

COMPARATIVE STUDY ON BLOOD PRESSURE AND BODY COMPOSITION IN ADULTS CONSUMING LACTO-VEGETARIAN AND NON-VEGETARIAN

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Science degree in Clinical Nutrition and Dietetics

by
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**DEPARTMENT OF CLINICAL NUTRITION AND DIETETICS
SCHOOL OF ALLIED HEALTH SCIENCES**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of Sri Ramya Boppana (40736008) who carried out the project entitled "COMPARATIVE STUDY ON BLOOD PRESSURE AND BODY COMPOSITION IN ADULTS CONSUMING LACTO-VEGETARIAN AND NON-VEGETARIAN" under my supervision from JUNE 2022 to MAY 2023.

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ABSTRACT

Vegetarian diets are now considered as nutritionally adequate and provides healthful benefits and helps in prevention of chronic diseases. Several studies have been carried out which mainly focus on the analysis of blood pressure and body composition in lacto-vegetarians and non-vegetarians. However, few studies have been undertaken in this population oriented to quality of life and health. Blood pressure and body compositions are two tools used to determine the health level of individuals. The aim of this study is to compare the blood pressure and body composition of lacto-vegetarians to non-vegetarians of healthy adults belonging to Hukumpeta, Rajahmundry rural, East Godavari district, Andhra Pradesh.

A comparative study was adopted. Around 60 healthy individuals of both genders' male and female following lacto-vegetarian diet and non-vegetarian diet aged between 20 to 55 years who were willing to participate in the study were selected from Hukumpeta, Rajahmundry rural, East Godavari district, Andhra Pradesh. The data were collected by a questionnaire which includes demographic data, anthropometric data and a food frequency questionnaire. The statistical analysis includes the comparisons between types of oil, consumption of milk and meat, BMI and blood pressure using Mann Whitney test, Tukey's multiple comparisons test and t test.

LIST OF ABBREVIATIONS

ACRONYM	ABBREVIATION
BMI	Body Mass Index
WHR	Waist Hip Ratio
cm	Centimetre
kg	Kilogram
Kg/m ²	Kilogram per meter square
BP	Blood pressure
ns	Non-significant
*	Significant

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“NOTHING WILL BENEFIT HUMAN HEALTH AND INCREASE CHANCES FOR SURVIVAL OF LIFE ON EARTH AS MUCH AS THE EVOLUTION TO AN VEGETARIAN DIET”

- ALBERT EINSTEIN

CHAPTER – 1

INTRODUCTION

In the past, many viewed vegetarianisms as strange and faddish but appropriately planned vegetarian diets are now recognized by many, including the American Dietetic Association, as being nutritionally adequate, and providing healthful benefits in the prevention and treatment of chronic diseases. A large body of scientific literature suggests that the consumption of a diet of whole grains, legumes, vegetables, nuts, and fruits, with the avoidance of meat and high-fat animal products, along with a regular exercise program is consistently associated with lower blood cholesterol levels, lower blood pressure, less obesity and consequently less heart disease, stroke, diabetes, cancer, and mortality. Hypertension can lead to stroke, blood vessel damage, heart attack, heart failure, and kidney failure. (US Department of Health and Human services, 2014)

It is an escalating trend, rising from 594 million in 1975 to 1.13 billion in 2015, and this mainly now occurs in low-income and middle-income countries. This global shifting has resulted from the increase in population growth and unprecedented process of aging. Diet and lifestyle choices play a vital role in the overall health of an individual. There are many types of diets with varying instructions on what kind and how much of a food, or food group, should be eaten. (2015, 2017)

Blood pressure and bioelectrical impedance are two tests used to determine the health level of individuals. Blood pressure is the force that blood exerts on arterial walls. Blood pressure is usually measured with a sphygmomanometer. Normal blood pressure is 120/80. Bio-electrical impedance is quick and non-invasive procedure that measures a person's fat free mass, (FFM) or also referred to as lean body mass (LBM). Bioelectrical impedance measures body composition by calculating the body's resistance to electrical flow. Body composition composed of >25% for men and >32% for women is typically indicating an increased risk of

morbidity. A heart rate of 60-100 beats per minute (BPM) is the normal range for adults (Flakoll P. J., 2014). This eight-week study found a 12-mmHg drop in systolic and diastolic blood pressures in the study group with no change in the control group.

1.1 LACTO-VEGETARIAN vs NON-VEGETARIAN DIET

Vegetarian diets have become increasingly popular, in part because they have been associated with many health benefits when compared to omnivorous diets. (Vanacore D., 2018). A vegetarian diet predominantly consists of foodstuffs of plant origin (cereals, vegetables, root crops, oilseeds, fruit, and nuts) and tends to exclude any type of meat, fish, or animal product or subproduct. (Hauner, 2015) The vegetarian diet can be further divided into several subgroups: ovo-vegetarian (includes eggs), ovo-lacto-vegetarian (includes eggs and dairy products), and lacto-vegetarian ((includes dairy products). Vegetarians who do not eat egg but does consume dairy products are also known as lacto-vegetarians. Most vegetarians do not consume any animal-derived products, which includes milk, dairy products, and eggs. But due to health and religious reasons some people have adopted this lacto-vegetarian diet which excludes egg, meat, fish, etc but allows dairy intake. This lacto-vegetarian diet is quite flexible and reduces your environmental impact. (Pilis W., 2014)

A non-vegetarian diet includes chicken, meat, eggs and fish. A non-vegetarian diet also has several health benefits because this type of food is rich in protein and vitamin B. Non-vegetarian food strengthens our muscles and helps them grow faster. It also helps to maintain body stamina and haemoglobin. Individuals who follow a vegan diet are normally concerned not only with what they eat but also with the environment and animal protection issues. (Vanacore D. M. G., 2018). A well-planned vegetarian diet in which minimally refined foods predominate can provide adequate food and nutrition (Melina V., Position of the academy of nutrition and dietetics: vegetarian diets., 2016) at any stage of life, including pregnancy, lactation, infancy, childhood, and adolescence, and in sports. (Marsh K., 2012)

Foods in vegetarian diets are typically rich in fibre, phytoestrogens, antioxidants, phytochemicals, n-3 fatty acids, and poor in cholesterol and saturated fat, allegedly contributing to a reduction in risk of cardiovascular disease, diabetes, and obesity, among others. (Crowe F.L., 2013). In contrast, adequate and optimal daily intake of

minimally refined plant foods can help improve LDL and TG concentrations, (De Biase S. G., Dieta vegetariana e níveis de colesterol e triglicérides., 2007), prevent hypertension, (Pettersen B. J., 2012), and maintain WC, (Rizzo N. S., 2011), and Body Mass Index (BMI) within normal ranges, including HDL levels in an optimal range, (Tonstad S., 2019)

According to the World Health Organization (WHO), about 1.2 billion people in the world were overweight at the turn of the 20th century. (Berkow S.E., 2006). Recent reports support the claim that a well-balanced vegetarian diet may be associated with a lower body mass index (BMI) compared to other diets. (Bakaloudi D.R., 2021). Thus, many studies have shown that dietary patterns with a lower meat intake like the vegetarian diet is associated with a lower rate of non-communicable disease particularly hypertension and contributed to a better health outcome and longer life expectancy. (Alexander S., 2017). In contrast, diets based on the consumption of meat and its derivatives play a crucial role in the increase of these chronic noncommunicable diseases because they are characterized by high caloric density, excess saturated fat, and simple sugar. (Vang A., 2018)

Consumption of red meat has been associated with the development of arterial thrombosis, cardiac ischemia, high blood pressure, and acute thrombotic infarction, among others, due to increased platelet aggregation. (J., 2015). Furthermore, the vegetarian diet plays a fundamental role in improving the psychological dimension of quality of life. (Conner T., 2017)

1.2 IMPACT OF DIET ON BLOOD PRESSURE AND BODY COMPOSITION

Hypertension is a disorder characterized by chronic high blood pressure. Approximately one billion people worldwide have hypertension. (Services). Blood pressure and bio-electrical impedance are two tests used to determine the health level of individuals. Blood pressure is the force that blood exerts on arterial walls. (Medline Plus). Normal blood pressure is 120/80. (Flakoll P. J., Jan/Feb). High blood pressure or hypertension is defined as systolic blood pressure of 140 mmHg or higher, and diastolic blood pressure of 90 mmHg or higher. (Whelton P.K., 2018). It is an independent and major risk factor for cardiovascular disease and chronic kidney failure. (Hadaegh F. M. R., 2013, 2015). Patients with hypertension have a twofold to threefold higher risk for heart disease or stroke, as compared with those

without hypertension. (Hadaegh F. M. R., 2013) In addition, patients with hypertension are more likely to develop type 2 diabetes, and patients with type 2 diabetes also have hypertension as well.

Hypertension is the lifetime risk for organ damage and cardiovascular disease. The risk of high blood pressure (BP) is initiated before the diagnosis of hypertension. From healthy younger adult subjects with high-normal BP in the early lifetime stage to the elderly hypertensive patients with cardiovascular risk factors and/or organ damage, higher BP exhibits increased the risk than normotensive subjects. (Arafa A, 2022)

Patients having both hypertension and diabetes possess the highest risk of developing a stroke event and having a fatal stroke. On top of that, hypertension alone contributed about 29% of the underlying cause of end-stage renal disease (Hu G., 2017) High blood pressure is often related to unhealthy lifestyle habits, such as smoking, drinking too much alcohol, being overweight and not exercising enough, type of dietary pattern followed for example type of oils used. Left untreated, high blood pressure can increase the risk of developing several serious long-term health conditions, including coronary heart disease and have a risk of damaging the blood vessels in the kidneys or eyes. (AR., 2016)

As a widely used surrogate for representing the nutrition status of individuals and the gold standard of defining overweight and obesity, body mass index (BMI) has been extensively studied and demonstrated to be significantly associated with blood pressure (BP), cardiometabolic risk, and mortality (Linderman GC, 2018) The World Health Organization (WHO), proposes anthropometry for evaluation of nutritional status as a method easy to apply, inexpensive, non-invasive, and may also be used to predict performance, health, and survival. According to WHO, in addition to weight and height, BMI and waist and hip circumferences should be measured to assess the deposition of fat mass.

BMI is very easy to measure and calculate and is therefore the most used tool to correlate risk of health problems with the weight at population level. It was developed by Adolphe Quetelet during the 19th century. During the 1970s and based especially on the data and report from the Seven Countries study, researchers

noticed that BMI appeared to be a good proxy for adiposity and overweight related problems. Like any other measure it is not perfect because it is only dependant on height and weight and it does not take into consideration different levels of adiposity based on age, physical activity levels and sex. (Hauner, 2015). For this reason, it is expected that it overestimates adiposity in some cases and underestimates it in others. The BMI ranges are based on the effect excessive body fat has on disease and death and are reasonably well related to adiposity. BMI was developed as a risk indicator of disease; as BMI increases, so does the risk for some diseases. Some common conditions related to overweight and obesity include: premature death, cardiovascular diseases, high blood pressure, osteoarthritis, some cancers, and diabetes. (Melina V., Position of the academy of nutrition and dietetics: vegetarian diets., 2016)

BMI is also recommended for use in children and adolescents. In children, BMI is calculated as for adults and then compared with z-scores or percentiles. During childhood and adolescence, the ratio between weight and height varies with sex and age, so the cut-off values that determine the nutritional status of those aged 0–19 years are gender- and age-specific. The cut-off points of the 2006 BMI-for-age reference for children aged 0–5 years for the diagnosis of overweight and obesity were set as the 97th and the 99th percentile, respectively. For those aged 5–19 years, overweight is defined as a BMI-for-age value over +1 SD and obesity as a BMI-for-age value over +2 SD. (WHO, 2017)

According to World Health Organisation, for adults over 20 years old, BMI falls into one of the following categories.

Table 1.2 classification of BMI according to WHO

BMI	NUTRITIONAL STATUS
Below 18.5	Under weight
18.5 – 24.9	Normal weight
25.0 – 29.9	Pre-Obesity
30.0 – 34. 9	Obesity class I
35.0 – 39.9	Obesity class II
Above 40	Obesity class III

Other measures, such as waist circumference (WC), can complement BMI estimates. Association between WC and health risks is not an easy task and should be done scientifically using proper techniques. (WHO, 2020)

The World Health Organization (WHO) Expert Consultation on Waist Circumference and Waist–Hip Ratio was held in Geneva, Switzerland on 8–11 December 2008. The consultation was organized by WHO's Department of Nutrition for Health and Development, in collaboration with the Department of Chronic Diseases and Health Promotion. It was opened by Dr Ala Alwan, WHO Assistant Director-General for Noncommunicable Diseases and Mental Health. The 1997 WHO Expert Consultation on Obesity recognized the importance of abdominal fat mass (referred to as abdominal, central, or visceral obesity), which can vary considerably within a narrow range of total body fat and body mass index (BMI). It also highlighted the need for other indicators to complement the measurement of BMI, to identify individuals at increased risk of obesity-related morbidity due to accumulation of abdominal fat. Waist–hip ratio was suggested as an additional measure of body fat distribution. The ratio can be measured more precisely than skin folds, and it provides an index of both subcutaneous and intra- abdominal adipose tissue. The suggestion for the use of proxy anthropometric indicators arose from a 12-year follow-up of middle-aged men, which showed that abdominal obesity (measured as waist–hip ratio) was associated with an increased risk of myocardial infarction, stroke, and premature death, whereas these diseases were not associated with measures of generalized obesity such as BMI. In women, BMI was associated with increased risk of these diseases; however, waist–hip ratio appeared to be a stronger independent risk factor than BMI. (WHO, 2000a).

According to the American Journal of Clinical Nutrition, there are healthy body fat percentages based on age. For people aged 20 to 39, women should aim for 21% to 32% of body fat. Men should have 8% to 19%. For people 40 to 59, women should fall between 23% to 33% and men should fall around 11% to 21%. If aged 60 to 79, women should have 24% to 35% body fat and men should have 13% to 24%. Women naturally have a higher body fat percentage than men. Their body fat will also naturally increase as they age. (Vanacore D. M. G., 2018)

CHAPTER – 2

LITERATURE REVIEW

Over the past decade, vegetarian is becoming increasingly popular in the present society. The increase in prevalence may be most likely due to benefits arising from various health related factors (lower blood cholesterol level and blood pressure, reduced risk of obesity and diabetes) (Dinu M, 2017). Vegetarian diets are rich in fibres, complex carbohydrates but low-fat content –therefore vegetarians are commonly found to have lower body mass indices than nonvegetarians, a much lower rate of death from ischemic heart disease due to the fact that vegetarians have been reported to show lower blood cholesterol levels lower blood pressure and lower rates of hypertension, type 2 diabetes. Legumes, fruits, vegetables, tomatoes allium vegetables, fibres and vitamin C which are also consumed considerably by vegetarians in higher amounts when compared to nonvegetarian. All these listed foods and its nutrients contains anticancer agents which give one a much higher protection over cancer. Though vegetarians own the privilege of a wide range of health benefits and of much lower risk of many diseases, however they are also cut off many essential nutritional values. Their diet tends to be lower in calories, saturated fat and cholesterol protein levels, long chain n-3(omega-3 fatty acids, vitamin D, calcium, zinc, and vitamin B-12. Vegetarians in general, typically have a much lower concentration of vitamin B-12 in their blood. (Whelton PK 2018)

Quite a few studies have consistently demonstrated the firmly epidemiological link between total body fat mass and raised prevalence of hypertension or BP elevation (Ye S, 2018). Moreover, fat tissue in various depots was indicated to have distinct impacts on BP. Trunk fat mass significantly associates with BP elevation or incident hypertension (Yano Y, 2016); however, accumulation of adiposity in limbs, especially in lower limbs, was found to be counterintuitively and negatively associated with hypertension or raised BP (Visaria A, 2022). In terms of lean/muscle mass, its effect on BP has not acquired as much attention and research interest as fat mass did, although weight gain is a combination of gain in both fat and lean mass (Haghighat N, 2021).

In fact, epidemiological data have indicated that total lean/muscle mass was significantly and positively associated with BP, even independent of total fat mass (Li W, 2018). Nevertheless, it should be noted that components of body composition correlates closely to each other (Chen GC, 2018), and thus it is highly important to adjust for the other components when investigating the association of one component with raised BP or hypertension.

