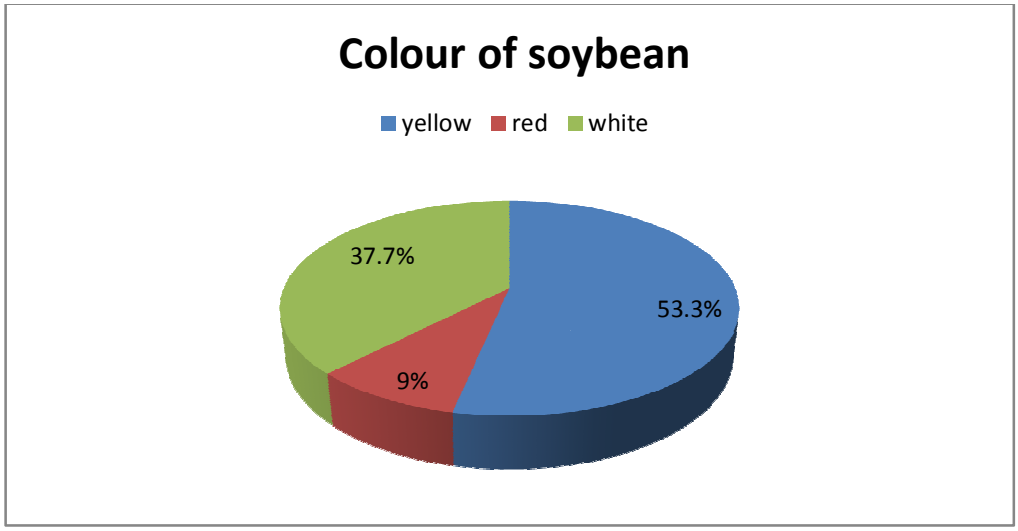


Fig. 4.13 Graphical presentation of colour of soybean

Table no. 4.3.10 Phytoestrogen

Phytoestrogen		
	Frequency	Percent
estrogen similar to human estrogen hormone	12	9.8
estrogen dissimilar to human estrogen hormone	10	8.2
chemical substances found in plants	14	11.5
none	86	70.5
Total	122	100.0

In this table we define that what are the phytoestrogens in different manner and check the response of the population. Estrogen similar to human estrogen 12 (9.8%), estrogen dissimilar to human estrogen hormone 10 (8.2%), chemical substances found in plants 14 (11.5%), and majority of the individuals do not know about the phytoestrogens 86 (70.5%).

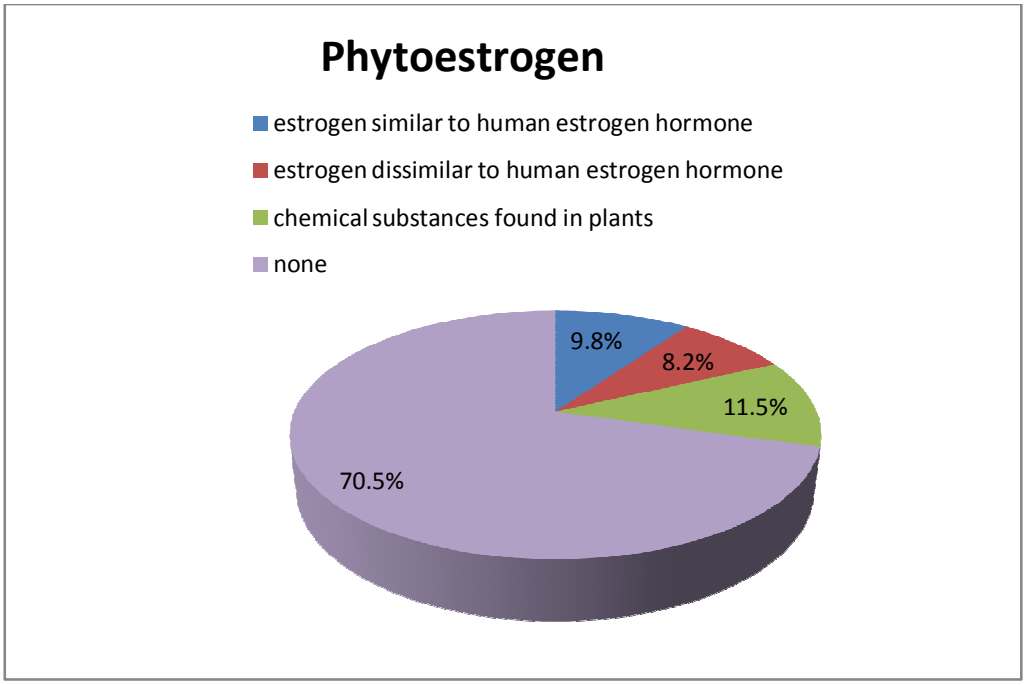


Fig. 4.14 Phytoestrogen similarity with human hormones

Table no. 4.3.11 Do you think isoflavones are phytoestrogen

do you think isoflavones are phytoestrogen			
		Frequency	Percent
Respondent	yes	32	26.2
	no	90	73.8
	Total	122	100.0

In this table we were checking the awareness of the respondent that they think that isoflavones were phytoestrogens. Then response of 32(26.2%) yes and 90 (73.8%) NO. That means that they are not aware about phytoestrogen.

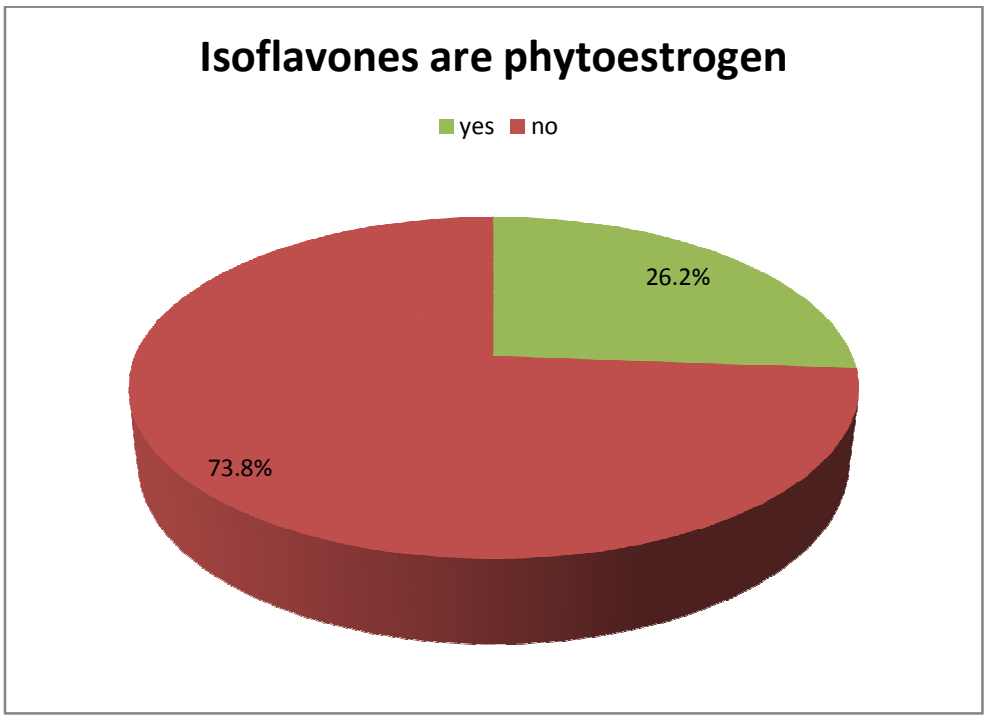


Fig.4.15 Relation between isoflavones and phytoestrogen

Table no. 4.3.12 Green tea Rich in

Green tea rich in			
		Frequency	Percent
Respondent	Catechins	49	40.2
	Curcumin	45	36.8
	DHA and EPA	28	23.0
	Total	122	100.0

In this table we were checking that green tea rich in which nutrients and collect the knowledge of the respondent. Catechins 49 (40.2%), curcumin 45 (36.9%) and

DHA & EPA 28 (23%). According to response they were aware about green tea but not much as in nutrients they know about its benefits.

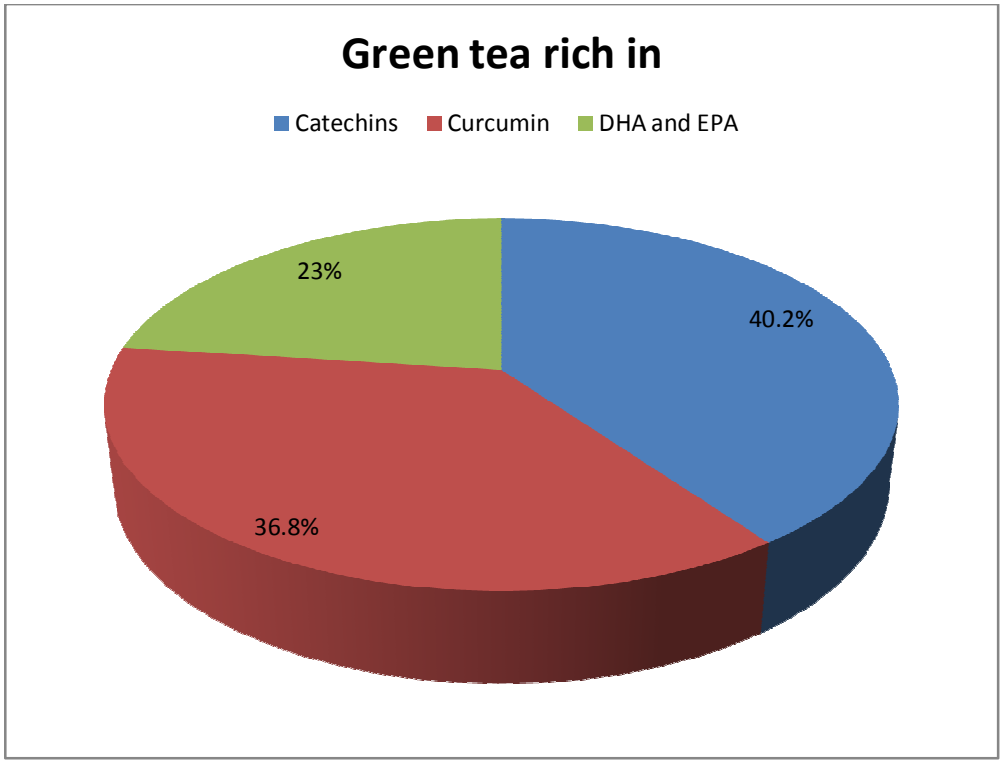


Fig.4.16 Green tea source

Table no. 4.3.13 Beta carotene is found in

Beta carotene is found in			
		Frequency	Percent
Respondent	yellow and orange fruits	63	51.6
	green leafy vegetables	29	23.8
	both	30	24.6
	Total	122	100.0

<

In this table we were checking that beta carotene found in which type of fruits and vegetables, yellow and orange fruits 63 (51.6%), green leafy vegetables 29 (23.8%) and for both 30 (24.6%). According to response that they were aware about the beta carotene.

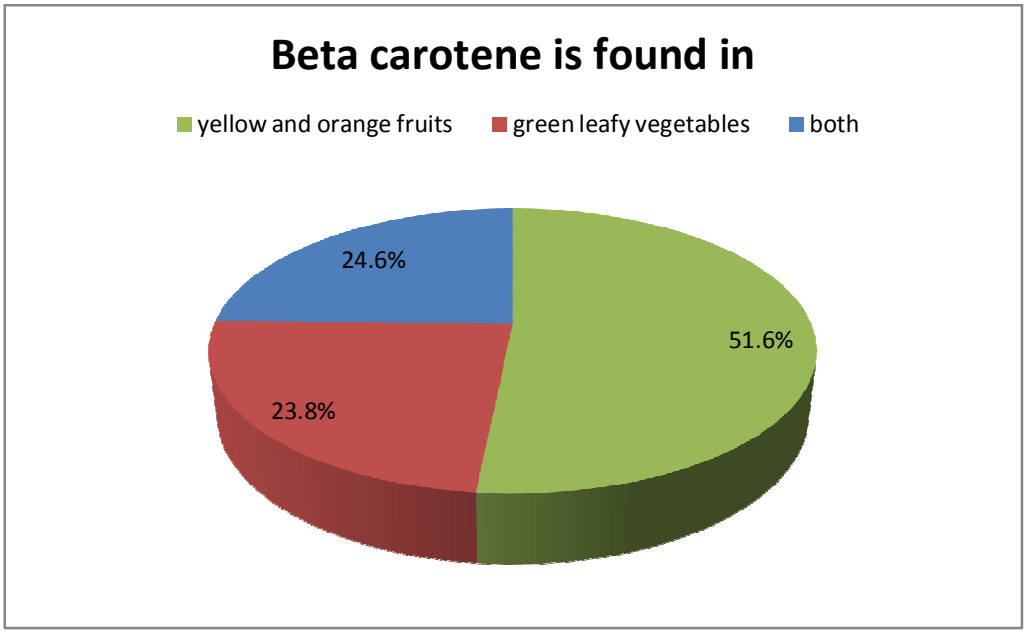


Fig. 4.17 Presence of beta carotene

4.4 Like- scale agreement level for the herbal product acceptance

Table no. 4.4.1 Herbal product and dietary supplement can be for health promotion

herbal product and dietary supplement can be for health promotion			
		Frequency	Percent
Respondent	Strongly Agree	54	44.3
	Agree	27	22.1
	neutral	17	13.9
	disagree	24	19.7
	Total	122	100.0

In this table we were checked to know that herbal product and dietary supplement can be for health promotion for population. The response was recorded that strongly agree 54 (44.3%), agree 27(22.1%), neutral 17 (13.9%), disagree 24(19.7%). According to response it was clear that consumer were using the herbal product for their daily routine bases.

