DIETARY AND PHYSICAL ACTIVITY PATTERN IN PCOS WOMEN

PROJECT SUBMITTED

In partial fulfillment of requirement for the award of the degree of

B. Sc. NUTRITION AND DIETETICSBY

ANKITHA PRAMOD

(Register No: SB20ND002)

DEPARTMENT OF CLINICAL NUTRITION AND DIETETICSST. TERESA'S

COLLEGE (AUTONOMOUS)

ERNAKULAM

APRIL 2023

CERTIFIED AS BONAFIDE RESEARCH WORK

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Signature of Internal Examiner **Signature of External Examiner**

DECLARATION

I hereby declare that the project entitled **" DIETARY AND PHYSICAL ACTIVITY PATTERN IN PCOS WOMEN"** submitted in partial fulfilment of the requirement for the award of the degree of B.Sc Nutrition and Dietetics is a record of original research work done by me under the supervision and guidance of **Ms. NAMITHA PRASTHEENA JOSEPH**, Assistant Professor, Department of Clinical Nutrition and Dietetics, Women's Study Centre, St. Teresa's College (Autonomous), Ernakulam and has not been submitted in part or full of any other degree/diploma/fellowship or the similar titles to any candidate of any other university.

Place: Ankitha Pramod

Date:

CERTIFICATE

I here certify that the project entitled **"DIETARY AND PHYSICAL ACTIVITY PATTERN IN PCOS WOMEN"** submitted in partial fulfilment of the requirement for the award of the degree of B. Sc. Nutrition and Dietetics is a record of original work done by Ms. Ankitha Pramod during the period of the study under my guidance and supervision.

Signature of the HOD

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CHAPTER-I
INTRODUCTION

Polycystic ovary syndrome (PCOS) is one of the most common endocrine and metabolic disorders in premenopausal women. The heterogeneous condition known as PCOS is defined by a combination of the signs and symptoms of both increased androgen levels and ovarian dysfunction. PCOS is usually linked to amenorrhea or menstrual cycle abnormalities, moderate to severe acne, hirsutism, abdominal adiposity, insulin resistance, obesity, metabolic diseases, and cardiovascular risk factors (Hector, 2018). Women who have PCOS are more likely to have lipid abnormalities, including low levels of HDL cholesterol and raised levels of triglycerides, as well as impaired fibrinolysis, impaired glucose tolerance, type 2 diabetes mellitus, and hypertension (Lobo & Carmina, 2000). According to the World Health Organization (WHO) data, approximately 116 million women (3.4%) are affected by PCOS globally. The prevalence of PCOS among women in India was found to be 11.33%. Another previous report from South India, which included adolescent girls, showed an incidence of 9.13% (Jabeen et al., 2022). Although the exact cause of this condition is still largely unclear,growing evidence points to PCOS as a complex multigenic illness with significant environmental and epigenetic impacts, including dietary and lifestyle choices. The diagnosis and treatment of PCOS are not complicated as it requires only the judicious application of a few well-standardized diagnostic methods and appropriate therapeutic approaches addressing hyperandrogenism, the consequences of ovarian dysfunction and the associated metabolic disorders.

The challenges to feminine identity and body image due to obesity, acne and excess hair, as well infertility and long-term health-related concerns compromise quality of life and adversely impact on mood and psychological well-being (Deeks et al., 2009; Coffee et al., 2006). Limited studies to date have reported that women who have PCOS are more prone to depression, anxiety, low self-esteem, negative body image, and psychosexual dysfunction (Coffey et al., 2003; Deeks et al., 2010). The other critical aspect of psychosocial impact in PCOS is the negative impact of mood disturbance, poor self-esteem and reduced psychological well-being on motivation and on ability to implement and sustain successful lifestyle changes that are critical in this condition (Moran et al., 2009).

Polycystic ovary syndrome (PCOS) is a frustrating experience for women, often complex for managing clinicians and is a scientific challenge for researchers. As research in PCOS is rapidly advancing, it is vital that research evidence is translated to knowledge and action among women, healthcare professionals and policy makers. PCOS is the most common endocrine abnormality in reproductive-age women.

According to Jacob (2022), there are various medications used to treat PCOS. The most common ones include:

1. Hypoglycemic agents: These agents reduce blood glucose levels. Example- Metformin
2. Antiandrogens: These drugs block androgen receptors, thereby blocking the effects of male sex hormones. They are used to treat hirsutism in women with PCOS. Example- Spironolactone
3. Topical Hair-Removal Agents: Remove excess facial hair in women. Eflornithine belongs to this drug class.
4. Oral contraceptives: Improve acne and excessive hair growth. Example- Ethinyl estradiol
5. Selective estrogen receptor modulators: Clomiphene citrate belonging to this drug class binds to estrogen receptors to induce ovulation within days.
6. Topical acne agents: These drugs are meant to clear acne associated with PCOS.

But unfortunately, these drugs do come with side effects. Some of the common side effects are mentioned below:

1. Hypoglycemic agents cause gastrointestinal upset, lactic acidosis, increase in homocysteine levels, weight gain, congestive heart failure and edema
2. Antiandrogens cause increase potassium levels, nausea, breast tenderness and hot flashes
3. The common side effect of Eflornithine includes mild skin irritation.
4. Oral contraceptives cause nausea, headache, spotting, inflammation of a vein caused by a blood clot, deep venous thrombosis, increased total cholesterol low-density lipoprotein cholesterol, blood clot, stroke, myocardial infarction.
5. Clomiphene citrate can cause multiple pregnancies, ovarian hyperstimulation, blood clot and visual disturbances.

Apart from these, other serious side effects or health problems that may occur because of the use of these drugs. On the contrary, exercise and dietary interventions have absolutely no side effects and is beneficial for keeping the symptoms of PCOS under control. Lifestyle modification is the most effective in achieving significant reduction in waist circumference, total androgen, and lipid profile as compared to medications. Therefore, lifestyle modification can be used as the first line of ovulation induction in PCOS patients (Karimzadeh, 2010). As little as 5% to 10% weight loss has significant clinical benefits improving psychological outcomes (Galletly et al., 1996), reproductive features (menstrual cyclicity, ovulation and fertility) and metabolic features (insulin resistance and risk factors for CVD and T2DM) (Clark et al., 1998; Huber-Buccholz et al., 1999). Evidence shows that lifestyle change with small achievable goals results in clinical benefits even when women remain in the overweight or obese range (Clark et al., 1998; Hamilton-Fairley et al., 1993; Wahrenberg et al., 1999). Exercise alone also improves clinical outcomes. As in the general population, goals for exercise must focus on overall health benefits not weight loss.

RELEVANCE OF THE STUDY

As there is currently no curative treatment for PCOS focusing on, regular exercise and diet helps to alleviate its clinical manifestations and helps to lower the risk of T2DM and cardiovascular disease (CVD). Considering the benefits, it may be very beneficial to include moderate exercise and a good diet in PCOS therapy. This is supported by the research which also shows that exercise can have positive impacts on IR, body fat distribution, and CVD risk in patients, even if most exercise trials in women with PCOS show little to no weight reduction (Kite et al., 2019). As per other studies, moderate exercise like brisk walking, jogging, cycling, or swimming are all great activities that can help alleviate PCOS. This type of exercise increases body sensitivity to insulin, which reduces the risk of cardiovascular disease and type 2 diabetes etc. Exercising 30 minutes or more a day can also help with weight management, symptoms of depression and anxiety, as well as improving frequency of menstrual cycles and ovulation and well-balanced plans emphasizing non-starchy vegetables and fruits, lean protein, healthy carbs and low-fat dairy can help against PCOS get healthier and prevent complications. So the study conducted helps to estimate the dietary and physical activity pattern in PCOS women and thereby gives an idea regarding how controlled the symptoms are.

AIM

To study the dietary and physical activity pattern of women with PCOS.

OBJECTIVES

- To assess the anthropometric measurements of the selected subjects.
- To study the clinical manifestations in the selected subjects.
- To find out the physical activity pattern of the selected subjects.
- To ascertain the dietary pattern of the selected subjects.

CHAPTER-II
REVIEW OF LITERATURE

The review of the study entitled **"Dietary and Physical Activity in PCOS Women"** is discussed under the following headings:

2.1 Prevalence of PCOS

2.2 Effect of diet on PCOS

2.3 Effect of Exercise on PCOS

2.4 Health Related Quality of Life in Women with PCOS

2.1 PREVALENCE OF PCOS

The study by George and Malini (2014) was conducted in specialist infertility clinics in Kottayam, Pathanamthitta and Alappuzha districts. Around 500 women at reproductive age(21 - 35) who admitted with complaints and symptoms suggesting various infertility cases were selected for the study. A biochemical analysis on follicle stimulating hormone (FSH), luteinizing hormone (LH), prolactin, thyroid stimulating hormone (TSH), thyroxin (T4), triiodo thyroxin (T3), progesterone, and total testosterone of several blood tests were conducted. The metabolic parameters such as the levels of blood glucose and serum cholesterol were estimated by standard biochemical techniques using standard kits. The result obtained from the study conducted was that, out of 500 samples, 168 patients were presented with polycystic ovarian syndrome (33%) and the rest showed 76% of incidence and PCOS condition was highly prevalent among Travancore women (33%) because of their unhealthy dietary habits and lifestyle modifications. Even the socioeconomic research on these individuals revealed that they were from wealthy background and consumed a lot of sugar in their diets. Hence from this study they were able to conclude that improving diet and exercise program by making lifestyle changes may reduce their risk for developing PCOS and chronic diseases associated with it such as diabetes, heart disease and endometrial cancer.

