

# ANTHROPOMETRY AND DIETARY PATTERNS OF POLYCYSTIC OVARY SYNDROME (PCOS) PATIENTS

Huma Islam<sup>1</sup>, Husna Wali<sup>1</sup>, Sajid Wahab<sup>3</sup>, Habban Ullah<sup>2</sup>, Hafsah Amjad, Hira Afridi, Huma Ahmad<sup>1</sup>

1. Department of Human nutrition, Women University Mardan.
2. Bachelor of Medicine and Bachelor of Surgery, Sargodha medical college, Sargodha.
3. Department of Human nutrition, The University of Agriculture Peshawar KPK Pakistan.

## Abstract

The aim of this study is to evaluate the dietary intake and nutritional status of PCOS patients. Women of reproductive age are susceptible to this endocrine condition known as polycystic ovarian syndrome (PCOS). This condition manifests as insulin resistance, obesity and cardiovascular issues. Data was gathered from Gul Medical center and District Headquarters Hospital of district Mardan through a questionnaire approved by the supervisor. The data collection process was finished between March 2022 and June 2022. The purpose of the questionnaire was to collect data on the patient's general characteristics, such as age, height, and weight, as well as signs and symptoms, physical activity, and food habits. Examining the nutritional status and dietary habits of PCOS patients was the aim of this study. According to the results of the investigation, PCOS is mostly brought on by a number of variables, including obesity, a sedentary lifestyle, excessive intake of carbonated beverages, fried foods, and fast foods. PCOS is more likely to develop in sedentary women who also consume more fast food, fried food, and carbonated beverages.

**KEY WORDS:** Polycystic, syndrome, insulin resistance, obesity, sedentary lifestyle, Carbonated beverages, fast foods.

## INTRODUCTION

Polycystic ovarian syndrome (PCOS) is an endocrine disorder that affects women of reproductive age. Infertility, insulin resistance, obesity, and cardiovascular difficulties are all symptoms of this syndrome, as well as a large number of other health concerns. (Patel 2018). PCOS is a heterogeneous condition characterized by a combination of androgen excess and ovarian dysfunction symptoms in the absence of other diagnosis. (Escobar-Morreale *et al.*, 2018) this condition is linked to a female endocrine reproductive disorder because the ongoing hormonal imbalances causes complications such as many cysts and an irregular menstrual cycle, which eventually leads to female infertility (Ajmal *et al.* 2019). The etiology of PCOS is generally quite complicated and not well understood, although it refers to multiple causes that can be inherited or modifiable variables, such as environmental and lifestyle factors, such as smoking, physical activity and food. However, improper lifestyle choices, especially unhealthy eating habits, lead to IR and obesity, which are thought to be the most common etiological factors for this condition. Women with a high risk of PCOS were found to follow more western dietary patterns and consume fewer plant-based diets (Farman *et al.* 2021). PCOS affects around 116 million women globally (3.4%), according to the World Health Organization (Bulsara *et al.* 2021). The worldwide prevalence of PCOS among reproductive aged women is 4 to 18% (Tahir *et al.*, 2020). The estimates varies markedly across countries and regions, with the highest rates per 100,000 in the Czech Republic(460.6) and the lowest in Sweden (34.10) The rates in Central and Eastern Europe are more than three times higher than those in Western countries. Within Central Europe, PCOS is lowest in Turkey and Albania, while in the majority of the remaining countries, the prevalence ranged between 420 and 440 per 100,000 (Kiesnowski *et al.* 2021). The prevalence of PCOS varies around the world from 1.6% in women in USA to 52% women in India. Although the prevalence of PCOS in Pakistani women is not known, one study has reported that around 54% of women visiting a hospital for gynecological issues suffer from PCOS. Furthermore, it is more prevalent in women aged 15 to 30 years than in women aged over 30 years. The modern lifestyle, which involves less physical activity, unhealthy dietary habits, gender role changes, and increased psychological pressure, is generally blamed for the increasing rate of PCOS in women in South Asia and European countries (Fatima *et al.* 2021). The most typical female reproductive condition is classified as polycystic ovary syndrome (PCOS). Given that so many women with PCOS are known to be overweight or obese, obesity is thought to be a major factor in the development of the illness. PCOS and obesity are strongly correlated with one another. In order to discover if PCOS causes obesity or whether obesity causes metabolic alterations that contribute to PCOS, this paper investigates the link between PCOS and obesity. Numerous research on the subject were examined and compared as part of the analysis. Both obese and non-obese PCOS subjects had their body fat distribution, insulin resistance, and hyperandrogenemia analyzed. The majority of