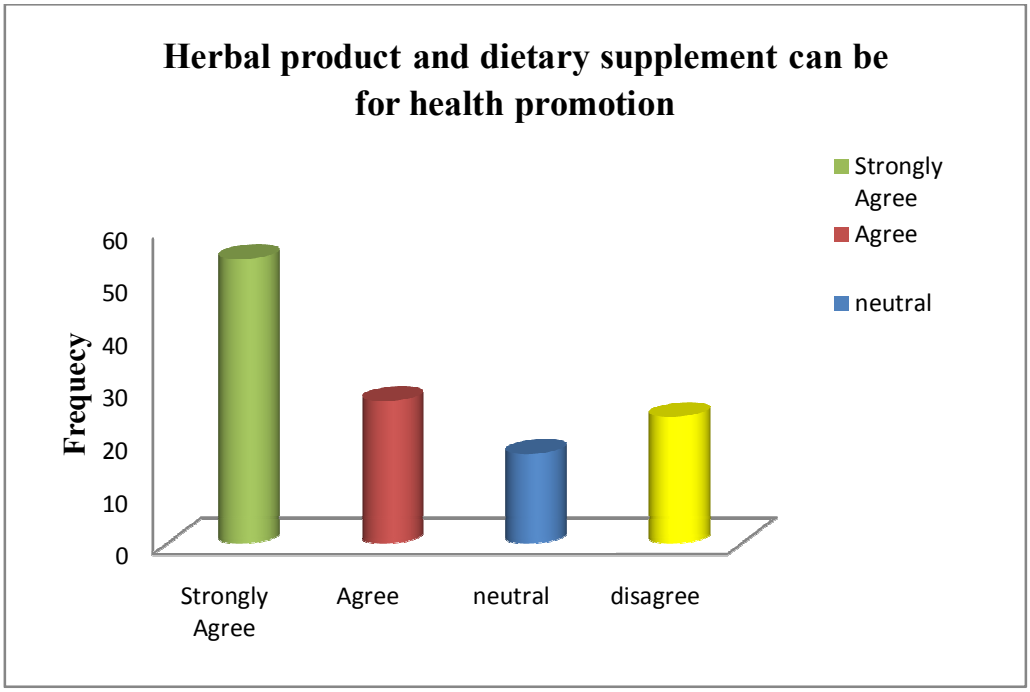


Fig.4.18 Herbal product for health promotion

Table no. 4.4.2 Herbal product and dietary supplement can have harmful side effect

herbal product and dietary supplement can have harmful side effect			
		Frequency	Percent
Respondent	strongly agree	9	7.4
	agree	16	13.1
	neutral	19	15.6
	disagree	78	63.9
	Total	122	100.0

In this table we were trying to know that herbal product causes the harmful side effect response of the population strongly agree 9(7.4%), agree 16(13.1%), neutral 19(15.6%), disagree 78 (63.9%). On the basis of this respond we said that herbal product was not causes

any side effect to health.

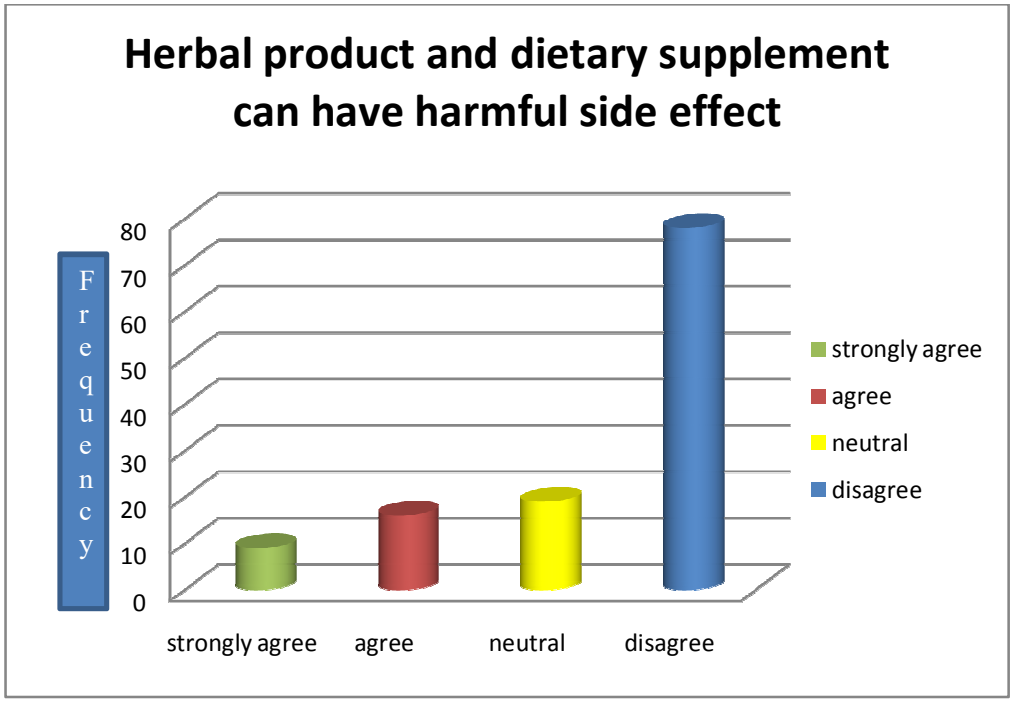


Fig.4.19 Herbal product ad their side effect

Table no. 4.4.3 Herbal product dietary supplement can interact with other supplement

Herbal product dietary supplement can interact with other supplement			
		Frequency	Percent
Respondent	strongly agree	8	6.6
	agree	33	27.0
	neutral	48	39.3
	disagree	33	27.0
	Total	122	100.0

In this question herbal product dietary supplement can interact with other supplement, we found that strongly agree 8 (6.6%), agree 33 (27%), neutral 48 (39.3%), disagree 33 (27%). On the basis of their response we could say that they were not aware that herbal product can interact with other supplements.

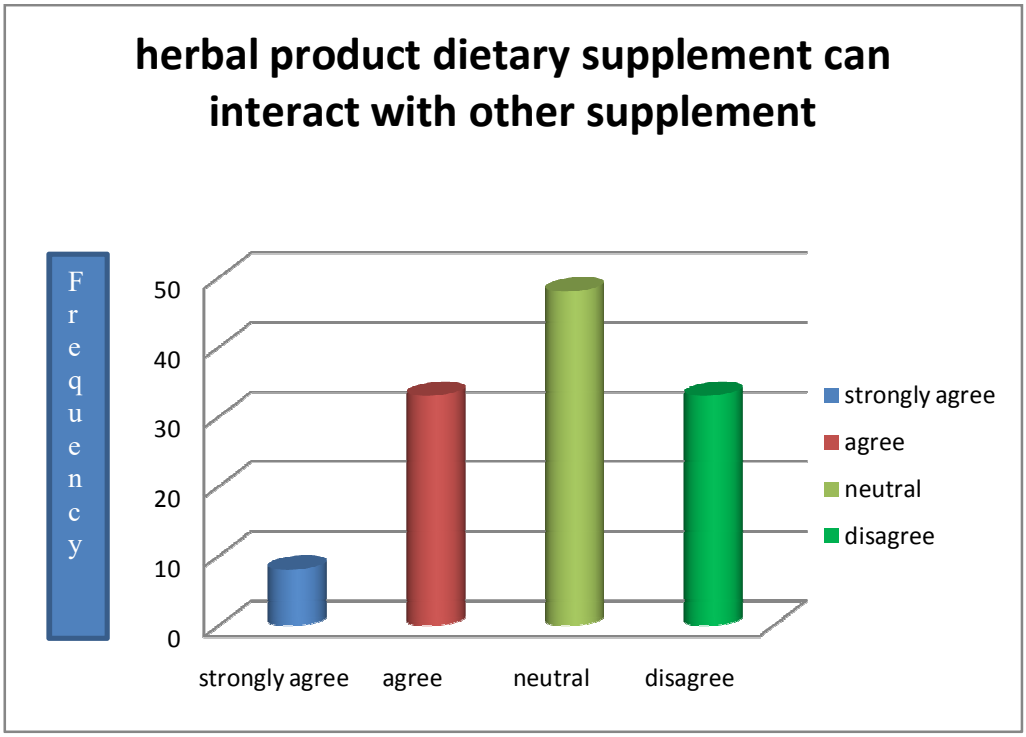


Fig.4.20 Herbal product interaction with food

Table no. 4.4.4 Feel comfortable my use of herbal product by doctor or health care provider

feel comfortable discussing my use of herbal product by doctor or health care provider			
		Frequency	Percent
respondent	strongly agree	37	30.3
	Agree	26	21.3
	Neutral	43	35.2
	Disagree	16	13.1
	Total	122	100.0

In this table using the herbal product prescription by doctor or health care provider they were used by consulted by doctor or health care strongly agree 37 (30.3%) and agree 26 (21.3%), majority number were neutral 43 (35.2%), some

people were disagree 16 (13.1%) with no need to ask by any because that herbal product was good to use and healthy. Similar study done by the mean agreement level for consumers' comfort in discussing use of herbal products and dietary supplements with healthcare professionals was high, 4.39 for physicians. [Owens et al. 2014].

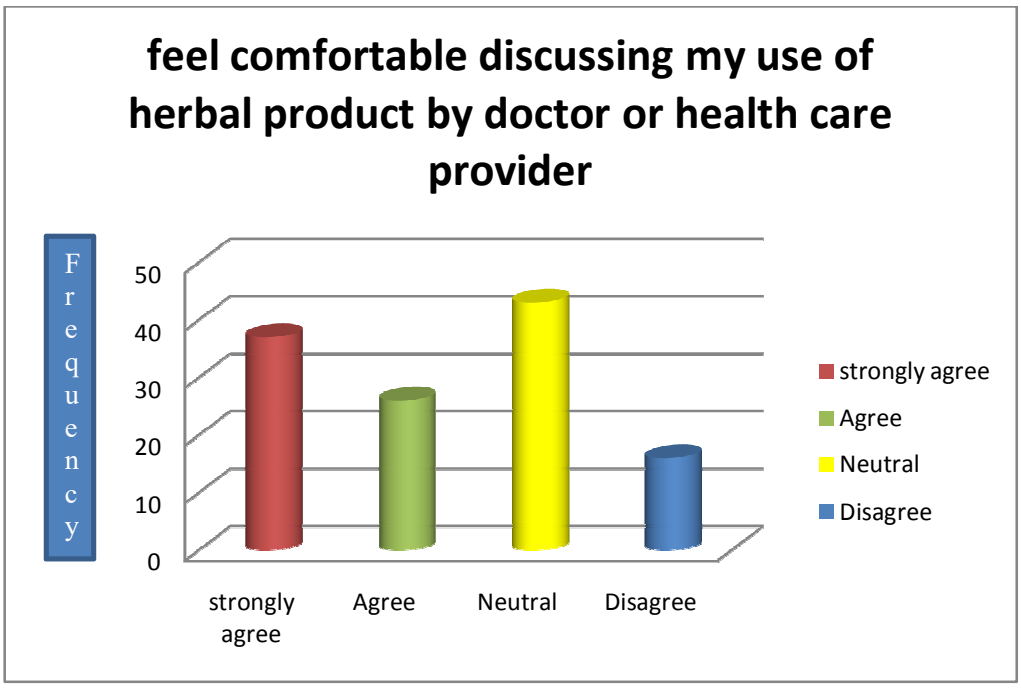


Fig.4.21 Use of herbal product by consulting doctor or health care

Table no. 4.4.5 Feel comfortable discussing my use of herbal product by pharmacist

feel comfortable discussing my use of herbal product by pharmacist			
		Frequency	Percent
Respondent	strongly agree	6	4.9
	agree	31	25.4
	neutral	37	30.3
	disagree	48	39.3
	Total	122	100.0

In this table we were knows that they were using herbal product by the recommendation of pharmacist response was found that strongly agree 6 (4.9%), agree 31 (25.4%), neutral 37 (30.3%) disagree 48 (39.3%). According to frequency could say that mostly population recommend herbal product with doctors permission. Similar study on the use herbal productthe mean agreement level for consumers' comfort in discussing use of herbal products and dietary supplements with healthcare professionals 4.32 pharmacists. [Owens et al. 2014]