Notably, body composition, indicated body mass index (BMI), waist circumference (WC), and percentage of body fat (BF%) could be attributed to dietary patterns such as type oil used, consumption of type of diet and simultaneously has been indicated to be positively associated with blood pressure (Fu, 2018)

In that way, body composition might confound or mediate the impact of dietary patterns on hypertension. For example, Shi et al. found the association between dietary pattern and hypertension was attenuated after the addition of BMI to the model (Shi, 2019).

Compared to vegan, lacto Ovo vegetarians can easily meet their nutrient needs through the consumption of milk and milk/dairy products, and eggs, particular in protein, calcium, vitamin B intake. (Clarys P, 2015)

Many studies have indicated that body mass index (BMI) is generally positively associated with blood pressure (Crowe FL 2013) Overweight and obesity is an emerging epidemic in with almost 30% of the adult population being classified as either overweight or obese. The high prevalence of hypertension as well as of overweight and obesity can be attributed to the recent economic development and urbanization accompanied by unfavourable changes in diet and lifestyle.

Multiple dietary factors affect blood pressure A large-scale intervention study on Dietary Approaches to Stop Hypertension revealed that a dietary pattern rich in fruits and vegetables, rich in low-fat dairy products, and reduced in saturated fat and cholesterol reduces the risk of hypertension. Furthermore, dietary sodium reduction regular aerobic physical activity, and moderation of alcohol consumption will help to maintain normal blood pressure (J. 2015).

Hypertension has been reported in relation to some western and South-East Asian dietary patterns (Flakoll P. J. 2014) Data from the Shanghai Mens Health Study

showed that a dietary pattern consisting mainly of fruit and milk was inversely associated with blood pressure among middle aged and elderly men. Wang et al found that a dietary pattern characterized by high intakes of fruit, pork poultry, rice vegetables aquatic products, and nuts, was inversely related with hypertension independent of BMI (Alexander S. 2017)

Hypertension has been described as a silent killer that accelerates another killer atherosclerosis. There has been a world-wide concern about prevention of this disease by dietary alterations. Currently there is an increasing scientific interest in vegetarian diets in the prevention of several diseases. (Zhang, 2021)

It is reported that the vegetarian populations have lower blood pressure, serum and urinary sodium, chloride, and body weight than non-vegetarian, but there is strong possibility that effect of diet may be confused by other lifestyle factors. Some studies showed the influence of vegetarian diet and lifestyle factors in hypertension and cardiovascular disease. (Kapoor OP)

Past studies have found a correlation between diets high in fruits and vegetables and lower rates of hypertension compared to general populations. "Epidemiological data suggests that plant-based dietary patterns are associated with a significantly lower prevalence of hypertension and obesity. A study in the Journal of Nutritional Medicine found diets abundant in fruits and vegetables help to lower the significance of hypertension and obesity. (AR., 2016)

The prevailing of hypertension is closely related to the global pandemic of overweight and obesity in the temporary society (Ng M, 2015), as indicated that excessive weight gain accounts for 65–75% of the risk for primary hypertension (Hall JE. do Carmo JM, 2015)

Scientific evidence suggests that restricting foods, based on meat and its derivatives, fish, and poultry, could improve some indicators of people's mental health status. (Aslanifar E., June 2014) Additionally, based on WHO recommendations, it contributes to better mental health, lower incidence of depression and anxiety, greater life satisfaction, and improved emotional well-being. (Pem D., 2015). These benefits of the quality-of-life aspects could be due to the presence of vitamin C, folic acid, and carotenoids. These nutrients present in fruits

and vegetables act as cofactors of dopamine and other neurotransmitters. (May J. M., 2012)

Although many studies have observed a positive relationship between body mass index (BMI) and BP in children and adolescents, it has been argued that BMI is a crude measure of adiposity and has been criticized for being unable to distinguish between fat and lean. (Strandberg TE, 2017)

Furthermore, correlations between BMI and body fat have been found to vary markedly among studies. However, studies have related components of body composition to BP in children, and even fewer studies have been carried out using direct measures of body composition. (Lewington S, 2018) The positive relationship of body mass index (BMI) with blood pressure (BP) has been demonstrated in several large-scale observational studies. Importantly, a causal association between BMI and hypertension has recently been verified by two Mendelian randomization studies. (GC Linderman, 2016)

Many studies have shown that dietary patterns with a lower meat intake like the vegetarian diet is associated with a lower rate of non-communicable disease particularly hypertension and contributed to a better health outcome and longer life expectancy. (Alexander, Ostfeld, Allen, & Williams, 2017)

Livingstone et al. reported the relevance of dietary pattern with hypertension was stronger in individuals with overweight/obese. (Livingstone, 2017) A recent study considered the effect of the Dietary Approaches to Stop Hypertension (DASH) diet for hypertension may be fully influenced by BMI (Louca, 2022). These studies suggest the relationship between diet pattern, body composition, and hypertension is complex and further research is needed.

CHAPTER – 3

METHODOLOGY

3.1 AIM OF THE STUDY

To compare blood pressure and body composition of adults consuming lacto-vegetarian and non-vegetarian diets at Hukumpeta, Rajahmundry rural, East Godavari district, Andhra Pradesh.

3.2 SPECIFIC OBJECTIVES OF THE STUDY

- To estimate the level of blood pressure among selected participants
- To assess the body composition among selected participants
- To compare the blood pressure levels and body composition among lacto vegetarians and non-vegetarians
- To compare the type of oil and dietary intake of lacto products and meat products with blood pressure and body composition of the selected participants.

3.3 OUTCOME OF THE STUDY

The study compares the impact of dietary pattern on blood pressure and body composition of adults at Hukumpeta, Rajahmundry rural, East Godavari district, Andhra Pradesh population which helps the community to prevent non - communicable diseases.

3.4 NOVELTY OF THE STUDY

The novelty of this study concentrates on comparison between lacto-vegetarian and non - vegetarian where most of the literature's emphasis on vegetarian diet.

3.5 DESIGN OF THE STUDY

A comparative study of adults consuming lacto-vegetarian diet and non-vegetarian diet in Hukumpeta, Rajahmundry rural, East Godavari district, Andhra Pradesh. A dietary survey questionnaire was prepared which comprises of diary and meat products and distributed to each individual from both the groups. The questionnaire comprised of anthropometric and dietary data. Each individual was interviewed as per questionnaire. The anthropometric measurement was taken for height, weight,

waist circumference, hip circumference and blood pressure, and then accordingly body mass index and waist hip ratio were calculated respectively.

3.6 STUDY AREA

The study subjects were chosen from Hukumpeta, Rajahmundry rural, East Godavari district, Andhra Pradesh.

3.7 SELECTION OF SUBJECTS

3.7.1 Inclusion Criteria

- The inclusion criteria for the study are the subjects from Hukumpeta, Rajahmundry rural of both male and female.
- Subjects who are healthy (for ex: - non hypertensive, non-diabetic) are only taken into the study
- Subjects aged between 20 to 55 years and consuming lacto-vegetarian diet and non-vegetarian diet are only taken in the study
- The subjects willing to participate in the study are only taken and concern forms were given to each individual during the interview schedule.

3.7.2 Exclusion Criteria

- The exclusion criteria for the study are the subjects who are unhealthy of both male and female and aged under 20 years and above 55 years are not taken in the study.
- Subjects of both gender male and female consuming other type of diets rather than lacto-vegetarian diet and non-vegetarian diet are not taken into the study.

3.8 DURATION OF THE STUDY

- The study duration lasted from November 2022 to January 2023.
- The selection of the topic and research based on the topic was done till November. 2022.
- The data was collected in the month of December 2022.
- The statistical work and result were concluded by January 2023.

3.9 TOOLS USED

3.9.1 Anthropometric data

3.9.1.1 BMI

Height was measured using the values marked on the wall by standing straight against the wall. Weight was measured by an manual weighing machine. Then accordingly BMI (Body Mass Index) was calculated through the formula.

BMI, formerly called the Quetelet index, is a measure for indicating nutritional status in adults. It is defined as a person's weight in kilograms divided by the square of the person's height in metres (kg/m²).

(For example, an adult who weighs 70 kg and whose height is 1.75 m will have a BMI of 22.9).

$$\text{BMI} = \frac{70(\text{in kg})}{1.75 \times 1.75 (\text{in m})} = 22.9 \text{ kg/m}^2$$

Note. BMI is derived from a person's weight in kilograms, divided by height (squared) in centimetres. The recommended levels are adapted from the global WHO recommendation of 18.5–24.9 as a normal BMI.

3.9.1.2 WHR

Waist circumference and Hip circumference were measured using an non stretchable inch tape or measuring tape, then accordingly WHR (Waist Hip Ratio) was calculated using the formula. An important issue in using and interpreting waist circumference or waist–hip ratio is the protocol used to obtain the measurements. Also important is the extent to which the measurement protocol varies across studies, and the potential for standardizing these measurements within a study or survey, when taken by different people.

- The anatomical placement of the measuring tape, its tightness and the type of tape used.
- The subject's posture, phase of respiration, abdominal tension, stomach contents and clothing.

The WHO STEP wise Approach to Surveillance (STEPS) provides a simple standardized method for collecting, analysing, and disseminating data in WHO Member countries. The WHO STEPS protocol for measuring waist circumference instructs that the measurement be made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest.

The United States (US) National Institutes of Health (NIH) protocol provided in the NIH Practical guide to obesity (NHLBI Obesity Education Initiative, 2000) and the protocol used in the US National Health and Nutrition Examination Survey (NHANES) III indicate that the waist circumference measurement should be made at the top of the iliac crest. The NIH also provided a protocol for the measurement of waist circumference for the Multi-Ethnic Study of Atherosclerosis (MESA) study. This protocol indicates that the waist measurement should be made at the level of the umbilicus or navel. However, published reports indicate that measurements of waist circumference made at the level of the umbilicus may underestimate the true waist circumference. Some studies have assessed the waist circumference at the point of the minimal waist. Hip circumference all the protocols indicates that the hip circumference measurement should be taken around the widest portion of the buttocks.

3.9.1.2.1 Tightness and type of tape

The accuracy of waist and hip circumference measurements depends on the tightness of the measuring tape, and on its correct positioning (i.e. parallel to the floor at the level at which the measurement is made). The WHO STEPS protocol states that, for both waist and hip, the tape should be snug around the body, but not pulled so tight that it is constricting. The protocol also recommends the use of a stretch-resistant tape that provides a constant 100 g of tension through the use of a special indicator buckle, use of this type of tape reduces differences in tightness. Both the protocol described in NIH Practical guide to obesity (NHLBI

Obesity Education Initiative) and the NHANES III protocol (Westat Inc) recommend that the measurements be made with the tape held snugly, but not constricting, and at a level parallel to the floor.

3.9.1.2.2 Subject posture and other factors

- The posture of the subject at the time the measurement is taken influences the accuracy of the measurement. Thus, the WHO STEPS protocol recommends that the subject stands with arms at the sides, feet positioned close together, and weight evenly distributed across the feet (WHO, 2008b). The NHANES III protocol recommends that the subject be standing erect, with the body weight evenly distributed.
- The phase of respiration determines the extent of fullness of the lungs and the position of the diaphragm at the time of measurement; it also influences the accuracy of the waist circumference. The WHO STEPS protocol suggests that the waist circumference should be measured at the end of a normal expiration, when the lungs are at their functional residual capacity. The NHANES III protocol states that the waist circumference should be measured at minimal expiration.
- The tension of the abdominal wall influences the accuracy of the waist circumference measurement. Lowering the tension of the abdominal wall increases waist circumference, whereas increasing the tension (by sucking in) reduces waist circumference. Many individuals unconsciously react to waist measurements by sucking in the abdominal wall; hence, a relaxed posture is best for taking waist measurements. The WHO STEPS protocol recommends advising the subject to relax and take a few deep, natural breaths before the actual measurement is made, to minimize the inward pull of the abdominal contents during the waist measurement.
- The amount of water, food or gas in the gastrointestinal tract will affect the accuracy of the waist measurement. Gibson, suggests that a waist measurement be made after the subject has fasted overnight or is in a fasted state, to reduce this effect. None of the protocols evaluated address this issue, perhaps because it would entail the subject being notified in advance of the measurement, and being present the morning after an overnight fast.

The waist-hip ratio or waist-to-hip ratio (WHR) is the dimensionless ratio of the circumference of the waist to that of the hips. 79The waist-to-hip ratio is calculated by dividing waist circumference at its narrowest point by hip circumference at the widest point. It is a simple and useful measure of fat distribution. For example, a person with a 75 cm of waist circumference and 95 cm of hip circumference will have an WHR of,

$$\text{WHR} = \frac{\text{WAIST CIRCUMFERENCE}}{\text{HIP CIRCUMFERENCE}} = \frac{75}{95} = 0.79\text{cm}$$

3.9.1.3 Blood pressure

Blood pressure reading was taken using a random baseline mercury sphygmomanometer from each individual.

3.9.2 Dietary Assessment

Dietary assessment was taken through food frequency table. Dietary intake was surveyed with the help of food frequency table structured to which comprises of milk products and meat products. Subjects were asked how frequently they consume the following products with respective to their type of diets with given options like daily, weekly twice, fortnight, monthly once, rarely, or never. Consumption frequencies of lacto products like milk, buttermilk, curd, paneer, cheese were taken for adults following lacto vegetarian diet and non-vegetarian products like egg, fish, shell fish, chicken, organ meta, lean meat, red meat, mutton, prawn, crab, country hen, emu were taken for adults following non vegetarian diets.

3.10 DATA COLLECTION

The gathered data is about age, gender, height, weight, wait circumference, hip circumference, bloop pressure and food frequency questionnaire that includes milk

products for lacto-vegetarian diet individuals and meat products for non-vegetarian diet individuals belonging to selected adult age group of 20 to 55 years.

3.11 SAMPLE SIZE

The sample size is calculated from Rao soft software with margin of error 5%, confidence level 95%, and population size 100, and response distribution 50% recommended sample size is 80. As it is a comparative study the population size of individuals consuming lacto-vegetarian diet is very less comparative to the population size of individuals consuming non vegetarian diets, so the sample size was restricted to 60 in which 30 subjects are lacto-vegetarians and 30 subjects are non-vegetarians.

3.12 SAMPLE METHOD

Random sampling among healthy men and women consuming lacto-vegetarian and non-vegetarian were done and collection of Demographic Data like Age, gender (M/F), do they exercise daily (yes/no), biochemical data like blood pressure and dietary data like type of oil and frequency of consumption of dairy products and meat by lacto-vegetarians and non-vegetarians respectively were taken.

3.13 STATISTICAL ANALYSIS

The comparison of Body Mass Index, systolic pressure, and diastolic pressure between lacto-vegetarians and non-vegetarians were done through Mann Whitney test. The comparison between meat consumption with Body Mass Index, systolic pressure and diastolic pressure were done through Mann Whitney test.

The comparison between dairy products consumption and body mass index was done through Mann Whitney test and comparison between dairy products consumption and systolic pressure was done through unpaired t test and comparison between dairy products consumption and diastolic pressure was done through paired t test.

Tukey's multiple comparisons test was used in the comparison of type of oil with BMI, systolic pressure and diastolic pressure of both lacto-vegetarians and non-vegetarians.

CHAPTER – 4

RESULT AND DISCUSSION

The result of the present study is discussed based on various topics comparing lacto-vegetarians and non-vegetarians in each aspect.

4.1 PERCENTAGE COMPARISON

The percentage was calculated and compared between the lacto-vegetarians and non-vegetarians in each aspect.

Table 4.1.1 Percentage comparison of number of participants of both groups based on age

Age (years)	Lacto-vegetarians	Non-vegetarians
25 – 35	40%	46.66%
36 – 45	30%	36.66%
46 – 55	30%	16.66%

Table 4.1.1 represents the Comparison of number of participants based on their age in which non-vegetarian participants aged between 25 to 45 years are comparatively more with 46.66% than lacto-vegetarian participants with 40%.

