Master of Science in Public Health

Prevalence of PCOS and its Association with Psychological Disorders among Women of Reproductive Age Visiting Rehab Facilities of Islamabad

By

Areeba Tayyab

Al-Shifa School of Public Health, PIO,

Al Shifa Trust Eye Hospital

Quaid-i-Azam University

Islamabad, Pakistan

(2022)

Prevalence of PCOS and its Association with Psychological Disorders Among Women of Reproductive Age Visiting Rehab Facilities of Islamabad.

Areeba Tayyab

362821-PIO/MSPH-2020

Dissertation submitted in partial fulfilment of the requirement for the degree of:

MASTER OF SCIENCE IN PUBLIC HEALTH (2022)

to

Al-Shifa School of Public Health, PIO, Al Shifa Trust Eye Hospital,

Faculty of Medicine

Quaid-i-Azam University,

Islamabad.

Word Count: 12467

DECLARATION

In submitting this dissertation, I certify that I have read and understood the rules and regulations of Al-Shifa School of Public Health (ASOPH) and QAU regarding assessment procedures and offences and formally declare that all work contained within this document is my own apart from properly referenced quotations.

I understand that plagiarism is the use or presentation of any work by others, whether published or not, and can include the work of other candidates. I also understand that any quotation from the published or unpublished works of other persons, including other candidates, must be clearly identified as such by being placed inside quotation marks and a full reference to their source must be provided in proper form.

This dissertation is the result of an independent investigation. Where my work is indebted to others, I have made acknowledgments.

I declare that this work has not been accepted in substance for any other degree, nor is it currently being submitted in candidature for any other degree.

_____ _____

Dr. Saman Waqar **Areeba Tayyab**

(QAU Registration number)

Date: MSPH (Year)

Al-Shifa School of Public Health,

PIO, Al Shifa Trust Eye Hospital Date: 8-04-2022

ACKNOWLEDMENTS

TABLE OF CONTENTS

Chapter   Page

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Back ground: PCOS is often characterized by hyper-androgenism. In hyper-androgenism, a female produces the higher levels of androstenedione. PCOS is also associated with rise of psychological disorder and screening for the disorders necessary to allow for early interventions.

Objectives: The main aim of this study is to find the prevalence of PCOS in women and its association with psychological disorder visiting rehab facilities of Islamabad.

Methodology: the study was conducted in two rehab facilities of Islamabad, which were chosen by multi cluster random sampling. Data was collected from the female in their reproductive age with and without PCOs meeting the inclusion criteria using interview based and online questionnaires, psychological disorder were assessed using DASS-21 scale. Data were analyzed in SPSS version 25.

Results: A total of 384 women of reproductive age visiting rehab facilities participated in this study in which 34.82% (n=135) women diagnosed with PCOS, while the percentage of normal women with no PCOS was 65.11% (n=250). A significant association was found between prevalence of PCOs and regular health checkup. $(x^2 (1) = 8.403$, p-value = 0.004), as evidenced by the chi-square test of association. Prevalence of PCOs and body weight were significantly associated $(x^2 (1) = 6.553$, p-value = 0.010). While physical activity, consider nutrients, and eat junk food was also significantly associated with PCOS $(x^2 (2) = 79.010$, p-value = 0.011), $(x^2 (1) = 8.720$, p-value = 0.003) and $(x^2 (1) = 8.149$, p-value = 0.004) respectively.

Conclusion: The overall prevalence of PCOs is high among women of reproductive age which is increasing the overall health, social and economic burden. Percentage of depression, anxiety and stress with PCOs was low as compared to without PCOS. Lifestyle and dietary modifications play a significant role in development of PCOs. our study also found that the percentage of depression, anxiety, and stress with PCOS was low as compared to without PCOS.

Keywords: Polycystic ovarian syndrome, depression, anxiety and stress scale

CHAPTER I: INTRODUCTION

1.1   Definition and background

Polycystic Ovarian Syndrome (PCOS) can be defined as a *"heterogeneous disorder characterized by signs and symptoms produced due to excess of androgen and loss of normal function of ovaries"* (Escobar-Morreale & F., 2018).

In PCOS, there are 12 or more ovaries have size ranging from 2mm to 9 mm while the ovarian volume is also increased. It is not necessary that both ovaries show these characteristics in PCOS (Yazdani, 1996).

1.2   Clinical symptoms

PCOS is often characterized by hyper-androgenism. In hyper-androgenism, a female produces the higher levels of androstenedione. The hyper-androgenism can be present in many form. It can be in the form of secondary hair growth on female's face similar to males or as acne. It can also causes the hair loss in females having similar pattern as male's hair loss (Sheehan, 2004).

Stein and Leventhal, gave the first definition of PCOS in 1935. He described PCOS as presences of oligomenorrhea or amenorrhea combined with multiple follicles and swollen ovaries. Hair growth like males was also present in one case (Stein, 1935). In 2003, Rotterdam, provided another criteria. According to his criteria, a person can be suffering from PCOS if presence of the amenorrhea, polycystic ovaries or biochemical hyper-androgenism is present. Presence of any two would also diagnose PCOS (Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004).

Inconsistency and irregularity in flow of the menstrual blood in female is called as oligomenorrhea. In this case, menstrual cycle is increased to 35 days and less than nine menstruation occurs in a year (Riaz & Parekh, 2021). Amenorrhea can be defined as lack of menstruation cycle when a female is in her reproductive stage of life. Common examples are in the case of pregnancy and during lactation (Rogol., 2022).

Androgen play a critical role in PCOS. Hyperandrogenism directly increases obesity in women. Hyperandrogenism serves as a risk factors for type II diabetes mellitus (Zhang, et al., 2018).

Increased level of androgen is associated with insulin resistance in women. Androgen also aggravate hypertension in PCOS patients. Hyper androgenism also increases the risks of left ventricular hypertrophy (Ye, Xie, Song, & Zhou, 2020).

Clinical symptoms of PCOS include menstrual abnormalities, obesity, hirsutism, androgenic alopecia, acanthosis nigricans and acne. A female suffering from PCOS can have normal menstruation, oligomenorrhea or amenorrhea. Anovulation, no release of ovum, is most frequently reported (Hart, Hickey, & Franks, 2004). Another paper reported that 85-90% of female suffering from oligo menorrhea and 30-40% females suffering from amenorrhea also suffers from the PCOS (Goldzieher & Green, 1962).

Acne is a common skin disease. It happens to almost everyone once in a life. In females, androgen can play a role in causing acne. Fluctuations in androgen levels as seen in PCOS can result in acne in the females (Shinkai, Kamangar, & Kanade, 2012).

Hirsutism can be characterized by presence of male like facial hairs on woman. In U.S., 4 million women suffer from hirsutism (S.Archer & Chang, 2004). Hirsutism is caused by hyperandrogenism as androgens are responsible for secondary hair growth. PCOS accounts for 72-80% of all hirsutism cases (Bode, Seehusen, & Baird, 2012).