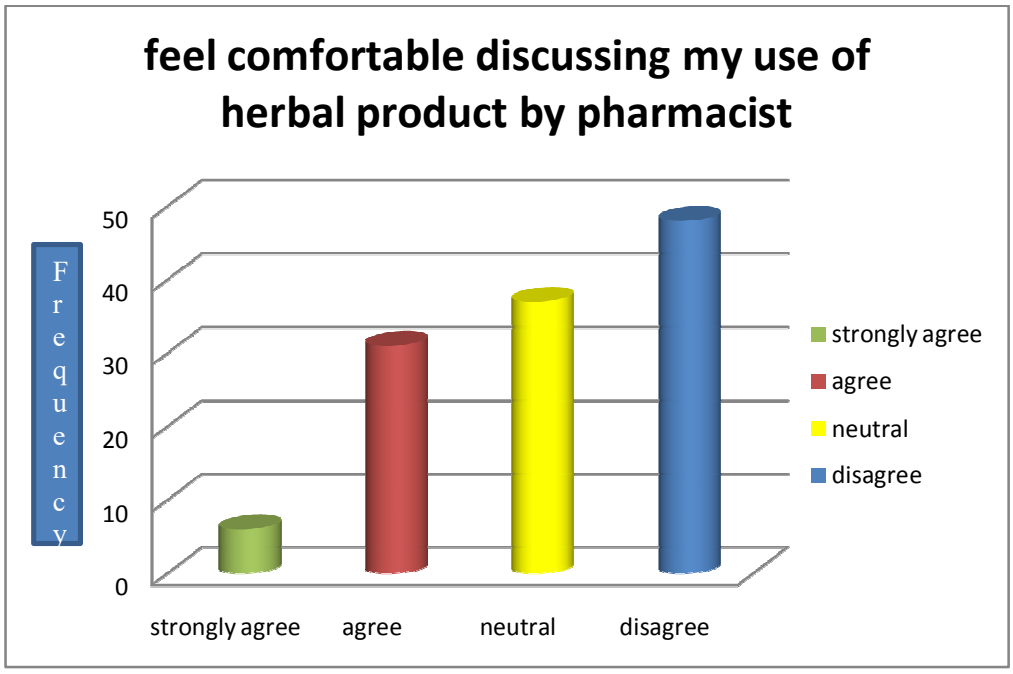


Fig.4.22 Use of herbal product by consulting pharmacist

A frequently reported finding of other surveys indicate that many individuals fail to inform their primary health care providers of all the herbal products and dietary supplements they may be taking for a variety of reasons, including fear of judgment or ridicule [Snyder et al. 2009, Samojlik et al. 2013, Tangkiatkumjai et al. 2013]. However, according to a recently published cross-sectional survey, the main reason for non-report was due to healthcare providers not asking [Tangkiatkumjai et al. 2013]. A positive finding of our survey was the reported comfort level of respondents in discussing use of dietary supplements with both physicians and pharmacists. This is encouraging and reinforces the need

for healthcare providers to assess the use of dietary supplements in their patients prior to initiating treatment. Strengthening communication between patients and healthcare professionals will support positive outcomes in patient treatment.

4.4 Dietary information

Table no. 4.5.1 Preference of diet

Type of diet you prefer			
		Frequency	Percent
Respondent	vegetarian	55	45.1
	non vegetarian	67	54.9
	Total	122	100.0

During survey procedure checking the dietary information of the respondent, asked by the respondent they prefer which type of diet in daily bases. The frequency of the respondent 55(45.1%) population were pure vegetarian and 67(54.9%) were found non-vegetarian. Half of the population was consuming both type of diet that means they were

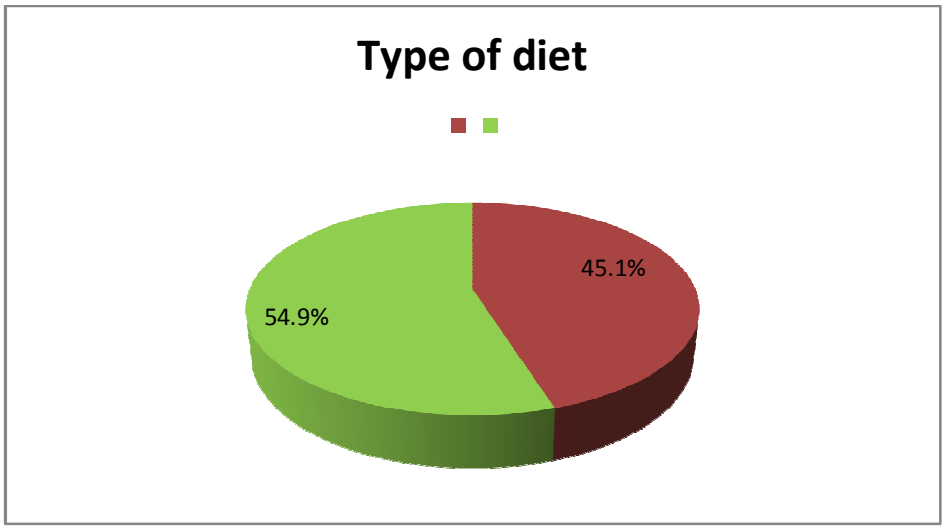


Fig.4.23 Preference of diet

Table no. 4.5.2 The frequency of meal intake

The frequency of meal intake			
		Frequency	Percent
Respondent	2 times	16	13.1
	3 times	86	70.5
	4 times	18	14.8
	5 times	2	1.6
	Total	122	100.0

During survey were asked by the respondent frequency of meal intake in day, 16(13.1%) population were respond 2 times meal intake, 86(70.5%) 3 times, 18(14.8%) 4 times and 2(1.6%) 5 times. It was clearly indicated that 70% population aware that how many time diet will consume in a day and 14.8% more aware they were consuming diet 4 times in day.

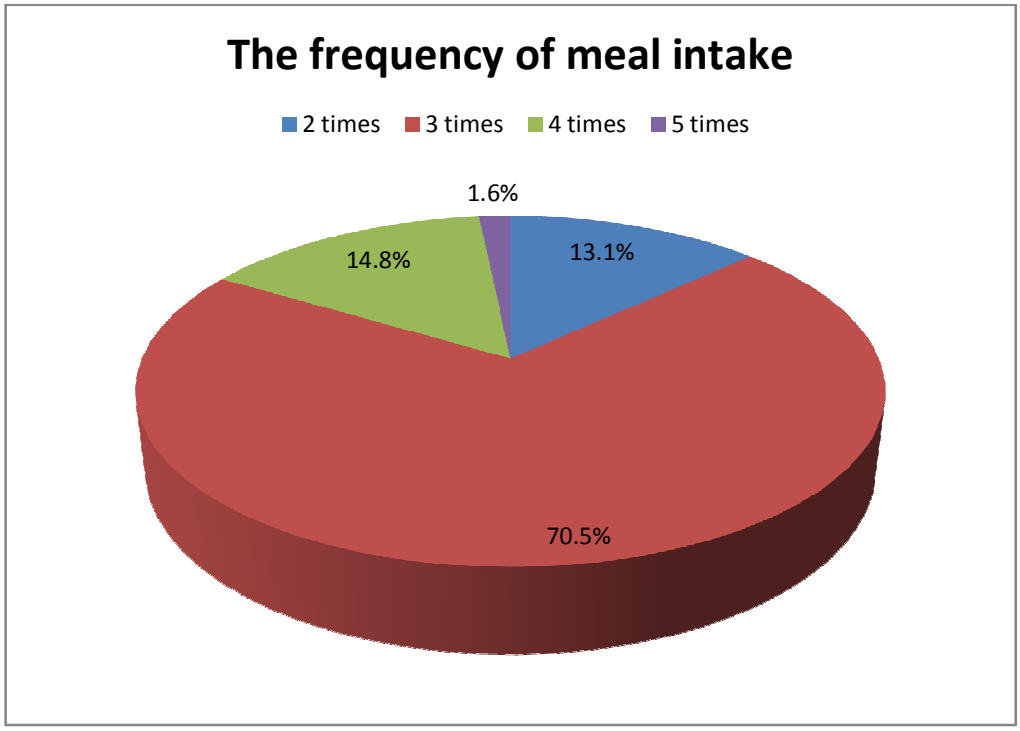


Fig.4.24 Frequency of meal intake

Table no. 4.5.3 Preference of junk food

Preference of junk food			
		Frequency	Percent
Respondent	Monthly	13	10.7
	Weekly	20	16.4
	Everyday	2	1.6
	occasionally	87	71.3
	Total	122	100.0

In this table shows that preference of junk food of the respondent 13(10.7%) once or twice in a month, 20(16.4%) were prefer once in a week, 2 (1.6%) prefer on the daily bases, majority of the population prefer occasionally which were 87(71.3%). From the above table it was indicated that they were knowing that fast food consumption was not good for health that was the reason behind most of the population consuming fast food occasionally or they were not consume regular basis.

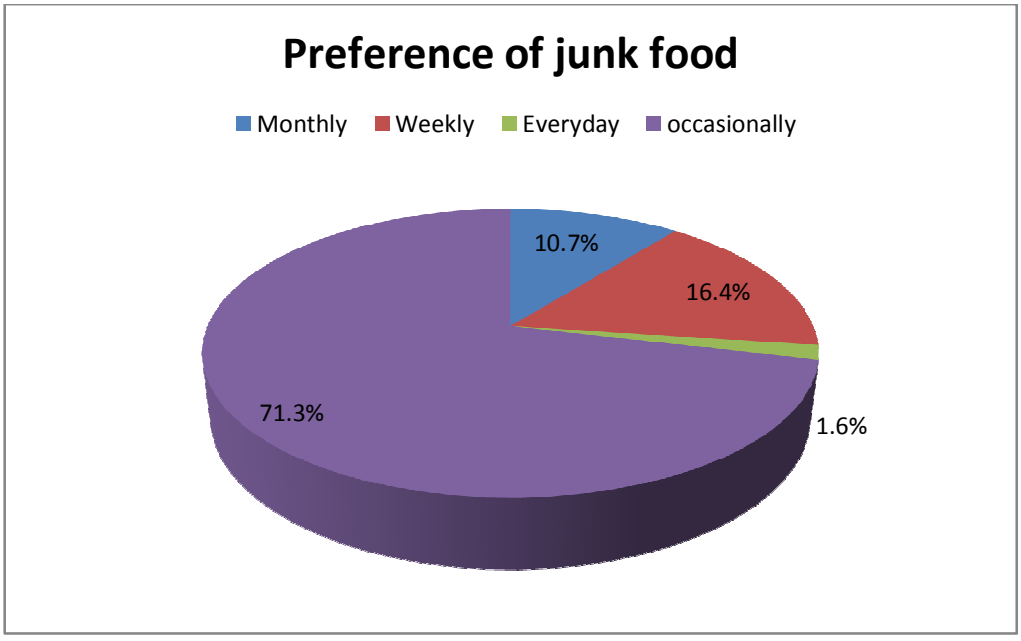


Fig. 4.25 Preference of junk food

Table no.4.5.4 Preference of street food

Name of junk food/street food which do you prefer most			
		Frequency	Percent
Respondent	pani puri	23	18.9
	Samosas	39	32.0
	Chaumin	8	6.6
	Burger	4	3.3
	Chaat	6	4.9
	Others	42	34.4
	Total	122	100.0

In this table and pie chart shows that name of junk food/ street food most prefer by the respondent 23(18.6%) population were prefer pani puri, 39(32.0%) were prefer most, chaumin preferred by 8(6.6%) respondent, burger and chaat were prefer less which was 4(3.3%) and 6(4.9%) respectively. In the above name mentioned junk foods others were prefer 42(34.4%) population. Most of the respondent was preferred by pani puri and samosas for consuming but it was not good for health because most of the street venders not handle with hygienic conditions and samosas was fried in used oil which may have the trans fat which causes carcinogenic.