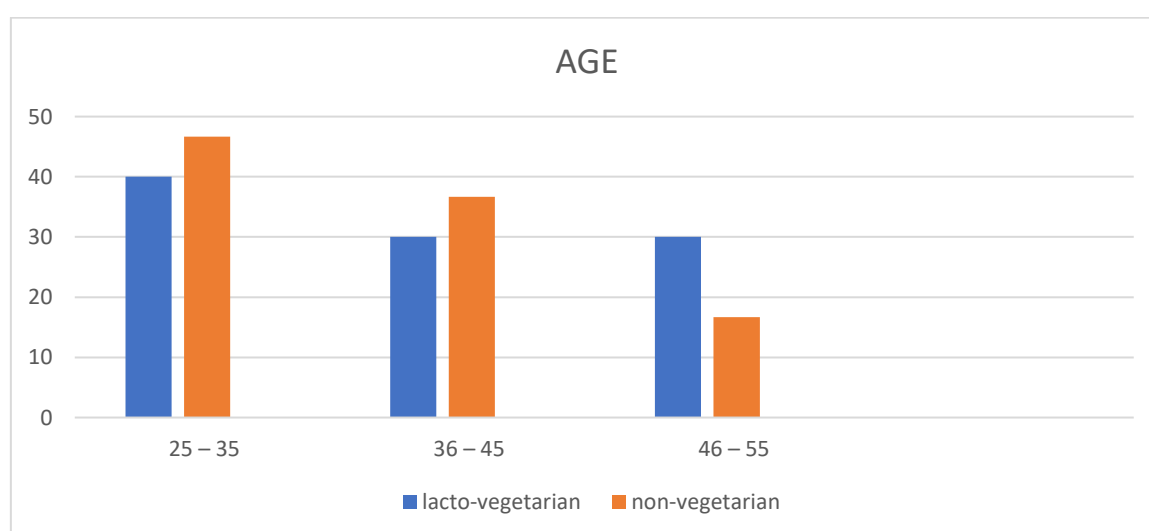


Fig.4.1.1 graphical representation of number of participants of both groups based on age

Table 4.1.2 Percentage comparison of number of participants of both groups based on gender

Gender	Lacto-vegetarians	Non-vegetarians
Male	60%	36.66%
Female	40%	63.33%

Table 4.1.2 represents the comparison of number of participants of both groups based on their gender in which male lacto-vegetarian participants are comparatively more with 60% than non-vegetarian participants with 36.33% and female non vegetarian participants are more with 63.33% than lacto-vegetarian participants with 40%.

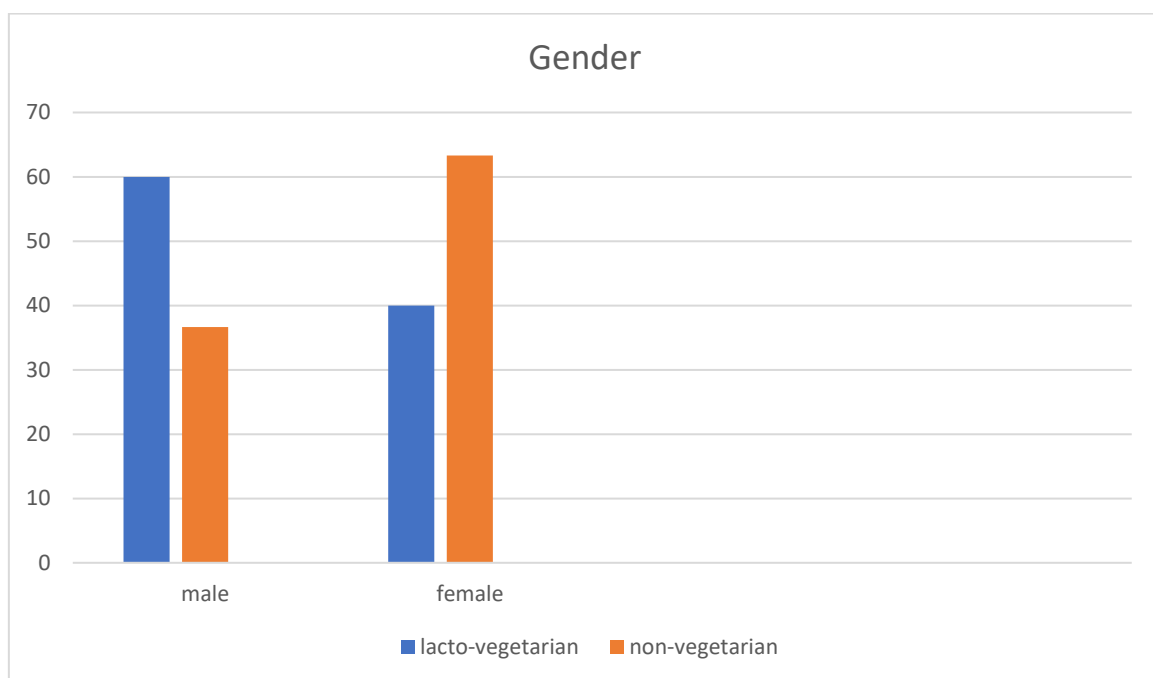


Fig.4.1.2 graphical representation of number of participants of both groups based on gender

Table 4.1.3 Percentage comparison of number of participants based on weight

Weight (in kg)	Lacto-vegetarians	Non-vegetarians
61 – 70	13.33%	13.33%
71 – 80	53.33%	23.33%
81 – 90	10%	30%
91 – 100	16.66%	20%
101 – 110	3.33%	13.33%

Table 4.1.3 represents the comparison of number of participants of both groups based on their, it was found that the non-vegetarian consuming participants weigh more of which 63.33% weigh more than 80 kgs than the lacto-vegetarian consuming participants of which only 29.99% weigh more than 80 kgs.

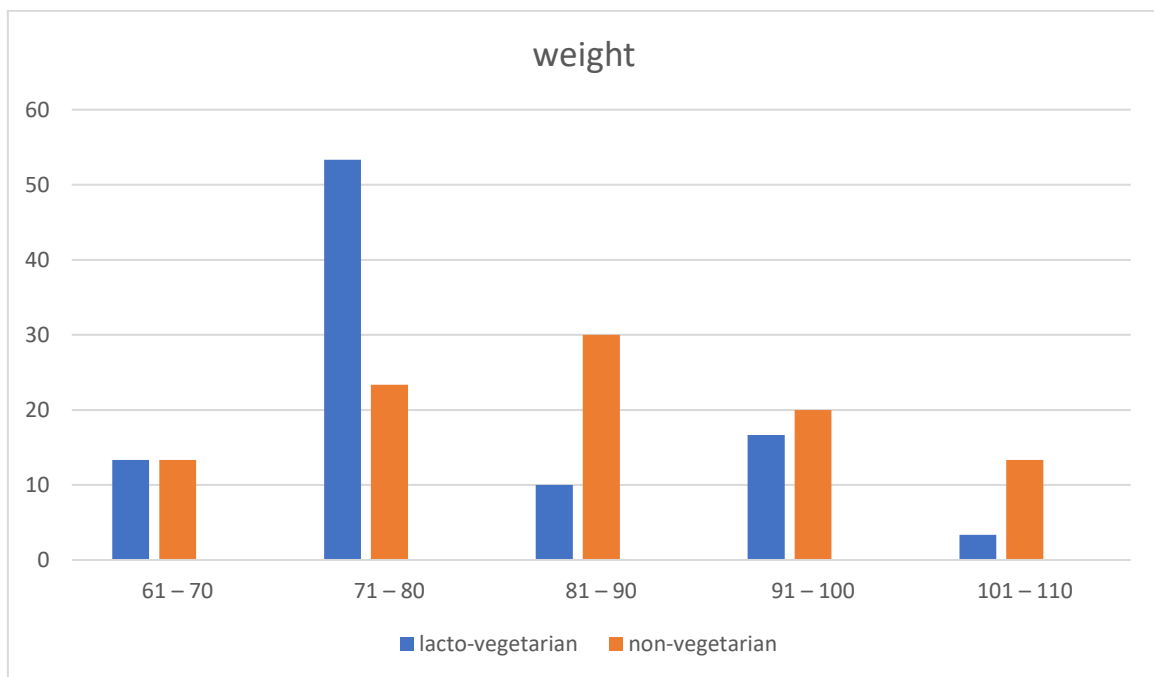


Fig.4.1.3 graphical representation of number of participants based on weight

Table 4.1.4 Percentage comparison of number of participants of both groups based on height

Height (in cm)	Lacto-vegetarians	Non-vegetarians
151 – 160	16.66%	30%
161 – 170	60%	26.66%
171 – 180	16.67%	33.33%
181 – 190	6.67%	10%

Table 4.1.4 represents the comparison of number of participants of both groups based on their height, in which non-vegetarian consuming participants of height between 171cm to 180cm are comparatively more with 33.33% than lacto-vegetarian consuming participants with only 16.67% and 60% of the lacto-vegetarian consuming participants are under 161 cm to 170cm of height.

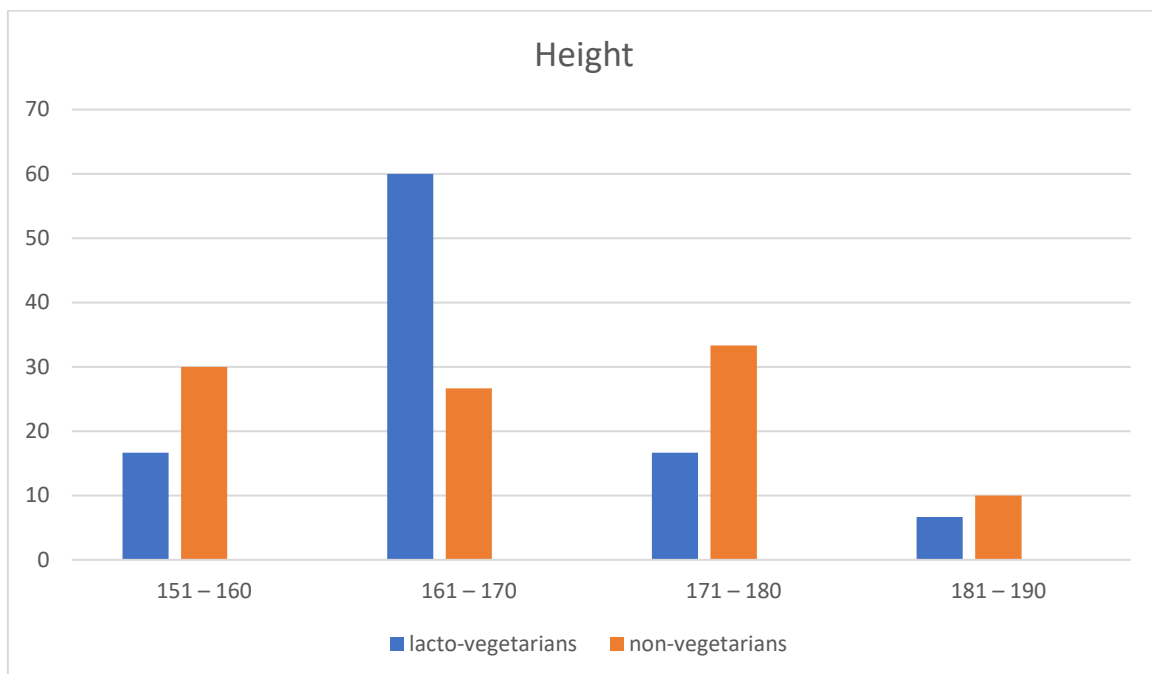


Fig.4.1.4 graphical representation of number of participants of both groups based on height

Table 4.1.5 Percentage comparison of number of participants based on BMI

BMI	Lacto-vegetarians	Non-vegetarians
Below 18.5	-	-
18.5 – 24.9	13.33%	23.34%
25.0 – 29.9	60%	26.67%
30.0 – 34.9	20%	23.34%
35.0 – 39.9	3.33%	23.4%
Above 40	3.33%	3.34%

Table 4.1.5 represents the comparison of number of participants of both groups based on their BMI, according to the classification by WHO, it was found that 50.08% of non-vegetarian consuming participants are comparatively more obese than the lacto-vegetarian consuming participants with 26.66%. More than half that is 60% of the lacto-vegetarian consuming participants are falling under the category of overweight.

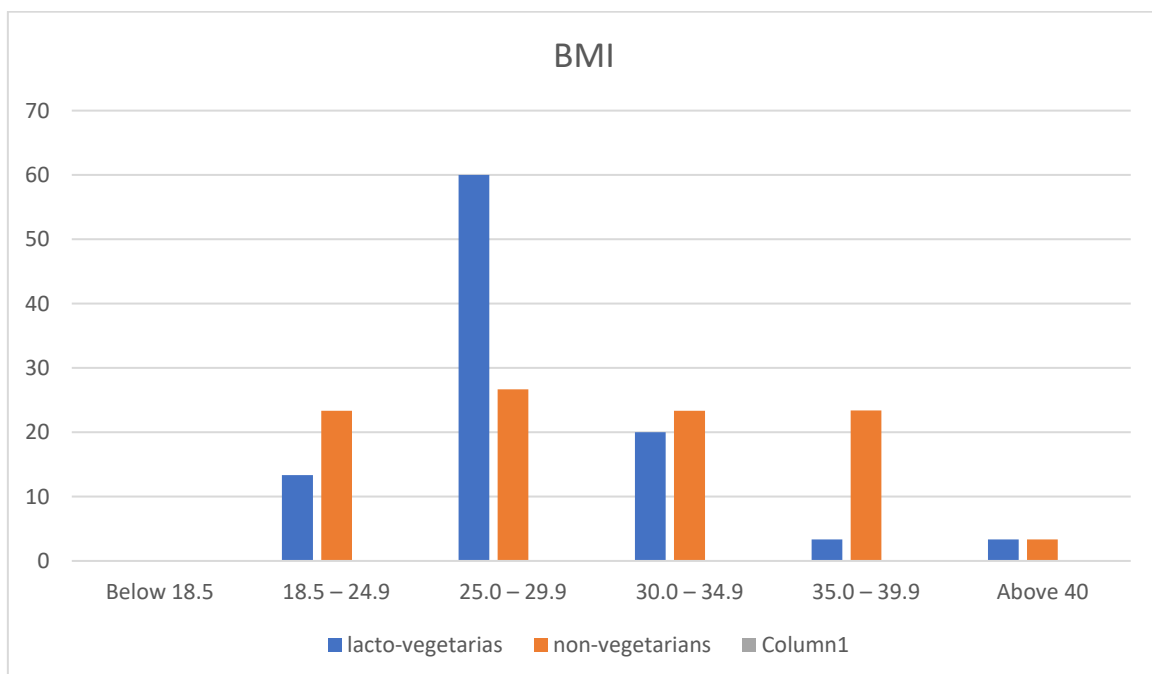


Fig.4.1.5 graphical representation of number of participants based on BMI

Table 4.1.6 Percentage comparison of number of female participants of both groups based on WHR

WHR (in cm)	Lacto-vegetarians	Non-vegetarians
Less than 0.85	52.6%	-
Greater than 0.85	47.3%	100%

Table 4.1.6 represents the comparison of the WHR of the female participants of both the groups, according to the classification by WHO, it was found that all the non-vegetarian consuming female participants are above the normal and in a category of obese comparatively in which only 47.3% of the female participants of lacto-vegetarian falls in the same category.

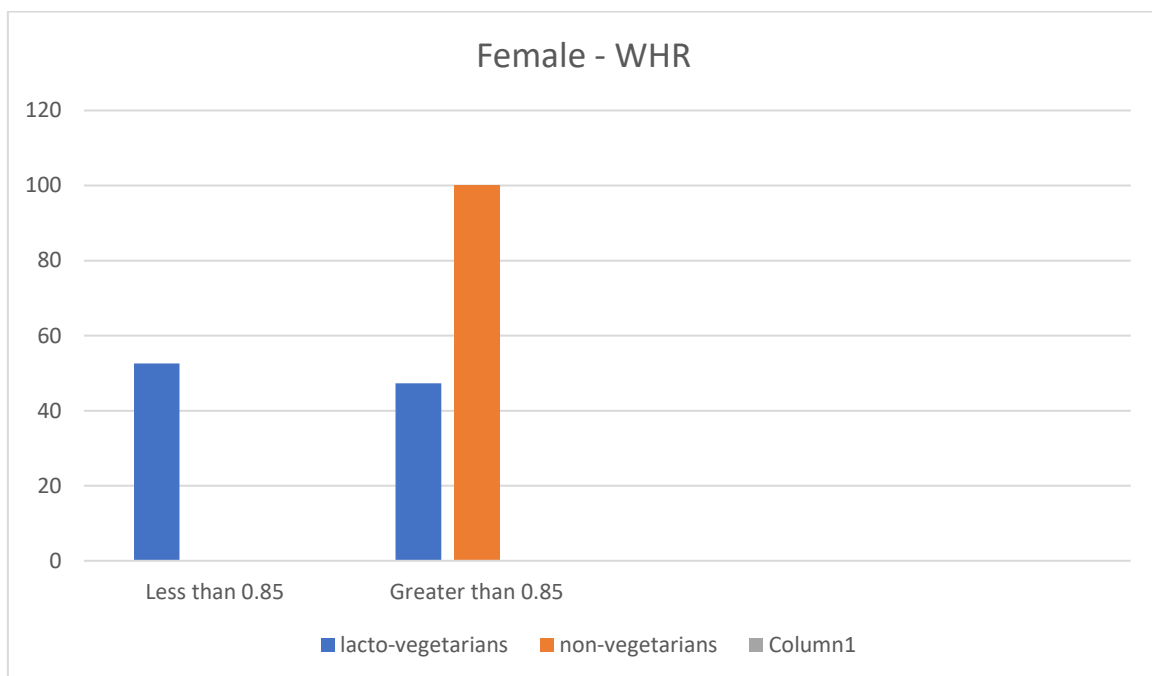


Fig.4.1.6 graphical representation of Number of female participants of both groups based on WHR

Table 4.1.7 Percentage comparison of number of male participants of both groups based on WHR

WHR (in cm)	Lacto-vegetarians	Non-vegetarians
Less than 0.90	38.88%	18.18%
Greater than 0.90	61.12%	81.82%

Table 4.1.7 represents the comparison of the WHR of the male participants of both the groups, according to the classification by WHO, it was found that 81.82% of the participants of non-vegetarian group are above the normal and in a category of obese whereas, 61.12% of participants belonging to lacto-vegetarian group are obese.