the studies considered in this review were unable to definitively prove that PCOS caused obesity or that obesity caused PCOS. The important points raised in the literature showed that obesity could be an important factor to predict PCOS. In women who are predisposed to PCOS, the metabolic and hormonal issues that are present such as insulin resistance and hyperandrogenism, can lead to weight gain and eventually obesity. Obesity in turn can exacerbate the symptoms of PCOS such as further metabolic issues and reproductive abnormalities (Rosenberg, L., 2019).

## MATERIALS AND METHOD

**3.1. STUDY LOCATION:** This cross-sectional study was conducted in Government hospital District Headquarter and Gul Medical Center located in district Mardan under the strict supervision of medical superintendents of the respective hospitals.

**3.2. SAMPLE SIZE:** The sample size included in the study was 150 women who were already diagnosed. Data was collected from March 2022 to June 2022. The willingness approval was taken from the study participants before collecting data from them.

**3.3. DATA COLLECTION:** The data for the study was collected using a validated questionnaire approved by the supervisor of the project. The questionnaire was designed to collect information about the patient's general data including age, height and weight, signs and symptoms, physical activity, and dietary habits. Similarly BMI was calculated according to the criteria approved by WHO, which is calculated by taking weight in kilograms divided by height in meter square ( $\text{kg/m}^2$ ). The BMI of less than  $18\text{kg/m}^2$  is considered as underweight, BMI ranging from  $18.5\text{--}24.9\text{ kg/m}^2$  is considered as normal while BMI ranging from  $25.0\text{--}29.9\text{ kg/m}^2$  is considered as overweight. BMI of greater than  $30\text{kg/m}^2$  is considered as Obese. (WHO, 1998)

### 3.3.1. ANTHROPOMETRIC DATA:

Anthropometric data including weight and height was collected by using standard procedures.

#### HEIGHT:

Height of an individual was measured by using an instrument known as stadiometer.

#### STADIOMETER:

A stadiometer is an instrument used to measure human height. It is constructed out of a ruler and a sliding horizontal headpiece which is adjusted to rest on the top of the head. The subject whose height to be measured is asked to remove his/her shoes and socks, stand straight over the stadiometer and it is ensured that they are standing perfectly straight with their head and back forward and against the wall, directly under the drop-down measuring device. The nose and ears of the individual should be parallel to the floor and after ensuring that the individual is all set for his/her height measurement the horizontal head piece must be gently placed on the top of the head and height is measured.

#### WEIGHT:

The weight of an individual was measured using a weighing scale or weight machine.

#### WEIGHT MACHINE:

Weight machine or weighing scale is an instrument used to measure weight or mass. It is also known as mass scale, balance scale or weight balance. The weight of an individual to be measure on the weighing scale is asked to remove any heavy extra clothing, shoes and accessories in order to avoid extra weight and then person the individual is asked to stand still on the weight machine and his/her weight is recorded in kg.