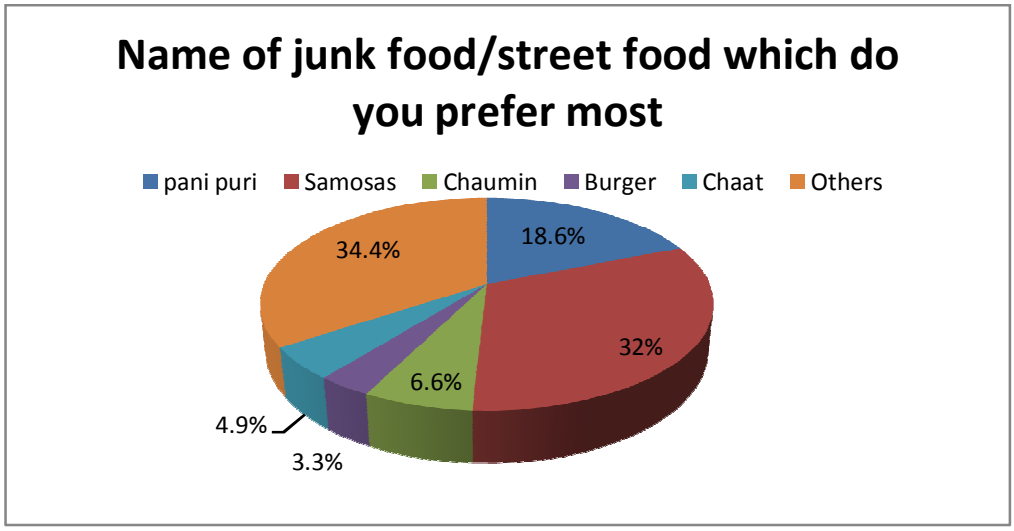


Fig.4.26 Types of junk food

Common food practices that daily uses by population

Table no. 4.5.5 Uses of pulses

uses of pulses			
		Frequency	Percent
Respondent	Daily	107	87.7
	2-3days/week	15	12.3
	Total	122	100.0

In this table use of pulses by population on this basis of daily consumption 107(87.7%) and 2-3 times in week 15(12.3%). This means that the total no. of population consuming pulses more on the daily routine.

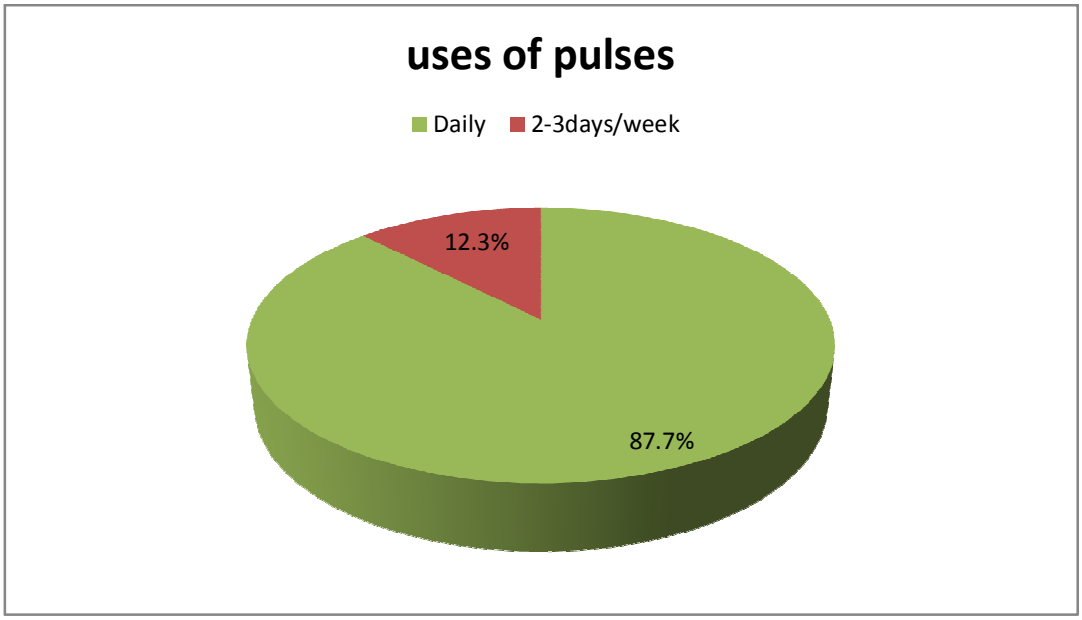


Fig. 4.27 Uses of pulses

Table no. 4.5.6 Uses of milk

Uses of milk			
		Frequency	Percent
Respondent	Daily	70	57.4
	2-3week/day	36	29.5
	Weekly	2	1.6
	Occasionally	14	11.5
	Total	122	100.0

In this table use of milk by the population on daily basis 70(57.4%) consume daily, 2-3/week 36(29.5%) were consuming, weekly 2(1.6%) and occasionally 14(11.5%). The conclusion draw from this table that majority of population were consuming milk on regular.

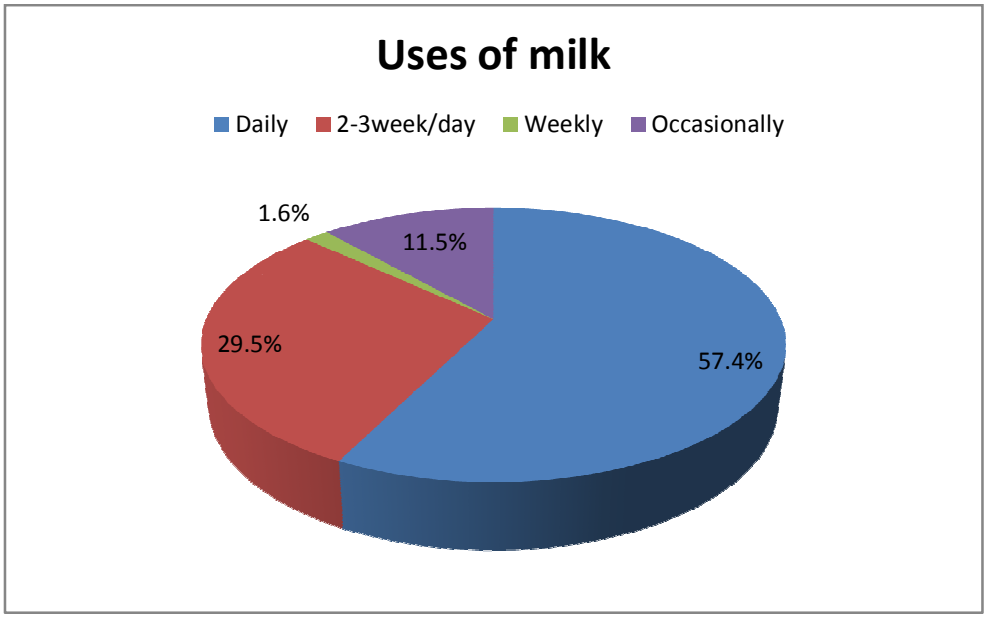


Fig.4.28 Uses of milk

Table no. 4.5.7 Uses of vegetables

Uses of vegetable			
		Frequency	Percent
Respondent	Daily	58	47.5
	2-3 days/ week	60	49.2
	Weekly	4	3.3
	Total	122	100.0

In this table use of vegetables by the population on daily basis 58(47.5%) consume daily, 2-3/week 60(49.2%) were consuming, weekly 4(3.3%) and occasionally consumption of vegetables record were not found. The conclusion draw from this table that majority of population were consuming vegetables on 2-3 days/week.

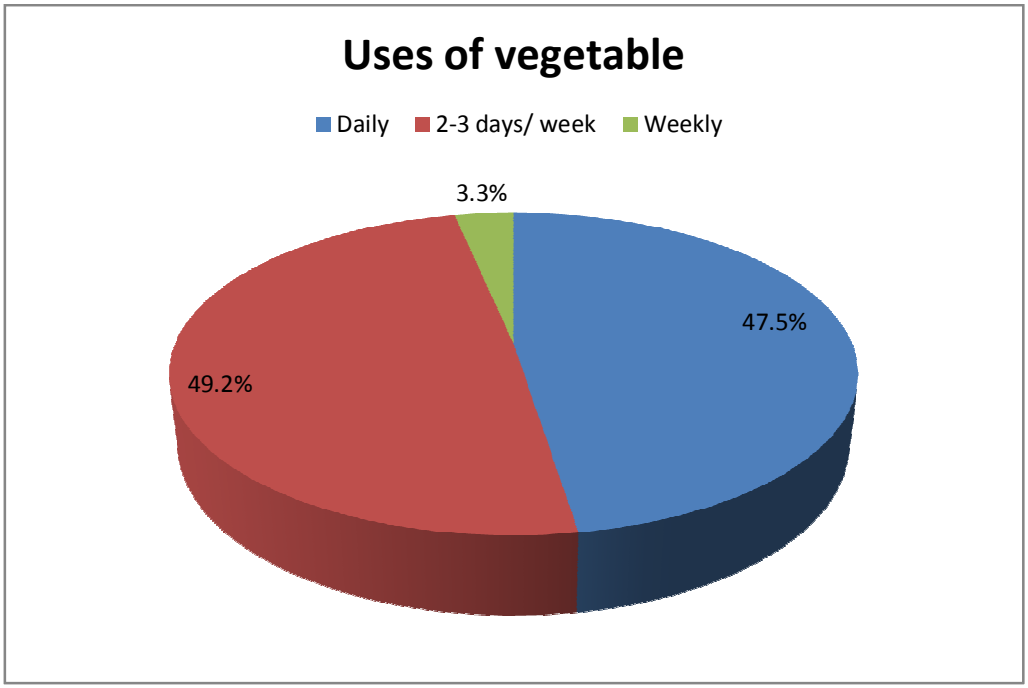


Fig.4.29 Uses of vegetables

Table no. 4.5.8 Uses of fruits

Uses of fruits			
		Frequency	Percent
Respondent	Daily	53	43.4
	2-3 days/week	56	45.9
	Weekly	13	10.7
	Total	122	100.0

In this table use of fruits by the population on daily basis 53(43.4%) consume daily, 2-3/week 56(45.9%) were consuming, weekly 13(10.7%) and occasionally consumption record were not found. The conclusion draw from this table that majority of population were consuming fruits on 2-3days/week.

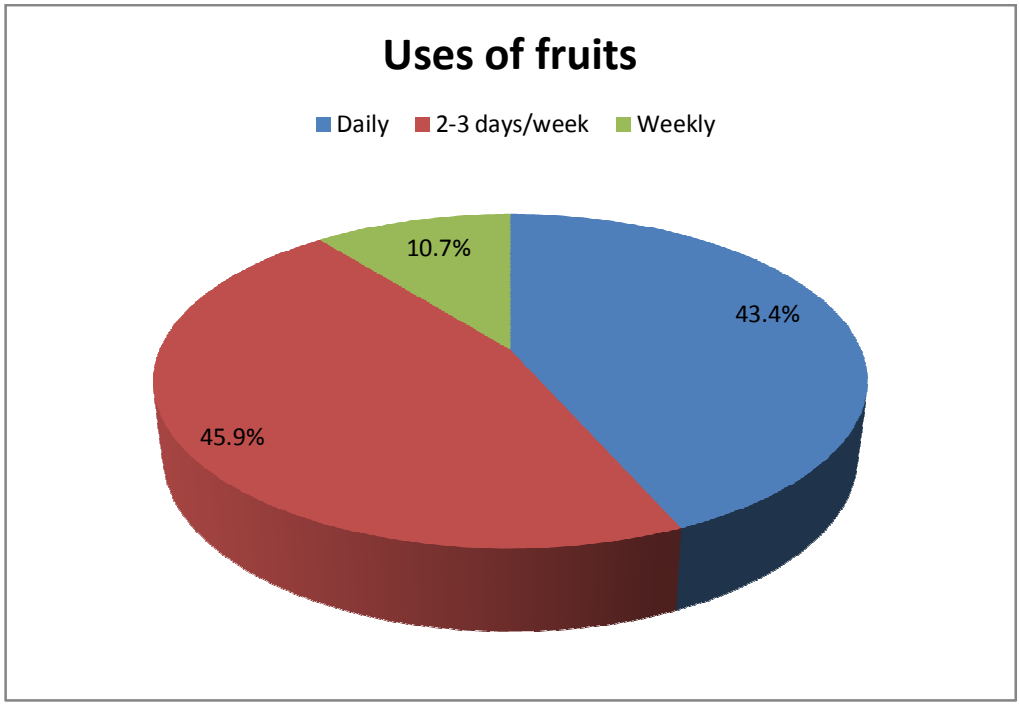


Fig.4.30 Uses of fruits

Table no. 4.5.9 Uses of sugar/jaggery

Uses of sugar/jaggery			
		Frequency	Percent
Respondent	Daily	103	84.4
	2-3 days / week	7	5.7
	Weekly	2	1.6
	Occasionally	10	8.2
	Total	122	100.0

In this table use of sugar/jiggery or sugar products by the population on daily basis 103(84.4%) consume daily, 2-3/week 7(5.7%) were consuming, weekly 2(1.6%) and occasionally 10(8.2%). The conclusion draw from this table

that majority of population were consuming sugar/jiggery or sugar products on regular.