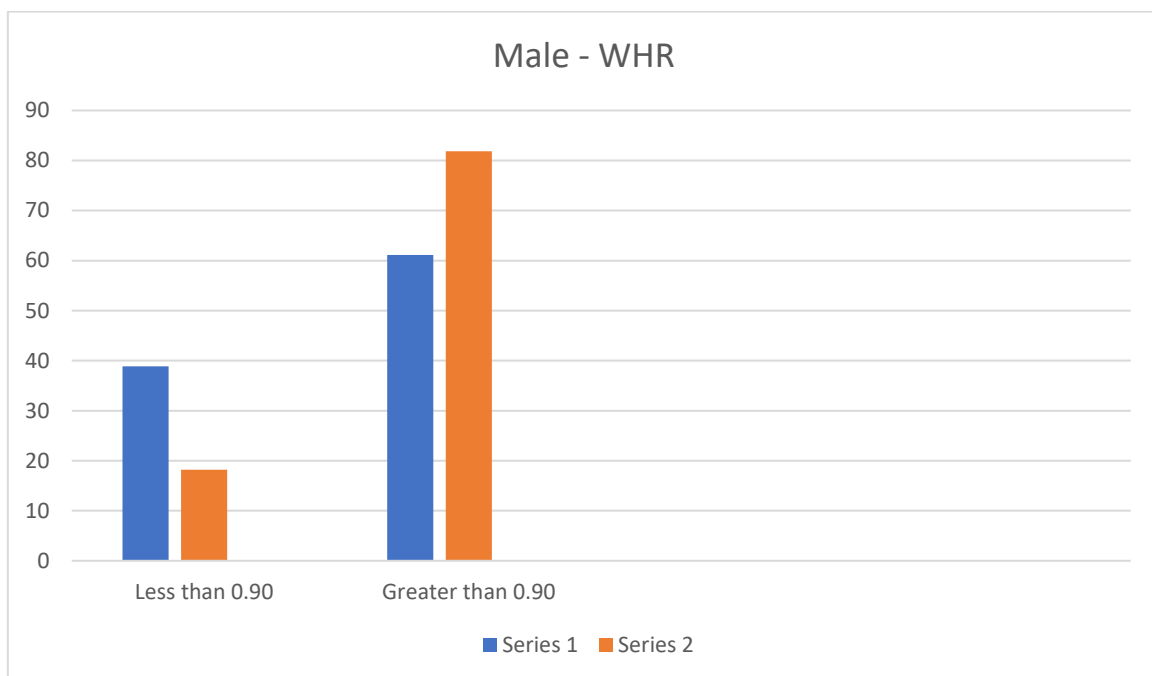


Fig.4.1.7 graphical representation of Number of male participants of both groups based on WHR

Table 4.1.8 Percentage comparison of number of participants based on Systolic Pressure

Systolic pressure	Lacto-vegetarians	Non-vegetarians
100	26.66%	13.33%
110	20%	13.33%
120	33.33%	16.67%
130	10%	30%
140	10%	26.67%

Table 4.1.8 represents the comparison of number of participants of both groups based on their systolic pressure, according to the WHO classification, it was found that 33.33% of participants of lacto-vegetarian group are under the normal range that is 120 whereas, 56.67% of participants of non-vegetarian group are above the normal range.

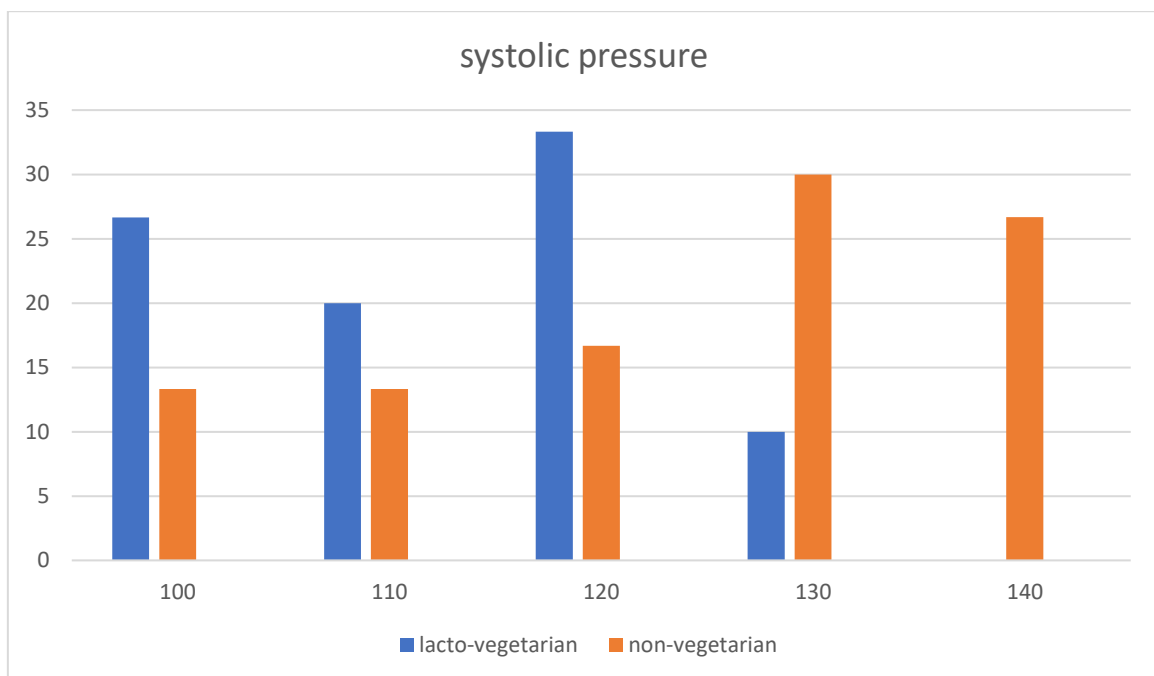


Fig.4.1.8 graphical representation of number of participants based on Systolic Pressure

Table 4.1.9 Percentage comparison of number of participants of both groups based on Diastolic Pressure

Diastolic pressure	Lacto-vegetarians	Non-vegetarians
60	6.67%	6.67%
70	33.33%	26.67%
80	33.33%	40%
90	26.67%	26.67%

Table 4.1.9 represents the comparison of the participants of both groups based on their diastolic pressure, according to the WHO classification, it was found that equal number of participants of both the groups are under the normal range that is 90.

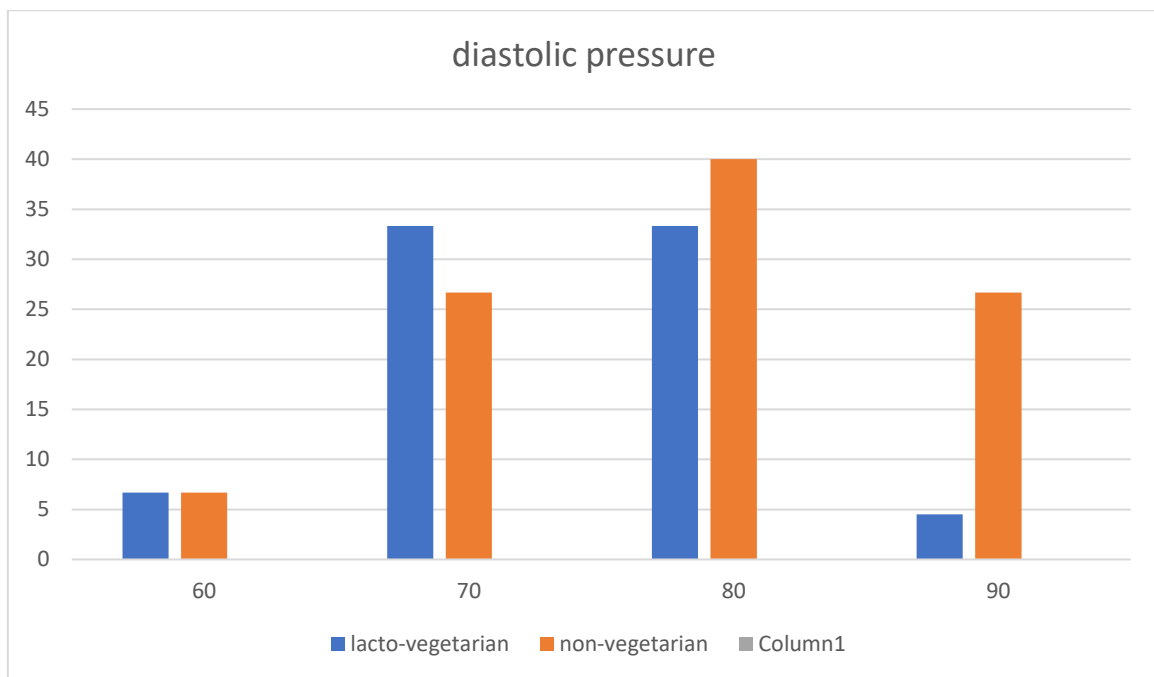


Fig.4.1.9 graphical representation of number of participants of both groups based on diastolic Pressure

Table 4.1.10 Percentage comparison of number of participants of both groups based on daily physical activity

Daily physical activity	Lacto-vegetarians	Non-vegetarians
YES	30%	13.33%
NO	60%	86.67%

Table 4.1.10 represents the comparison of number of participants of both groups based on their daily physical activity in which more than 50% of the participants of both the groups do not exercise regularly.

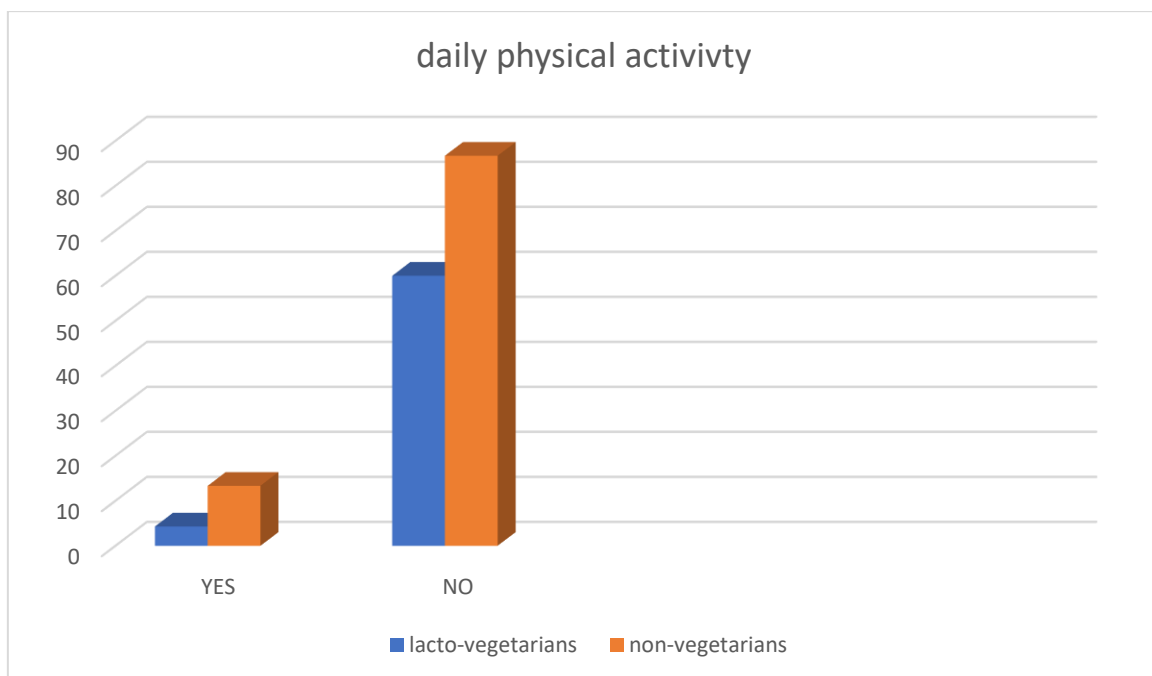


Fig.4.1.10 graphical representation of number of participants of both groups based on daily physical activity

Table 4.1.11 Percentage comparison of number of participants of both the groups based on consumption of type of oil

TYPE OF OIL	Lacto-vegetarians	Non-vegetarians
Coconut oil	13.33%	13.33%
Sunflower oil	20.5%	70%
Ground nut oil	53.33%	6.67%
Other type oils	13.33%	10%

Table 4.1.11 represents the comparison of number of participants of both the groups based on the type of oil they are consuming; it was found that 70% of the non-vegetarian consuming participants consumes sunflower oil whereas 53.33% of the participants of lacto-vegetarian group consume ground nut oil in which least percentage of participants that is only 10% of non-vegetarian group consume the same oil.

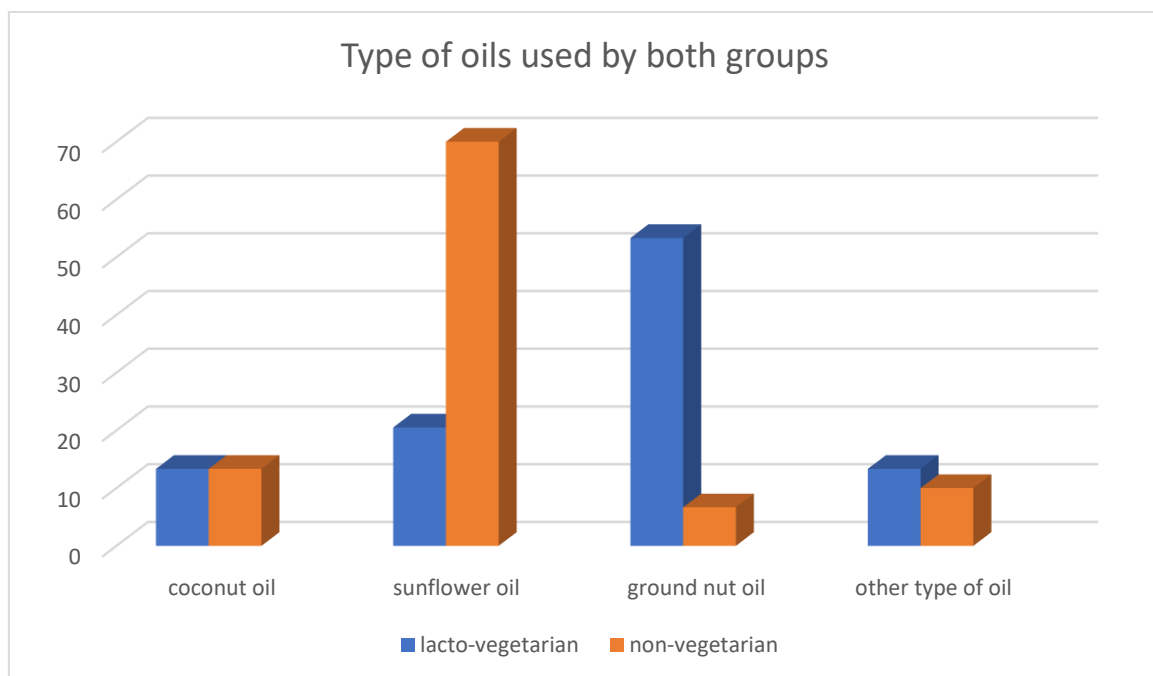


Fig.4.1.11 graphical representation of number of participants of both the groups based on consumption of type of oil

Table 4.1.12 Percentage frequency of consumption of milk by lacto-vegetarian group participants

Frequency of consumption	Milk
Daily	100%
Weekly twice	-
Fortnight	-
Monthly	-
Rarely/never	-

Table 4.1.12 represents the frequency of consumption of milk by lacto-vegetarian group participants, it was found that all the participants were consuming milk daily.