#### BODY MASS INDEX (BMI):

BMI was calculated according to the criteria approved by WHO, which is calculated by taking weight in kilograms divided by height in meter square ( $\text{kg/m}^2$ ). The BMI of less than  $18\text{kg/m}^2$  is considered as underweight, BMI ranging from  $18.5\text{--}24.9\text{ kg/m}^2$  is considered as normal while BMI ranging from  $25.0\text{--}29.9\text{ kg/m}^2$  is considered as overweight. BMI of greater than  $30\text{kg/m}^2$  is considered as Obese. (WHO, 1998)

### 3.3.2. DIETARY INTAKE:

Different questions were asked from the patients about their dietary habits. (Annex)

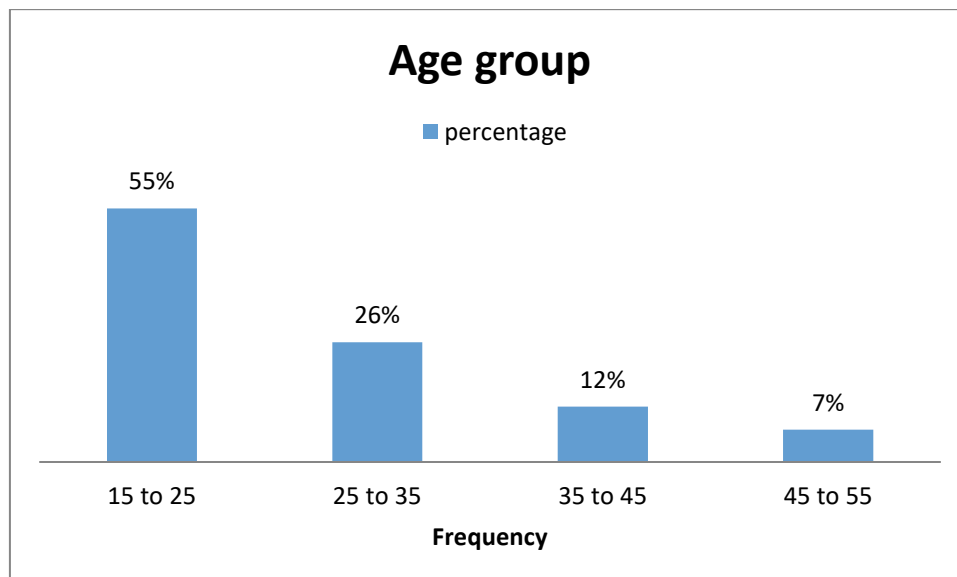
## RESULTS

This cross-sectional study was conducted in District Headquarters Hospital and Gul Medical center Mardan to evaluate nutritional status and dietary pattern of patients with PCOS. The sample size was 150, i.e. 65 married women and 85 unmarried women. The study concluded with the following results: Table 4.1 shows the age of the subjects. More than half lie in the age range between 15 to 26% subjects ( $n=39$ ) lie in the age range between 25 to 35. 12% subjects ( $n=18$ ) lie in the age range between 35 to 45. While 7% subjects ( $n=11$ ) lie in the age range from 45 to 55.

**Table no 4.1: Age of the subjects**

| Age | Frequency(N) | Percentage (%) |
|-----|--------------|----------------|
|     |              |                |

|          |    |    |
|----------|----|----|
| 15 to 25 | 82 | 55 |
| 26 to 35 | 39 | 26 |
| 36 to 45 | 18 | 12 |
| 46 to 55 | 11 | 7  |



**Figure 4.1.1: Age of the subjects**

Table 4.2 shows mean weight, height and age of the subjects. The mean age of the subjects was  $28 \pm 9$ , whereas the mean height and weight of the subjects were  $154 \pm 4$  and  $70 \pm 19$  respectively.

**Table no 4.2: Weight, Height and Age of the subjects**

| Variable     | Mean | Standard Deviation |
|--------------|------|--------------------|
| Weight in kg | 70   | 19                 |
| Height in cm | 154  | 4                  |
| Age          | 28   | 9                  |

Table 4.3 shows Body Mass Index (BMI) of the subjects. The mean BMI of the unmarried subjects was  $27 \pm 5$ . Whereas the mean BMI of married subjects was  $32 \pm 8$ .