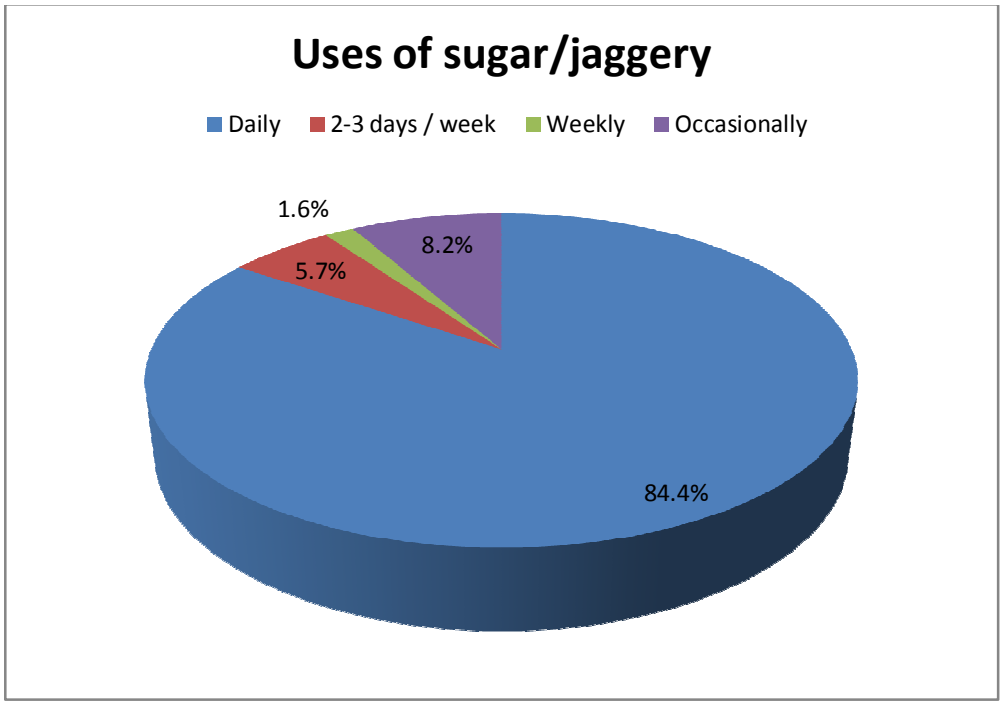


Fig.4.31 Uses of sugar ad jaggery

Table no. 4.5.10 Uses of meat and meat product

Uses of meat and meat product			
		Frequency	Percent
Respondent	2-3 days /week	18	14.8
	Weekly	30	24.6
	Occasionally	21	17.2
	Missing System	53	43.4
Total		122	100.0

In this table use of meat and meat by the population on daily basis record not found for consuming daily, 2-3/week 18(14.8%) were consuming, weekly 30(24.6%) and occasionally 21(17.2%). The conclusion draw from this table that majority of population were consuming meat on weekly.

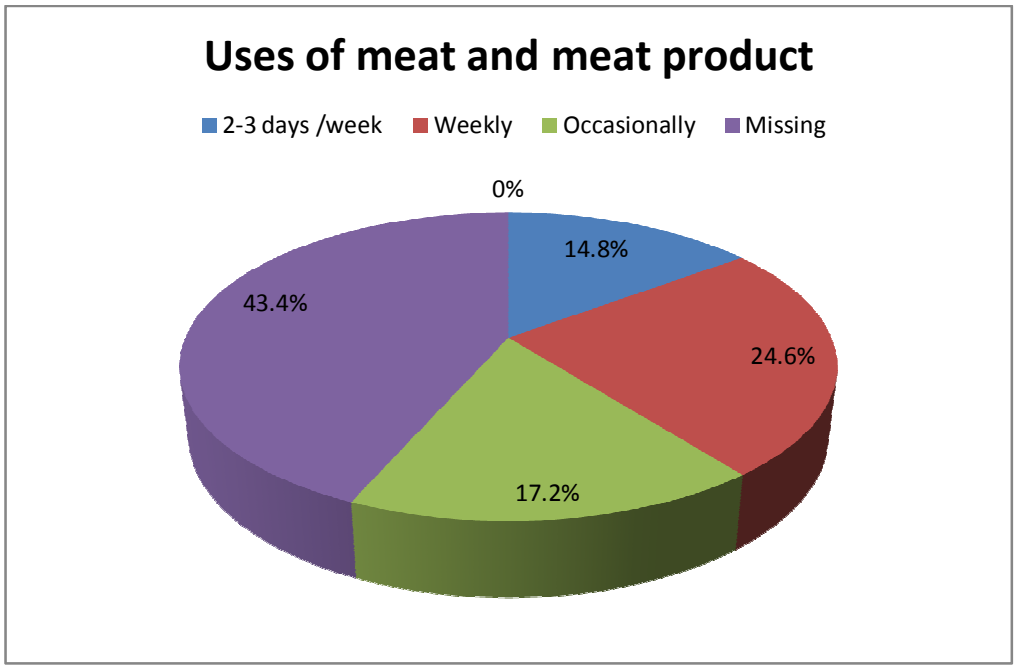


Fig.4.32 Uses of meat and meat products

Another study was done on diet and Food intake was assessed in detail using a modified dietary history consisting of a 3-day record and a meal based list of foods to check the usual consumption of the previous month (de Groot et al. 1988). Food consumption data were converted into nutrient data by using country-specific food composition tables. Based on the knowledge on circadian rhythms, it was hypothesized that different mealtime patterns across Europe might lead to different metabolic responses and can thus influence the onset and development of disease (Schlittwein et al. 1996). The relations between the energy contribution of the midday meal and other factors that can influence health, such as the total intake of energy and the consumption of certain foods (Schlittwein et al. 1999), might also play a role.

4.5 Nutrients of the product

Table no. 4.6 Nutritional value of the product

Nutritional Content (per100gms)	
Protein(g)	**16.25**
Carbohydrate(g)	**20**
Fat(g)	**5**
Carotene(µg)	**599**
Folic acid(µg)	**34.5**
Zinc(mg)	**1.06**
Energy(Kcal)	**180**

Nutrients are micronutrients required in little amount and are including in the gene expression. The measure of Vitamin-A present as carotene in this item is (599 g/100g). PEPCK is vitamin A reliant protein associated with transformation of oxaloacetate to phospho enol pyruvate, one of the vital strides in gluconeogenesis Phosphoenol pyruvate carboxykinase (PEPCK) gene expression is diminished in vitamin A– deficiency (VAD) mice. Vitamin A inadequacy condition prompts changes in chromosomal structure of RARE (Retinoic Acid Responsive Element), which further prompts change in co controller authoritative and action. The decrease in RNA Pol (polymorphism) II affiliation is characteristic of interference in the immediate associations of RNA Pol II with the PEPCK promoter, with general interpretation factors as well as with co controller particles that add to the enactment of the PEPCK quality. These outcomes increment comprehension of the sub-atomic reason for diminished PEPCK gene expression in VAD mice *in vivo* and offer extra knowledge into the guideline of other retinoid responsive qualities (Kelly *et al*., 2003)

Carbohydrate

Estimated carbohydrate is (20g/100g), The role of dietary carbohydrate in weight gain has turned into an imperative inquiry in the public consciousness. Carbohydrates have been generally named basic (monomeric and dimeric) or complex (polymeric) based on their synthetic structure. A basic deformity of this characterization is its failure to predict the plasma glucose and insulin reactions related with various sorts of starches. The glycemic index, created two decades back (Jenkins *et al*., 2002) [10] permits examination of various nourishments dependent on their physiologic impacts as opposed to on their chemical composition. A positive relationship between glycemic index and body weight has been appeared a few momentary trial studies and restricted observational investigations (Ludwig *et al*., 1999) [13]. The possible biologic systems of glycemic index on body weight are believed to be identified with insulin levels, craving and satiation, and fundamental metabolic procedures (Roberts, 2000).

Protein

Protein (16g/100g) is fundamental for development, to create resistance, typical upkeep of body capacity and structure separated from multiplication and generation. The function of protein in body is not just at full macro level however it additionally works at gene dimension. An assortment or number of genes reacts to dietary protein both protein amounts just as quality impacts quality articulation. Insulin secretion was decreased in rodents, which are encouraged with low protein diet because of decrease in pancreatic b-cell mass lower reaction of remaining □-cells to supplements and brought down protein kinase activity (PKA). PKA is associated with capability of glucose actuated insulin secretion by gastrointestinal hormones, for example, GIP and GLP-1. Low protein diet nourishing to rodents modified the numerous quality articulation, which are in charge of proteins identified with insulin biosynthesis, secretion and cell redesigning. Ordinary insulin discharge is affected by dimension of Protein Kinase C (PKC), K+ channel protein, calcium particle (Ca 2+) and PKA□. Expanded ATP to ADP proportion accomplished through glucose digestion, close the K+ ATP channel, which prompts depolarization of b-cells. Depolarized □-cells opens the voltage subordinate Ca 2+ directs which results in flood of calcium prompts exocytosis of

insulin granules. Encouraging low protein diet likewise expanded articulation of PFK in islets (tetramers M, P, L, and C) results in blemished glucose digestion; it further prompts expired glucose instigated insulin emission. Sustaining low protein diet diminishes insulin level; it additionally acts through diminished development of intracellular calcium.

Dietary fat

Fat present (5g/100g), unsaturated fats, notwithstanding their imperative job as vitality yielding supplements, may apply a noteworthy effect on the guideline of quality articulation (Jump *et al*., 1999) [9]. A few rat examines demonstrate that dietary lipids weak the outflow of qualities in skeletal muscle, with an expansion in the errand person RNA (mRNA) articulation of qualities associated with unsaturated fat digestion after iso-vigorous high-fat weight control plans contrasted and low fat, high-starch slims down (Samec *et al*., 1999) [20]. The impact of changed dietary fat admission on the declaration of qualities encoding proteins fundamental for unsaturated fat transport and ß-oxidation in skeletal muscle has been reported. A fast and checked limit with respect to changes in dietary fatty acid accessibility to adjust the statement of mRNA-encoding proteins is essential for fatty acid transport and oxidative digestion. This finding is proof of supplement quality communications in skeletal muscle.

Folate

Folate (34.5 g/100g) is one of the B-group vitamins (like niacin) and is basic for the amalgamation (making) of the nucleic acid RNA and DNA. It is additionally associated with DNA replication and fix. Folate goes about as a co-factor for some, compounds, enabling them to catalyze response. Folate can likewise influence how DNA is translated to mRNA and afterward to proteins that is gene expression. For instance, a supplement called folate, which is found in green vegetables, citrus, entire green grains and bread is basic for making DNA and RNA.

Zinc

Zinc (1.06 g/100g) is a essential trace element with co-factor works in a substantial number of proteins of delegate metabolism, hormone discharge pathways and immune defense mechanism. Zn is engaged with guideline of small intestinal, thymus and hepatocytes quality articulation. (Tako *et al*., 2003) MTF-I (Metal Responsive component Factor-I) is a Zn subordinate transcriptional activator directs mettalothionin I and II through MRE (Menard, 1981). Zn subordinate KLF4 interpretation factor is associated with protein planning of HT-29 cells. The other protein have Zn in it as constituents are ATP feelings, cytochrome c, a, NADP dehydrogenase I and II directed by Zn.

4.7 Product acceptance

Table no. 4.7.1 Appearance scale of Product Acceptance

Appearance scale			
		Frequency	Percent
Respondent	like moderately	27	54.0
	like slightly	10	20.0
	neither like nor dislike	9	18.0
	dislike moderately	4	8.0
	Total	50	100.0

This bar diagram shows that 54% respondent were likely moderately, 8% respondent dislike moderately. This data was reveal on the basis of the public opinion on the time of survey for checking the quality of the product for acceptance.

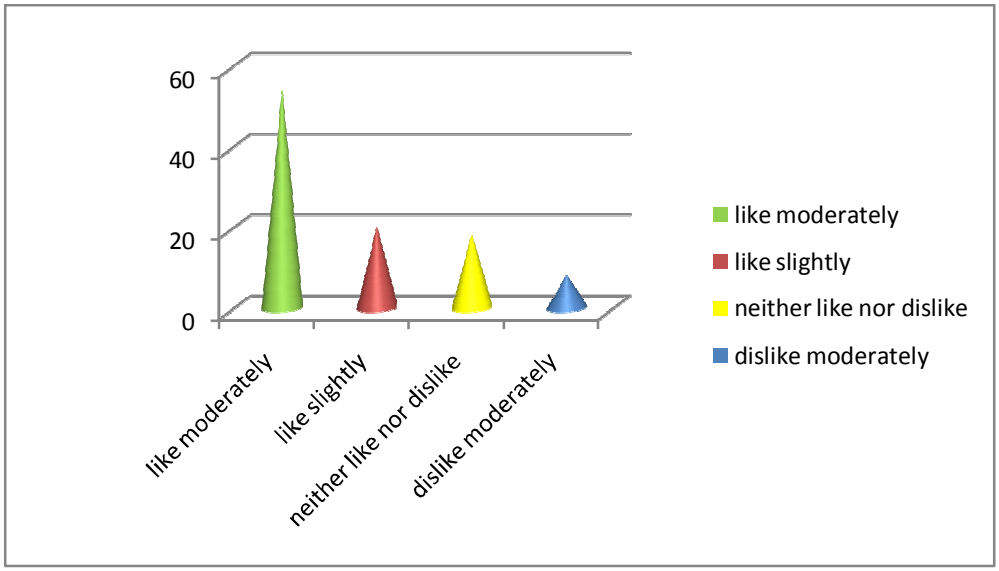


Fig.4.33 Like product on Appearance base

Table no. 4.7.2 Taste of the Product

Taste			
		Frequency	Percent
Respondent	like moderately	2	4.0
	like slightly	31	62.0
	neither like nor dislike	11	22.0
	dislike slightly	5	10.0
	dislike moderately	1	2.0
	Total	50	100.0

This diagram shows that taste of the product checking of the respondent 62% people likes the taste. This review was drawn by publically by taste on bites of product consumed at the time of acceptance was checking.