Table 4.1.13 Percentage frequency of consumption of paneer by lacto-vegetarian group participants

Frequency of consumption	Paneer
Daily	-
Weekly twice	20%
Fortnight	40%
Monthly	33.33%
Rarely/never	6.67%

Table 4.1.13 represents the frequency of consumption of paneer by lacto-vegetarian group participants, it was found that 40% of the participants consumes once in every two weeks and 33.33% consume once in a month, 20% consume once in every two weeks and 6.67% consume rarely.

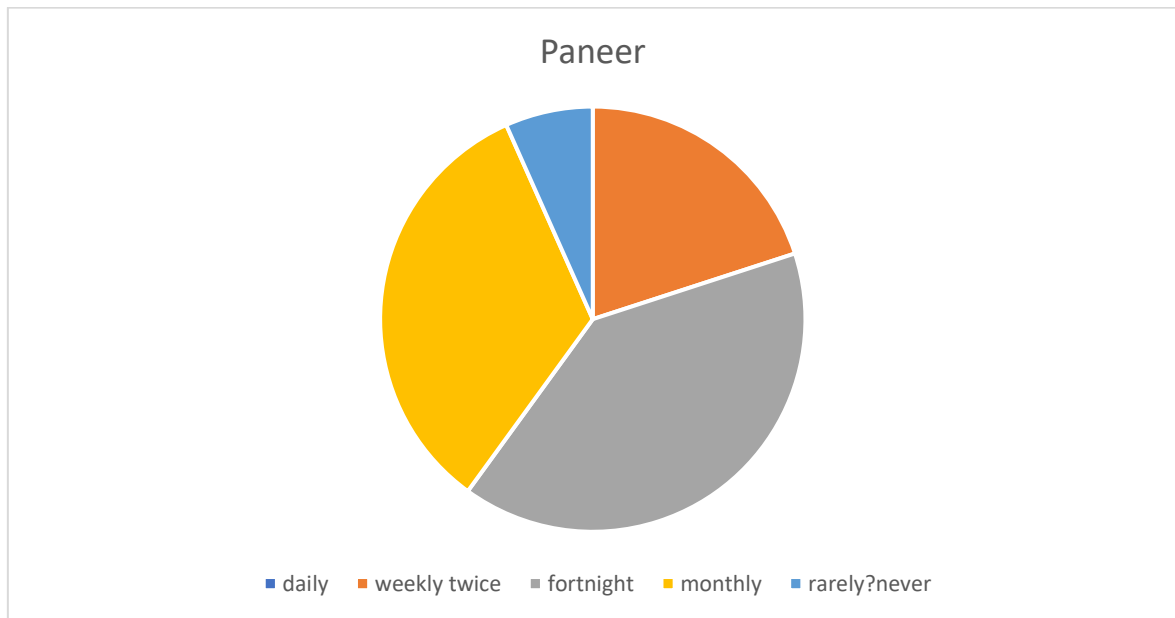


Fig.4.1.13 graphical representation of frequency of consumption of paneer by lacto-vegetarian group participants.

Table 4.1.14 Percentage frequency of consumption of cheese by lacto-vegetarian group participants

Frequency of consumption	Cheese
Daily	0
Weekly twice	0
Fortnight	10%
Monthly	50%
Rarely/never	40%

Table 4.1.14 represents the frequency of consumption of cheese by lacto-vegetarian group participants, it was found that cheese is not consumed daily or weekly twice and half of the participants consume it once in a month, 40% consume rarely and 10% consume once in every two weeks.

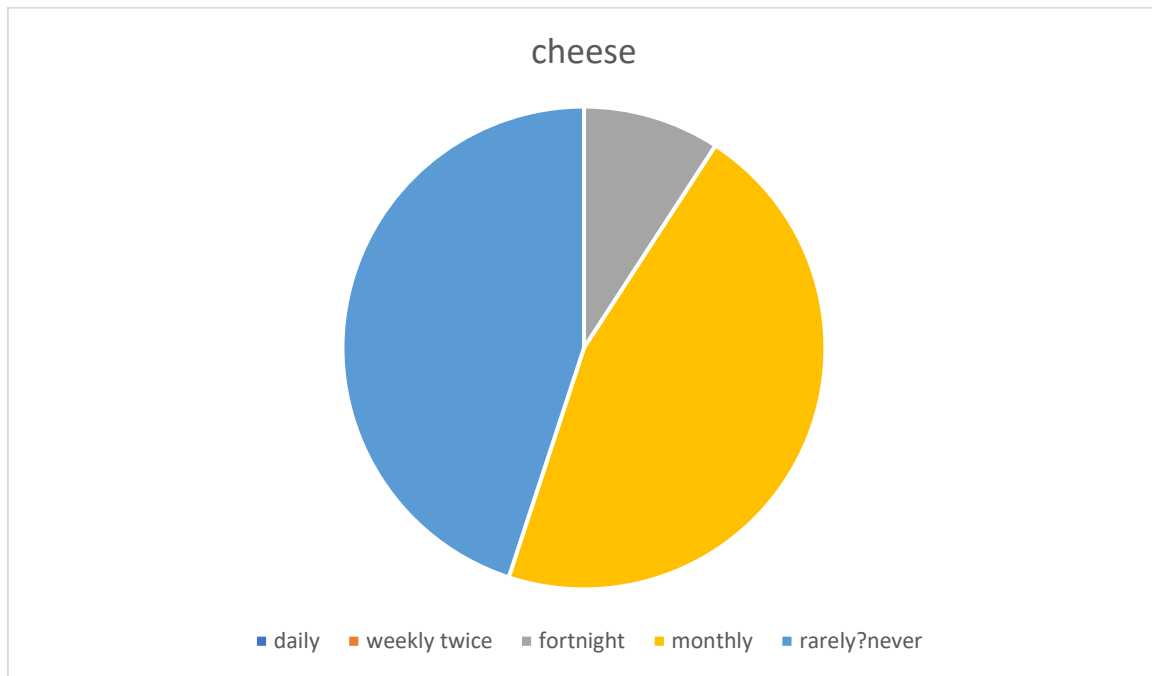


Fig.4.1.14 graphical representation of frequency of consumption of cheese by lacto-vegetarian group participants.

Table 4.1.15 Percentage frequency of consumption of curd by lacto-vegetarian group participants.

Frequency of consumption	Curd
Daily	50%
Weekly twice	36.67%
Fortnight	13.33%
Monthly	0
Rarely/never	0

Table 4.1.15 represents the frequency of consumption of curd by lacto-vegetarian group participants, it was found that half of the participants consume daily and 36.3% of the other half participants consume twice in a week and 13.33% consume once in every two weeks.

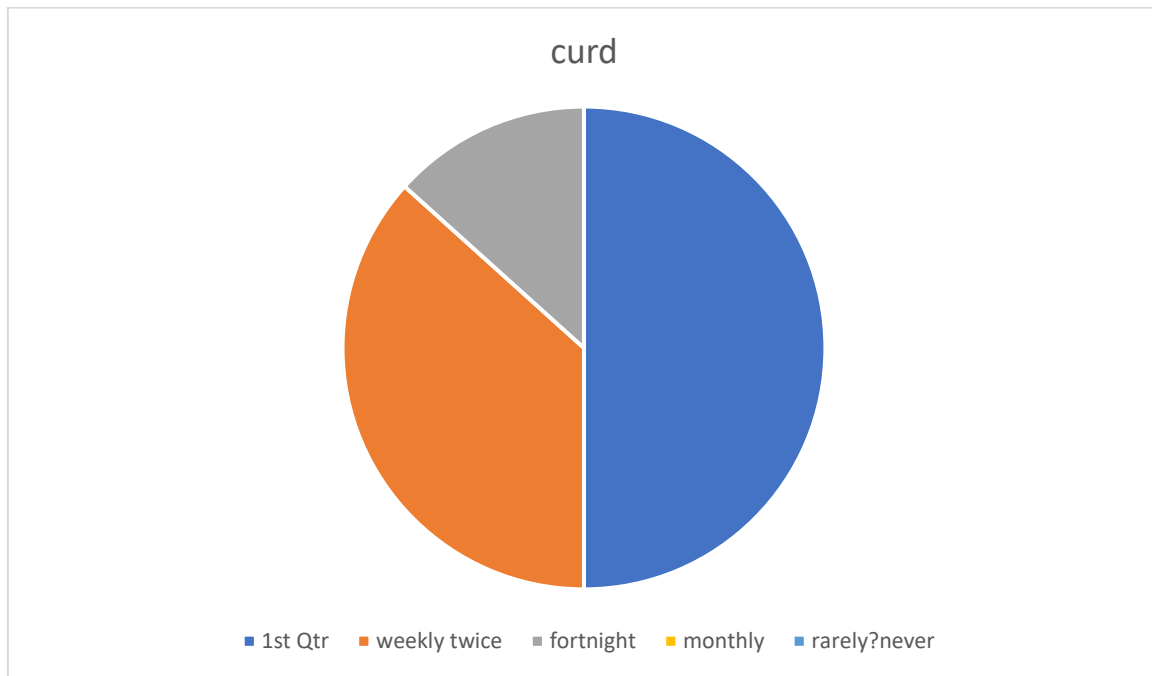


Fig.4.1.15 graphical representation of frequency of consumption of curd by lacto-vegetarian group participants.

Table 4.1.16 Percentage frequency of consumption of buttermilk by lacto-vegetarian group participants

Frequency of consumption	Buttermilk
Daily	56.67%
Weekly twice	43.33%
Fortnight	0
Monthly	0
Rarely/never	0

Table 4.1.16 represents the frequency of consumption of buttermilk by lacto-vegetarian group participants, it was found that all the participants consume buttermilk in which 56.67% of the participants consume it daily while the remaining 43.33% consume it twice in a week.

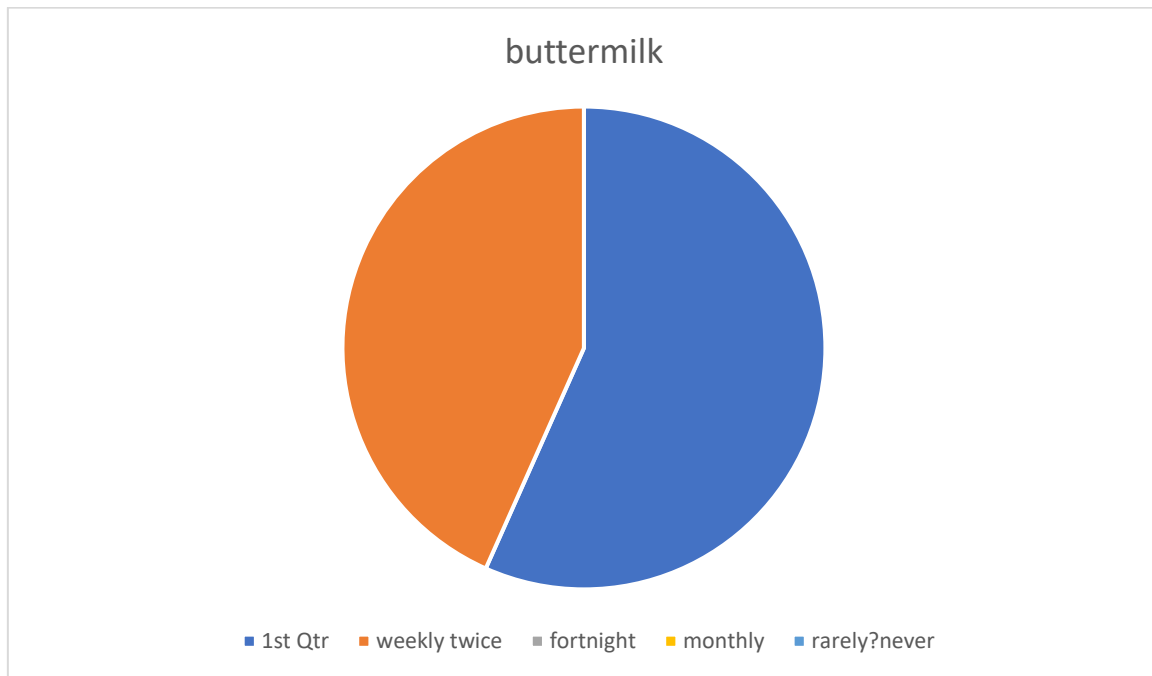


Fig.4.1.16 graphical representation of frequency of consumption of buttermilk by lacto-vegetarian group participants

Table 4.1.17 Percentage frequency of consumption of egg by non-vegetarian group participants

Frequency of consumption	Egg
Daily	56.67%
Weekly twice	16.67%
Fortnight	13.33%
Monthly	6.67%
Rarely/never	6.67%

Table 4.1.17 represents the frequency of consumption of egg by non-vegetarian group participants, it was found that 56.67% of the participants were consuming daily, 16.67% consume twice a week, 13.33% consume once in every two weeks, 6.67% consume once in a month and rarely.

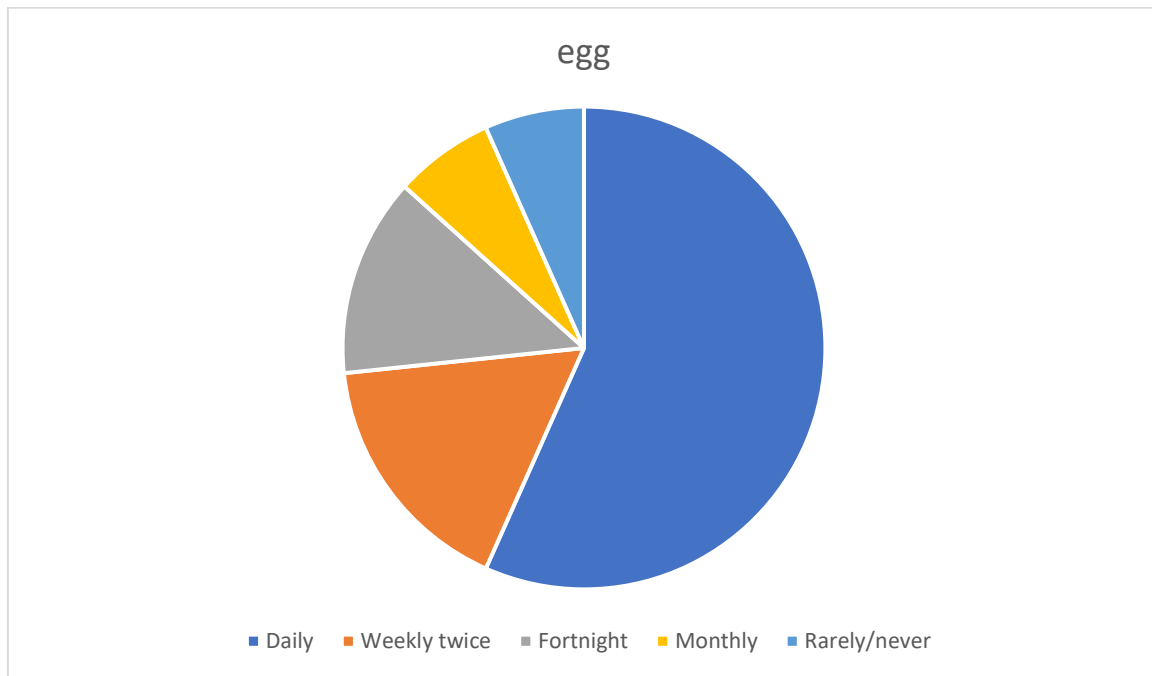


Fig.4.1.17 graphical representation of frequency of consumption of egg by non-vegetarian group participants

Table 4.1.18 Percentage frequency of consumption of fish by non-vegetarian group participants

Frequency of consumption	Fish
Daily	0
Weekly twice	13.3%
Fortnight	50%
Monthly	36.67
Rarely/never	0

Table 4.1.18 represents the frequency of consumption of fish by non-vegetarian group participants, it was found that half of the participants consume once in every two weeks and 36.67% of the remaining half consume once in a month and 13.3% consume twice a week.