**Table no 4.3: Body Mass Index on the basis of marital status**

| Marital Status | Mean | Standard Deviation |
|----------------|------|--------------------|
| Unmarried      | 27   | 5                  |
| Married        | 32   | 8                  |

Table 4.4 shows the physical activity of the subjects on the basis of their marital status. The lifestyle of 51% ( $n=33$ ) married women was sedentary. While 46% ( $n=30$ ) married women had moderate physical activity and 3 ( $n=2$ ) married women had extreme physical activity. The lifestyle of 42% ( $n=36$ ) unmarried women was sedentary. While 48% ( $n=41$ ) unmarried women had moderate physical activity and 9% ( $n=8$ ) had extreme physical activity.

**Table no 4.4: Physical Activity of the Subjects**

Table 4.5 shows the family history of PCOS for married and unmarried women. 54% (n=35) married women

| Marital status | Physical activity | Frequency(N) | Percentage (%) |
|----------------|-------------------|--------------|----------------|
| Married        | Sedentary         | 33           | 51             |
|                | Moderate          | 30           | 46             |
|                | Extreme           | 2            | 3              |
| Unmarried      | Sedentary         | 36           | 4              |
|                | Moderate          | 41           | 48             |
|                | Extreme           | 8            | 9              |

had the family history of PCOS while 46% (n=30) had no case of PCOS in their family. 72% (n=61) unmarried women had the family history of PCOS while 28% (n=24) unmarried women had no family history of PCOS.

**Table no 4.5: Family History of PCOS**

| Marital status | Family history | Frequency(N) | Percentage (%) |
|----------------|----------------|--------------|----------------|
| Married        | NO             | 35           | 54             |
|                | Yes            | 30           | 46             |
| Unmarried      | No             | 61           | 72             |
|                | Yes            | 24           | 28             |

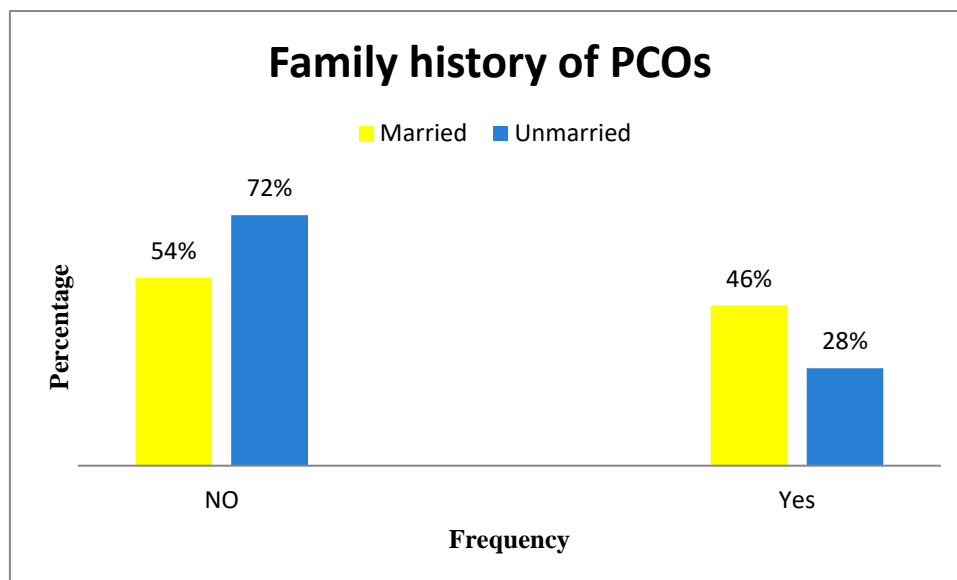
**Figure 4.5.1: Family History of the Subjects**

Table no 4.6 shows whether the periods or menstrual cycle of the subject is normal or not.