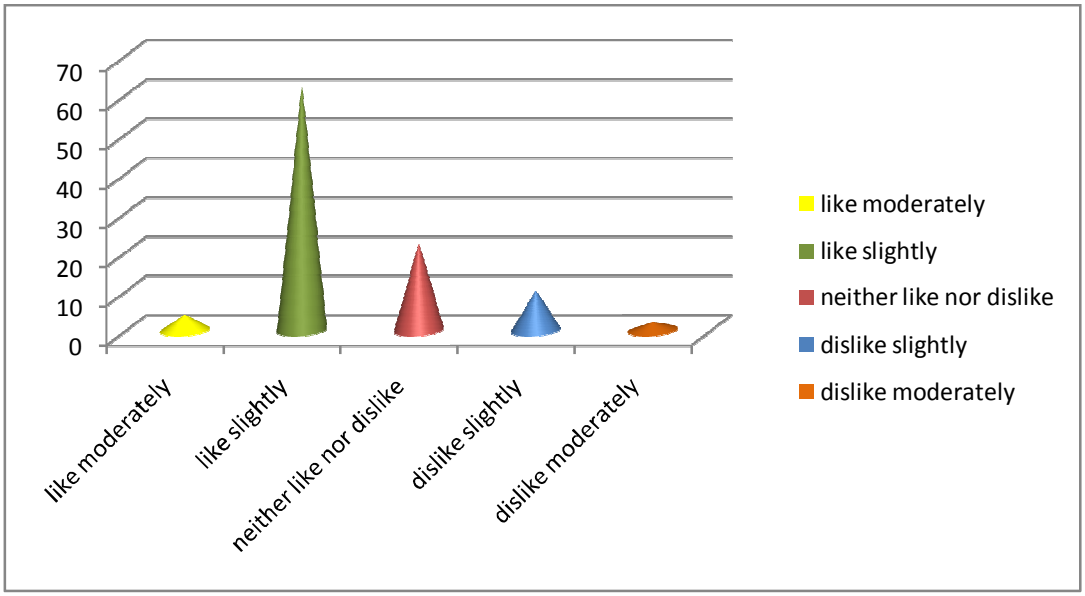


Fig.4.34 Like product on taste base

Table no. 4.7.3 Smell of the Product

Smell			
		Frequency	Percent
Respondent	like slightly	11	22.0
	neither like nor dislike	29	58.0
	dislike slightly	5	10.0
	dislike moderately	5	10.0
	Total	50	100.0

In this figure-3 represent the smell of the product developed for the consumption to the respondent. The respondent reaction was noticed and gives their response on the score based sheet of the hedonic rating scale. This was found that 58% of the reaction was positive in sense of smell of the product for consumption was good.

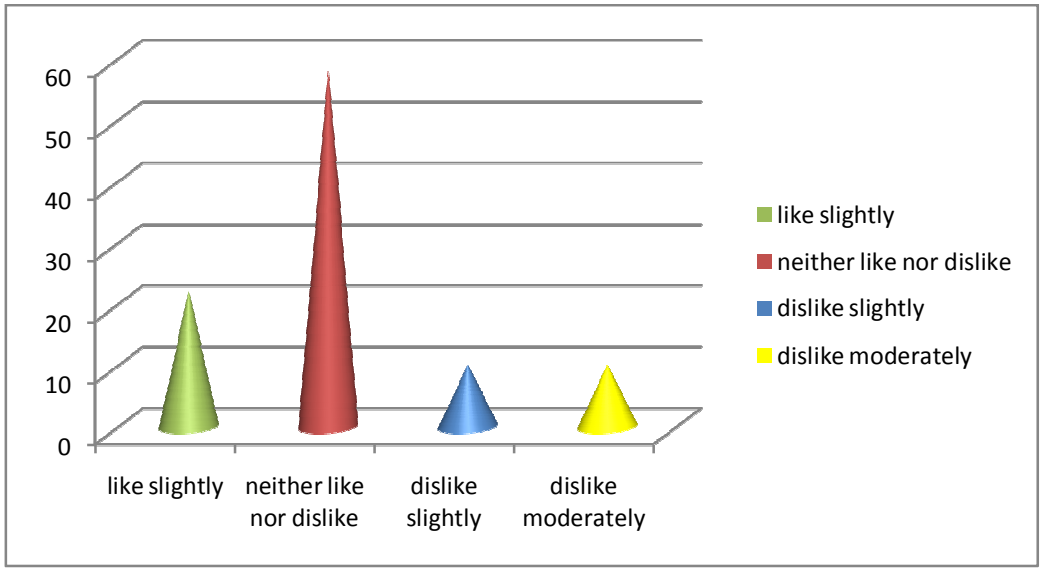


Fig.4.35 Like product on smell base

Table no. 4.7.4 Texture of the product

Texture			
		Frequency	**Percent**
Respondent	like moderately	13	26.0
	like slightly	29	58.0
	neither like nor dislike	3	6.0
	dislike slightly	5	10.0
	Total	50	100.0

In this graph represent the texture of the product (nutrigenomic badi). This graph shows that 58% of the respondent gives them like slightly to product for the texture. This conclusion drawn by the score system on the hedonic rating scale 0-9 points for the product.

Fig.4.36 Like product on texture base

Table no.4.7.5 Aroma of the Product

Aroma			
		Frequency	Percent
Respondent	like slightly	23	46.0
	neither like nor dislike	15	30.0
	dislike slightly	9	18.0
	dislike moderately	3	6.0
	Total	50	100.0

In this figure shows the result of aroma related to the product which was developed for the consumption to the population. That was checked by the public respondent that was selected on the time for checking awareness of the respondent for that scale aroma of product given by the respondent was 46% like slightly for this.

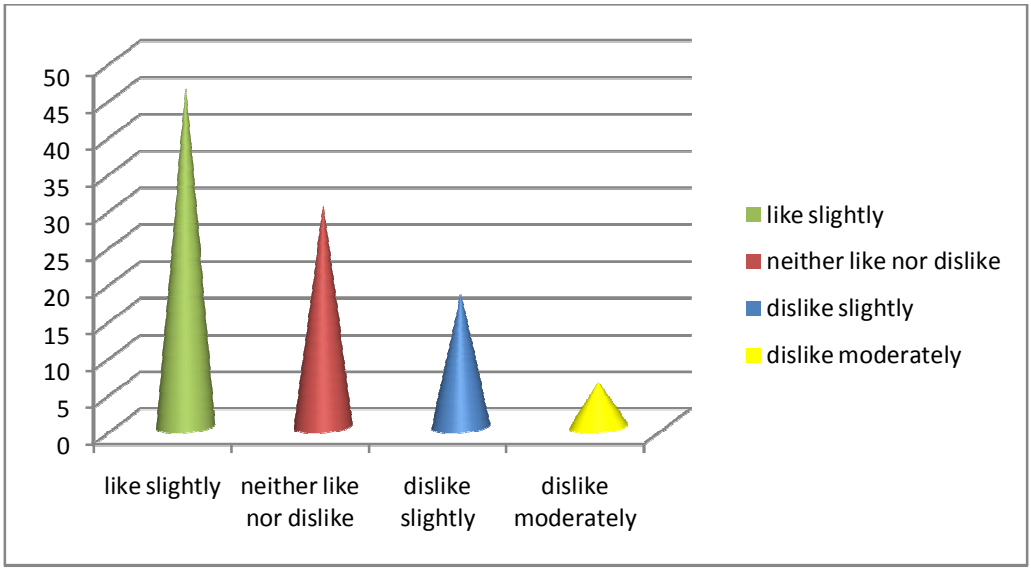


Fig.4.37 Like product on aroma base

Table no. 4.7.6 Overall acceptance of the product

Over all acceptance			
		Frequency	Percent
Respondent	like moderately	10	20.0
	like slightly	25	50.0
	neither like nor dislike	7	14.0
	dislike slightly	8	16.0
	Total	50	100.0

This graph shows overall acceptance of the product which was developed. This acceptance was based on the like, taste, smell, texture and aroma on the hedonic rating scale. Overall acceptance were given to the product by respondent was 50% like slightly.

Fig.4.38 Overall acceptance of product

The product acceptance was checked on those respondents who were participated in the survey of questionnaire scheduled. Each respondent were eat the product and given score on hedonic scale. On the basis of that score conclusion drown that how much product was acceptable.

Role of Micronutrients in Nutrigenomic Food Preventing Lifestyle diseases

Vitamin A

Dietary vitamin A is a product derived from a variety of carotenoids found in plants, with a broad range of beneficial effects on human health. It not only acts as an antioxidant, protecting against oxidative stress and DNA damage, but also at the cellular level, it modulates cell growth while regulating methylation. Vitamin A is considered to have a more complex mechanism of action that is currently being investigated [Lv W et al.2015], consisting in a wide range of biochemical and immunological roles against cancer [Alizadeh F. et al. 2014]. For example, a study revealed that vitamin A reduced oral mucositis, a consequence of chemotherapy [Chaitanya N.C. et al.2017]. Vitamin A or its related analogs, the retinoids, were demonstrated to have the capacity to reduce head, neck and lung

carcinogenesis in animal models. The inhibition of premalignant lesion was demonstrated to be achieved via the regulation of genes involved in cell growth and differentiation. Retinoids and lycopene can have beneficial effects in treating oral leukopathia, with important roles in oral cancer prevention [Hayden et al. 2012]. A combination of bexarotene and retinoid was able to reduce the chemical induction of oral carcinogenesis by 4-nitroquinoline 1-oxide,via a mechanism of ROS prevention [Tang et al. 2014].

Retinoic acid amide has been shown to inhibit the JAK-STAT pathway in lung cancer, leading toapoptosis [Li H.X. et al. 2014]. Vitamin A-associated effects are completed mainly via all trans retinoic acid (ATRA),which targets a wide range of nuclear receptors. These nuclear receptors include retinoic acid receptor(RAR), retinoid X receptor (RXR), and peroxisome proliferator-activated receptor (PPARβ/δ), where polymorphic retinoic acid (RA) response elements are able to activate the kinase cascades (assimilated in the nucleus via the phosphorylation of RA signaling effectors) [Tanoury et al. 2013]. The nuclear receptors targeted by ATRA have been shown to have a role in oral cancer [Wang et al. 2013]. Therefore, ATRA treatment was able to restore gap junctional intercellular communication for oral cancer cells by the up regulation of Cx32and Cx43 [Wang et al. 2013].

RAR promoter methylation can be used as a predictive diagnostic marker for non-small cell lung cancer (NSCLC) [feng et al. 2016]. The hyper methylation of RAR promoter has been shown to be associated with other known factors that influence lung cancer, one of the most important being cigarette smoke [Li et al. 2015].The therapeutic induced hypomethylation of RAR promoter has been achieved by using curcumin, thus identifying a possible anti-cancer therapy [Jiang et al. 2015]. In addition, retinoid X receptor (RXR) and histone deacetylase (HDAC) have been in vitro and in vivo targeted for activation and inhibition, respectively, revealing pleiotropic antitumor activities [Wang L. et al. 2015]. The repression of PPAR has been shown to promote chemoresistance in NSCLC [Wang M. et al. 2017], while PPAR agonists have been associated with a role in

preventing and treating lung cancer [lakshmi et al. 2017]. PPAR-related mechanisms have been used in experimental models to inhibit key genes involved in tumorigenesis, such as matrix metalloproteinase 2 (MMP-2) in the lung adenocarcinoma cell line A549 [Chuang et al. 2016]. Some tumors were observed to be resistant to the antiproliferative action of RA, mainly via protein kinase B (AKT) or different mitogen activated protein kinases (MAPKs), including extracellular signal-regulated kinase (ERK), Jun N terminal kinase(JNK) or p38 [Mustafi et al.2018]. Despite the exposition of the possible underlying molecular mechanisms, the association between vitamin A (including retinol and carotenoids) and cancer still remains controversial.