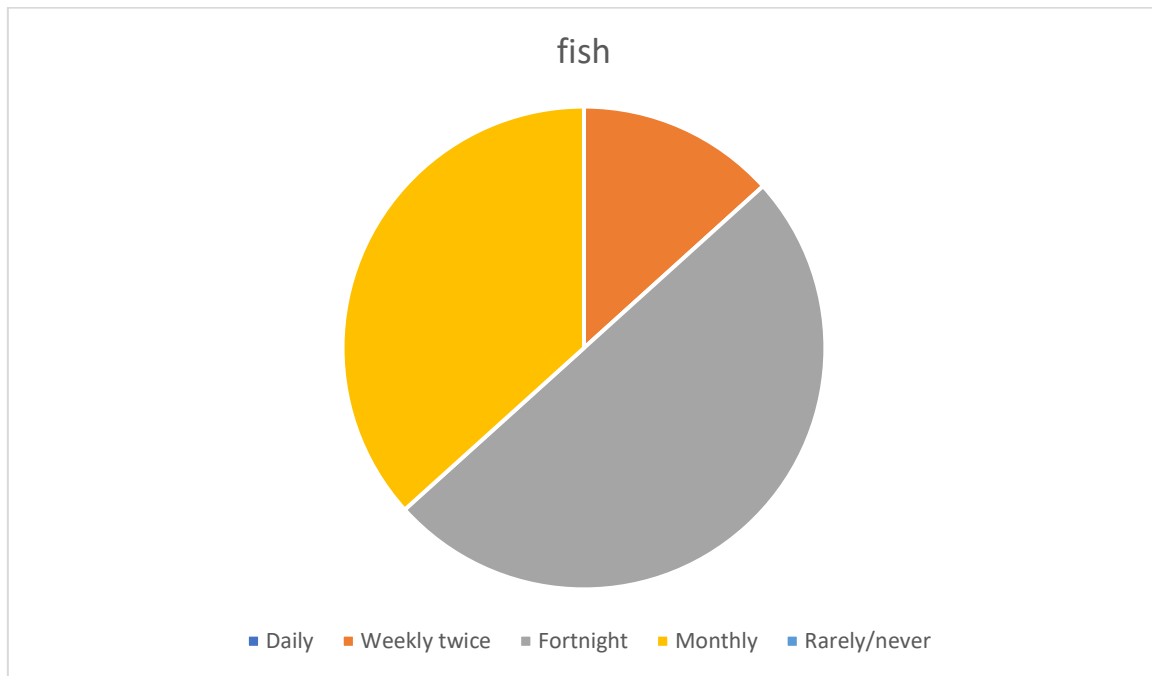


Fig.4.1.18 graphical representation of frequency of consumption of fish by non-vegetarian group participants

Table 4.1.19 Percentage frequency of consumption of chicken by non-vegetarian group participants

Frequency of consumption	Chicken
Daily	16.67%
Weekly twice	40%
Fortnight	33.33%
Monthly	10%
Rarely/never	0

Table 4.1.19 frequency of consumption of chicken by non-vegetarian group participants, it was found that 40% of the participants consume twice in a week and 33.33% once in every two weeks and least of 10% them consume once in a month and 16.67% consume daily.

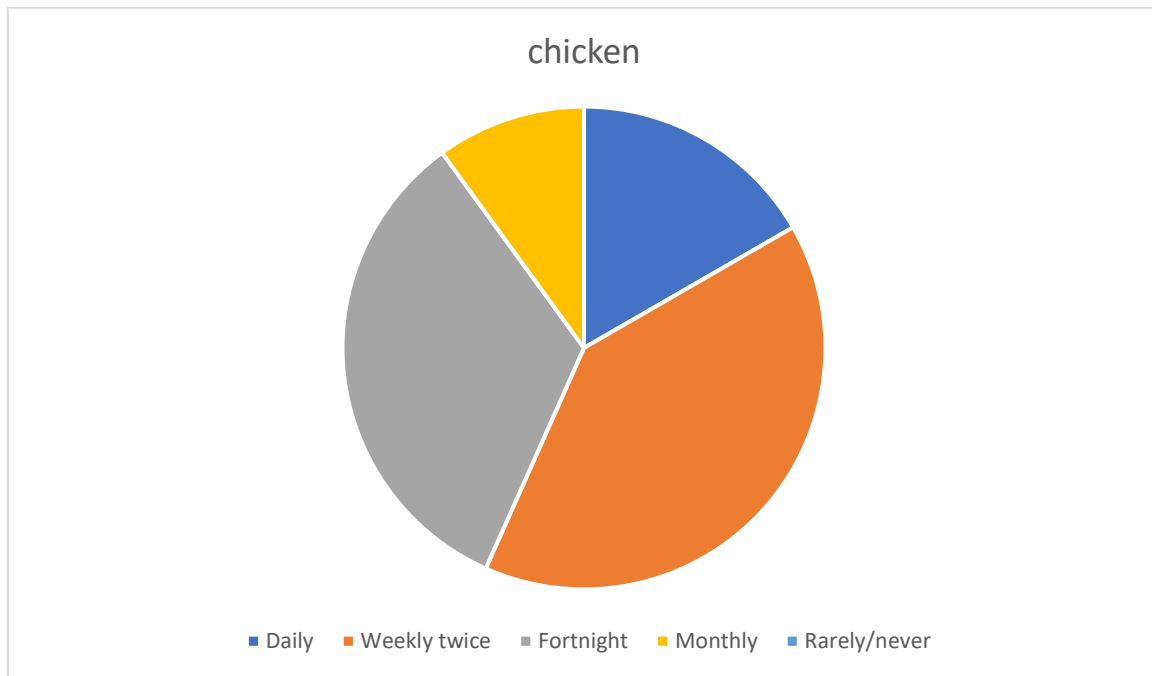


Fig.4.1.19 graphical representation of frequency of consumption of chicken by non-vegetarian group participants

Table 4.1.20 Percentage frequency of consumption of organ meat by non-vegetarian group participants

Frequency of consumption	Organ meat
Daily	0
Weekly twice	16.66%
Fortnight	33.33%
Monthly	36.67%
Rarely/never	13.33%

Table 4.1.20 represents the frequency of consumption of organ meat by non-vegetarian group, it was found that 1/3rd of the participants consumes once in every two weeks, 16.66% consume twice a week, 36.67% consume once in a month and 13.33% consume rarely.

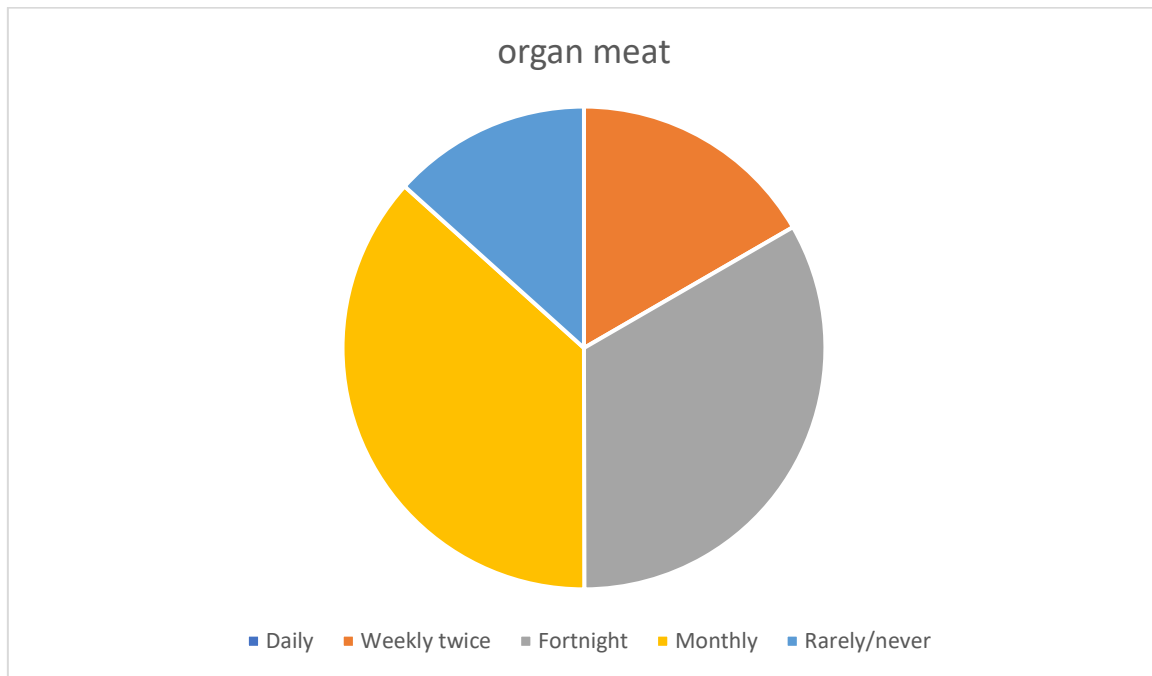


Fig.4.1.20 graphical representation of frequency of consumption of organ meat by non-vegetarian group participants

Table 4.1.21 Percentage frequency of consumption of lean meat by non-vegetarian group participants

Frequency of consumption	Lean meat
Daily	6.67%
Weekly twice	16.67%
Fortnight	33.33%
Monthly	43.33%
Rarely/never	0

Table 4.1.21 represents the frequency of consumption of lean meat by non-vegetarian group participants, it was found that only 6.67% of the participants consume daily and 43.33% consume once in a month, 16.67% consume twice a week and 33.33% consume once in every two weeks.

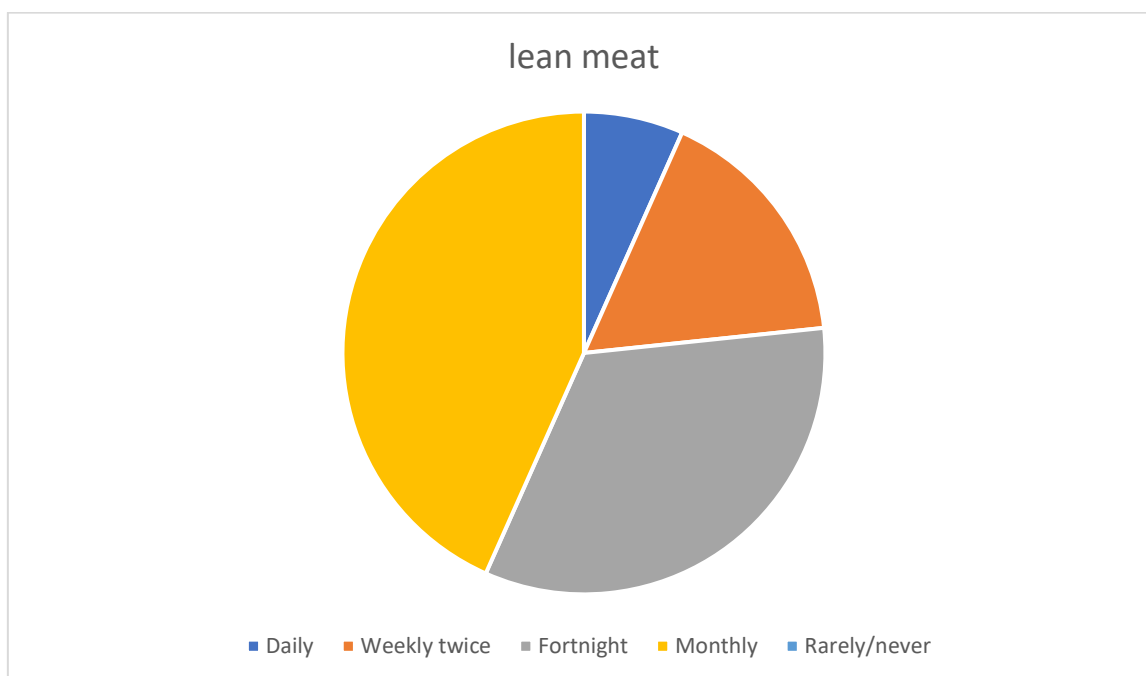


Fig.4.1.21 graphical representation of frequency of consumption of lean meat by non-vegetarian group participants.

Table 4.1.22 Percentage frequency of consumption of mutton by non-vegetarian group participants

Frequency of consumption	Mutton
Daily	0
Weekly twice	23.33%
Fortnight	30%
Monthly	46.66%
Rarely/never	0

Table 4.1.22 represents the frequency of consumption of mutton by non-vegetarian group participants, it was found that none of the participant consume daily or even rarely, in which 46.66% of the participants consume once in a month, 23.33% consume twice a week and 30% consume once in every two weeks.

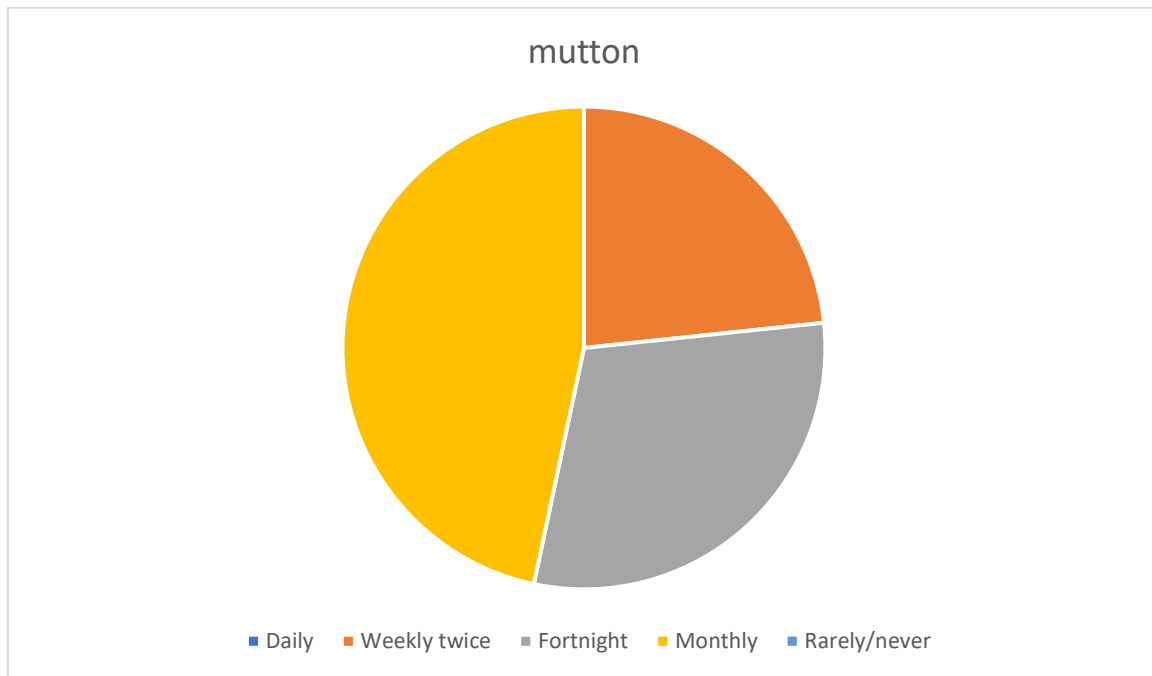


Fig.4.1.22 graphical representation of frequency of consumption of mutton by non-vegetarian group participants.

Table 4.1.23 Percentage frequency of consumption of crab by non-vegetarian group participants

Frequency of consumption	Crab
Daily	0
Weekly twice	0
Fortnight	16.67%
Monthly	63.33%
Rarely/never	20%

Table 4.1.23 represents the frequency of consumption of crab by non-vegetarian group participants, it was found that a majority of more than half of the participants that is 63.33% consume once in a month, 16.67% consume once in every two weeks, and 20% consume rarely.