Androgenic alopecia (AGA) is progressive hair loss. It is common in men. That is why it is also called man pattern baldness. Androgen hormones are most common cause behind AGA as these hormones are chief regulators of the hair growth, epidermal barrier and differentiation of sebaceous glands (Lolli, et al., 2017). Women experience less hair loss in AGA than men. In women, AGA starts from frontal area of skull and gradually moves up (Vera, 2003).

Acanthosis nigricans (AN) can be characterized by the appearance of hyper pigmented, soft and silky thickening in sub-cutaneous layer of skin. It can occur on almost all parts of body. Most of the time it occurs on neck, in armpits, groin, knew cap, elbow and umbilical region of abdomen. Papillomatosis may also occur but on mucosal layers (Schwartz, 1994). AN occur in 7-74% of population. Its occurrence depends upon age, race, obesity and endocrine issue associated with AN (Das, et al., 2020).

A study was conducted Baghdad to find the association of AN and PCOS. In group 1 with infertile females having PCOS, AN was detected in 68.75% patients. In second group with females having benign AN, at least three criteria of PCOS were present in 75% patients. 65% suffered from obesity

while, 60% suffered from hirsutism and only half patients had menstrual abnormalities (Sharquie, Al-Bayatti, Al-Bahar, & Al-Zaidi, 2004).

1.3   Prevalence

A study was conducted to find a prevalence of AGA in PCOS patients. Out of 254 PCOS patients, only fifty-six had AGA. This means only 22% PCOS patient suffered from AGA. (Quinn, et al., 2014) Another study was conducted with the same aim. 95 patient of androgenic alopecia were taken as sample. 60 of them were suffering from PCOS. This study also proved that women with androgenic alopecia also had higher levels of luteinizing hormone (LH), testosterone and androgens (Cela, et al., 2003)

Obesity play a critical role in the PCOS. It has been proven that 38-88% PCOS patients are overweight. If a PCOS patient loses even 5% of her weight, a significant increase in ovulary function and hyperandrogenism's symptoms can be observed. (Barber, McCarthy, Wass, & Franks, 2006) It has been reported that obesity can be increased by PCOS, especially visceral obesity. It was also reported that 30% of PCOS cases could have been prevented if the women had normal body weight (were not obese) (Vrbikova & Hainer, 2009). Women who have BMI of 24 kg/m^2 or more has an increased risk of anovulation, no release of ovum during menstrual cycle. Obesity in PCOS patient worsens the hyper androgenism (Sam, 2007)

1.4   Rotterdam Criteria

Diagnosis of PCOS have been difficult because of presence or absence of clinical symptoms. National Institute of Child Health and Human Development (NICHD) gave the first criteria for diagnosis. According to their criteria, hyper-androgenism and anovulation must be present as symptoms for PCOS (Dunaif & Zawadzki, 1992)

In 2003, Rotterdam proposed his own criteria for diagnosis of PCOS. According to his criteria, two of the following symptoms must be present in a woman to be diagnosed with PCOS. These symptoms include hyper-androgenism, anovulation and polycystic ovaries. (Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004)

In 2006, another criterion for diagnosis of PCOS was presented by an expert panel of Androgen Excess Society (AES). According to their criteria a woman must have hyper-androgenism with either anovulation or polycystic ovaries t be diagnosed with PCOS. (Azziz, et al., 2009)

1.5   Risk factors

PCOS have a number of risk factors. Escobar *et. al*. showed in their paper that PCOS prevalence increases if participants under study suffers from either Type I or Type II diabetes (Escobar-Morreale, et al., 2000). A study was conducted at the Middlesex Hospital to determine prevalence of PCO in diabetic patients. This study reported that 82% of all type II Diabetic women were suffering from PCOS as well. This prevalence was four times greater than general population (Conn, Jacobs, & Conway, 2001)

Another study was conducted in Italy with same aim as above. The study reported the 39.3% prevalence of PCOS among Type II diabetic females which was lower than previous one but still higher than average general female population (Gambineri, et al., 2012)

PCOS had significant effects on Type II Diabetes. PCOS increased prevalence of Type 2 diabetes by 15% in general population and 1.5% if women were non-obese. Between age of 20-39 years, PCOS increased prevalence of Type II Diabetes by 15% (Carreau & Baillargeon, 2015)

PCOS and several risk factors of cardiovascular diseases (CVDs) are associated with each other. Women suffering from PCOS have been reported to have higher prevalence of sleeping disorders such as sleep apnea. There is also higher prevalence of weight related CVDs risk factors in women suffering from PCOS (W.Bates & S.Legro, 2013). A meta-analysis was performed with aim to find effect of PCOS on CVDs markers. Women suffering in PCOS had significantly increased amount of all CVD markers such as interlukin-6, lipoprotein A, endothelin-1, ADMA and others. (Toulis, et al., 2011)

In women with PCOS it was found that triglyceride and cholesterol levels were twice than normal range. There was 60% reduction in levels of high density lipoproteins (HDLs) (A.Wild, 2012). A study was conducted in Korea to evaluate prevalence of dyslipidemia in Korean women with PCOS. 26.7% PCOS patient had elevated triglyceride levels while 30% low levels of HDL (Chae, et al., 2008). Another study reported the prevalence of dyslipidemia in non-obese PCOS patients in Korea at 35.7% (Kim & Choi, 2013)

The aim of this study is to determine the prevalence of PCOs in women, find out prevalence of stress among women with and without PCOs and to compare the stress level in women with and without PCOs.

1.6 OBJECTIVE(S)

1. To determine the prevalence of PCOs in women.
2. To find out prevalence of stress among women with and without PCOs.
3. To compare the stress level in women with and without PCOs.

1.7 OPERATIONAL DEFINITIONS

1. **Polycystic ovarian syndrome:** (PCOS) is one of the most common reproductive endocrinological disorders with a broad spectrum of clinical manifestations involving infrequent, irregular or prolonged menstrual periods and often excess male hormone (androgen) levels.

2. **Psychological disorder:** is an ongoing dysfunctional pattern of thought, emotion and behavior that causes significant distress and it is considered deviant in that person's culture or society. According to bio-psycho-social model, psychological disorders have biological, psychological and social causes.

3. **Reproductive age**: In women, those years of life between menarche and menopause, roughly from 12 to 49.

4. **DASS-21:** The depression, anxiety and stress scale-21 items (DASS-21) is a set of three self-report scales of depression, anxiety and stress. Each of three DASS-21 scales contain 7 items, divided into subscales with similar content.

CHAPTER II: LITERATURE REVIEW

A study was conducted to find the prevalence of PCOS in women. 400 women were selected. 22.8% reported menstrual abnormalities while only 0.75% had PCOS while half of them can have PCOS. There were only 4% women with hirsutism only, out of which only 1.5% had PCOS while 1.75% can have PCOS. 2.75% women had both hirsutism and PCOS of which 1.5% had PCOS while 1% can have PCOS. Overall prevalence of PCOS was 6.6% (Azziz, et al., 2004).