Shane K et al. (2020) conducted an online survey polled students, faculty, and staff at Texas Woman's University campuses in Denton, Dallas, and Houston. Seven hundred sixty-nine respondents including 722 females and 47 males completed the survey. The mainobjective of this study was to conduct a survey on the prevalence and knowledge of PCOS among men and women. According to the results obtained ,769 of the 823 respondents that took the survey completed it, representing 4% to 5% of the total student body on each TWU campus. Caucasian respondents made up the bulk of respondents (60.8%), followed by Hispanic respondents (15.2%), and then African Americans. Around 28.5% of the 722 womenwho responded had an official diagnosis of PCOS from a medical practitioner. 40.5% of womenwho had not been medically diagnosed with PCOS reported having two or more physical traitslinked with PCOS according to the Rotterdam criteria. Women who were unsurewhether they had a formal PCOS diagnosis (6.2% of respondents) exhibited symptomsassociated with the diagnostic criteria (8.6%). Women with PCOS commonly reported irregular periods and characteristics indicative of hyperandrogenism and hyperinsulinemia (hirsutism, fast weight gain, post pubertal acne, and acanthosis nigricans).

A study was conducted by Oriji and Onwuegbulam (2019) with an objective to determine the prevalence and the prevalent phenotypic characteristics of infertile patients with PCOS attending the fertility clinic of the University of Port Harcourt Teaching Hospital. A cross-sectional study was conducted on 174 women attending the fertility clinic of the University of Port Harcourt Teaching Hospital between January 2016 and June 2016. Data on age, parity, height, weight, degree of hirsutism (using modified Ferriman-Gallway scoring), antral follicle count, ovarian volume, serum follicle stimulating hormone (FSH), luteinizing hormone (LH), prolactin, progesterone and testosterone were collected. As per the results obtained, in 16.7% of infertile individuals, polycystic ovarian syndrome (according to Rotterdam criteria) was present. 12.6% of infertile women with normal ovaries had hirsutism, compared to 55.2% of those with PCOS. Oligomenorrhoea was experienced by 2.4% of infertile women with normal ovaries and 27.5% of infertile women with PCOS. When compared to women with normal ovaries, infertile women with PCOS had significantly greater rates of anovulation due to lower mid-luteal progesterone levels on average and higher mean testosterone levels on average. Therefore, the study was able to conclude that 16.7% of women who had fertility issues had PCOS. Compared to infertile women with normal ovaries, infertile patients with PCOS had a significantly greater incidence of annovulatory cycles with oligomenorrhoea, hirsutism, and serum testosterone levels.

2.2 EFFECT OF DIET ON PCOS

Zhang et al. (2019) conducted an eight randomized control trials involving 327 patients and a meta-analysis was performed to obtain results on the effect of LCD on PCOS. The primary outcomes included the changes in BMI, homeostatic model assessment for insulin resistance (HOMA-IR), and blood lipids, including total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C), follicle-stimulating hormone (FSH), luteotropic hormone (LH), total testosterone (T), and sex hormone-binding globulin (SHBG). As per the results obtained from the data collected, it was revealed that LCD treatment has significantly improved BMI, lipid levels (TC, and LDL-C), HOMA-IR, T, FSH, and SHBG in women with PCOS. That is, long-term low-fat/low-CHO LCD helps in the reduction of BMI, treatment of PCOS with insulin resistance, prevention of high LDL-C, increasing the levels of FSH and SHBG, and decreasing the T level. Hence, from the study conducted, they were able to conclude that LCD dietary pattern helps in lowering carbohydrate consumption to less than 45% of total daily calorie intake and thereby helps in reducing weight in obese patients, reducing insulin levels, and improving insulin resistance and other endocrine abnormalities.

A trial conducted by Astrup et al. (2011) involved 57 PCOS females, with no calorie restrictions, the women were randomly allocated using rank minimization to either the High Protein (HP) diet (>40% of energy from protein and 30% from fat) or the Standard Protein (SP) diet (15% of energy from protein and 30% from fat). Dietary counselling was provided to the ladies every month. Anthropometric measures were taken and blood samples were taken at the baseline, 3 and 6 months. The HP (High Protein) diets were found to be effective and produced a greater weight loss, body fat loss, reduced waist circumference, and decreased glucose levels than SP (Standard Protein) diet. Whereas, the testosterone concentrations in the SP-diet group were considerably lower than in the HP-diet group after accounting for weight changes. Hence, the study was able to conclude that, in ad libitum diets, replacing carbs with protein enhances weight reduction and enhances glucose metabolism through a mechanism that appears to be independent of weight loss, and hence appears to offer an effective dietary therapy for PCOS women.

A study was conducted by Williams et al. (2006) with an objective to enumerate the effect of meal replacements in short-term weight-loss and longer-term carbohydrate- or fat-restriction strategies on weight maintenance and improvements in reproductive and metabolic variables in overweight women with PCOS condition. As a part of this, overweight women

with PCOS condition were asked to follow an 8-week weight loss regimen (Phase1) and then a 6 months weight maintenance carbohydrate-restriction regimen (Phase 2). As per the results obtained there had been a significant reduction in the weight, insulin and testosterone levels during Phase 1. During Phase 2, improvements in menstrual cyclicity occurred in 28 subjects. Meal replacement strategy has been found to be effective in the short-term management of PCOS.

2.3 EFFECT OF EXERCISE ON PCOS

Shetty et al. (2017) had conducted a study on 'Exercise in Polycystic Ovarian Syndrome: An Evidence Based Review' and concluded that exercise training and physical activity in PCOS have shown to have a good impact on improving the anthropometric measurements such as body mass index, waist circumference, and metabolic parameters such as total cholesterol, IR, and lipid profile thus reducing metabolic syndrome and other risk factors associated with PCOS. The study also suggested that exercise training should be included in the routine medical management to augment the benefits of ovulation chances, reducing cardiovascular risks and improving the quality of life in PCOS women.

Wang et al. (2019) studied the 'Effects of Exercise Intervention on the Improvement of Polycystic Ovary Syndrome' and found that adjusting lifestyle to lose weight, which is frequently utilised in clinical practise, was beneficial to improve endocrine abnormalities and minimise the risk of metabolic syndrome for PCOS patients. Dietary and exercise modifications prior to assisted pregnancy may help restore spontaneous ovulation and increase natural pregnancy rates in obese PCOS patients who receive assisted pregnancy treatment, improve the outcome of assisted pregnancy, raise the success rate of assisted pregnancy, and lower the risk of pregnancy complications. Adjusting one's lifestyle to lose weight has distinctadvantages over weight-loss surgery, ovulatory medications, and IVF aided pregnancy treatment, such as strong practicality, cheap cost, and significant benefits. But, a significant challenge remained in how to keep the target weight while maintaining an acceptable, steady, and long-term weight loss. In recent years, multidisciplinary collaboration involving diet, exercise, and psychosocial intervention to guide obesity PCOS weight loss has drawn increasing attention. This is of great significance to help clinicians develop more scientific andeffective individual weight loss programmes, improve the outcome of assisted pregnancy, and improve the long-term life quality of obese PCOS patients.

Woodward et al. (2020) in their review article reported that the evidence suggested lifestyle modification should be the first line of therapy for women with PCOS. Several studies have examined the impact of exercise interventions on reproductive function, with results indicating improvements in menstrual and/or ovulation frequency following exercise. Enhanced insulin sensitivity underpins the mechanisms of how exercise restores reproductive function. Women with PCOS typically have a cluster of metabolic abnormalities that are risk factors for CVD. There is irrefutable evidence that exercise mitigates CVD risk factors in women with PCOS. The mechanism by which exercise improves many CVD risk factors is again associated with improved insulin sensitivity and decreased hyperinsulinemia. In addition to cardiometabolic and reproductive complications, PCOS has been associated with an increased prevalence of mental health disorders. Exercise improves psychological well-being in women with PCOS, depending on certain physiological factors. An optimal dose-response relationship to exercise in PCOS may not be feasible because of the highly individualized characteristics of the disorder. Guidelines for PCOS suggested at least 150 min of physical activity per week.

2.4 HEALTH RELATED QUALITY OF LIFE IN WOMEN WITH PCOS

McCook et al. (2005) carried out a comparative study on the 'Health-Related Quality of Life Issues in Women with Polycystic Ovary Syndrome' to evaluate the influence of obesity, fertility status, and androgenism scores on health-related quality of life in women with PCOS. A sample of 128 women with PCOS, half of whom were attempting to conceive in addition to being treated for PCOS were selected. The mean age was 30 years. The most common health-related quality of life concern reported by women with PCOS was weight, followed in descending order by menstrual problems, infertility, emotions, and body hair.

Sánchez-Ferrer et al. (2020) conducted a case control study on 'Health-Related Quality of Life in Women with Polycystic Ovary Syndrome Attending to a Tertiary Hospital in Southeastern Spain'. The findings of the study were HRQoL significantly decreased in adult women with PCOS and its anovulatory phenotype compared to controls attending the outpatient clinic of a tertiary hospital. These results may have implications for clinical practice and suggest the need for specific interventions in women with PCOS.