**Table no 4.6: Menstrual Cycle**

| Marital status | Menstrual cycle                            | Frequency(N) | Percentage (%) |
|----------------|--|--------------|----------------|
| Married        | No, they have never been.                  | 16           | 25             |
|                | Yes  | 17           | 26             |
|                | No, they have been regular for few months. | 32           | 49             |
| Unmarried      | No, they have never been regular.          | 16           | 19             |
|                | Yes  | 34           | 40             |
|                | No, they have been regular for few months. | 35           | 41             |

Table 4.7 shows the sleeping pattern of married and unmarried women with PCOS. It is clear from the table that 40% (n=26) married women had abnormal sleeping pattern while 60% (n=39) married women had normal sleeping pattern. While in unmarried women, 53% (n=45) had abnormal sleeping pattern while 47% (n=40) had normal sleeping pattern.

**Table no 4.7: Sleeping pattern**

| Marital status | Normal sleeping pattern | Frequency(N) | Percentage (%) |
|----------------|-------------------------|--------------|----------------|
| Married        | No                      | 26           | 40             |
|                | Yes                     | 39           | 60             |
| Unmarried      | No                      | 45           | 53             |
|                | Yes                     | 40           | 47             |

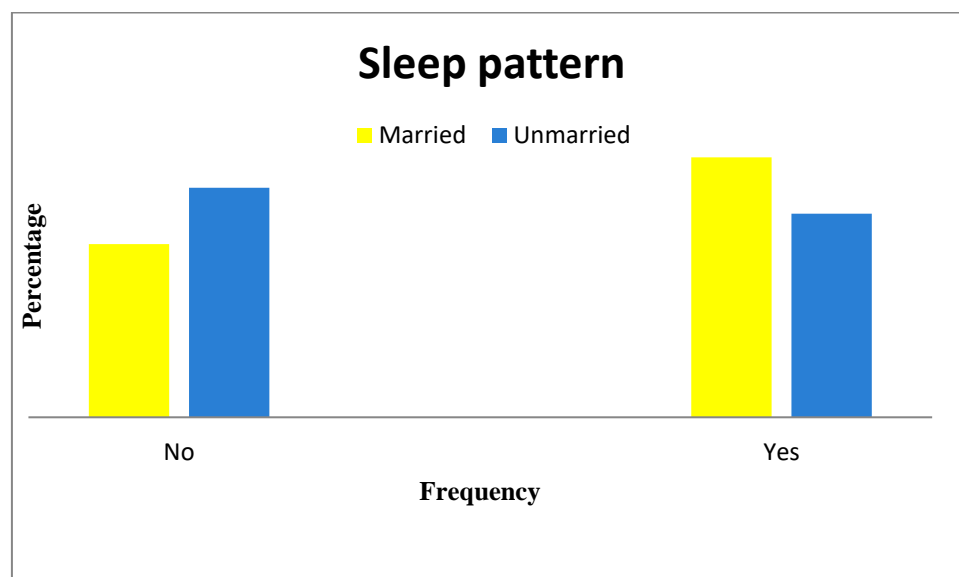
**Figure 4.7.1: Sleeping Pattern of the Subjects**

Table 4.8 shows how much often, the subjects consumed cereals. It is clear from the table that 100% of both the married (n=65) and unmarried women (n=85) consumed cereals twice a day.

**Table no 4.8: Intake of cereals**

| Marital status | Consumption frequency | Frequency(N) | Percentage (%) |
|----------------|-----------------------|--------------|----------------|
| Married        | Twice a day           | 65           | 100            |
| Unmarried      | Twice a day           | 85           | 100            |

Table 4.9 shows how much often the subjects consumed pulses. It is clear from the table that 3% (n=2) married women never consumed pulses. Those married women who consumed pulses once or twice a week or 49% (n=32). While those married women who consumed pulses once or twice a month are 48% (n=31). Unmarried women who never consumed pulses are 21% (n=18). Those unmarried women who consumed pulses once or twice a week are 40% (n=34). While those unmarried women who consumed pulses once or twice a month are 39% (n=33).