2.1   Prevalence of PCOs in Asian Countries

A study was conducted at An Najah National University, Palestine to determine prevalence of PCOS. 137 students participated in this study. According to NIH criteria, the prevalence of PCOS was 7.3% (Musmar, Afaneh, & Mo'alla, 2013).

A Study was conducted in Rasht, Iran to evaluated prevalence of PCOS among high school girls. The age of these girls were 17-18 years. 1850 students were selected. 20.4% had oligomenorrhea or amenorrhea. 11.34% was the prevalence of PCOS in accordance with NIH definition. 24.1% PCOS patients had hirsutism and 26.7% had acne (Asgharnia & Soltani, 2011).

A study was conducted by Tehran Lipid and Glucose Study (TLGS) to determine the prevalence of PCOS. 1060 women were selected randomly. They were 18-45 years old. 30% of them were overweight and 20.5% obese. According to NIH definition, 8.5% women had PCOS. 5.1% had both hirsutism and menstrual abnormalities (Tehrani, Rashidi, & Azizi, 2011).

Another study was conducted in the Iran to check for prevalence of PCOS in Iranian women. They used all three criteria of diagnosis. PCOS prevalence determined using Rotterdam criteria was 14.6%, using AES criteria it was 11.7% and using NIH criteria it was, 7.1% (J & Munsch, 2011). A Southern China study reported prevalence of at 2.2% according to AES criteria and 2.4% according to Rotterdam's criteria. 20% of PCOS patients were overweight. Hyper-androgenism was present in 21.6% patients. 74.7% of PCOS patients had elevated levels of LH (Chen, et al., 2008).

A study was conducted in Sultan Qaboos University Hospital (SQUH). Prevalence of PCOS was 2.8%. 56% of PCOS patients were 25-34 years of age, 36% were below 25 years of age and 6.7% were above the age of 34. Prevalence of PCOS in patient arriving from Muscat was 4.4%, Dakhliya 3.5%, Batinah 2.4% and Sharqiyah 2.0% (Khaduri, Farsi, Najjar, & Gowria, 2014).

Another study was conducted in China. They used Rotterdam's criteria for diagnosis of PCOS. 15,924 women participated in this study. Prevalence of PCOS was 5.6%. Another 29.8% women were suspected of having PCOS because of presence of either oligomenorrhea or amenorrhea, hirsutism or acne. 34.1% women with PCOS were obese, while 85% of PCOS patients showed hyper-androgenism (Li, et al., 2013).

A study was conducted at Virginia Commonwealth University with the aim of evaluating prevalence of metabolic Syndrome (MetS) in PCOS patients. 106 women participated. 43% of them had MetS according to definition of NCEP ATP III. This prevalence of MetS in PCOS women increased with age. For less than 20 years old, the prevalence was 23%, for 20-29, it was 45% and for 30-39, it was 53% (Apridonidze, Essah, Iuorno, & Nestler, 2005).

A study was conducted in the Kashmir Valley to measure the prevalence of PCOS. 964 women were selected for final questionnaire and other tests. According to Rotterdam's criteria, 35.3% of them had PCOS, according to NIH criteria the prevalence was 28.9% and for AES criteria, it was 34.3%. An additional 12% women probably had PCOS but was not diagnosed (Ganie, et al., 2020).

Another study was conducted in Ahmedabad, India with the aim of measuring prevalence of PCOS and its risk factors. 881 girls were selected. 13.54% of them had PCOS according to Rotterdam's criteria. Prevalence of menstrual abnormality was 29.41% while that of the severe hirsutism was 47.05% in girls with PCOS. Prevalence of severe acne was 5.88% and diabetes mellitus in family was 37.81%. 45.37% of girls with PCOS belonged to upper socioeconomic class (Desai, Tiwari, & Patel, 2018).

A study was conducted in the Andhra Pradesh, India with aim of finding prevalence of PCOS in adolescent girls. 253 girls were selected among which more than 50% belonged to higher socio economic class. The prevalence was 15.4% in this study. Central obesity was present in 27.9% PCOS patient while 20.2% had a family history of diabetes mellitus. (Bhuvanashree, Gupta, Anitha, & Venkatarao, 2013).

A study was conducted in Tamil Nadu and Chennai, India with aim of evaluating prevalence of PCOS in rural (Tamil Nadu) and Urban (Chennai) lifestyles. 1068 girls participated, 502 were from urban lifestyle while 572 were from rural lifestyle. Prevalence rate in urban area was 8.9% while in the rural it was 1%. In urban lifestyle, oligomenorrhea was present in 10.11% population

while in rural it was present in 15.35% while rate of hirsutism was 1.5% for urban and 2.1% for rural area. (Bharathi, et al., 2017).

A study was conducted at Celal Bayer University, Turkey to check whether oxidative stress exists in young, non-obese PCOS patients. Malonldialdehyde (MDA) act as biomarker for oxidative stress. MDA levels were measured in PCOS patients as well as normal patients MDA level was slightly elevated (0.12) in PCOS patients as compared to normal women (0.10) Insulin resistance further increased MDA levels in PCOS patients (Kuşçu & Var, 2009).

A study conducted in Turkey consisted of 30 PCOS patients and 20 normal women. The aim of the study was to check for xanthine oxidase activity in PCOS patients. Women with the PCOS had 2.0 U/ml compared to 0.8 U/ml in normal women. Levels of thiol (424.5 μmol/l) and nitric oxide (8.1 μmol/l) was also higher in PCOS women than normal women (401.5 μmol/l and 7.7 μmol/l, respectively) (Baskol, et al., 2012).

Another similar study was conducted at Bulent Ecevit University, Turkey to check the whether xanthine oxidase (XO) in PCOS women is associated with inflammatory response and CVDS. 83 women were selected in which 45 had PCOS. XO activity in PCOS 1.105 in PCOS women as compared to 0.49% in normal women. This indicated increase in XO activity. Platelet counts of PCOS women was $297.22 \times 10^3/mm^3$ compared to $216 \times 10^3/mm^3$ while C-reactive protein was 5.46 mg/ml in PCOS patients and 2.86 mg/l in the normal women. This indicts that XO activity is positively associated with the inflammatory biomarkers (Isık, et al., 2016).

2.2   PCOs Trends in Australia

A study was conducted in Melbourne Australia to evaluate prevalence of PCOS. The study reported 17% bilateral PCO and 6% unilateral PCO. The total incidence of PCO was 23%. 8% of women had acne in past and 2% reported hirsutism. No CVDs were reported in any women (Lowe, Kovacs, & Howlett, 2005).

Another Australian study aimed to measure prevalence of PCOS in Queen Elizabeth Hospital, Adelaide Australia. They diagnosed the PCOS on all three criteria, according to NIH criteria, the prevalence was at 8.7% while for Rotterdam's criteria it was 11.95 and for AES criteria, it was 10.2% (March, et al., 2010).