Asdaq et al. (2020) in their cross-sectional study on the 'Impact of Polycystic Ovary Syndrome on Eating Behavior, Depression and Health Related Quality of Life' in Riyadh have found that PCOS significantly lowers quality of life in terms of health (HRQ). High scores for

irregular eating are linked to a decline in quality-of-life ratings and an aggravation of the psychiatric disorder. Of the total 494 women participated in the study, 116 were PCOS individuals. The odds of developing abnormal health related quality of (HRQ) in patients with PCOS was significantly high when compared to non-PCOS participants. Out of the three parameters studied, abnormal health related quality of life possessed a higher influence of PCOS compared to depression and abnormal eating behavior. The study concluded by demonstrating that women with PCOS are significantly more likely to experience mental disorders, disordered eating patterns, and a lower quality of life. To reduce the impact of PCOS on already burdened persons, the essential treatment and screening must be provided. It is also crucial to take the required actions to stop the eating behavior in addition to managing the comorbid conditions to improve the quality of life for PCOS patients.

Hanh et al. (2005) conducted a study on 'Clinical and Psychological Correlates of Quality-of-Life in Polycystic Ovary Syndrome' and found that a lower quality of life has been linking to polycystic ovarian syndrome (PCOS). This study investigates the impact of various PCOS symptoms on sexual satisfaction, psychosocial well-being, and quality of life. About 120 PCOS-afflicted women's complete metabolic, hormonal, clinical, and psychosocial data were collected. To determine whether there were any changes in patients' emotional and qualityof life, 50 healthy women were also compared. The relationship between psychosocial factorsand the main clinical manifestations of PCOS, including obesity, excessive body hair, acne, hyperandrogenism, disrupted insulin control, menstrual cycle disruptions, and infertility, was also examined. When compared to healthy controls, PCOS patients had significantly lower quality of life, more psychiatric disorders, and less sexual satisfaction. Physical components of quality-of-life and sexual satisfaction were correlated with obesity and hirsutism levels but not with acne. There was no discernible impact of androgens or insulin resistance on psychosocial factors. The kind of menstrual cycle irregularities or infertility had no effect on psychological well-being.

CHAPTER-III

METHODOLOGY

The methodology adopted for the present study entitled **"Dietary and Physical Activity Pattern in PCOS Women"** is discussed under the following headings:

3.1 Selection of area

3.2 Selection of subjects

3.3 Selection of tool

3.4 Collection of data

- **3.4.1 General Profile**
- **3.4.2 Socio Demographic and Socio-economic Profile**
- **3.4.3 Anthropometry Measurements**
- **3.4.4 Clinical Symptoms**
- **3.4.5 Physical Activity Pattern**
- **3.4.6 Dietary Pattern**
- **3.4.7 Food Frequency Questionnaire**

3.5 Analysis and interpretation of data

3.1 SELECTION OF AREA

The present study was carried out in Ernakulam district. The convenience and the familiarity of the investigator towards the area led to the selection of this area for the study.

3.2 SELECTION OF SUBJECTS

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in women of reproductive age (Kujanpaa L. et al., 2022). Therefore, in the present study PCOS women in the age group of 18-49 were selected. A total of 50 women affected with PCOS were selected for the study through a random sampling method.

3.3 SELECTION OF TOOL

The tool selected for the study was an interview schedule. An interview schedule is a proforma containing a set of questions which is generally filled out by the research worker,

who can interpret questions when necessary (Kothari, 2004). Therefore, in the present study, a well-structured interview schedule was formulated with details including general profile, socio-economic profile, anthropometric measurements, biochemical parameters, clinical symptoms, physical activity and dietary pattern of the respondents. The interview schedule used for the present study is given in appendix-I.

3.4 COLLECTION OF DATA

The data was collected from the 50 subjects in the Ernakulam district by personally interviewing them. The details collected from the subjects were their general profile. socio-economic profile, anthropometric measurements, clinical symptoms, physical activity and dietary pattern.

3.4.1 General Profile

The general profile included basic information about the subject like name, age, qualification, type of residence, occupation.

3.4.2 Socio-economic Profile

The socio-economic profile included education of the head of family, occupation of the head of family and monthly family income.

3.4.3 Anthropometry Measurements

Anthropometric measurements of the subjects (height and weight) were used to calculate BMI using formula:

$$\text{BMI} = \text{Weight (kgs)} / \text{Height } (m^2)$$

3.4.4 Clinical Symptoms

The presence of clinical signs and symptoms of PCOS were used to assess the severity of the disease in the subjects. The symptoms which were included are acne, acanthosis nigricans, hirsutism, androgenic alopecia, amenorrhea, oligomenorrhea, hypomenorrhea, menorrhagia and abdominal obesity.

3.4.5 Physical Activity Pattern

One of the lifestyle modifications is exercise which has been used as the first line of treatment in PCOS. The type of exercise, frequency and duration were asked under this section.

3.4.6 Dietary Pattern

Dietary pattern of subjects describes the overall diet; the foods, food groups, and nutrients included, regarding the diet they follow, the number of meals they consume in a day, and the frequency and quantity with which they are habitually consumed.

3.4.7 Food Frequency Questionnaire

An FFQ involves asking individuals (by interview or checklist) how often (daily, monthly, weekly, occasionally) specific foods are eaten. Usual dietary intake of the individuals was obtained through this method for the study.

3.5 Analysis and interpretation of data

Data collected from the subjects were tabulated and interpreted. Percentage analysis was used to analyse the data.

CHAPTER-IV
RESULT AND DISCUSSION

The results of the study entitled "**The Dietary and Physical Activity Pattern in PCOS Women**" are presented under the following headings:

4.1 Socio-demographic and Socio-economic Characteristics of the Subjects

4.2 Anthropometric Measurements of the Subjects

4.3 Clinical Symptoms of the Subjects

4.4 Physical Activity Pattern of the Subjects

4.5 Dietary Pattern of the Subjects

4.1 SOCIO-DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS OF THE SUBJECTS

The socio-demographic characteristics gives a basic information on the age, area of residence, employment status of the selected subjects. Socio-economic status provides the position of subjects on the socio-economic scale which is being determined by factors like education and occupation of head of family and monthly family income. The socio-demographic characteristics and socio-economic characteristics of the selected subjects in presented in table-1.

Table-1: Socio-demographic and Socio-economic Characteristics

Characteristics	Frequency (n)	Percentage (%)
Age		
18-25 years	20	40
26-30 years	7	14
31-35 years	9	19
36-40 years	9	17
41-49 years	5	10
Area of Residence		
Urban	50	100
Rural	0	0

Employment Status		
Employed	14	28
Unemployed	36	72
Socio-economic status		
Upper	10	20
Upper Middle	21	42
Lower Middle	14	28
Upper Lower	5	10
Lower	0	0

Women between the ages of 18-49 were selected for the study as PCOS affects women of childbearing age. Reproductive age refers to those years of life between menarche and menopause, roughly from ages 12 to 49. Majority of the samples selected, that is 40% of women were found to be between 18-25 years old. Whereas, only 10% of women were betweenthe ages of 41-49.

The samples were selected based on convenience and accessibility of the investigator. Therefore, all the samples were found to be from urban areas such as cities and towns.

It was also found that 72% of women were unemployed as most of them were either students or homemakers. Only 28% of women were working and these were mainly office jobs. As a result, majority of the women were leading a sedentary lifestyle or were involved in moderate physical activity.

Based on the socio-economic status, majority (42%) of the respondents were from upper middle category. About 28% of the respondents were from lower middle category, 20% of the respondents were from upper category and around 10% of the respondents were from upper lower category.

4.2 ANTHROPOMETRIC MEASUREMENTS OF THE SUBJECTS

Anthropometry studies the measurements of the human body totally or partially. The collection of these anthropometric measures is particularly useful to understand their nutritional status. The anthropometric data collected here was height and weight which was then used to

calculate the Body Mass Index. The anthropometric measurements of the subjects is presented in table-2.

Table-2: Anthropometric Measurements

Anthropometric Parameters	Mean	SD
Height (cm)	160.8	6.21
Weight (Kg)	65.2	13.51
BMI (Kg/m^2)	25.27	5.28

From the above table, it is clear that the mean height obtained is 322.9 and the standard deviation obtained for height is 15.77. The mean and standard deviation calculated for weight is 133.8 and 43.45 respectively. Finally the mean value obtained for BMI is 51.12 and the standard deviation is 7.97.