**Table no 4.9: Intake of pulses**

| Marital status | Consumption frequency | Frequency(N) | Percentage (%) |
|----------------|-----------------------|--------------|----------------|
| Married        | Never                 | 2            | 3              |
|                | Once or twice a week  | 32           | 49             |
|                | Once or twice a month | 31           | 48             |
| Unmarried      | Never                 | 18           | 21             |
|                | Once or twice a week  | 34           | 40             |
|                | Once or twice a month | 33           | 39             |

Table 4.10 shows how much often the subject consumed vegetables. It is clear from the table that 6% (n=4) married women never consumed vegetables. 87% (n=56) married women consumed vegetables once or twice a week. While 7% (n=5) married women consumed vegetables once or twice a month. Unmarried women who never consumed vegetables are 8% (n=7). Those unmarried who consumed vegetables once or twice a week are 89% (n=76). While those unmarried women who consumed vegetables once or twice a month are 2% (n=2).

**Table no 4.10: Intake of vegetables**

| Marital status | Intake                | Frequency(N) | Percentage (%) |
|----------------|-----------------------|--------------|----------------|
| Married        | Never                 | 4            | 6              |
|                | Once or twice a week  | 56           | 87             |
|                | Once or twice a month | 5            | 7              |
| Unmarried      | Never                 | 7            | 8              |
|                | Once or twice a week  | 76           | 89             |
|                | Once or twice a month | 2            | 2              |

Table 4.11 shows how much often the subjects consumed fruit. It is clear from the table that 10% (n=6) married women never consumed fruit. 84% (n=55) married women consumed fruit once or twice a week. While 6% (n=4) women consumed fruit once or twice a month. Unmarried women who never consumed fruit are 6% (n=5). Those unmarried women who consumed fruit once or twice a week are 92% (n=78). While those unmarried women who consumed fruit once or twice a month are 2% (n=2).

Table no 4.11: Intake of fruits

| Marital status | Intake                | Frequency (N) | Percentage (%) |
|----------------|-----------------------|---------------|----------------|
| Married        | Never                 | 6             | 10             |
|                | Once or twice a week  | 55            | 84             |
|                | Once or twice a month | 4             | 6              |
| Unmarried      | Never                 | 5             | 6              |
|                | Once or twice a week  | 78            | 92             |
|                | Once or twice a month | 2             | 2              |

Table 4.12 show how much often the subjects consumed meat and meat products. 14% married (n=9) women never consumed meat and meat products. Those married women who consumed meat and meat products once or twice a week are 72% (n=47). While those who married women who consumed meat and meat products once or twice a month are 14% (n=9). Those unmarried women who never consumed meat and meat products are 5% (n=4). Married women who consumed meat and meat products once or twice a week are 94% (n=80). While those who consumed meat and meat products once or twice a month are 1% (n=1).

Table no 4.12: Intake of meat and meat products

| Marital status | Intake                | Frequency (N) | Percentage (%) |
|----------------|-----------------------|---------------|----------------|
| Married        | Never                 | 9             | 14             |
|                | Once or twice a week  | 47            | 72             |
|                | Once or twice a month | 9             | 14             |
| Unmarried      | Never                 | 4             | 5              |
|                | Once or twice a week  | 80            | 94             |
|                | Once or twice a month | 1             | 1              |

Table 4.13 shows how much often the subjects consumed dairy products. 20% (n=13) of married women never consumed dairy products. Those married women who consumed dairy products once or twice a week are 78% (n=51). While those married women who consumed dairy products once or twice a month are 2% (n=1). Unmarried women who never consumed dairy products are 29% (n=25). Those married women who consumed dairy products once or twice a week are 68% (n=58). While those who consumed dairy products once or twice a month are 2% (n=2).