A study was conducted in Victoria, Australia to measure prevalence of PCOS in women age 16-29. 300 women were selected for final analysis. Prevalence of PCOS according to NIH criteria was 13% (Varanasi, et al., 2014).

On Greek Island of Lesbos, a study was conducted with the aim of finding prevalence of PCOS. 192 women were selected in this study. 108 (56.25%) women had a normal menstrual cycle. They also had no signs of hirsutism, acne or hyper-androgenism. 56 (29%) women had hirsutism, of which 18 (9.4%) cases were severe and had oligomenorrhea as well. 10 out of 18 cases of severe hirsutism had acne too. Prevalence of PCOS was 6.7% only (Diamanti-Kandarakis, et al., 1999).

A study was conducted by Australian Longitudinal Study of Women's Health (ALSWH) to evaluate prevalence of stress, anxiety and depression in PCOS patients and comparing them with normal women. 478 PCOS patients and 8134 normal women were selected. Prevalence of depression in PCOS patients was 27.3% while in normal women, it was 18.8%. 50% PCOS patients showed anxiety symptoms while only 39.2% normal women showed them. PCOS women had 1.01% prevalence in terms of stress as compared to normal women having 0.88 stress (Damone, et al., 2019).

2.3   PCOs Trends in Europe

A study was conducted on Caucasian women living in Spain, with aim of finding prevalence of PCOS. 145 women participated in this study. 5.2% had hirsutism while 12.3% had acne. 19.5% had oligomenorrhea in past. PCOS was diagnosed only in 10 patients (6.5% prevalence) (Asunción, et al., 2000).

University of Alabama conducted a study to find prevalence of PCOS in women. 369 women participated in this study. 277 (129 whites and 148 Blacks) were thoroughly examined and only 11 women (4%) had PCOS. 6 (4.7%) were white while 5 (3.4%) were black. Out of 11, 8 had hyper-androgenism, and 3 had oligomenorrhea history (Knochenhauer, et al., 1998).

Prevalence of PCOS varies with ethnicity. In Madrid, Spain, prevalence was 6.5%, while in Oxford, U.K., it was 8%. In both cases the participants were white females. In U.S., prevalence of PCOS in white women was 4.7%, for black women was 3.4% and for Mexican women, it was 13%. Similarly, Thai Chinese had 5.7% prevalence while Southern Chinese had 2.2% prevalence of PCOS (YueZhao & JieQiao, 2013).

A study was conducted to find prevalence of PCOS in European Countries. 42 European countries were considered in this study. The highest prevalence was reported in Czech Republic (460/100,000 cases) followed by Poland (447.22/100,000 cases) and Russia (443.14/100,000 cases). The lowest prevalence was reported in Sweden (34.1/100,000 cases) followed by Norway (106.55/100,000 cases) and Germany (114.96/100,000 cases) (Miazgowski, Martopullo, Widecka, Miazgowski, & Brodowska, 2019).

A study was conducted in Laiko University Hospital, Athens, Greece to evaluate effects of increased levels of glycosylation products in PCOS women. 51 women were selected out of which 29 had PCOS. PCOS women had 9.81 U/ml of glycosylation products compared to 5.8 U/ml in normal women. Expression of receptors (on monocytes) of these glycosylated products, called RAGE, in PCOS women was 30.91% compared to 7.97% in normal women (Diamanti-Kandarakis, Piperi, Kalofoutis, & Creatsas, 2005).

2.4   Prevalence of PCOs in America

A study was conducted at TW University, Denton. Two campuses were selected, Dallas and Houston. 769 participants completed the survey. 6% of the participants were men. 60.2% were Caucasians, 15.2% were Hispanics and 10.5% were African Americans. 28.5% women had PCOS diagnosed already. 40.5% had 2 or more characteristics of PCOS according to Rotterdam's criteria (Rao, Broughton, & LeMieux, 2020).

A study was carried in Salvador, Brazil to evaluate prevalence of PCOS. 859 women were selected for this study. 88.5% were black. 1.6% were previously diagnosed with the PCOS. 13.6% had one criteria while 5.8% had two. 78.9% had no criteria. After further ultrasonography and hormone evaluation, the prevalence of PCOS was just 8.5% according to Rotterdam's criteria and 8.03% according to NIH criteria (Gabrielli & Aquino, 2012).

Another study was performed with same aim as above. 368 PCOS patients were selected for final assessment. 33.4% of them had MetS. The prevalence of MetS varied with ethnicity. Caucasian had 34%, African had 26%, Hispanic had 31%, Asian had 50% and PCOS patients having mixed ancestors had 43% prevalence of MetS (Ehrmann, et al., 2006).

A study was conducted at Copenhagen University Hospital, Rigshospitalet, Denmark. 447 participants were finalized for study. 73 (16.33%) Women having PCOS were significantly younger, had higher BMI, and the higher frequency of obesity and hirsutism when compared with

normal women. Prevalence of PCOS was higher (33.3%) in women aged below 30, than women with age 30-34 (14.7%) and above 35 (10.2%) (Lauritsen, et al., 2014).

A study was performed in MENA (Middle East and North Africa) region to evaluate prevalence of PCOS in MENA region. This study reported 2079.7 cases per 100,000 women from 1990-2019 in MENA region. In 2019, alone, the prevalence was 77.2 cases per 100,000 women. Kuwait reported the highest cases (2,832.1 cases per 100,000 women), followed by Qatar (2,748.1 cases per 100,000 women) and Saudi Arabia (2,692 cases per 100,000 women). The lowest cases was reported by Yeman (1,231.2 cases per 100,000 women) and Sudan (1,796 cases per 100,000 women). 89.2% increase was reported by Sudan in 29 years which was the highest followed by 73.9% of Oman and 50.6% of Algeria (Asghari, et al., 2022).

2.5   PCOs Trends in Pakistan

A Study was conducted in Karachi, Pakistan at a tertiary care hospital with the aim of evaluating the prevalence of PCOS. 305 women were selected for this study. 54.41% of the women were suffering from PCOS. Symptoms of PCOS varied. Infertility was the most common symptom followed by menstruation irregularities, obesity, hirsutism and acne. PCOS associated complications were most common for women aged 21-30 years (Zafar, et al., 2019).

Another study was conducted in Karachi, Pakistan to evaluate prevalence of the PCOS symptoms and their knowledge in urban women of Pakistan. 177 urban women were selected. 9% had oligomenorrhea while 3% had amenorrhea. 37% of women suffered from one or other form of hirsutism. Only 11.29% had knowledge about this disease (Gul, 2014).

A survey was carried out in Karachi, Pakistan to evaluate attitude of the patients towards PCOS. 270 PCOS patients participated in this survey. 51.8% of them were obese. 48.1% of cases were reported in adolescence while only 29.6% were reported in adults. 40.7& of patients had family history of menstrual abnormalities while 37% had obesity in family. 74% of PCOS acknowledged that this disease has caused problems in their life while 25.9% denied this fact (Rizvi, et al., 2014).