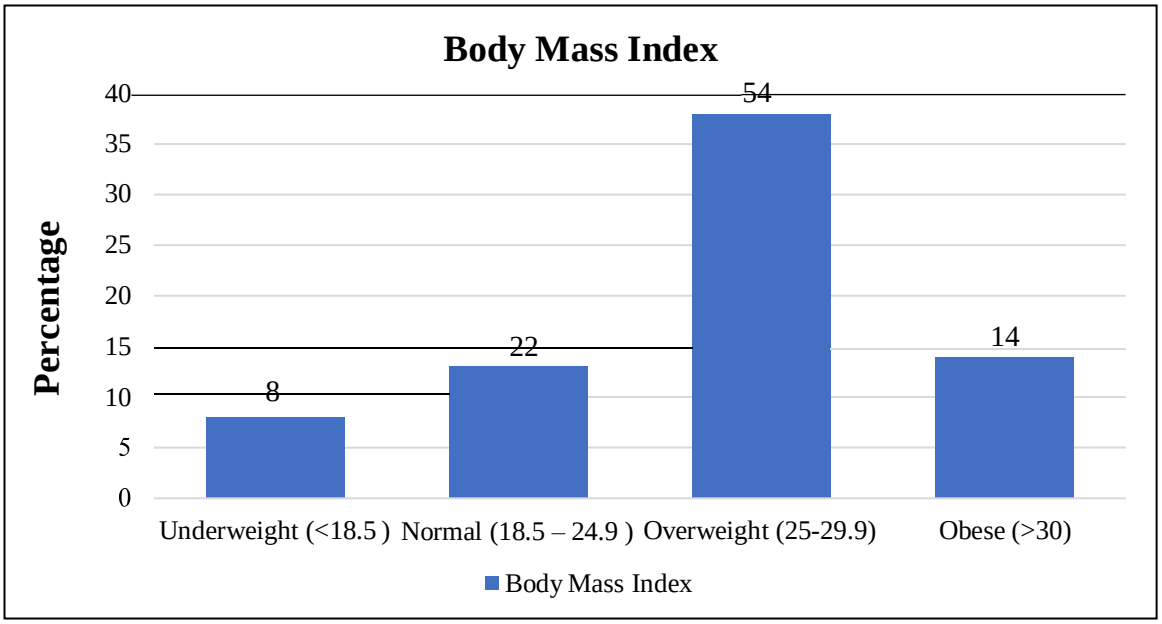


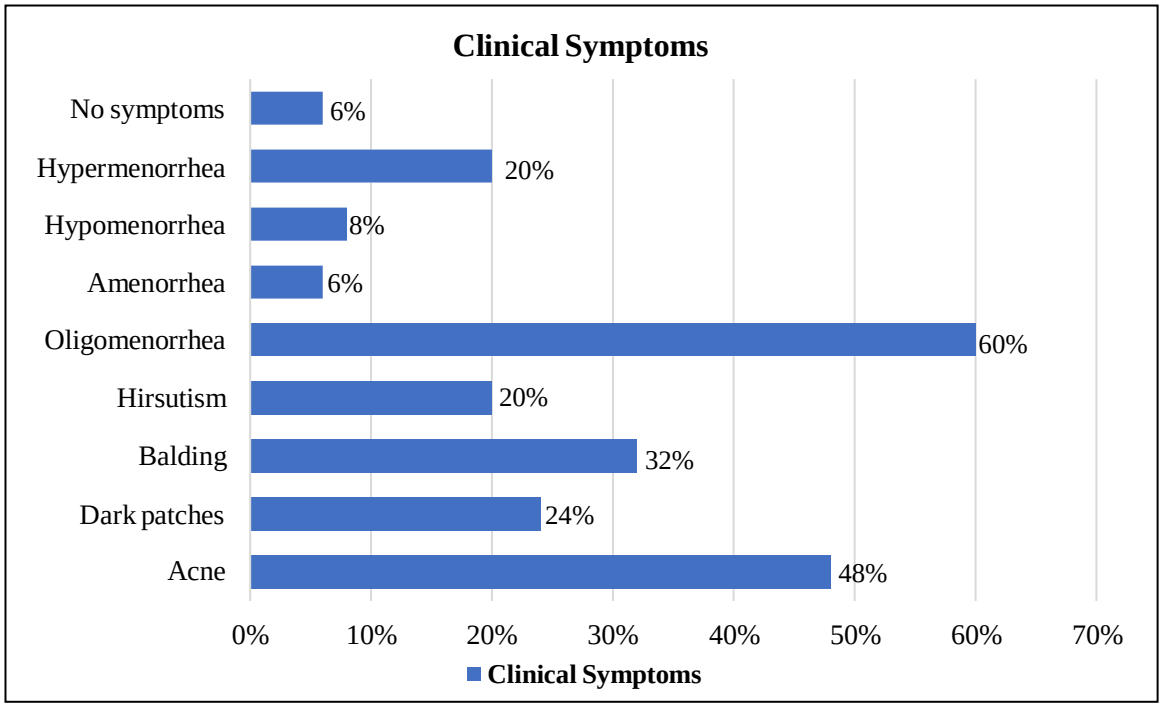
Figure-1: Body Mass Index of the Subjects

The body mass index of the subjects was calculated using the height and weight given by the samples. Most of the women, which constituted 54% were found to be in the overweight

category. About 14% of women were obese and 8% were underweight. The remaining 22% were seen to be in the normal weight range. Thus, it is clear that majority of the women were possibly overweight due to insulin resistance in the body which is seen in PCOS. PCOS makes it more difficult for the body to use the hormone insulin, which normally helps convert sugars and starches from foods into energy. This condition is called insulin resistance and can cause insulin and sugar to build up in the bloodstream. High insulin levels increase the production of male hormones called androgens which triggers weight gain.

4.3 CLINICAL SYMPTOMS OF SUBJECTS

Common symptoms of PCOS include irregular periods or no periods at all, difficulty getting pregnant (because of irregular ovulation or no ovulation), excessive hair growth (hirsutism), weight gain, thinning hair and hair loss from the head, oily skin or acne. The presence of these symptoms was assessed to understand the severity of the disease in each woman and the influence of diet and exercise in keeping these symptoms at bay. The clinical symptoms of the subjects are presented in figure-3.



*Multiple response

Figure-2: Clinical Symptoms of the Subjects

From the above figure it clear that, Majority (60%) of the respondents had irregular periods and 48% of the respondent had acne. 24% of the respondent had dark patches in the creases of neck, armpits, groin, or other places, 32% of the respondents had thinning, and

balding near temples and/or the crown of head, 20% of the respondents had dark hair growth on face, chest, and heavy bleeding. About 6% of the respondents had no periods and 8% of the respondents had light bleeding. Around 6% of the respondents showed no symptoms. High androgen levels lead to symptoms such as body hair growth, acne, irregular periods etc. High androgen levels are basically due to increased levels of insulin. Hence this factor primarily contributes to weight gain (because the weight gain is triggered by male hormones), typically in the abdomen region.

Menstrual irregularity occurs if ovulation does not occur, the lining of the uterus (endometrium) does not uniformly shed and regrow as in normal menstrual cycle. Instead, the endometrium becomes thicker and may shed irregularly, which can result in heavy and/or prolonged bleeding. Also, when your body has too much androgen, it can affect your regular monthly cycle. The hormonal imbalance prevents the eggs from developing or releasing properly. As a result, women can miss periods as well as no periods.

4.4 PHYSICAL ACTIVITY PATTERN OF SUBJECTS

Carrying out exercise, such as regular walking, reduces waist-to-hip ratio, an indicator of diabetes and other morbidities, and homocysteine levels, an indicator of cardiovascular risk, in overweight PCOS. Evidence suggests lifestyle modification should be the first line of therapy for women with PCOS. Several studies have examined the impact of exercise interventions on reproductive function, with results indicating improvements in menstrual and/or ovulation frequency following exercise. Exercise has also been found to enhance insulin sensitivity restores reproductive function (https://bmcpublichealth.biomedcentral.com/10.1186/s12889-020-10028-5). The physical activity pattern of the subjects are presented in figure-3.

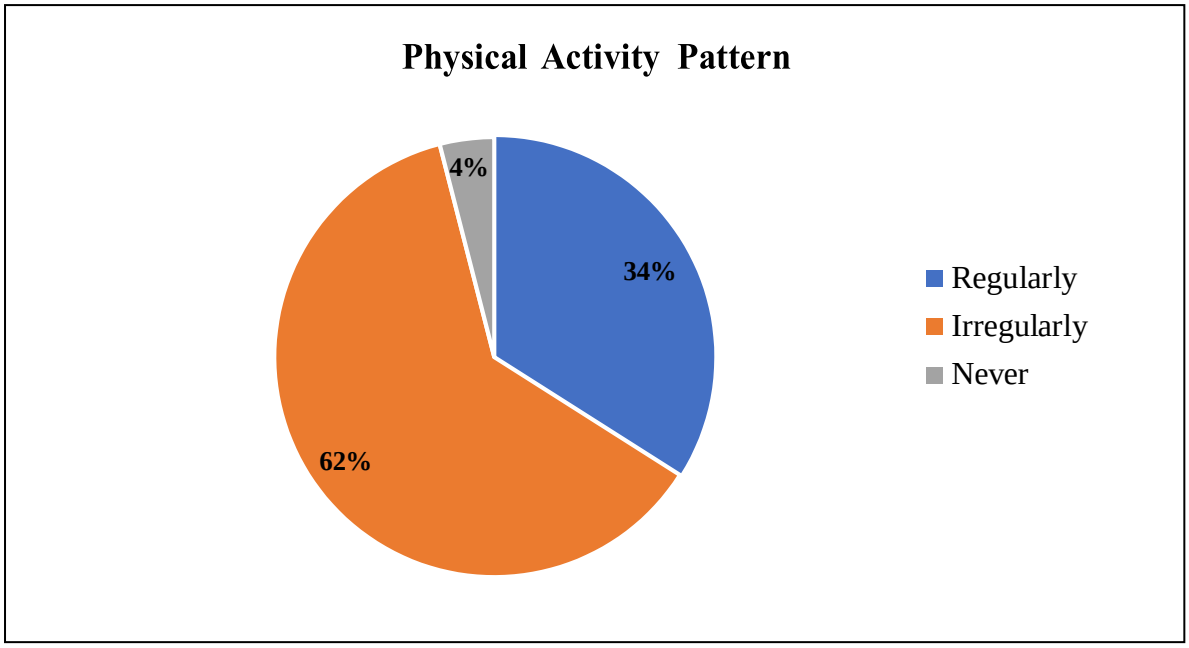


Figure-3: Physical activity pattern of the subjects

It was noted that the physical activity pattern greatly varied among the subjects. Majority (62%) of the subjects were not regular with their exercise. About 34% of women exercised regularly every week. While only 4% of women were found to never participate in any type of exercise.