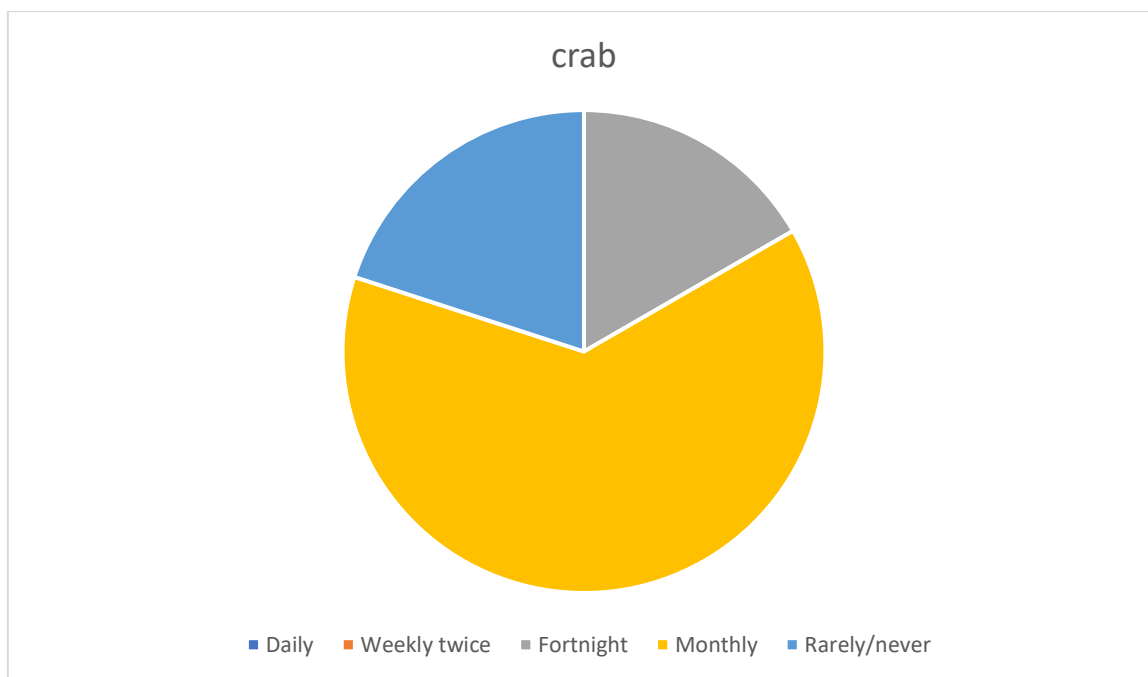


Fig.4.1.23 graphical representation of frequency of consumption of crab by non-vegetarian group participants.

Table 4.1.24 Percentage frequency of consumption of prawn by non-vegetarian group participants

Frequency of consumption	Prawn
Daily	0
Weekly twice	10%
Fortnight	20%
Monthly	43.33%
Rarely/never	26.67%

Table 4.1.24 represents the frequency of consumption of prawn by non-vegetarian group participants, it was found that a majority of $\frac{1}{4}$ th of the participants consume very rarely, 10% consume twice in a week, 20% consume once in every two weeks, every and 43.33% consume once in a month.

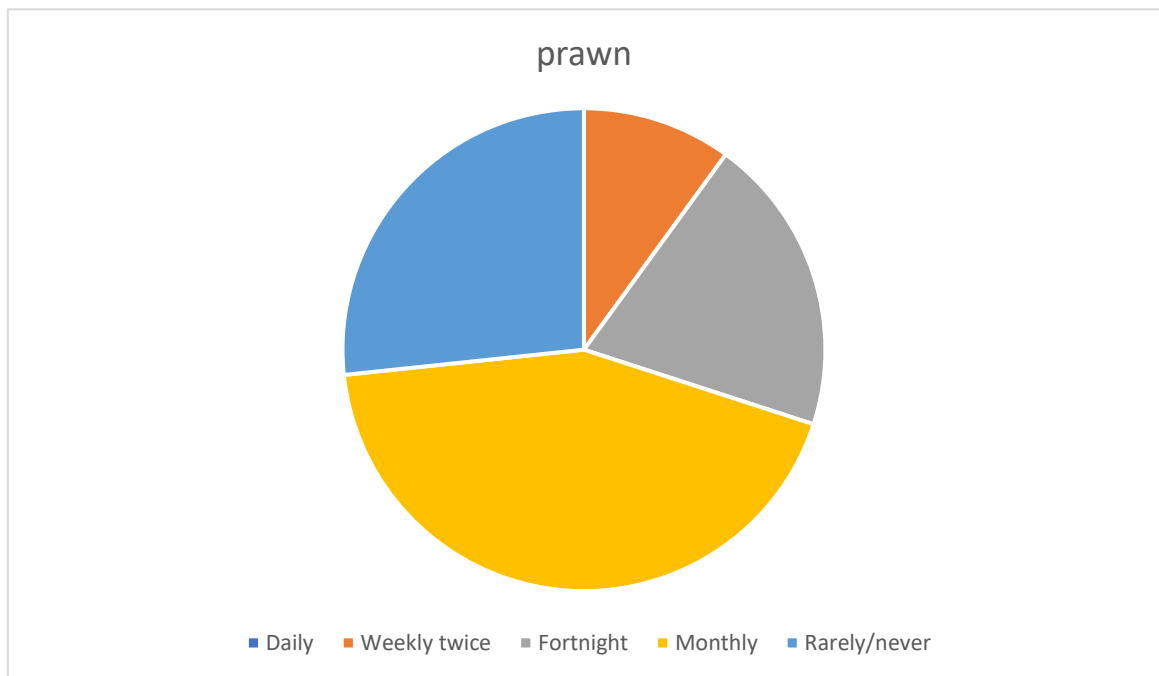


Fig.4.1.24 graphical representation of frequency of consumption of prawn by non-vegetarian group participants

4.2 STATISTICAL ANALYSIS

To compare the significance of the study, different tests such as Tukey's multiple comparisons test, Mann Whitney test, Unpaired t test with Welch's correction, Unpaired t test, Paired t test were used under statistical analysis.

Table 4.2.1 Analysis of comparison between BMI based on type of oil consumed by lacto-vegetarian group.

Number of families	1							
Number of comparisons per family	3							
Alpha	0.05							
Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Significant?	Summary	Adjusted P value			
Sunflower oil vs. Coconut oil	-1.395	-6,634 to 3,844	No	Ns	0.5705	A-B		
Coconut oil vs. Ground nut oil	-3.711	-7,232 to -0,1891	Yes	*	0.039	A-C		
Coconut oil vs. Ground nut oil	-2.316	-8,775 to 4,144	No	Ns	0.4068	B-C		
Test details	Mean 1	Mean 2	Mean Diff,	SE of diff,	n1	n2	Q	DF
Sunflower oil vs. Coconut oil	27.13	28.53	-1.395	1.254	12	4	1.574	3
Sunflower oil vs. Ground nut oil	27.13	30.84	-3.711	1.304	12	13	4.025	11
Coconut oil vs. Ground nut oil	28.53	30.84	-2.316	1.546	4	13	2.119	3

Table 4.2.1 represents the analysis of comparison between BMI based on type of oil consumed by lacto-vegetarian group shows a significant comparison of BMI between the participants consuming ground nut oil and coconut oil with a

significance level of 0.05. Whereas, there is no significance of BMI between participants consuming sunflower oil and coconut oil and also between coconut oil and ground nut oil.

Table 4.2.2 Analysis of comparison between systolic pressure based on type of oil consumed by lacto-vegetarian group

Number of families	1							
Number of comparisons per family	3							
Alpha	0.05							
Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Significant?	Summary	Adjusted P Value			
Sunflower oil vs. Coconut oil	0	-17,81 to 17,81	No	ns	>0,9999	A-B		
Sunflower oil vs. Ground nut oil	-31.35	-43,70 to -19,00	Yes	****	<0,0001	A-C		
Coconut oil vs. Ground nut oil	-31.35	-48,99 to -13,71	Yes	***	0.0004	B-C		
Test details	Mean 1	Mean 2	Mean Diff,	SE of diff,	n1	n2	q	DF
Sunflower oil vs. Coconut oil	112.5	112.5	0	7.168	12	4	0	26
Sunflower oil vs. Ground nut oil	112.5	143.8	-31.35	4.97	12	13	8.919	26

Table 4.2.2 represents the analysis of comparison of systolic pressure based on type of oil consumed by lacto-vegetarian group, shows a significant comparison of systolic pressure between the participants consuming ground nut oil and coconut oil and also between sunflower oil and ground oil with a significance level of 0.05. Whereas, there is no significance of systolic pressure between participants consuming sunflower oil and coconut oil.

Table 4.2.3 Analysis of comparison between diastolic pressure based on type of oil consumed by lacto-vegetarian groups

Number of families	1							
Number of comparisons per family	3							
Alpha	0.05							
Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Significant?	Summary	Adjusted P Value			
Sunflower oil vs. Coconut oil	4.167	-12,49 to 20,83	No	ns	0.6034	A-B		
Sunflower oil vs. Ground nut oil	-4.103	-18,07 to 9,869	No	ns	0.7148	A-C		
Coconut oil vs. Ground nut oil	-8.269	-31,07 to 14,54	No	ns	0.4006	B-C		
Test details	Mean 1	Mean 2	Mean Diff,	SE of diff,	n1	n2	q	DF
Sunflower oil vs. Coconut oil	76.67	72.5	4.167	3.987	12	4	1.478	3
Sunflower oil vs. Ground nut oil	76.67	80.77	-4.103	5.173	12	13	1.122	11
Coconut oil vs. Ground nut oil	72.5	80.77	-8.269	5.457	4	13	2.143	3

Table 4.2.3 represents the analysis of comparison of diastolic pressure based on type of oil consumed by lacto-vegetarian group, shows there is no significance of comparison of diastolic pressure between the participants consuming ground nut oil and coconut oil, between sunflower oil and ground oil and also between sunflower oil and coconut oil.

Table 4.2.4 Analysis of comparison between BMI based on type of oil consumed by non-vegetarian group

Number of families	1							
Number of comparisons per family	3							
Alpha	0.05							
Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Significant?	Summary	Adjusted P Value			
Sunflower oil vs. Coconut oil	4.202	-4,220 to 12,62	No	ns	0.3194	A-B		
Sunflower oil vs. Ground nut oil	0.9788	-15,53 to 17,49	No	ns	0.9758	A-C		
Coconut oil vs. Ground nut oil	-3.223	-13,73 to 7,285	No	ns	0.5666	B-C		
Test details	Mean 1	Mean 2	Mean Diff,	SE of diff,	n1	n2	q	DF
Sunflower oil vs. Coconut oil	31.12	26.92	4.202	2.588	17	6	2.296	5
Sunflower oil vs. Ground nut oil	31.12	30.14	0.9788	4.632	17	5	0.2988	4
Coconut oil vs. Ground nut oil	26.92	30.14	-3.223	2.948	6	5	1.546	4

Table 4.2.4 represents the analysis of comparison of BMI based on type of oil consumed by non-vegetarian group, shows there is no significance of comparison of systolic pressure between the participants consuming ground nut oil and coconut oil, sunflower oil and ground oil and also between sunflower oil and coconut oil.

Table 4.2.5 Analysis of comparison between systolic pressure based on type of oil consumed by non-vegetarian group

Number of families	1							
Number of comparisons per family	3							
Alpha	0.05							
Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Significant ?	Summary	Adjusted P Value			
Sunflower oil vs. Coconut oil	28.63	19,06 to 38,20	Yes	****	<0,0001	A-B		
Sunflower oil vs. Ground nut oil	23.29	13,04 to 33,55	Yes	****	<0,0001	A-C		
Coconut oil vs. Ground nut oil	-5.333	-17,54 to 6,871	No	ns	0.5298	B-C		
Test details	Mean 1	Mean 2	Mean Diff,	SE of diff,	n1	n2	q	DF
Sunflower oil vs. Coconut oil	135.3	106.7	28.63	3.842	17	6	10.54	25
Sunflower oil vs. Ground nut oil	135.3	112	23.29	4.117	17	5	8.002	25
Coconut oil vs. Ground nut oil	106.7	112	-5.333	4.9	6	5	1.539	25

Table 4.2.5 represents the analysis of comparison between systolic pressure based on type of oil consumed by non-vegetarian group, shows a significant comparison of systolic pressure between the participants consuming sunflower oil and coconut

oil and also sunflower oil and ground oil with a significance level of 0.05. Whereas, there is no significance of systolic pressure between participants consuming ground nut oil and coconut oil.

Table 4.2.6 Analysis of comparison between diastolic pressure based on type of oil consumed by non-vegetarian group

Number of families	1							
Number of comparisons per family	3							
Alpha	0.05							
Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Significant?	Summary	Adjusted P Value			
Sunflower oil vs. Coconut oil	17.16	2,793 to 31,52	Yes	*	0.0261	A-B		
Sunflower oil vs. Ground nut oil	0.8235	-11,22 to 12,86	No	ns	0.968	A-C		
Coconut oil vs. Ground nut oil	-16.33	-36,04 to 3,376	No	ns	0.0872	B-C		
Test details	Mean 1	Mean 2	Mean Diff,	SE of diff,	n1	n2	q	DF
Sunflower oil vs. Coconut oil	88.82	71.67	17.16	4.414	17	6	5.496	5
Sunflower oil vs. Ground nut oil	88.82	88	0.8235	3.378	17	5	0.3447	4
Coconut oil vs. Ground nut oil	71.67	88	-16.33	5.53	6	5	4.177	4

Table 4.2.6 represents the analysis of comparison of diastolic pressure based on type of oil consumed by non-vegetarian group, shows a significant comparison of diastolic pressure between the participants consuming sunflower oil and coconut oil with a significance level of 0.05. Whereas, there is no significance of diastolic pressure between participants consuming sunflower oil and ground nut oil and also between coconut oil and ground nut oil.

Table 4.2.7 Analysis of comparison between BMI based on type of oil consumed by both groups

BMI								
Number of families	1							
Number of comparisons per family	3							
Alpha	0.05							
Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Significant ?	Summary	Adjusted P Value			
Sunflower oil vs. Coconut oil	1.908	-2,082 to 5,898	No	ns	0.4122	A-B		
Sunflower oil vs. Ground nut oil	-1.178	-5,310 to 2,954	No	ns	0.7487	A-C		
Coconut oil vs. Ground nut oil	-3.086	-5,801 to -0,3713	Yes	*	0.0276	B-C		
Test details	Mean 1	Mean 2	Mean Diff,	SE of diff,	n1	n2	q	DF
Sunflower oil vs. Coconut oil	29.47	27.56	1.908	1.429	29	10	1.888	9
Sunflower oil vs. Ground nut oil	29.47	30.65	-1.178	1.611	29	18	1.034	17
Coconut oil vs. Ground nut oil	27.56	30.65	-3.086	0.9724	10	18	4.489	9

Table 4.2.7 represents the analysis of comparison between BMI based on type of oil consumed by both groups shows a significant comparison of BMI between the participants consuming ground nut oil and coconut oil with a significance level of 0.05. Whereas, there is no significance of BMI between participants consuming sunflower oil and coconut oil and also between coconut oil and ground nut oil.

Table 4.2.8 Analysis of comparison between systolic pressure based on type of oil consumed by both group

Number of families	1							
Number of comparisons per family	3							
Alpha	0.05							
Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Significant?	Summary	Adjusted P Value			
Sunflower oil vs. Coconut oil	16.86	3,126 to 30,60	Yes	*	0.0125	A-B		
Sunflower oil vs. Ground nut oil	-9.138	-20,38 to 2,101	No	ns	0.1322	A-C		
Coconut oil vs. Ground nut oil	-26	-40,77 to -11,23	Yes	***	0.0003	B-C		
Test details	Mean 1	Mean 2	Mean Diff,	SE of diff,	n1	n2	q	DF
Sunflower oil vs. Coconut oil	125.9	109	16.86	5.699	29	10	4.184	54
Sunflower oil vs. Ground nut oil	125.9	135	-9.138	4.664	29	18	2.771	54
Coconut oil vs. Ground nut oil	109	135	-26	6.13	10	18	5.999	54

Table 4.2.8 represents the analysis of comparison between systolic pressure based on type of oil consumed by both groups shows a significant comparison of systolic pressure between the participants consuming ground nut oil and coconut oil and also between sunflower oil and coconut oil with a significance level of 0.05. Whereas, there is no significance of systolic pressure between participants consuming sunflower oil and ground nut oil.

Table 4.2.9 Analysis of comparison between diastolic pressure based on type of oil consumed by both group

Number of families	1							
Number of comparisons per family	3							
Alpha	0.05							
Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Significant ?	Summary	Adjusted P Value			
Sunflower oil vs. Coconut oil	11.79	-0,7910 to 24,38	No	ns	0.0657	A-B		
Sunflower oil vs. Ground nut oil	1.015	-8,036 to 10,07	No	ns	0.9555	A-C		
Coconut oil vs. Ground nut oil	-10.78	-23,51 to 1,954	No	ns	0.0971	B-C		
Test details	Mean 1	Mean 2	Mean Diff,	SE of diff,	n1	n2	q	DF
Sunflower oil vs. Coconut oil	83.79	72	11.79	4.507	29	10	3.7	9
Sunflower oil vs. Ground nut oil	83.79	82.78	1.015	3.528	29	18	0.4069	17
Coconut oil vs. Ground nut oil	72	82.78	-10.78	4.56	10	18	3.343	9

Table 4.2.9 represents the analysis of comparison of diastolic pressure based on type of oil consumed by both groups, shows there is no significance of comparison of diastolic pressure between the participants consuming ground nut oil and coconut oil, sunflower oil and ground oil and also between sunflower oil and coconut oil.