A study was conducted in Quetta, Pakistan among different universities students to evaluate prevalence of PCOS as well as knowledge students have regarding PCOS. 451 females participated. 5.5% were already diagnosed with PCOS. 3.5% had signs and symptoms of PCOS, 17.5% were suspected to have PCOS while 73,4% were not diagnosed 82.9% were not aware of PCOS and its symptoms and were provided with necessary education (Haq, et al., 2017).

A study was conducted at Khalil Hospital, Gujarat, Pakistan. 140 patients were selected for this study. 34.3% of the patients had PCOS. 25.7% were obese while 9.3% had menstrual abnormalities and only 11.4% hirsutism. Only 2/9% patients had both, menstrual abnormalities and obesity (Fatima, Naeem, Ali, & Asfar, 2022).

A study was conducted in Isra University, Hyderabad, Pakistan to evaluate prevalence of PCOS, its risk factors and complications associated with PCOS. 185 females were selected for this study. 15.7% of females previously had PCOS while 23.3% had family history of PCOS. According to Rotterdam's criteria, PCOS was present in 37.3%. Among PCOS patients, hirsutism was present in 10.4% (Memon, et al., 2020).

Another study was conducted in Nazeer Hussain Medical Complex (NHMC), Hyderabad, Pakistan to evaluate prevalence of PCOS and its associated risk factors. 200 females participated in this study. 48.5% of participants had PCOS according to Rotterdam's criteria. 24.5% of participants had family history of PCOS. Hirsutism was present in 36% PCOS patients while acne was present in 42.2%. 11.3% PCOS patients reported alopecia. LH level was elevated while FSH elevated was lower than normal in PCOS patients (Memon, et al., 2020).

Oxidative stress is defined as a disparity between formation of free oxygen species and the ability of our body to protect against their harmful consequences. This disparity can produce toxic effects which can damage cells. They can also trigger necrosis and apoptosis. (Lennon, Martin, & Cotter, 1991). Oxidative stress is measured vuia levels of biomarkers. These biomarkers include Malonldialdehyde (MDA), Nitric Oxide (NO), Xanthine oxidase (XO) and glycosylated end products known as glycotoxins (Mohammadi, 2019).

A study was conducted to determine the association of Nitric oxide (NO) which is a biomarker for oxidative stress, and fibrinogen in PCOS. 52 women were selected in this study. 21 of them had PCOS. 53.8% of PCOS patient were obese while 61% were overweight. NO concentration was 11.5 μmol/l in PCOS patient as compared to 10.2 μmol/l in normal women. Fibrinogen was 336 mg/dl in PCOS patients and 313 mg/dl in normal women (A.P.Nácul, Andrade, P.Schwarza, Jr, & P.M.Spritzer, 2007).

CHAPTER III: METHODOLOGY

3.1   Study Design

The study design was a cross sectional study, focused prevalence of PCOS and its association with psychological disorder.

3.2   Study setting

This study was conducted in the fitness and rehabilitation centers of Islamabad. Non-probability convenience sampling was used. 2 health facilities were selected via sampling.

3.3   Study Duration

The study was conducted over a period of 6 months i.e. from March 2022 to August 2022.

3.4   Study population

All adults of age more than 15 years and less than 45 years were a part of the study.

3.5   Inclusion criteria

➢ Reproductive age (15-45 years) visiting the rehab centers.
➢ Those who consented to participate in the study.

3.6   Exclusion criteria

➢ Pregnant and lactating women.

3.7   Sampling

➢ **Sampling frame:** All clients of age >15yrs and <45 yrs. visiting the health facility of Islamabad.

➢ **Sampling unit:** A client of age >15yrs and <45 yrs. visiting the health centers.

➢ **Sample size:** Sample size will be calculated using following formula.

$$N = z^2 \times P \times Q \div E^2$$

Where,

P= estimated prevalence in previous studies

Z= confidence interval at 95% (standard value of 1.96)

Q= 1-P

E= margin of error

Prevalence of metabolic syndrome in Pakistan is 52% which when put in formula gives a total sample of 384 participants, with confidence interval 95% and margin of error 5%.

3.8   Sampling Technique

Multistage random sampling will be done in following steps.
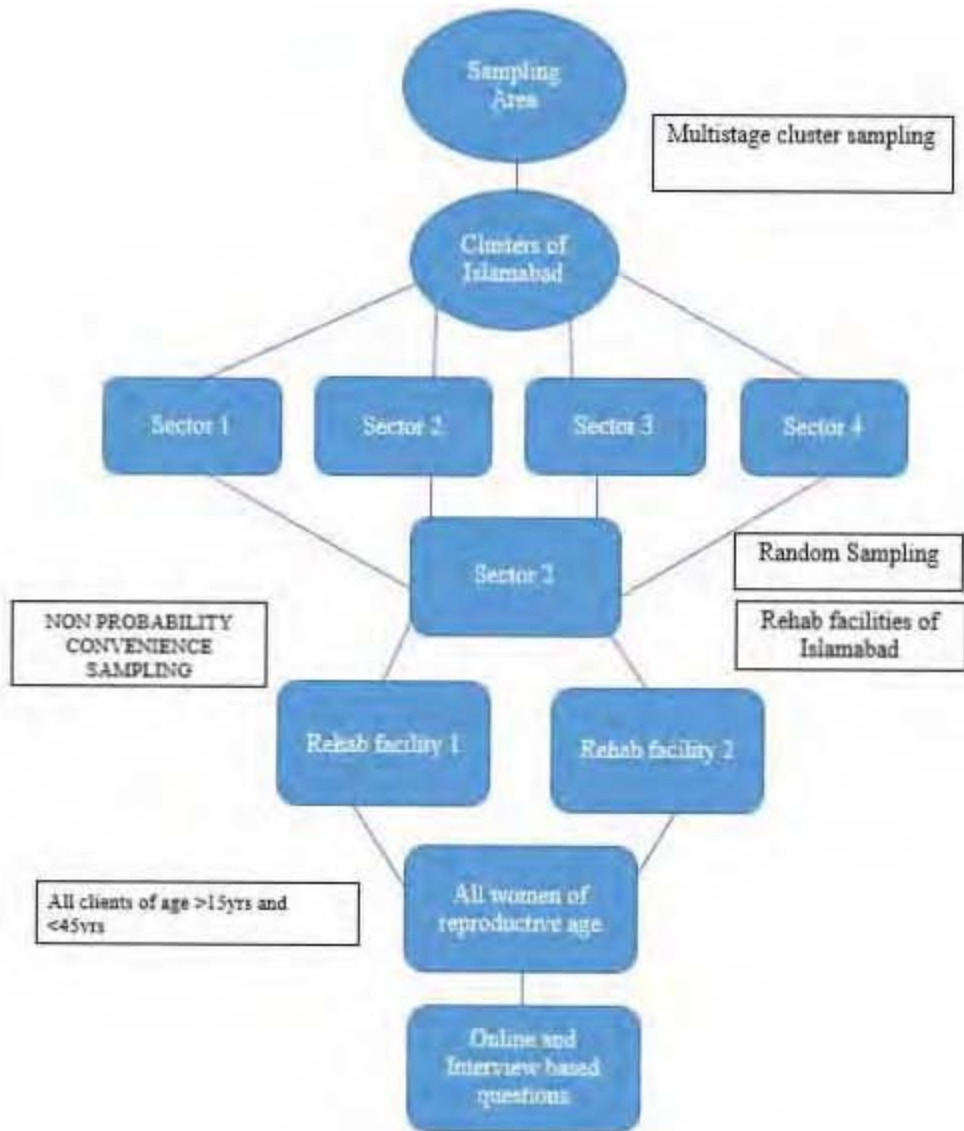
3.9   Data collection procedure