Folic acid:-

Folic acid, or the natural form present in food sources, folate, is now the substrate of an intense debate regarding its pro- or anticarcinogenic effects. Low folate concentrations have been linked to carcinogenesis by the incorporation of uracil in the DNA helix and the causation of double stranded breaks, which in turn can cause cancer-driven mutations [Boughanem et al.2020]. Some controversial literature data showed that in some cases this supplement can inhibit the development of malignant masses, where as in others it can contribute to the progression of cancer; thus, folate can act as a “double-edged sword”. Folate is an essential water-soluble factor found in food sources. It is one of the nutrients that are widely used in fortification programs, either from natural sources or in synthetic form. This is due to its important role in the processes of DNA, RNA, and protein methylation, as well as DNA synthesis and maintenance [Berger S.H. et al. 2008]. A methylation profiling study in the case of 162 elderly subjects versus 14 controlsled to the identification of 431,312 differentially methylated genes. The differentially methylated regions (DMRs) were mainly grouped in six regions, based on comparing the folic acid group versus the control group. An important modification pattern was observed in the case of *DIRAS3*, *ARMC8*, and *NODAL* genes, involved in carcinogenesis and early embryonic development [Crider et al. 2012].

One important gene implicated in the metabolism of folic acid is methylene tetrahydro folate reductase(MTHFR), which catalyzes the synthesis of 5-methyl tetrahydro folate. A significant polymorphism at the level of the *MTHFR* gene is C677T, which induces increased homocysteine concentrations and DNA hypomethylation. Furthermore, it has been shown to be associated with neural tube defects, white matter integrity in Alzheimer patients, venous thrombosis, colorectal cancer survival, breast cancer and leukemia [Chang et al. 2017]. Continuing on, the links between MTHFR polymorphisms and lung cancer have also been extensively studied. C677T polymorphism is associated with a higher risk of developing this malignancy [Yang et al.2016].

Folic acid is involved in physiological processes related to DNA methylation which, once unbalanced, will lead to alterations in DNA biosynthesis, repairing and methylation mechanisms. Perturbing these processes can accelerate aging mechanisms and carcinogenic processes, in addition to affecting normal embryonic development [Duthie 2011 & Boughanem et al. 2020]. It is clear that this small compound is involved in the genomic stability of eukaryotic cells [Fenech M. 2001]. It was demonstrated that DNMT3B methylation enzyme polymorphism (C46359T and SHMT1 C1420T) can be involved in the regulation of the folate pathway, related to carcinogenesis in the head and neck [succi et al. 2014].

Dietary folate and vitamin B6 can have protective roles for nasopharyngeal carcinoma, a fact demonstrated in a large patient cohort on a Chinese population [Zeng et al. 2016],and in an Egyptian patient cohort.

Isoflavons:-

Isoflavones are a class of bioactive phytochemicals that have been widely studied for their potential role in the prevention of various chronic diseases, such as cardiovascular diseases, neurodegenerative diseases, osteoporosis, cancers… Soy and its processed products (tofu, tempeh, miso, natto, soymilk, soy-based yoghurts and desserts) are the only sources providing high quantities of isoflavones in the human diet. Isoflavone intake has been estimated to 25–50 mg/day in Asian countries, with a maximum around 100 mg/d for elderly

Japanese men [Messina et al. 2006]. Americans and Europeans, who have low soy content in their habitual diet, only consume few milligrams of isoflavones per day. The beneficial effect of isoflavones, especially for relieving postmenopausal symptoms, has led to self-supplementation through isoflavone-rich foods or dietary supplements. Isoflavones in soybeans mainly include daidzein, genistein and glycitein, which are present in glycosylated or aglycone forms. The structural similarity of aglycones with 17β-estradiol gives them the capacity to bind estrogen receptors (ERs) and to induce hormone-like effects. Isoflavones and their protective role against various pathologies involving hormonal dysregulation have been extensively studied because of this particular property.

The lower risk of prostate and breast cancer in areas of high soy and isoflavone intake, especially in Asia [sing et al. 2000], as well as the increased risk observed for Asian people who migrated to Western countries or adopted a westernized lifestyle [Shimizu et al. 1991] are well known. A recent meta-analysis compiling 2 cohort studies and 6 case–control studies in Western and Asian populations estimated that high soy food intake can be related to a 30 % reduction in prostate cancer risk (odds ratio 0·70, 95 % CI 0·59–0·83) [Yan & Spitznagel 2005]. For breast cancer, a smaller risk reduction (odds ratio 0·86, 95 % CI 0·75–0·99), stronger for premenopausal women, was found in a meta-analysis compiling 6 cohort and 12 case–control studies [Trock et al. 2006]. Asian women whose soy intake was high during puberty experienced lower risk for breast cancer than women who did not consume soy products or did only as adults [Shu et al. 2001 & Wu A.H. et al. 2002].

Among hundreds of dietary components that have been proposed as potential cancer preventive agents, only a few have been used in clinical trials. The impact of isoflavone supplementation has been studied on some prostate cancer-related endpoints such as serum levels of Prostate-Specific Antigen (PSA), PSA velocity, plasma levels of testosterone, dihydro testosterone (DHT), insulin-like growth factor 1 (IGF-1) and IGF binding protein 3 (IGFBP-3). Among the 11 trials recently reviewed by Messina *et al.*2006, only 4 reported a significant effect on PSA levels. However, reduction in prostate cancer risk may occur without any

reduction in PSA levels. No beneficial effects were observed on levels of steroids, or on IGF-1/IGFBP-3 ratio. One study which compared the incidence of apoptosis in prostate tumours of patients supplemented or not with red clover isoflavones (160 mg/d for 7–54 days), reported significantly higher apoptosis in supplemented patients than in control subjects (1·48 % *v.* 0·25 %, $P = 0·0007$), specifically in regions of low to moderate-grade cancer (Gleason grade 1–3) [Jarred et al. 2002]. It is worth noting that no adverse effects were observed in any trial. The whole available data have been considered sufficiently encouraging to justify the funding of additional Phase II trials by the NIH [Messina *et al.*2006].

Messina *et al.*2006 recently discussed the published and ongoing clinical breast cancer studies. Three double-blind randomized controlled trials reported no effect of a 1 to 2-year isoflavone supplementation on mammographic density used as a marker of breast cancer risk [Maskarinec et al. 2004, Atkinson et al. 2004]. A 2-week administration of a soy supplement (45 mg/d isoflavones) increased epithelial cell proliferation and progesterone receptor (PR) expression in normal breast tissue, suggesting an estrogen agonist effect [McMichael-Phillips et al. 1998]. However, the potential link with proliferation of breast cancer cells is difficult to assess. Conflicting results have been obtained regarding the impact of soy isoflavones on hormone-related breast cancer risk factors such as plasma steroid hormone levels, Sex Hormone Binding Globulin (SHBG) plasma levels, urinary 2:16α-hydroxyestrone ratio, and menstrual cycle length [Zand et al. 2002].

The inconsistencies in the results and the failure to observe clear clinical effects may be explained, at least in part, by disparities in experimental designs, in the form of isoflavone administration, the dose, or the duration of the study. Furthermore, diverse subpopulations may respond differently to isoflavone consumption due to age, sex, ethnic background, gene polymorphisms, history of cancer, known risk factors, nutritional status, hormonal status or colonic microbiota composition. In this regard, the most critical parameters affecting the biological responses to isoflavone intake remain to be identified. The populations or subpopulations which may benefit, or possibly may experience some adverse effects while consuming isoflavones, also need to be identified.

The factors likely to affect isoflavone bioavailability may first modulate physiological responses to isoflavone intake. A compilation of 15 bioavailability studies in humans showed that plasma metabolite concentrations usually reach about 2 mol/l after consumption of 50 mg isoflavones (aglycone equivalent) [Setchell et al. 2005]. Inter-individual variability in isoflavone absorption and metabolism has never been assessed in large and ethnically non-homogeneous population, however some bioavailability studies suggest that it may be high. Maximum plasma concentrations ranged between 4 and 27 mol/l genistein among 20 American men with prostate cancer challenged with a high pharmacological dose of genistein [Miltyk et al. 2003].

Zinc:-

Zinc is one of the most relevant nutritional factors in ageing because it affects the immune response, metabolic harmony, and antioxidant activity, leading to a healthy state (Mocchegiani et al. 1998; Rink and Haase 2007). On the cellular level, zinc is essential for proliferation and differentiation, but zinc homeostasis is also involved in signal transduction (Cousins et al. 2006) and apoptosis (Truong-Tran et al. 2001). Cells depend on a regular supply of zinc and make use of a complex homeostatic regulation by many proteins (Liuzzi and Cousins 2004), but the plasma pool, which is required for the distribution of zinc, represents less than one percent of the total body content (Vallee and Falchuk 1993). Despite its important function, the body has only limited zinc stores that are easily depleted and can not compensate longer periods of zinc deficiency. Additionally, during infections pro-inflammatory cytokines mediate changes in hepatic zinc homeostasis, leading to sequestration of zinc into liver cells and subsequently to hypozincaemia (Liuzzi et al. 2005). Alterations in zinc uptake, retention, sequestration, or secretion can quickly lead to zinc deficiency and affect zinc dependent functions in virtually all tissues, and in particular in the immune system.

Taking into account that zinc homeostasis is regulated by Metallothioneins (MT) during an inflammatory/immune response (Mocchegiani et al. 2000), the

interrelationship between zinc and MT is crucial in ageing in order to prevent disabilities due to age-related diseases. The role of zinc and MT on inflammatory/immune response in human and mice ageing, with a focus on the role of genetic polymorphism at MT and IL-6 genes in modulating effect of zinc supplementation on the immune system of elderly humans as well as old mice.

Zinc, MT and ageing:-

Metallothioneins (MT), are a group of low-molecular- weight metal-binding proteins with high affinity for zinc (Kagi and Schaffer 1998). MT exist in different isoforms characterized by the length of amino acid chain: isoform I, II, III and IV mapped on chromosome 16 in man and on chromosome 8 in mice with complex polymorphisms (West et al. 1990). The more common isoforms are I and II; the isoform III, also called growth inhibitory factor (GIF) is a brain-specific member, and the isoform IV is restricted to squamous epithelia. MT contain 20 cysteines, all in reduced form, and bind seven zinc atoms through mercaptide bonds that have the spectroscopy characteristics of metal thiolate clusters (Maret and Vallee 1998). MT distribute intracellular zinc as zinc undergoes rapid inter- and intracluster exchange (Maret 2003). The redox properties of MT in the clusters are crucial for the protective role of MT in presence of ionizing and UV radiations (Cai et al. 1999), heavy metals (mercury, cadmium), lipid peroxidation, reactive oxygen species (ROS), oxidative stress caused by anticancer drugs, and conditions of hyperoxia (Sato and Kondoh 2002). This protective role of MT has been studied in young-adult MT knockout mice (null mice) for short periods of exposure to toxic metals, cadmium (Habeebu et al. 2000) and mercury (Satoh et al. 2002), anticancer agents (Kondo et al. 2002) or during zinc excess or zinc deficiency (Kelly et al. 1996). A protective role for MT in transient and acute stress-like condition. However, the role of MT in the presence of a persistent low grade chronic inflammation and stress, as it may occur during ageing, has been scarcely investigated.

It has been shown that IL-6 can induce synthesis of MT in different cellular models (Schroeder and Cousins 1990; Bauer et al. 1993). Transgenic expression

of IL-6 in the central nervous system was also shown to induce MT proteins but this chronic situation was also associated with development of chronic progressive neurodegenerative disease (Hernandez & Hidalgo 1998). Elevated and persistent IL- 6 levels observed in aged individual are also associated with increased and persistent MT expression in peripheral mononuclear cells (Mocchegiani et al. 2002b). This condition may reverse the protective role of MT proteins leading to an increased sequestration of zinc, and subsequent immune impairment in old age. By the other side, this phenomenon might be consistent with the ‘‘Antagonistic Pleiotropy Theory of Ageing’’ (Williams and Day 2003).

CHAPTER5: SUMMARY AND CONCLUSION

The concept that diet impacts wellbeing is an ancient one. Nutrigenomics incorporates known connections among sustenance and acquired qualities, called 'inborn errors of metabolism', that have for some time been treated by controlling the eating regimen. For instance is Phenylketonuria (PKU), it is brought about by a change (transformation) in a solitary gene. Influenced people must stay away from nourishment containing the amino acid phenylalanine. The Human Genome Project of the 1990s, which sequenced the whole DNA in the human genome, kicked off the art of nutrigenomics. By 2007 (Castle & David) researchers were finding various interrelationships between genes, sustenance, and ailment. Nutrigenomics brings along new phrasing, novel exploratory systems and an in a general sense new way to deal with nourishment inquire about, for example, high throughput advancements that empowers the worldwide investigation of quality articulation in a phone or living being. Nutrigenomics would require a community exertion from individuals in hereditary qualities and the businesses of general wellbeing, sustenance science and culinary. It's anything but difficult to make great tasting food with certain fixings. Put some oil or margarine in it and it will taste great. The test is the manner by which to take the fat out and make fortifying yet additionally great tasting nourishment." Therefore a move in general wellbeing is incredibly required, and with an expanding occurrence of weight and unending sicknesses, for example, type II diabetes, nutrigenomics may end up being the panacea later on.