Table-3: Duration for regular exercise

Duration	Frequency (n)	Percentage (%)
15 – 30 min	8	16
30 min – 1 hr	5	11
More than 1 hr	4	7

Out of 50 subjects, only 17 exercises on a daily basis while remaining 33 had an irregular exercise pattern. Out of 17 subjects, majority (16%) of women would exercise regularly for 15-30 minutes and 11% were exercising for 30 minutes to 1 hour. It was also noted that only 7% were exercising more than an hour.

Table-4: Duration for irregular exercise

Duration	Frequency (n)	Percentage (%)
15 – 30 min	16	33
30 min – 1 hr	14	27
More than 1 hr	1	2

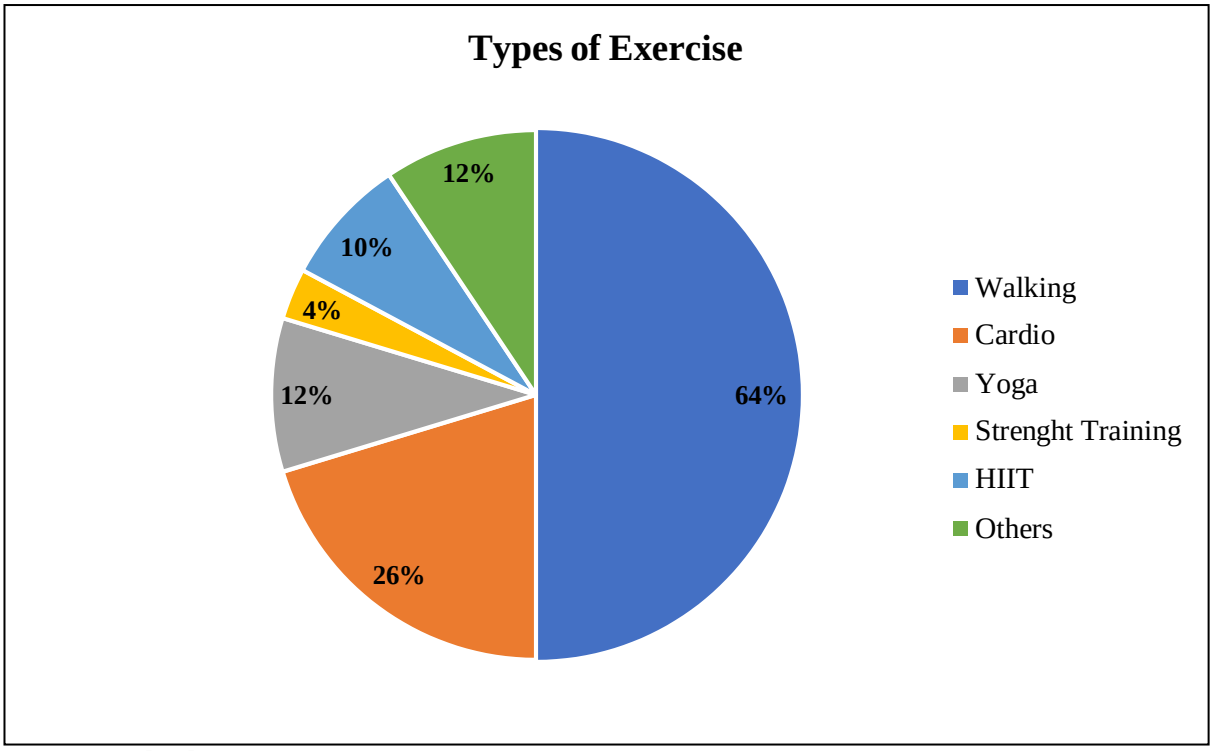
For those women who were exercising irregularly, it was found that most of them which is 33% preferred to exercise for 15-30 mins. 27% of women chose to exercise for 30 minutes to 1 hour and 2% of women would exercise for more than an hour.

Table-5: Days of regular exercise in a week

Number of days	Frequency (n)	Percentage (%)
1-2	3	17.64
3-5	10	58.82
6-7	4	23.52

Among the 17 women who were exercising regularly, it was found that 58.82% exercised for 3-5 days either for 15-30 mins or 30 mins to one hour which fulfils the exercise requirement for PCOS. 23.52% exercised for 6-7 days and 17.64 % did physical activity for 1-2 days. It was observed that PCOS symptoms were relatively controlled in these women and they had regular periods as well.

Guidelines for PCOS suggest at least 150 min of physical activity per week which means at least 20 minutes per day. But it was found that majority of women which is 62% were not exercising regularly or were irregular with their exercise routine. Only 34% of women were following a regular exercise schedule. The lack of exercise and physical activity was evident in most of the subjects in the form of excess body fat and in the manifestation of symptoms as well.



*Multiple response

Figure-4: Type of exercise performed by the subjects

It was noted that the women who were exercising regularly or irregularly performed a combination of various exercises rather than just following one type of exercise. Majority of the women (64%) have been found to do exercise by walking. Walking is a great exercise for beginners. It can be done almost anywhere, it doesn't require equipment, and it puts minimal stress on joints. Cardio exercises like jogging, cycling or swimming which are good for reducing insulin resistance, boosting fertility and stabilising mood were done by 26%. Strength training exercises like squats, push ups or triceps dips which are good for reducing insulin resistance, increasing metabolic rate and improving body composition (more muscle and less fat tissue) were done by 10% of women. Hight intensity interval training involves swapping between short bouts of high intensity work and lower intensity recovery and is good for reducing excess testosterone and improving insulin resistance. It was performed by 4% women. Practicing yoga regularly may help ease the symptoms of PCOS, decrease testosterone levels and promote relaxation and it was seen as the choice of exercise for 12% of women. Another 12% of women were found to do other types of exercises such as dancing and zzumba.

4.5. DIETARY PATTERN OF SUBJECTS

PCOS is principally a disease of over-nutrition, the primary management in most cases is centred on proper nutritional approach. Adequate consumption of balanced diet and adopting a healthy lifestyle has been found to decrease the incidence of PCOS. The dietary habits of the subjects is presented in figure-5.

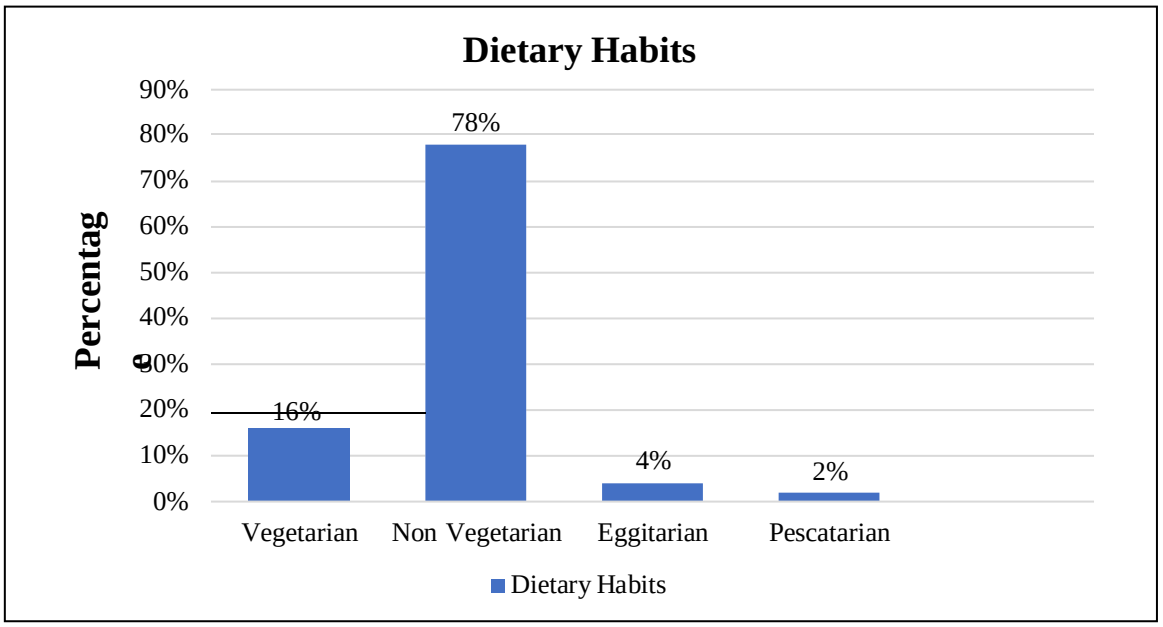


Figure-5: Dietary habits of the subjects

From the above figure, it was clear that majority (78%) of the respondents followed non vegetarian diet, 16% of the respondents followed vegetarian diet, 4% of the respondents were found to be eggetarian and only 2% of the respondents were found to be Pescatarian.

Table-6: Meals consumed in a day

No. of meals	Frequency (n)	Percentage (%)
Less than 3	8	15
3	12	25
4 or more	30	60

From the above table it was clear that, majority (60%) of the respondents consumed more than 4 meals a day, 25% of the respondents consumed 3 meals a day and only 15% of the respondents consumed less than 3 meals a day.