Data for this research is collected using interview based and online questionnaires, which was also translated into Urdu to make it understandable by the majority of the study population. Interview based questionnaires were distributed to the clients that visited the rehab centers and complete guidance was given to them for better understanding. Online questionnaires were sent to the clients that met the inclusion criteria via google form. Pilot testing was done on 10% of the sample size in a similar setting before proceeding further. The structured questionnaire used in this study has 3 sections. Section-A for demographic details, Section-B for the PCOS assessment using Rotterdam criteria and section C for psychological disorder using DASS 21.

3.10   Data analysis

Data was entered and analysed in SPSS version 25. A P-value of less than 0.05 will be considered as significant with 95% confidence interval.

3.11   Descriptive statistics:

➢   **Categorical/qualitative variables:** is presented in form of frequency, percentages, and bar charts.

3.12   Inferential statistics

➢   Chi square test

```
                    ┌─────────────────────────┐
                    │      DATA ANALYSIS      │
                    │       PROCEDURE         │
                    │   (ALL DATA WILL BE     │
                    │    ANALYZED USING       │
                    │        SPSS 25)         │
                    └─────────────────────────┘
              ┌──────────────────┐      ┌──────────────────┐
              │   DESCRIPTIVE    │      │   INFERENTIAL    │
              │   STATISTICS     │      │   STATISTICS     │
              └──────────────────┘      └──────────────────┘
        ┌──────────────────┐                  ┌──────────────────┐
        │   QUALITATIVE    │                  │                  │
        │      DATA:       │                  │      CHI-        │
        │   PERCENTAGES,   │                  │     SQUARE       │
        │   FREQUENCIES,   │                  │                  │
        │   BAR CHARTS     │                  └──────────────────┘
        └──────────────────┘
```
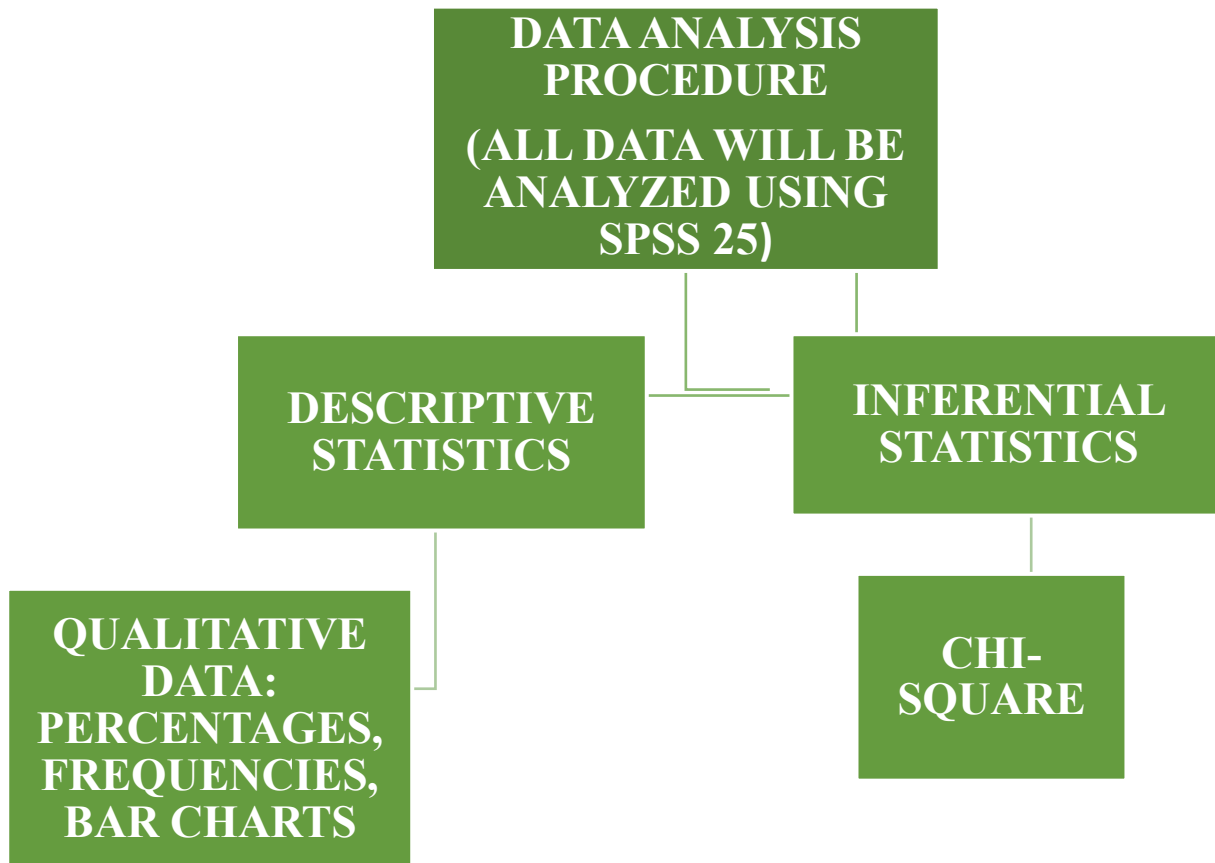
3.13 Ethical Considerations

i.   A formal permission letter from the Al Shifa Review Board to carry out the study was obtained.

ii.   A permission letter from each fitness and rehab center before study conduction was obtained.

iii. Clients were given a brief introduction about the study and its purpose according to their understanding level.

iv.   The anonymity of each participant was ensured.

v.   Privacy and confidentiality of data were thoroughly maintained

CHAPTER IV: RESULTS

4.1   Descriptive Results

4.1.1   Socio-demographic Frequencies

A total of 385 women of reproductive age visiting rehab facilities participated in this study (table 1), out of which 47.8% (n=184) were married females and 52.2% (n=201) were unmarried and resided in Islamabad. The age-wise distribution of the participants included 80% (n=309) in the age group of 15-30 years, and 20% (n=76) in the age group 31-45 years. Table 1 of demographic characteristics shows that there were 42.9% (n=165) of women having an intermediate level of education participated in the study as compared to women having higher education and non-formal education their ratio was 36.1% (n= 139) and 21.0% (n= 81) respectively. The frequency of women having moderate physical activity was seen to be 58.7% (n=230), while 31.4% (n= 121) admitted to living a sedentary life; not having any physical activity. The frequency of considering nutrients was less 16.4% (n=64) and only 17.7% (n= 68) admitted to regular health check-up.