Unhealthy living practices are the major factor associated with present life style. It is culminating into high mortality rate diseases, especially noncommunicable chronic diseases (NCDs) that are responsible for most of the deaths in past decade. Life style associated diseases are a group of diseases resulted from exposure of humankind over longer period to unhealthy diet, lifestyle and living environment. These diseases share almost similar risk factors, owing to, slow in progression, non infectious and non transmissiblee.g. cardiovascular, nutrition induced cancers, diabetes, renal failure, hypertension etc.

Primary motive in selection of life style associated diseases in present review is entirely based on their impact in human health. WHO report suggested a rapid change in disease profile for past few decades from communicable diseases to noncommunicable diseases irrespective of region, ethnicity and economy. About 60 % deaths worldwide resulted from life style associated chronic diseases, double than infectious diseases. In India too, the non-communicable diseases were responsible for 53 % deaths, out of which 24 % causalities alone contributed by cardiovascular disease (CVDs). Generally, these diseases have specific metabolic risk factors associated cellular mechanism that results mainly in mitochondrial alterations, oxidative stress and inflammation etc. like epidemiological characteristics. These responses to changed environment contribute significantly in the inception and progression of lifestyle related diseases. Primarily, it is the unhealthy diet that led to increase in metabolic risk factors of bloods like pressure, glucose, lipids etc. Diseases associated with modern life style also alter human body inflammation process. It is a self limiting and controlled process executed by innate immune system (IIS), required restrict incursion of foreign material and limiting further damage to the human body.

Chapter 1 dealt with the history of nutrigenomics and role of nutrigenomics how it works on human genome, preventive nature of health, application of nutrigenomics on anti ageing, obesity, cancer and medical claims, and also defined introductory part of life style related diseases like diabetes, cancer etc. and defined role of soyabean, carrot, ginger, cabbage, green pea and benefits of their nutrient content and health benefits in nutrigenomic according to the objective.

Chapter 2 dealt with the review of literature genes affects metabolic signals of nutrients, expression of genetic information, essential nutrients, transcriptional factors, how food affecting genetic information, discussed proteomics for protein expression. Carrots roots is important vegetables having carotenoids and dietary fibre, their nutrient sources, blanching, dehydration and drying methods in different temperature, work on determining physical and chemical parameters

influencing their nutritive content. Ginger (*Zingiber officinalis*), it is widely distribution and their uses in food, beverages, antioxidant properties and medicinal uses, also described antioxidant activity in different methods. Soybean contained high protein which relief from PCM and its protein compare with animal protein, its cosmopolitan distribution and excellent source of micronutrients and phytochemicals most concentrated source of isoflavones. Cabbage botanical features and different types of cultivation, antioxidant, anti-inflammatory properties and clinical facilitating the reduction of serum LDL as proposed in objective.

Chapter 3 dealt with material and method proposed in the synopsis a study on "to checking the awareness on nutrigenomic food and life style related diseases" was conducted for gaining the overall information about the study. The study was conducted on 122 respondents in which 79 male and 43 female were participated, questionnaire was asked on hypertension, CVD, diabetes, family history by their age and gender. Preparation of premixes of cabbage, carrot, ginger, pea and soybean for the development of product, product preparation was done by different ratio taken of the premixes, nutrient analysis of the product and checked acceptance of the product.

Chapter 4 dealt with result and discussion of the study. Statistical analysis was done through frequency, percentage in different age group and gender and checking the awareness and acceptance of the product, role of nutrients present in the product as proposed in synopsis.

5.1 Testing of hypothesis

H01: There exists o association between age and life style diseases.

It was observed that there was statiscally significant association among age and life style diseases, hence null hypothesis was rejected and alterative hypothesis accepted.

H02: There exists no association between gender and life style diseases.

It was observed that there was statiscally significant association among gender and life style diseases, hence null hypothesis was rejected and alterative hypothesis accepted.

H03 There exists no effect of herbal product and health status.

It was observed that there was statiscally significant association among herbal product and health status, hence alterative hypothesis accepted and simultaneously proven.

H04: There exists no association between education and knowledge about the nutraceutical and functional food.

It was observed that there was statiscally significant association among education and knowledge of the nutraceutical and functional food, hence alterative hypothesis accepted and simultaneously proven.

H05: There exists no association between diet and health status of the respondent.

It was observed that there was no statiscally significant association among diet and health status, hence null hypothesis accepted and simultaneously proven.

H06: There exists no association between developed product and acceptance of the product.

It was observed that there was no statiscally significant association among developed product and acceptance of the product, hence null hypothesis accepted and simultaneously proven.

5.2 Conclusion

This part has given principal bits of knowledge into personalization; learning that is basic to comprehend the significance and results of genomics-based personalization in the sustenance area. The wholesome science is to tailor nourishing prerequisites to the individual and consequently enhance abstains from food for wellbeing. Nonetheless, customizing diets is a profoundly faulty research need. The emphasis on nutrigenomics is innovation and market driven - it has not been educated by an appraisal of the conceivable advantages to wellbeing. Fitting

weight control plans to hereditary make-up raises significant concerns on the grounds that privatizing and individualizing dietary guidance could without much of a stretch befuddle and undermine adhering to a good diet messages. There is noteworthy potential for shoppers to be misdirected about their wellbeing as a result of the absence of control of hereditary tests and the befuddling and opposing data that individual will be sold.

Nutrigenomics is the investigation of impact of dietary bioactive segments on genome to modify quality articulation and at last phenotype. We eat a complex sustenance which contains various supplements. Insufficiency or over abundance of specific supplements prompts diseased or healthy body. Satisfactory dietary supplements anticipate or postpone endless scatters as well as decline the movement and seriousness of perpetual sicknesses. The test for nutrigenomics analyst is to find the qualities and their relationship to consume fewer calories that are associated with the advancement of endless maladies. In not so distant future nutrigenomics analyst will almost certainly give customized nourishment as per person's genotype.

It seems designing a comprehensive program regarding a healthy lifestyle in this population to be of prime necessity because this age of life need to be a special treatment for sustaining rest of life. So, our results suggest measuring the quality of life and general health status in elderly people.

Changes in eating habits, availability of fast food, better living environment and work standard, easier life style with limited walking, better economic status and urbanization are some examples of current life style. This shift has improved present human living standards but has taken a fall on health status as shown by marked increase in mortality rates in last decade by non-communicable diseases. Also luckily there has been a greater invention in past decade regarding knowledge of human genome, besides various transcriptomics, genomics, metabolomics and other omics which has added nutritional and medical science researchers to counter the posed challenges. Nutrigenomics has become important both for unhealthy as well as healthy people to improve health using modification of diet. Multiple in vitro, in vivo studies along with clinical

studies have been carried over worldwide that have increased chances of healthy living using dietary intervention. However important is need of high integrity and use of regulatory mechanism with ethical means to further nutrigenomic research.

5.3 Recommendation for Further Studies

- Study could be come out on target sample in order to achieve equal no. of person from each group described by population group.
- Advancement of developed product ingredients can be replaced by locally available food or by evergreen seasonally available vegetables.
- Molecular studies could also be carried out for developed nutrigenomic product and lifestyle diseases.
- Comparison between developed nutrigenomic product and commercially available nutrigenomic product could also be done.

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APPENDIXES

Questionnaire to Assess the Knowledge and Awareness about the Nutrigenomic Food

A) Demographic Information

1-Name:

2-Age (yr): 40-45 ☐ 46-50 ☐ 51-55 ☐ 56-60 ☐ 61-above ☐

3-Gender

Male ☐ Female ☐ Transgender ☐

4- Educational qualification-

High school ☐ Intermediate ☐

Graduation Post graduation ☐ Other ☐

5-Occupation: Employed ☐ Students ☐ Unemployed ☐ Retired ☐

House wife ☐

6- Income group: LIG ☐ MIG ☐ HIG ☐

7-Height (cm): .....

8-Body weight (kg): .....

B) Awareness on life style related diseases

1-Have you ever been diagnosed with any of the following:

(a) Hypertension ☐ (b) diabetes mellitus I ☐

(c) diabetes mellitus II ☐ (d) Cardiac Complication ☐

(e) Obesity ☐ (f) Arthritis ☐

(g) digestive disorder ☐ (h) None ☐

2-Have you ever been suffered with blood pressure related complications?

a. Yes ☐ b. No ☐

3-Have you ever been suffered with back Ache?

a. Yes ☐ b. No ☐

4-Have you ever been suffered with Insomnia?

a. Yes ☐ b. No ☐

5-Are you under regular medication or treatment for any health problems?

a. Yes ☐ b. No ☐

6- Are you suffering from any degenerative disease related from bone health?

a. Yes ☐ b. No ☐

7- **How** long have you been ailing with the health problems?

1 week ☐ for few month ☐ for few years ☐ None

8- Do you have any history of disease(s) in your family?

High /low BP ☐ Depression ☐ Cardiac complication ☐

Diabetes type I ☐ Diabetes type II ☐ Arthritis ☐

Digestive disorder ☐ other ☐

9-Do you prefer any regular exercise?

a. Yes ☐ b. No ☐

10-How do you rate yourself in terms of alcohol intake?

(a) Occasionally ☐ (b) Regular ☐ (c) Not at all ☐

11- Role of Mineral and vitamin deficiency in diseases.

Mineral & vitamin deficiency disease	Role of vitamin and mineral			
Anemia	Zinc	Iron	Cobalt	Sodium
Goiter	Iron	Iodine	Sodium	Magnesium
Bone	Vitamin A	Vitamin D	Vitamin C	Vitamin B

Night blindness	Vitamin B	Vitamin C	Vitamin A	Vitamin D

12- Which hormone metabolism is affected in diabetes mellitus?

Insulin ☐ Pepsin ☐ Melanin ☐ Oxytocin ☐

13-Which of the following is not responsible for hypertension?

Smoke ☐ Obesity ☐ Lack of physical activity ☐

Too much salt in the diet ☐ Stress ☐ Balanced diet ☐

14- Which type of fat is responsible for CVD?

Saturated ☐ unsaturated fat ☐ Trans fat ☐

C) Awareness on Functional foods and Nutraceuticals

1- Do you think that the foods you consume daily have any medicinal properties?

a. Yes ☐ b. No ☐

2- Have you come across the word "functional food"?

a. Yes ☐ b. No ☐

3- What are the "functional foods"

a) Foods having health benefits beyond their nutritive content ☐

b) Food for specific body function ☐

c) Isolated or purified bioactive ingredients in foods ☐

d) None ☐

4- Have you heard about the word "nutraceuticals"

a. Yes ☐ b. No ☐

5- An active component named " allyl sulfur" is present in……

Apple ☐ Sprouted pulses ☐ Onion and Garlic ☐

6- What are the dietary fibers?

Complex foods ☐ Minerals ☐ Indigestible polysaccharides ☐

Vitamins ☐ All the above ☐

7- Fibers are present in……..

Fruits and vegetables ☐ Whole cereals and pulses ☐ Both ☐

8- Isoflavones are found in….

Soy bean ☐ Runner bean ☐ Kidney bean ☐ All of the above ☐

Don't No ☐

9- What is the colour of soy bean / soya beans?

Yellow ☐ Red ☐ White ☐

10- What are phytoestrogens?

Plant estrogen similar to the structure of human estrogen hormone ☐

Plant estrogen dissimilar to the structure of human estrogen hormone ☐

Chemical substances found in plants ☐

None ☐

11- Do you think that isoflavones are phytoestrogens?

Yes No

12- Green tea is rich in…….

Catechins ☐ Curcumin ☐ DHA and EPA ☐

13- Beta carotene is found abundantly in……

Yellow and orange fruits ☐

Green leafy vagetables ☐ Both ☐

14- What mode of cooking do you adopt for the following foods?

a) Carrot - Steaming ☐ Frying ☐ Boiling ☐ Raw ☐

b) Greens - Frying ☐ Pressure ☐ Boiling ☐

D) Like –scale agreement level for the herbal product acceptance –

1- Herbal product and dietary supplements can be useful for trading certain medical conditions and/ or promote health and wellness.

Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐

2- Herbal products and dietary supplements can have harmful side effect.

Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐

3- Herbal products and dietary supplements can interact with other supplements or medications.

Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐

4- I feel comfortable discussing my use of herbal products and dietary supplements with my doctor or health care provider.

Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐

5-I feel comfortable discussing my use of herbal products and dietary supplements with my pharmacist.

Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐

E) Dietary Information-

1- Which type of diet you prefer?

Vegetarian ☐ Non vegetarian ☐ Eggetarian ☐

2- The frequency of meal intake?

2times ☐ 3 times ☐ 4 times ☐ 5 times ☐

3- Common food related practices:-

S.No.	Food items	Daily	2-3dyas/week	weekly	Occasionlly
1.	Pulses				
2.	Milk/Milk Product				
3.	Green leafy				

	vegetables				
4.	Fruits				
5.	Sugar/jaggery				
6.	Meat/Meat product				

5-Preference of junk food

Monthy ☐ weekly ☐ Everyday ☐ Occasionally ☐

6-Name of junk food / street food which do you prefer most?

Pani puri ☐ Samosas ☐ Chaumin ☐ Pizza ☐

Burger ☐ Chaat ☐ Others ☐