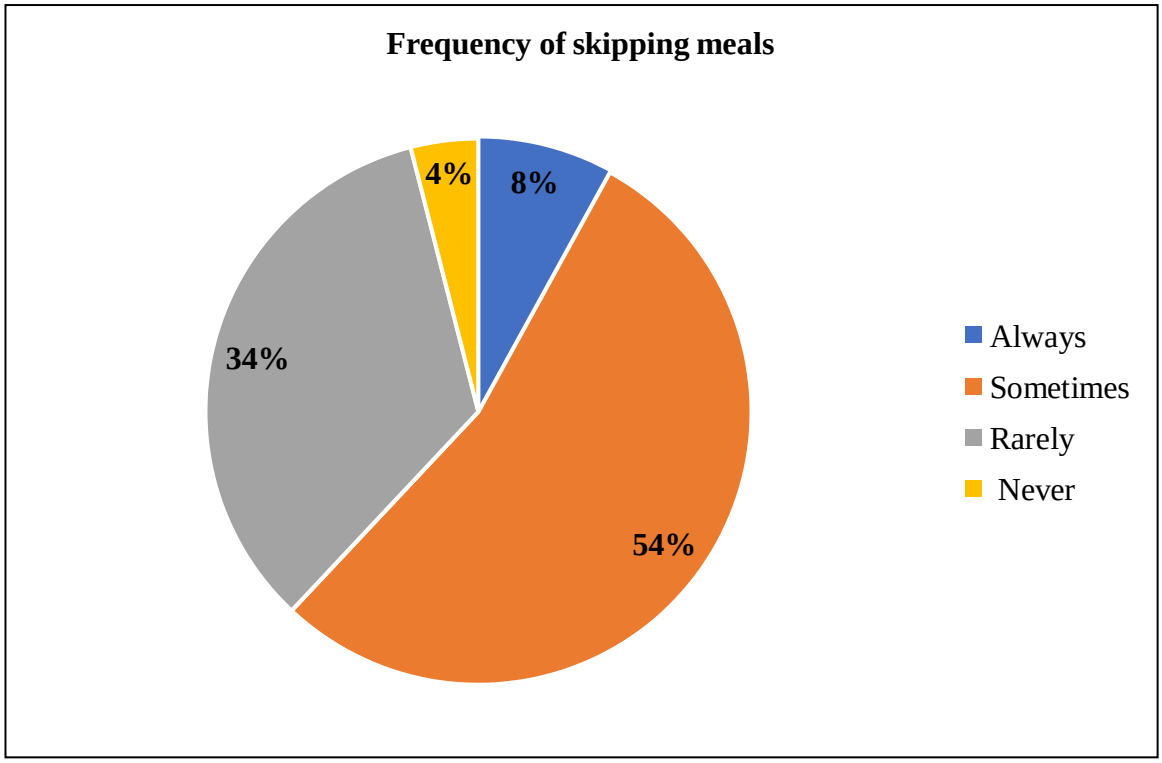


Figure – 4: Skipping of meals

From the above figure, it was clear that majority (54%) of the respondents were found to skip meals sometimes, 34% of the respondents were found rarely to skip meals, around 8% of the respondent were found to skip meals always and only 4% of the respondents were never found to miss meals. Erratic eating (which includes skipping meals, going long periods of time without eating, or grazing all day long) disrupts your blood sugar and can contribute to issues with energy, mood, digestion, and hormones. Skipping meals can also lead to overeating. These things put additional stress on your body and can contribute to worsening PCOS symptoms by amplifying blood sugar and cortisol issues. Hence eating about every 3-5 hours throughout the day supports stable blood sugar and hormones.

Table-7: Food Frequency Table

Food items	Daily		Weekly twice		Weekly once		Monthly		Occasionally		Never	
	n	%	n	%	n	%	n	%	n	%	n	%
Cereals												
Rice	40	80	8	16	2	4	0	-	0	-	0	-
Wheat	37	74	9	18	4	8	0	-	0	-	0	-
Barley	0		0		0		8	16	15	30	27	54
Oats	14	28	9	18	16	32	6	12	4	8	0	
Ragi	2	4	3	6	3	6	7	14	18	36	17	34
Pulses and dals												
Chickpeas	0		8	16	12	24	15	30	15	30	-	-
Lentils	11	22	11	22	7	14	4	8	17	35	0	-
Green peas	0		11	22	8	16	7	14	18	36	6	12
Kidney beans	0		4	8	9		15	30	17	34	5	10
Poultry, egg, meat and fish												
Tuna	0		12	24	8	16	12	24	6	12	12	24
Mackerel	0		14	28	13	26	6	12	5	10	12	24
Pearl spot	0		5	10	11	22	18	36	4	8	12	24
Sardine	2	4	23	46	5	10	8	16	0		12	24
Egg	26	52	15	30	4	8	0		0		5	10
Chicken	4	8	26	52	7	14	0		1	2	13	26
Red meat	1	2	3	6	7	14	11	22	15	30	13	26
Processed meat	2	4	3	6	7	14	10	20	12	24	16	32
Milk and milk products												
Milk	39	78	6	12	5	10	0		0		0	
Curd	14	28	20	40	16	32	0		0		0	
Cheese	6	12	9	18	12	24	8	16	6	12	0	
Butter	19	38	8	16	14	28	0		9	18	0	
Fruits												
Red grape	0		4	8	14	28	8	16	23	46	1	2
Blackberries	0		0		2	4	5	10	18	36	25	50
Blueberries	0		0		5	10	7	14	12	24	26	52

Cherries	0		0		0		0		9	18	41	82
Apple	6	12	19	38	9	18	11	22	5	10		
Orange	11	22	16	32	13		6	12	4	8		
Banana	14	28	21	42	7	14	3	6	4	8	1	2
Watermelon	0	0	0	0	0	0	20	40	27	54	3	6
Green leafy vegetables												
Spinach	6	12	8	16	5	10	5	10	19	38	7	14
Amaranth	9	18	13	26	11	22	6	12	8	16	0	
Cabbage	7	14	18	36	23	46	0		2	4	0	
Cauliflower	0		16	32	17	34	8	16	7	14	2	4
Nuts												
Walnuts	2	4	3	6	5	10	11	22	11	22	18	46
Pistachios	12	24	9	18	7	14	13	26	7	14	2	4
Almonds	10	20	7	14	6	12	15	30	10	20	2	4
Spices and condiments												
Turmeric	34	68	5	10	2	4	3	6	4	8	0	-
Cardamom	7	14	0	-	0	-	13	26	18	36	12	24
Basil	3	6	0	-	0	-	0	-	23	46	24	48
Fenugreek	8	16	5	10	9	18	11	22	17	34	0	-
Ginger	50	-	0	-	0	-	0	-	0	-	0	-
Coconut	43	86	7	14	0	-	0	-	0	-	0	-
Oils												
Coconut oil	37	74	4	8	2	4	0	-	7	14	4	8
Palm oil	0	-	0		2	4	5	10	18	36	25	50
Sunflower oil	0	-	7	14	13	26	19	38	9	18	2	4
Olive oil	2	4	8	16	6	12	17	34	14	28	3	6
Sugars												
White sugar	44	88	5	10	1	2	0	-	0	-	0	-
Brown sugar	6	12	0	-	0	-	7	14	15	30	16	32
Jaggery	2	4	8	16	9	18	15	30	16	32	0	-
Miscellaneous												
Chocolate	0	-	2	4	10	20	2	4	32	64	6	12

Cakes	0	-	0	-	6	12	18	36	26	52	0	-
Pastries	0	-	0	-	9	18	11	22	25	50	5	10
White bread	7	14	16	32	11	22	7	14	9	18	0	-
Pizza	1	2	2	4	14	28	9	18	21	42	1	2
Burger	1	2	3	6	24	48	8	16	14	28	0	-
Carbonated drinks	0	-	1	2	2	4	22	44	25	50	0	-

From the above table it was clear that out of the cereals category, majority (40%) of the respondents consumed rice on daily basis and the least (2%) consumed was found to be ragi. In the case of pulses, majority (22%) of the respondents consumed lentils on daily basis and the least (8%) consumed was found to be kidney beans on weekly basis whereas in the case of fish, the majority (23%) of the respondents consumed sardine on daily basis and the least consumed was found to be pearl spot on weekly basis, in the case of eggs, 52% of the respondents consumed on daily basis, in the case of meat, it was found that majority of the respondents which constitutes 26%, consumed chicken on daily basis, out of milk and milk products category, the majority (72%) of the respondents were found to consume milk on daily basis, in the case of fruits, widely consumed fruit variety amongst the respondents were found to be banana, which constitutes 28%.

From the category of green leafy vegetables, majority (18%) of the respondents consumed amaranth daily and daily consumption of cauliflower was found to be negligible. Among nuts, 24% of people consumed pistachios while only 4% consumed walnuts. In the category of spices and condiments, the spice which was consumed by the greatest number of people was turmeric (68%) and the one which was consumed by least number of people was basil (6%). Ginger was consumed by all the subjects while coconut was consumed by 86%. Among oils, coconut oil was consumed by majority of the people daily and constituted 74% while palm oil and sunflower oil were preferred for daily consumption. 4% of people consumed olive oil daily. When it comes to sugars, 88% of people consumed white sugar whereas only 4% consumed jaggery daily. Chocolates, cakes, pastries and carbonated drinks were not found to be consumed daily. Instead, these food items were majorly consumed occasionally. Majority (64%) mainly consumed chocolate and consumption of pastries and carbonated drinks by people occasionally were found to be 50%. It was noted that pizza was preferred over burger occasionally with 42% of people consuming pizza and 28% consuming burger. But burger was

consumed by 48% once in a week while pizza was only consumed by 28%. White bread was found to be consumed by 7% of people daily.

Foods beneficial for PCOS include natural, unprocessed foods, high-fiber foods, fatty fish, dark leafy greens, dark red fruits, beans, lentils, and other legumes, healthful fats, such as olive oil, nuts, dark chocolate in moderation and spices, such as turmeric and cinnamon. Foods that must be avoided are refined carbohydrates, such as pastries and white bread, fast food, sugary beverages, processed meats, solid fats and excess red meat. It was found that majority of the people were not consuming all the beneficial foods on a daily basis but at the same time most of them did not consume unhealthy foods everyday as well.