Table 1: Frequencies of Socio-demographic Variables

Variables	Categories	N (%)
Age	15 – 30 years	309 (80)
	31– 45 years	76 (20)
Educational level	No Formal education	81 (21.0)
	Intermediate	165 (42.9)
	Higher education	139 (36.1)
Marital status	Married	184 (47.8)
	Unmarried	201 (52.2)
Employment status	Employed	90 (34.4)
	Unemployed	207 (53.8)
	Housewife	88 (22.9)
House-hold Income/month	<50k	102(26.5)
	50k-1lac	211(54.8)
	>1 lac	72 (18.7)
Height (inches)	5.0-5.45	252 (65.5)
	5.46-5.90	133 (34.5)
Weight	44-56kg	99(25.7)
	57-100 kg	286 (74.3)
Physical activity	Sedentary	121 (31.4)
	Moderate	230 (58.7)
	Active	34 (8.8)
Work demand PA	Yes	117 (30.4)
	No	268 (69.6)
Eat junk food	Yes	360 (67.5)
	No	125 (32.5)
Consider nutrient	Yes	64 (16.4)
	No	321 (83.4)
Regular health checkup	Yes	68 (17.7)
	No	317 (82.3)

4.1.2 Frequencies of PCOS' Symptoms

Of the 385 participants, Table 2 shows that 67.3% (n=259) reported that they have mood swings problems, 52.2% (n=201) reported having irregular periods, having testosterone level of 6-58ng/Dl was reported 71.2% (n=274) of the participants, a waist measurement of <80cm was found 45.5% (n= 175), 80-90 cm was found in 42.1% (n=162) of the participants, 91-100 cm waist was found in 10.4% (n=40) of the participants, while >100 cm waist was found only in 2.1% (n=8) of the participants. Out of 385 participants, 48.6% (n=187) had Alopecia, 35.6% (n= 136) had skin coloration problem, 46% (n=177) had excess hair on skin, and 46.5% (n= 179) were reported to have acne.

Table 2: Frequencies of PCOS' Diagnosis

Variables	Categories	N (%)
Waist circumference	<80cm	175 (45.5)
	80-90 cm	162 (42.1)
	90-100 cm	40 (10.4)
	>100cm	8 (2.1)
Irregular periods	Yes	201 (52.2)
	No	184 (47.8)
Cyst diagnosed	Yes	141 (36.6)
	No	244 (63.4)
Testosterone levels	6-58ng/Dl	274 (71.2)
	>58ng/Dl	111 (28.8)
Skin coloration	Yes	136 (35.3)
	No	249 (64.7)
Excess hair on skin	Yes	177 (46.0)
	No	208 (54.0)
Acne	Yes	179 (46.5)
	No	206 (53.5)
Alopecia	Yes	187 (48.6)
	No	198 (51.4)
Mood swings	Yes	259 (67.3)
	No	126 (32.7)

4.1.3 Frequencies of DASS-21

Results obtained from the DASS-21, depicted in table 3 indicate that 30.9% (n=119) of females were normal, while 36.9% (n= 142) had a moderate level of depression, and 9.4% (n= 36) had a severe level of depression (figure 1).
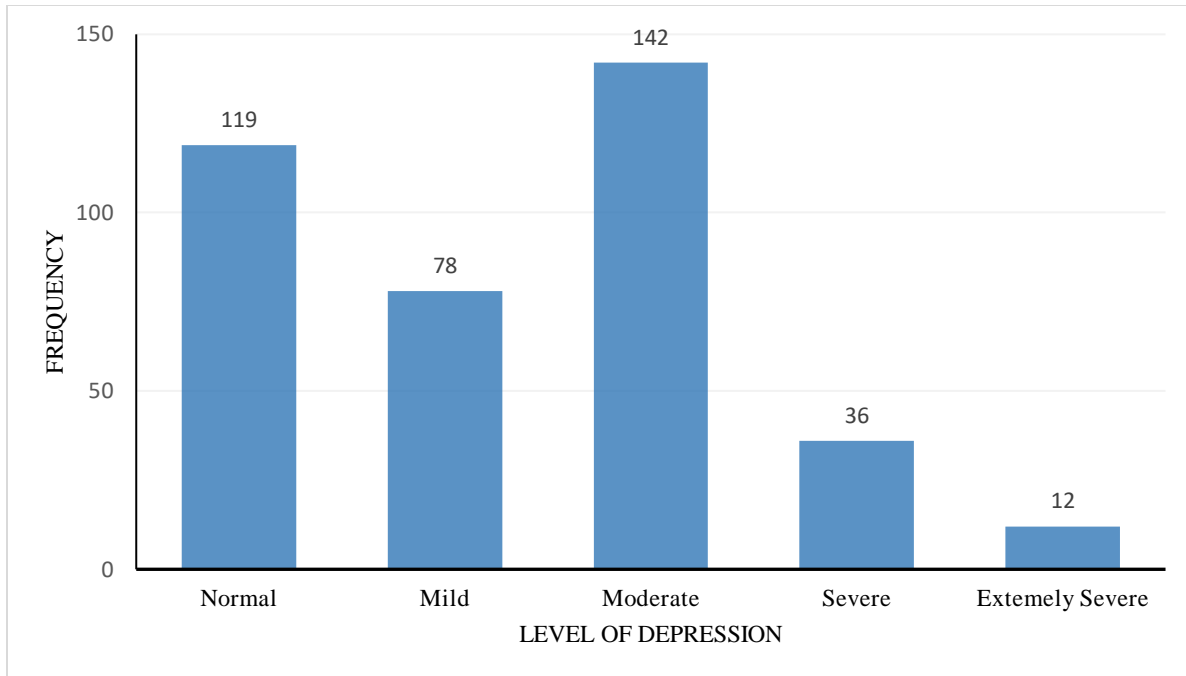
Figure 1: Level of depression in the study.