Table 4.2.10 Analysis of comparison between BMI based on the frequency of composition of milk and milk products by lacto-vegetarian group

Table Analyzed	Lacto vs BMI
Column B	LOW CONSUMPTION
vs.	vs,
Column A	HIGH CONSUMPTION
Mann Whitney test	
P value	0.2679
Exact or approximate P value?	Exact
P value summary	ns
Significantly different ($P < 0.05$)?	No
One- or two-tailed P value?	Two-tailed
Sum of ranks in column A, B	350,5, 114,5
Mann-Whitney U	69.5
Difference between medians	
Median of column A	29,00, n=21
Median of column B	28,90, n=9
Difference: Actual	-0.1
Difference: Hodges-Lehmann	-2

Table 4.2.10 represents analysis of comparison between BMI based on the frequency of composition of milk and milk products by lacto-vegetarian group, shows there is no significance of comparison of BMI between the frequency of consumption milk and milk products.

Table 4.2.11 Analysis of comparison between systolic pressure based on the frequency of composition of milk and milk products by lacto-vegetarian group

Table Analyzed	Lacto vs Sys
Column B	LOW CONSUMPTION
vs.	vs,
Column A	HIGH CONSUMPTION
Unpaired t test	
P value	0.0758
P value summary	ns
Significantly different (P < 0.05)?	No
One- or two-tailed P value?	Two-tailed
t, df	t=1,844, df=28
How big is the difference?	
Mean of column A	130.5
Mean of column B	116.7
Difference between means (B - A) $\pm$ SEM	-13,81 $\pm$ 7,490
95% confidence interval	-29,15 to 1,532
R squared (eta squared)	0.1083
F test to compare variances	
F, DF _n , Df _d	1,579, 20, 8
P value	0.5184
P value summary	ns
Significantly different (P < 0.05)?	No
Data analyzed	
Sample size, column A	21
Sample size, column B	9

Table 4.2.11 represents analysis of comparison between systolic pressure based on the frequency of composition of milk and milk products by lacto-vegetarian group, shows there is no significance of comparison of systolic pressure between the frequency of consumption of milk and milk products.

Table 4.2.12 Analysis of comparison between diastolic pressure based on the frequency of composition of milk and milk products by lacto-vegetarian group

Table analyzed	Lacto vs Diastolic
Column B	LOW CONSUMPTION
vs.	vs,
Column A	HIGH CONSUMPTION
Paired t test	
P value	0.8487
P value summary	ns
Significantly different ($P < 0.05$)?	No
One- or two-tailed P value?	Two-tailed
t, df	t=0,1971, df=8
Number of pairs	9
How big is the difference?	
Mean of differences (B - A)	-1.111
SD of differences	16.91
SEM of differences	5.638
95% confidence interval	-14,11 to 11,89
R squared (partial eta squared)	0.004831
How effective was the pairing?	
Correlation coefficient (r)	0
P value (one tailed)	0.5
P value summary	ns
Was the pairing significantly effective?	No

Table 4.2.12 represents analysis of comparison between diastolic pressure based on the frequency of composition of milk and milk products by lacto-vegetarian group, shows there is no significance of comparison of diastolic pressure between the frequency of consumption of milk and milk products.

Table 4.2.13 Analysis of comparison between BMI based on the frequency of composition of meat by non-vegetarian group

Table Analyzed	Meat vs BMI
Column B	LOW CONSUMPTION
vs.	vs,
Column A	HIGH CONSUMPTION
Unpaired t test with Welch's correction	
P value	0.9178
P value summary	ns
Significantly different (P < 0.05)?	No
One- or two-tailed P value?	Two-tailed
Welch-corrected t, df	t=0,1045, df=21,00
How big is the difference?	
Mean of column A	29.97
Mean of column B	30.21
Difference between means (B - A) ± SEM	0,2396 ± 2,293
95% confidence interval	-4,528 to 5,007
R squared (eta squared)	0.0005198
F test to compare variances	
F, DFn, Dfd	1,002, 10, 18
P value	0.9549
P value summary	ns
Significantly different (P < 0.05)?	No
Data analyzed	
Sample size, column A	19
Sample size, column B	11

Table 4.2.13 represents analysis of comparison between BMI based on the frequency of composition of meat by non-vegetarian group, shows there is no significance of comparison of BMI between the frequency of consumption of meat.

Table 4.2.14 Analysis of comparison between systolic pressure based on the frequency of composition of meat by non-vegetarian group

Table analyzed	Mean vs Sys
Column B	LOW CONSUMPTION
vs.	vs,
Column A	HIGH CONSUMPTION
P value	0.3579
Exact or approximate P value?	Exact
P value summary	ns
Significantly different (P < 0.05)?	No
One- or two-tailed P value?	Two-tailed
Sum of ranks in column A,B	273 , 192
Mann-Whitney U	83
Difference between medians	
Median of column A	130,0, n=19
Median of column B	130,0, n=11
Difference: Actual	0
Difference: Hodges-Lehmann	10
Mean of column A	122.6
Mean of column B	128.2
Difference between means (B - A) $\pm$ SEM	5,550 $\pm$ 5,592
95% confidence interval	-6,073 to 17,17
R squared (eta squared)	0.04443
F test to compare variances	
F, DFn, Dfd	1,019, 18, 10
P value	
P value summary	
Significantly different (P < 0.05)?	No
Data analyzed	
Sample size, column A	19
Sample size, column B	11

Table 4.2.14 represents analysis of comparison between systolic pressure based on the frequency of composition of meat by non-vegetarian group, shows there is no significance of comparison of systolic pressure between the frequency of consumption of meat.

Table 4.2.15 Analysis of comparison between diastolic pressure based on the frequency of composition of meat by non-vegetarian group

Table Analyzed	Meat vs Diastolic
Column B	LOW CONSUMPTION
vs.	vs,
Column A	HIGH CONSUMPTION
Mann Whitney test	
P value	0.7608
Exact or approximate P value?	Exact
P value summary	ns
Significantly different (P < 0.05)?	No
One- or two-tailed P value?	Two-tailed
Sum of ranks in column A,B	287 , 178
Mann-Whitney U	97
Difference between medians	
Median of column A	80,00, n=19
Median of column B	90,00, n=11
Difference: Actual	10
Difference: Hodges-Lehmann	0

Table 4.2.15 represents analysis of comparison between diastolic pressure based on the frequency of composition of meat by non-vegetarian group, shows there is no significance of comparison of diastolic pressure between the frequency of consumption of meat.

Table 4.2.16 Analysis of comparison between BMI of lacto-vegetarian group and BMI of non-vegetarian group

Table Analyzed	
Column B	NON – VEG BMI
vs.	vs,
Column A	LACTO BMI
Mann Whitney test	
P value	0.7835
Exact or approximate P value?	Exact
P value summary	ns
Significantly different ($P < 0.05$)?	No
One- or two-tailed P value?	Two-tailed
Sum of ranks in column A,B	441 , 379
Mann-Whitney U	189
Difference between medians	
Median of column A	29,00, n=21
Median of column B	28,70, n=19
Difference: Actual	-0.3
Difference: Hodges-Lehmann	-0.48

Table 4.2.16 represents analysis of comparison between BMI of lacto-vegetarian group and BMI of non-vegetarian group, shows there is no significance of comparison between BMI of lacto-vegetarian group and non-vegetarian group.

Table 4.2.17 Analysis of comparison between systolic pressure of lacto-vegetarian group and systolic pressure of non-vegetarian group

Table Analyzed	
Column B	NON-VEG - SYST
vs.	vs,
Column A	LACTO – SYST
Mann Whitney test	
P value	0.3792
Exact or approximate P value?	Exact
P value summary	ns
Significantly different ($P < 0.05$)?	No
One- or two-tailed P value?	Two-tailed
Sum of ranks in column A,B	463 , 357
Mann-Whitney U	167
Difference between medians	
Median of column A	120,0, n=21
Median of column B	130,0, n=19
Difference: Actual	10
Difference: Hodges-Lehmann	-10

Table 4.2.17 represents analysis of comparison between systolic pressure of lacto-vegetarian group and systolic pressure of non-vegetarian group, shows there is no significance of comparison between systolic pressure of lacto-vegetarian group and non-vegetarian group.

Table 4.2.18 Analysis of comparison between diastolic pressure of lacto-vegetarian group and diastolic pressure of non-vegetarian group

Table Analyzed	
Column B	NON-VEG - DIAS
vs.	vs,
Column A	LACTO – DIAS
Mann Whitney test	
P value	0.1164
Exact or approximate P value?	Exact
P value summary	ns
Significantly different ($P < 0.05$)?	No
One- or two-tailed P value?	Two-tailed
Sum of ranks in column A,B	375 , 445
Mann-Whitney U	144
Difference between medians	
Median of column A	80,00, n=21
Median of column B	80,00, n=19
Difference: Actual	0
Difference: Hodges-Lehmann	10

Table 4.2.18 represents analysis of comparison between diastolic pressure of lacto-vegetarian group and diastolic pressure of non-vegetarian group, shows there is no significance of comparison between diastolic pressure of lacto-vegetarian group and non-vegetarian group.

The results done at Hukumpeta, Rajahmundry rural, East Godavari district, Andhra Pradesh supports the study of Soong. F (2018) concluded that the notably, body composition, indicated body mass index (BMI), waist circumference (WC), and percentage of body fat (BF%) could be attributed to dietary patterns such as type oil used, consumption of type of diet and simultaneously has been indicated to be positively associated with blood pressure

CHAPTER – 5

SUMMARY AND CONCLUSIONS

The present study was conducted in Hukumpeta, Rajahmundry rural, East Godavari district, Andhra Pradesh by considering equal number of participants in both groups. This study revealed that BMI of half 50.08% of the selected participants belonging to non-vegetarian group are under the category of obesity and different classes of obesity condition whereas majority 60% of the selected participants belonging to lacto-vegetarian group are under the category of overweight. All the female non-vegetarian participants have an WHR of above normal range when compared to the female lacto-vegetarian participants in which majority 52.6% are in a normal range whereas most of the male participants of both non-vegetarian (81.82%) and lacto-vegetarian groups (61.12%) are above the normal range. While comparing the blood pressure of both the groups, majority 79.99% of the lacto-vegetarian participants have a normal value of systolic pressure whereas comparatively only 43.33% of the non-vegetarian participants have normal value. Comparatively both the groups have a normal value of diastolic pressure. The frequency of consumption of milk and milk products by lacto-vegetarian group participants was found that 100% consume milk daily, 40% consume paneer once in every two weeks, 50% consume cheese monthly once and curd daily and majority 56.67% consume buttermilk daily. The frequency of consumption of meat by non-vegetarian group participants was found that 56.67% consume eggs daily, 50% consume fish once in every two weeks, 40% consume chicken weekly twice, whereas 36.67% consume organ meat, 43.33% consume lean meat, 46.66% consume mutton, 63.33% consume crab once in a month.

Significant comparison was found between BMI based on type of oil, systolic pressure based on type of oil consumed by lacto-vegetarian group, such as the comparison of BMI between the participants consuming ground nut oil and coconut oil with a significance level of 0.05. The comparison of systolic pressure between the participants consuming ground nut oil and coconut oil and also between sunflower oil and ground oil with a significance level of 0.05. Whereas, there is no significance of BMI between participants consuming sunflower oil and coconut oil and also between coconut oil and ground nut oil and the systolic pressure between

participants consuming sunflower oil and coconut oil and diastolic pressure based on type of oil.

Significant comparison was found between systolic pressure based on type of oil, diastolic pressure based on type of oil consumed by non-vegetarian group, such as the comparison of systolic pressure between the participants consuming sunflower oil and coconut oil and also sunflower oil and ground nut oil and the comparison of diastolic pressure between the participants consuming sunflower oil and coconut oil with a significance level of 0.05. Whereas, there is no significance of BMI between participants consuming ground nut oil and coconut oil and the comparison of systolic pressure between participants consuming sunflower oil and ground nut oil and also between coconut oil and ground nut oil and comparison of diastolic pressure between participants consuming sunflower oil and ground nut oil and also between coconut oil and ground nut oil.

There is no significant comparison between BMI of lacto-vegetarian participants and BMI of non-vegetarian participants, systolic pressure of lacto-vegetarians participants and systolic pressure of non-vegetarian participants, diastolic pressure of lacto-vegetarians participants and diastolic pressure of non-vegetarian participants.

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APPENDIX

The study has results based on the statistical analysis performed using few tests.

1. Tukey's multiple comparisons test
2. Mann Whitney test
3. Unpaired t test with Welch's correction
4. Unpaired t test
5. Paired t test

A concern form was distributed to all the individuals willing to participate in the study. The information sheet consists of two parts.

Part 1- General information about the researcher, period and duration of the intervention, purpose of the study and eligibility criteria.

Part – 2 Rights, benefits, and risks

It also consists of the informed consent form by agreeing to the terms and conditions with the name and signature of the participant including the date of the sample collected.

INFORMATION SHEET

Dear participant,

This 'Participant Information Sheet' will give you details of the study and help you decide whether to participate in the study or not. It sets out why we are doing the study, what your participation would involve, what the benefits and risks to you might be, and what would happen after the study ends. We request you to thoroughly read and understand this form. Any doubt, concern or question can be addressed to 'ramzboppana@gmail.com' and we will be responding to it within a span of 24 hours.

I am Sri Ramya Boppana, a student in the Department of Clinical Nutrition and Dietetics, Sathyabama Institute of Science and Technology, Chennai. My research work in the field of clinical nutrition and dietetics, is being supervised by Asst Prof. Ms. Priya. S. To meet certain objectives of my research, I am conducting an interview schedule program individually that primarily uses collection of blood pressure and food habits. I request and encourage your participation in this study and your decision to refuse participation will be respected as your own right.

Part 1: General Information

Name of the researcher: Sri Ramya Boppana

Contact no: 9533333372

Period and duration of the intervention: session will last for 10 – 15 minutes.

Purpose of the study: The study compares the impact of diet to forecast the non-communicable disease related to blood pressure.

Eligibility: Non hypertensive Adults consuming lacto-vegetarian or non-vegetarian, living in Hukumpeta, Rajahmundry rural, East Godavari district, Andhra Pradesh.

Part 2: Rights, benefits, and risks

Every participant is entitled to withdraw from the study and no negative consequence will be imposed on them for the same. There is no anticipated risk to the participants, to the best of researcher's knowledge. There may be a few insights and reflections that participants may want to discuss with a professional mentor or coach and the researcher will make appropriate referrals for the same.

INFORMED CONSENT FORM

1. I confirm that I have read and understood the Participant Information Sheet and have had the opportunity to ask questions.
2. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without my rights being affected.
3. I understand that my identity will not be revealed in any information released to third parties or published.
4. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific/ academic purpose(s).
5. I agree to take part in the above study.
6. I agree to engage in responsible and safe behaviors during the interview schedule.

Date

Name of the participant

Signature

QUESTIONNAIRE

NAME:
AGE:
GENDER:
WEIGHT:
HEIGHT:

BMI:
HIP CIRCUMFERENCE:
WAIST CIRCUMFERENCE:
WAIST HIP RATIO:
BLOOD PRESSURE:

Do you exercise regularly? YES/NO

What type of oil do you prefer? _____

Are you a lacto-vegetarian or non-vegetarian?

[A] Lacto-Vegetarian [B] Non – vegetarian

IF OPTION A, fill the food frequency table based on the frequency of consumption

S. No	Food items	Daily	Weekly twice	Fortnight	Monthly	Rarely/never
1.	Milk					
2.	Paneer					
3.	Cheese					
4.	Curd					
5.	Butter milk					

IF OPTION B, fill the food frequency table based on the frequency of consumption

S. No	Food items	Daily	Weekly twice	Fortnight	Monthly	Rarely/never
1.	Egg					
2.	Fish					
3.	Shell fish					
4.	Chicken					
5.	Organ meat					
6.	Lean meat					
7.	Red meat					
8.	Country hen					
9.	Emu					
10.	Prawn					
11.	Mutton					
12.	Crab					

PICTURES DURING SAMPLE COLLECTION