CHAPTER-V
SUMMARY AND CONCLUSION

The study entitled **"Dietary and Physical Activity Pattern in PCOS Women"** was undertaken with the objectives to assess the diet and physical activity of women affected with PCOS. For the study, 50 women between the ages of 18 and 49, having the condition were randomly selected as samples.

After analyzing and interpretating the data, it was evident that majority of the subjects were suffering from the symptoms of PCOS such as acne, hirsutism, androgenic alopecia, acanthosis nigricans, irregular menstrual cycle etc. due to lack of any sort of intervention. On the other hand, the relatively smaller group of women who claimed to exercise regularly had significant improvements in their menstrual cycle and the symptoms were under control as well. These women were following a reasonably healthy diet too which surely aided in treating the disorder.

The important points of the study are summarized below:

- Majority (40%) of the selected samples were found to be between 18-25 years old. Whereas, only 10% of women were between the ages of 41-49. It was found that 72% of women were unemployed as most of them were either students or homemakers. Only 28% of women were working and these were mainly office jobs. As a result, majority of the women were leading a sedentary lifestyle or were involved in moderate physical activity. Majority (42%) of the respondents were from upper middle category, about 28% of the respondents were from lower middle category, 20% of the respondents were from Upper category and around 10% of the respondents were from upper lower category.
- With regard to the anthropometric measurements, majority of the women (38%) were found to be in the overweight category. 4% of women were obese and 8% were underweight. The remaining 13% were seen to be in the normal weight range. The mean height obtained was 322.9 and the standard deviation obtained for height was 15.77. The mean and standard deviation calculated for weight was 133.8 and 43.45 respectively. Finally the mean value obtained for BMI was 51.12 and the standard deviation was 7.97.
- Most of the subjects had various PCOS symptoms. 48% of the respondents had acne, 24% of the respondent had dark patches in the creases of neck, armpits, groin, or other places,

32% of the respondents had thinning, and balding near temples and/or the crown of head, 20% of the respondents had dark hair growth on face, chest, and back, around 60% of the respondents had irregular periods, 6% of the respondents had no periods, 8% of the respondents had light bleeding, about 20% of the respondents has heavy bleeding and around 6% of the respondents showed no symptoms.

- Assessment of physical activity pattern provided insight about the type, frequency and duration of exercise performed. It was determined that the physical activity pattern greatly varied among the subjects. Majority of the subjects were not regular with their exercise and constituted 62%. 34% of women exercised regularly every week. While 4% of women were found to never participate in any type of exercise. 16% of women, which is the majority would exercise regularly for 15-30 minutes. 11% were exercising for 30 minutes to 1 hour. Only 7% were found to exercise for more than an hour. Among the 17 women who were exercising regularly, it was found that 58.82% exercised for 3-5 days either for 15-30 mins or 30 mins to one hour which fulfills the exercise requirement for PCOS. 23.52% exercised for 6-7 days and 17.64 % did physical activity for 1- 2 days. It was observed that PCOS symptoms were relatively controlled in these women and they had regular periods as well.
- From the category of green leafy vegetables, majority of the people, i.e. 18% consumed amaranth daily and daily consumption of cauliflower was found to be 0%. Among nuts, majority (24%) of people consumed pistachios while only 4% consumed walnuts. In the category of spices and condiments, the spice which was consumed by the greatest number of people was turmeric (68%) and the one which was consumed by least number of people was basil(6%). Ginger was consumed by all the subjects while coconut was consumed by 86%. Among oils, coconut oil was consumed by majority of the people daily and constituted 74%while palm oil and sunflower oil were preferred for daily consumption. 4% of people consumed olive oil daily. When it comes to sugars, majority (88%) of people consumed white sugar whereas only 4% consumed jaggery daily.
- Chocolates, cakes, pastries and carbonated drinks were not found to be consumed daily. Instead, these food items were majorly consumed occasionally. Majority of the people, that made up 64% mainly consumed chocolate and consumption of pastries and carbonated drinks by people occasionally were found to be 50%. It was noted that pizza was preferred over burger occasionally with 42% of people consuming pizza and 28% consuming burger. But burger was consumed by 48% once in a week while pizza was only consumed by 28%. White bread was found to be consumed by 7% of people daily. Out of the cereals category,

majority of the respondents which constitutes 40%, consumed rice on daily basis and the least consumed was found to be ragi, 2%, in the case of pulses, majority of the respondents, which constitutes 22%, consumed lentils on daily basis and the least consumed was found to be kidney beans on weekly basis,8%, whereas in the case of fish, the majority of the respondents, which constitutes 23% ,consumed Sardine on daily basis and the least consumed was found to be Pearl spot on weekly basis, in the case of eggs, the respondents consumed 52% on daily basis, in the case of meat, it was found that majority of the respondents which constitutes 26%, consumed chicken on daily basis, out of milk and milk products category, the majority of the respondents, which constitutes 72%, were found to consume milk on daily basis, in the case of fruits, widely consumed fruit variety amongst the respondents, which constitutes 28% were found to be banana.

CONCLUSION

The study **"Dietary and physical activity pattern in PCOS women"** estimated that majority of the women, was observed to be between 18-25 years old. Regarding their anthropometric measurements, majority of the women were found to be in the overweight category. Based on the clinical symptoms most of the samples had irregular menstrual cycle. Whenthe physical activity pattern was assessed, majority of the subjects were not regular with their exercise. On the basis of dietary assessment it was observed that most of the subjects consumedamaranth daily, among spices and condiments, turmeric was found to be consumed at a higherrate, among oils, coconut oil was consumed by majority of the people on daily basis , sugars were consumed at a higher rate on daily basis , in the case of cereals, majority of the respondents consumed rice on daily basis, in the case of fish, majority was found to consumedSardine on daily basis, in the case of meat, it was found that majority of the respondents consumed chicken on daily basis, out of milk and milk products category, the majority of the respondents were found to consume milk on daily basis, in the case of fruits, widely consumedfruit variety amongst the respondents, were found to be banana.

REFERENCE

1. Asdaq, S. M. B., Jomah, S., Hasan, R., Al-Baroudi, D., Alharbi, M., Alsubaie, S., Buhamad, M. H., Alyahya, B., & Al-Yamani, M. J. (2020). Impact of polycystic ovary syndrome on eating behavior, depression and health related quality of life: A cross-sectional study in Riyadh. *Saudi journal of biological sciences. pubmed*. https://doi.org/10.1016/j.sjbs.2020.08.039
2. Bharali M, Rajendran R, Goswami J, et al., December 09. (2022). *Prevalence of Polycystic Ovarian Syndrome in India: A Systematic Review and Meta-Analysis.* cureus 14(12): e32351. doi:10.7759/cureus.32351
3. Clark AM, Thornley B, Tomlinson L, Galletley C, Norman RJ. (1998). *Weight loss in obese infertile women results in improvement in reproductive outcome for all forms of fertility treatment*. Hum Reprod. Pubmed. https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-8-41
4. Coffey S, Mason H. (2003). *The effect of polycystic ovary syndrome on health-related quality of life.* Gynecol Endocrinol. Pubmed. https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-8-41
5. Deeks AA, Gibson-Helm ME, Teede HJ. (2010). *Anxiety and depression in polycystic ovary syndrome: a comprehensive investigation.* Fertil Steril.
6. Galletly C, Clark A, Tomlinson L, Blaney F. (1996). *A group program for obese, infertile women: weight loss and improved psychological health.* J Psychosom Obstet Gynaecol. Pubmed. https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-8-41
7. Goodarzi M, Dumesic D, Chazenbalk. (2011). *Polycystic ovary syndrome: etiology, pathogenesis and diagnosis*. Nat Rev Endocrinol 7, 219–231 (2011). https://doi.org/10.1038/nrendo.2010.217
8. Farshchi H, Rane A, Kennedy R L. (2007). *Diet and nutrition in polycystic ovary syndrome (PCOS): Pointers for nutritional management*, School of Medicine, James Cook University, Douglas, Australia, https://www.researchgate.net/publication/5751025_Diet_and_nutrition_in_polycystic_ovary_syndrome_PCOS_Pointers_for_nutritional_management
9. Hamilton-Fairley D, Kiddy D, Anyaoku V, Koistinen R, Seppala M, Franks S. (2003). *Response of sex hormone binding globulin and insulin-like growth factor binding protein-1 to*

an oral glucose tolerance test in obese women with polycystic ovary syndrome before and after calorie restriction. Clin Endocrinol (Oxf). Pubmed. https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-8-41