Table no 4.13: Intake of milk and dairy products

| Marital status | Intake                | Frequency (N) | Percentage (%) |
|----------------|-----------------------|---------------|----------------|
| Married        | Never                 | 13            | 20             |
|                | Once or twice a week  | 51            | 78             |
|                | Once or twice a month | 1             | 2              |
| Unmarried      | Never                 | 25            | 29             |
|                | Once or twice a week  | 58            | 68             |
|                | Once or twice a month | 2             | 2              |

Table 4.14 shows how much often the subjects consumed carbonated beverages. 23% (n=15) married women never consumed carbonated beverages. Those married women, who consumed carbonated beverages, once a day, are 26% (n=17). While those who consumed carbonated beverages once or twice a week, are 51% (n=33). Unmarried women who never consumed carbonated beverages are 31% (n=26). Those unmarried women, who consumed carbonated beverages, once a day, are 33% (n=28). While those who consumed carbonated beverages once or twice a week are 36% (n=28).

**Table no 4.14: Intake of carbonated beverages**

| Marital status | Intake               | Frequency (N) | Percentage (%) |
|----------------|----------------------|---------------|----------------|
| Married        | Never                | 15            | 23             |
|                | Once a day           | 17            | 26             |
|                | Once or twice a week | 33            | 51             |
| Unmarried      | Never                | 26            | 31             |
|                | Once a day           | 28            | 33             |
|                | Once or twice a week | 31            | 36             |

Table 4.15 shows how much often the subjects consumed fast foods. 24% (n=16) married women never consumed fast foods. 62% (n=40) married women consumed fast food once or twice a week. While 14% (n=9) married women consumed fast food once or twice a month. Unmarried women who never consumed fast food are 36% (n=31). Those who consumed fast food once or twice a week are 60% (n=51). While those who consumed fast food once or twice a month are 4% (n=3).

**Table no 4.15: Intake of fast food**

| Marital status | Intake | Frequency (N) | Percentage (%) |
|----------------|--------|---------------|----------------|
| Married        | Never  | 16            | 24             |
|                | Week   | 40            | 62             |
|                | Month  | 9             | 14             |
| Unmarried      | Never  | 31            | 36             |
|                | Week   | 51            | 60             |
|                | Month  | 3             | 4              |

Table 4.16 shows how much often the subjects consumed fried foods. 25% (n=16) of married women never consumed fried foods. 50% (n=33) Consumed fried foods once or twice a week. While 25% (n=16) married women consumed fried foods once a day. The percentage of unmarried women who never consumed fried foods is 36% (n=31). 33% (n=28) unmarried women consumed fried foods once or twice a week. While 31% (n=26) unmarried women consumed fried foods once a day.

**Table no 4.16: Intake of fried foods**

| Marital status | Intake               | Frequency (N) | Percentage (%) |
|----------------|----------------------|---------------|----------------|
| Married        | Never                | 16            | 25             |
|                | Once or twice a week | 33            | 50             |
|                | Once a day           | 16            | 25             |
| Unmarried      | Never                | 31            | 36             |
|                | Once or twice a week | 28            | 33             |
|                | Once a day           | 26            | 31             |



Table 4.17 shows how much often the subjects consumed tea, coffee, green tea etc. 6% (n=4) of married women never consumed tea. 1% (n=1) of married women consumed tea once a day. While 92% (n=60) married women consumed tea more than twice a day. The percentage of unmarried women who never consumed tea is 5% (n=5). 93% (n=79) unmarried women consumed tea once a day. While 1% (n=1) women consumed tea more than twice a day.

**Table no 4.17: Intake of tea, coffee, green tea**

| Marital status | Intake          | Frequency | Percentage |
|----------------|-----------------|-----------|------------|
| Married        | Never           | 4         | 6%         |
|                | Day             | 1         | 1%         |
| Unmarried      | More than a day | 60        | 92%        |
|                | Never           | 5         | 5%         |
|                | Day             | 79        | 93%        |
|                | More than a day | 1         | 1%         |