10. Hahn, S., Janssen, O. E., Tan, S., Pleger, K., Mann, K., Schedlowski, M., Kimmig, R., Benson, S., Balamitsa, E., & Elsenbruch, S. (2005). *Clinical and psychological correlates of quality-of-life in polycystic ovary syndrome.* European journal of endocrinology, pubmed. https://doi.org/10.1530/eje.1.02024
11. Huber-Buchholz MM, Carey DG, Norman RJ. (1999). *Restoration of reproductive potential by lifestyle modification in obese polycystic ovary syndrome: role of insulin sensitivity and luteinizing hormone*. J Clin Endocrinol Metab. Pubmed. https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-8-41
12. Jacob D. (2022). *Types of Medication for PCOS.* rxlist. https://www.rxlist.com/types_of_medication_for_pcos/drugs-condition.htm
13. Pernille K, Bjerre D. B, Ravn P. (2014) *The effect of dietary carbohydrates in women with polycystic ovary syndrome,* Department of Gynaecology and Obstetrics, Odense University Hospital, Denmark, Pubmed, https://www.researchgate.net/publication/262977858_The_effect_of_dietary_carbohydrates_in_women_with_polycystic_ovary_syndrome.
14. Karimzadeh MA, Javedani M. (2010). *An assessment of lifestyle modification versus medical treatment with clomiphene citrate, metformin, and clomiphene citrate-metformin in patients with polycystic ovary syndrome*. Fertil Steril. pubmed. https://pubmed.ncbi.nlm.nih.gov/19463994/
15. Kunjanpaa L, Arffman K.R., Pesonen P, Korhonen E, Karjula S, Jarvelin R.M. , Franks S, Tapanainen S. J. , Papunen M. L. ,Piltonen T. T. (2022). *Women with polycystic ovary syndrome are burdened with multimorbidity and medication use independent of body mass index at late fertile age: A population-based cohort study*. wiley. https://obgyn.onlinelibrary.wiley.com/doi/10.1111/aogs.14382
16. Cronin L, Guyatt G, Griffith **L. (**1998). *Development of a Health-Related Quality-of-Life Questionnaire (PCOSQ) for Women with Polycystic Ovary Syndrome (PCOS), The Journal of Clinical Endocrinology & Metabolism,* https://doi.org/10.1210/jcem.83.6.4990

17. Moran J L , Noakes M, Clifton M. P. (2006). *Short-term meal replacements followed by dietary macronutrient restriction enhance weight loss in polycystic ovary syndrome,* Discipline of Obstetrics and Gynaecology (Research Centre for Reproductive Health), School of Paediatrics and Reproductive Health, Adelaide, Australia, PMID: 16825684/DOI: 10.1093/ajcn/84.1.77.

18. Sørensen B. L , Søe M. (2011). *Effects of increased dietary protein-to-carbohydrate ratios in women with polycystic ovary syndrome,* Department of Human Nutrition, Centre for Advanced Food Studies, Faculty of Life Sciences, University of Copenhagen, Denmark, https://pubmed.ncbi.nlm.nih.gov/22158730/

19. McCook, J. G., Reame, N. E., & Thatcher, S. S. (2005). *Health-related quality of life issues in women with polycystic ovary syndrome.* Journal of obstetric, gynecologic, and neonatal nursing : JOGNN. pubmed. https://doi.org/10.1177/0884217504272945

20. Moran LJ, Pasquali R, Teede HJ, Hoeger KM, Norman RJ. (2009). *Treatment of obesity in polycystic ovary syndrome: a position statement of the Androgen Excess and Polycystic Ovary Syndrome Society*. Fertil Steril. Pubmed. https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-8-41

21. Sánchez-Ferrer, M. L., Adoamnei, E., Prieto-Sánchez, M. T., Mendiola, J., Corbalán-Biyang, S., Moñino-García, M., Palomar-Rodríguez, J. A., & Torres-Cantero, A. M. (2020). *Health-related quality of life in women with polycystic ovary syndrome attending to a tertiary hospital in Southeastern Spain: a case-control study.* Health and quality of life outcomes. pubmed. https://doi.org/10.1186/s12955-020-01484-z

22. Broughton K. S. (2020). Cross-sectional Study on the Knowledge and Prevalence of PCOS at a Multiethnic University, Monique J. LeMieux, PhD, Department of Nutrition and Food Sciences, Texas Woman's University, Denton, https://journals.lww.com/progprevmed/fulltext/2020/06000/cross_sectional_study_on_the_knowledge_and.1.aspx

23. Shetty D, Baskaran C, Watson A. S. , Joseph O. (2017). *Exercise in polycystic ovarian syndrome: An evidence-based review.* sjosm. org. https://www.sjosm.org/citation.asp?issn=1319-6308;year=2017;volume=17;issue=3;spage=123;epage=128;aulast=Shetty;aid=SaudiJSportsMed_2017_17_3_123_215912

24. Oriji K. V. (FWACS), Onwuegbulam C. (FWACS). (2019). *Prevalence of Polycystic Ovary Syndrome (PCOS) Among Infertile Women Attending Fertility Clinic at a University Teaching Hospital in Nigeria*. J Gynecol Women's Health. 2019: 15(5): 555922. DOI: 10.19080/JGWH.2019.15.555922

25. Wahrenberg H, Ek I, Reynisdottir S, Carlstrom K, Bergqvist A, Arner P. (1999). *Divergent effects of weight reduction and oral anticonception treatment on adrenergic lipolysis regulation in obese women with the polycystic ovary syndrome.* J Clin Endocrinol Metab. Pubmed. https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-8-41

26. Wang, S., Zhang, Z., & Liu, Y. (2020). *Effects of Exercise Intervention on the Improvement of Polycystic Ovary Syndrome.* IntechOpen. https://www.intechopen.com/chapters/68692

27. Woodward, A., Klonizakis, M., & Broom, D. (2020). *Exercise and Polycystic Ovary Syndrome. Advances in experimental medicine and biology*, pubmed. https://doi.org/10.1007/978-981-15-1792-1_8

28. Zhang X, Zheng Y , Guo Y, Zhiwen Lai. (2019). *The Effect of Low Carbohydrate Diet on Polycystic Ovary Syndrome: A Meta-Analysis of Randomized Controlled Trials*, Chongqing Medical University, No. 1, Medical College Road, Yuzhong District, Chongqing 400010, China, https://doi.org/10.1155/2019/4386401.

APPENDIX – 1

Questionnaire to Elicit Information on the 'Dietary and Physical Activity Pattern in PCOS Women'

I)Personal Information

1.Name :

2.Age :

3.Type of residence:

a) Urban ☐ b)Rural ☐

4.Occupation:

a) Working ☐ b)Not working ☐

If working, specify _____

5.Socioeconomic status:

Education of head of family	
Profession of honour	
Intermediate or diploma	
Graduate or post graduate	
High school certification	
Middle school certification	
Primary school certification	
Illiterate	
Occupation of head of family	
Legislators, Senior Officials and Managers	
Professionals	
Technicians and Associate Professionals	
Clericals	
Skilled Workers and Shop and Market Sales Workers	
Skilled Agricultural and Fishery Workers	
Craft and Trade Related Works	
Plant and Machine Operators and Assemblers	

Elementary Occupation	
Unemployed	
Monthly family income	
₹ ≥ 123,322	
₹ 61,663- ₹123,321	
₹ 46,129- ₹61,662	
₹ 30,831- ₹46,128	
₹ 18,497- ₹30,830	
₹ 6,175 - ₹18,496	
₹≤ 6,174	

II) **Anthropometric Measurements**
6. Height:
7.Weight:
8. BMI:

III) Clinical Symptoms

9. Which among the following symptoms do you have? (More than one option can be selected)

A. Acne ☐
B. Dark patches in the creases of neck, armpits, groin, or other places. ☐
C. Thinning, and balding near temples and/or the crown of head. ☐
D. Dark hair growth on face, chest, and back. ☐
E. Irregular periods ☐
F. No periods ☐
G. Light bleeding ☐
H. Heavy bleeding ☐
I. No symptoms ☐

10. Are you struggling to maintain your body weight?

A. No, weight is in the healthy range. ☐
B. Yes, gained weight, especially in the midsection (around abdomen). ☐
C. Underweight. ☐

V) Physical Activity

11. How often do you exercise?

A. Regularly ☐

B. Irregularly ☐

C. Never ☐

12. If regularly, how many days in a week do you exercise? _____

13. For what duration is the exercise performed?

A. 15-30 mins ☐

B. 30mins- 1hr ☐

C. More than an hr ☐

14. What is the type of exercise that is done? (More than one option can be selected)

A. Brisk walking ☐

B. Cardio (jogging, swimming, cycling) ☐

C. Strength training ☐

D. HIIT ☐

E. Yoga ☐

F. Other- ☐ _____

VI) Dietary Pattern

15. What diet do you follow?

A. Veg ☐

B. Non- Veg ☐

C. Vegan ☐

D. Eggetarian ☐

E. Pescatarian ☐

16. How many meals do you consume in a day?

A. Less than 3 meals ☐

B. 3meals ☐

C. 4 or more meals ☐

17. How often do you skip meals?

A. Always ☐

B. Sometimes ☐

C. Rarely ☐

D. Never ☐

18. Food Frequency Questionnaire

Food items	Daily	Weekly twice	Weekly once	Monthly	Occasionally	Never
Cereals						
Rice						
Wheat						
Barley						
Oats						
Ragi						
Pulses and dals						
Chickpeas						
Lentils (parippu)						
Green peas						
Beans						
Poultry, meat and fish						
Tuna (choora)						
Mackerel (ayaala)						
Pearl Spot (karimeen)						
Sardine(chala)						
Chicken						
Red meat						
Processed meat						

Milk and milk products						
Milk						
Curd						
Cheese						
Buttermilk						
Fruits						
Red grape						
Blackberries						
Blueberries						
Cherries						
Apple						
Orange						
Banana						
Watermelon						
Green leafy vegetables						
Spinach						
Amaranth						
Cabbage						
Cauliflower						
Nuts						
Walnuts						

Pistachios						
Almonds						
Spices and condiments						
Turmeric						
Cardamom						
Basil						
Fenugreek						
Ginger						
Coconut						
Oils						
Coconut oil						
Palm oil						
Sunflower oil						
Olive oil						
Sugars						
White sugar						
Brown sugar						
Jaggery						
Miscellaneous						
Chocolate						
Cakes						
Pastries						

White bread						
Pizza						
Burger						
Carbonated drinks						