## DISCUSSION

Gopalan *et al.* (2021) in a research they conducted on PCOS patients, discovered that majority of the patients were 24 years old. While the bulk of the PCOS patients in the current study ranged in age from 15 to 25. Additionally, Gopalan *et al.* (2021) discovered that most of PCOS patients were obese. The current study comes to a similar conclusion as according to the BMI results, the majority of the PCOS patients in this study were obese. Azziz *et al.* (2000) conducted a study on PCOS patients and found that a major risk factor for the disease is family history. According to their research, 40% of women received PCOS from their mother and grandmother or other close relatives. However their findings are in conflict with this study as the current study found that 54% of married and 72% of unmarried women developed PCOS without a history of the condition in their families, which makes their findings incongruent with ours. The majority of women with PCOS had irregular cycles, according to a study by Prakash *et al.* (2012). The current study's findings are consistent with previous findings that most PCOS patients have irregular menstrual cycle. Seventy percent of women with PCOS who participated in a study by George and Alex (2021) reported eating fast food. The majority of PCOS-afflicted women in this study consumed fast food, so these results are consistent with the previous study. According to Altieri *et al.* (2012), women with PCOS consumed largely vegetables. In contrast to the previous study, it was found in the current study that patients with PCOS consumed more vegetables each week. Researchers Javed *et al.* (2012) showed that PCOS patients consume more meat than the general population. This study also revealed that majority of PCOS-afflicted consumed meat on a daily basis. In a study on PCOS conducted by Sheshdhar *et al.* (2016), they found that the majority of the women who had the condition did not consume milk or other dairy products. These results do not match the findings of the current study because the majority of PCOS-afflicted women who participated in the current study consumed milk and dairy products. Vaidya *et al.* in 2019 conducted a research on 38 women with PCOS. The women ranged in age from 17 to 40, with a mean age of 25 years. The majority of PCOS patients experienced sleep insufficiency (57.9% slept less than 7 hours per day); of these, 12 women reported sleeping for 6 to 7 hours, while 7 reported sleeping for just 5 to 6 hours per day, and 4 reported sleeping for less than 5 hours per day. Eight women reported experiencing sleep latency, and five of them reported fragmented sleep. In 14 patients, a misalignment of sleep with the waking pattern was noted. So the overall findings of the study demonstrated that PCOS patients have a significant level of sleep insufficiency. These results do not match with the findings of the current study because according to this study 40% (n=26) married women had abnormal sleeping pattern while 60% (n=39) married women had normal sleeping pattern. While in unmarried women, 53% (n=45) had abnormal sleeping pattern while 47% (n=40) had normal sleeping pattern. According to a study on PCOS patients by Afrin *et al.* (2021), the majority of patients did not typically consume cereals. Similar findings from Trabert *et al.* (2010) investigation indicated that majority of patients were not consuming cereals. However their findings are in conflict with this study as the current study found that 100% of both the married (n=65) and unmarried women (n=85) consumed cereals twice a day.

**Conclusions** The purpose of this research work was to evaluate nutritional status and dietary pattern of PCOS patients. Based on the analysis conducted, it can be concluded that multiple factors like obesity, sedentary lifestyle, too much consumption of carbonated beverages, fried foods and fast foods are major causes of PCOS. Women who have sedentary lifestyle and consume more fast foods, fried foods and carbonated beverages are at increased risk of developing PCOS.

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## AUTHORS

**First Author-** Huma Islam, B.Sc. (Hons), Department of Human nutrition, Women University Mardan.

**Second Author** – – Husna Wali B.Sc. (Hons), Department of Human nutrition, Women University Mardan.

**Third Author** – Sajid Wahab, B.Sc. (Hons), Department of Human nutrition, The University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan

**Fourth Author** – Habban Ullah, MBBS, Bachelor of Medicine and Bachelor of Surgery, Sargodha, medical, college, Sargodha.

**Fifth Author.** Hafsa Amjid, B.Sc. (Hons), Department of Human nutrition, Women University Mardan.

**Sixth Author** – Hira Afridi, B.Sc. (Hons), Department of Human nutrition, Women University Mardan.

**Seventh Author** – Huma Ahmad, B.Sc. (Hons), Department of Human nutrition, Women University Mardan