Out of 385 participants, 27% (n=104) of females were normal, while 31.9% (n= 123) had moderate level of anxiety, 13.8% (n= 53) had severe, and 11.7% (n= 45) was suffered from extremely severe level of anxiety (figure 2).
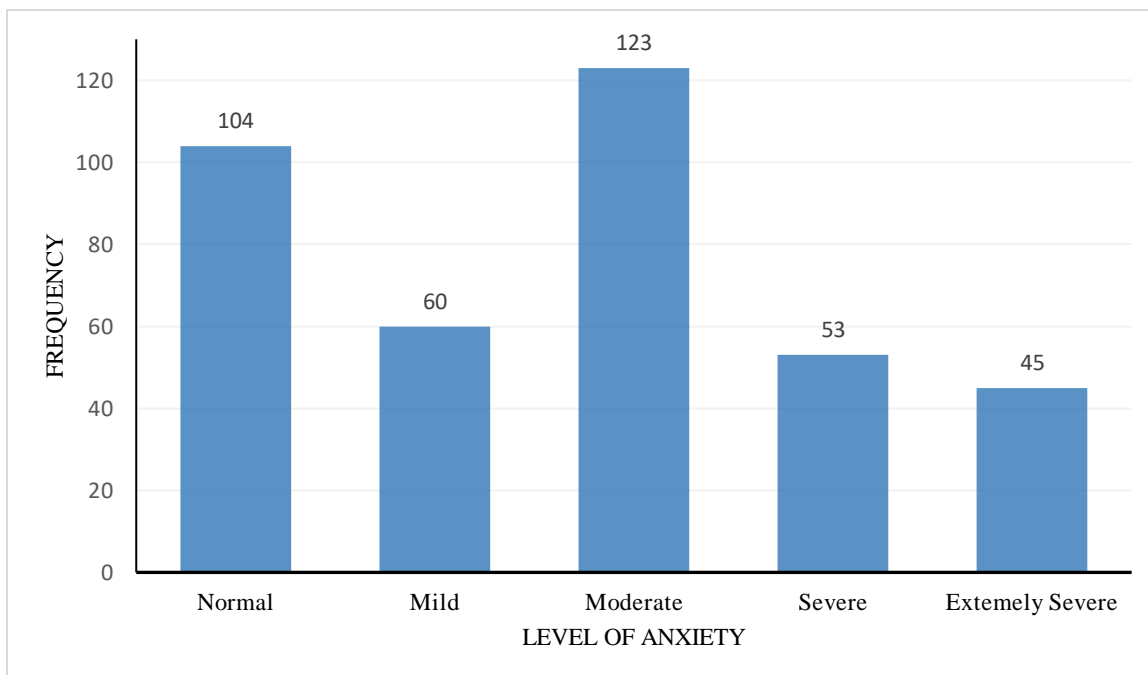
Figure 2: Level of Anxiety in the study

The study results also showed that 56.9% (n=219) of females were normal, while 20.8% (n= 80) had mild level of stress, 17.4% (n= 67) had moderate, and 4.7% (n= 18) was suffered from severe level of stress (figure 3).
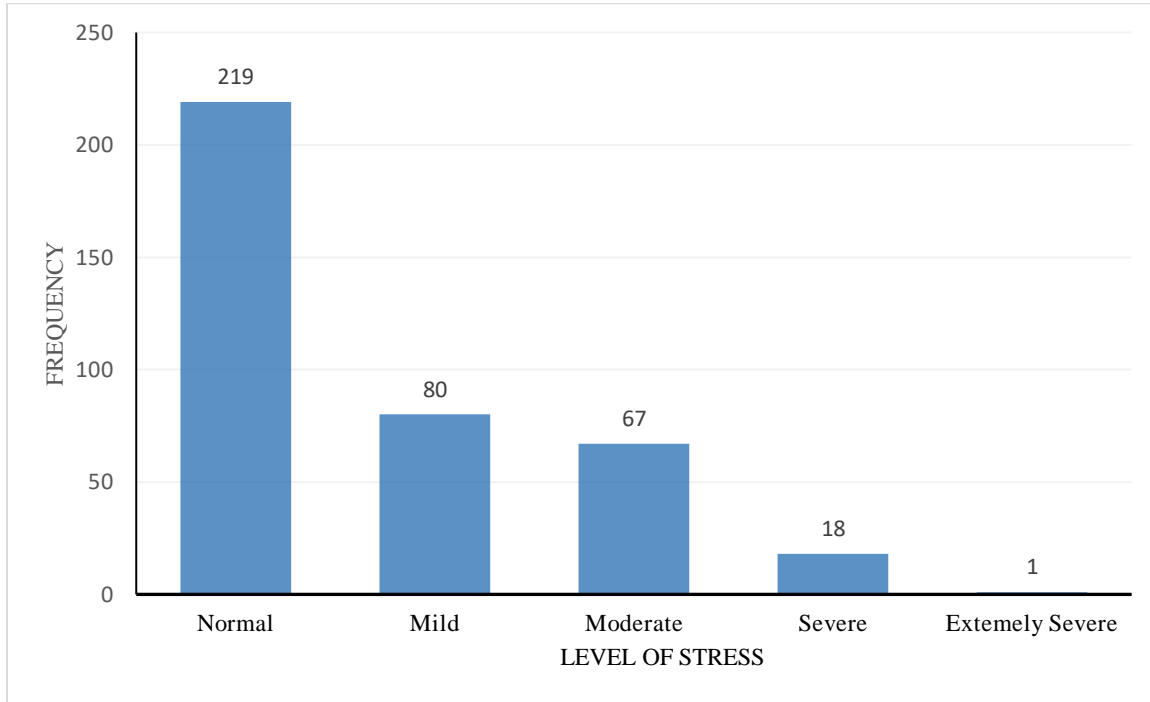
Figure 3: Level of Stress in the study

Table 3: Frequencies of DASS-21

Variables	Categories	N (%)
Level of Depression	Normal	119 (30.9)
	Mild	76 (19.7)
	Moderate	142 (36.9)
	Severe	36 (9.4)
	Extremely severe	12 (3.1)
Leve of Anxiety	Normal	104 (27.0)
	Mild	60 (15.6)
	Moderate	123 (31.9)
	Severe	53 (13.8)
	Extremely severe	45 (11.7)
Level of Stress	Normal	219 (56.9)
	Mild	80 (20.8)
	Moderate	67 (17.4)
	Severe	18 (4.7)
	Extremely severe	1 (0.3)

4.2   Inferential Results

4.2.1 Prevalence of PCOS

Our study results show that out of 385 participants, those women who were going to regular health checkups made up 8.8% (n=34) of total diagnosed PCOS cases while 26% (n=100) of the diagnosed cases were found in those who don't go for a regular health checkup. A significant association was found between prevalence of PCOs and regular health checkup. (x^2 (1) = 8.403, p-value = 0.004), as evidenced by the chi-square test of association. Those women with weighting

44-56kg made up 6.2% (n=24) of total diagnosed PCOS cases while 28.6% (n=110) of the diagnosed cases were found in those who had 57-100kg weight. Hence prevalence of PCOs and body weight were significantly associated (x^2 (1) = 6.553, p-value = 0.010). While physical activity, consider nutrients, and eat junk food was also significantly associated with PCOS (x^2 (2) = 79.010, p-value = 0.011), (x^2 (1) = 8.720, p-value = 0.003) and (x^2 (1) = 8.149, p-value = 0.004) respectively. All other factors of sociodemographic showed a non-significant association with the PCOS.

The pie chart shows that out of 385 women, 34.82% (n=135) women diagnosed with PCOS, while the percentage of normal women with no PCOS was 65.11% (n=250) (figure 4).
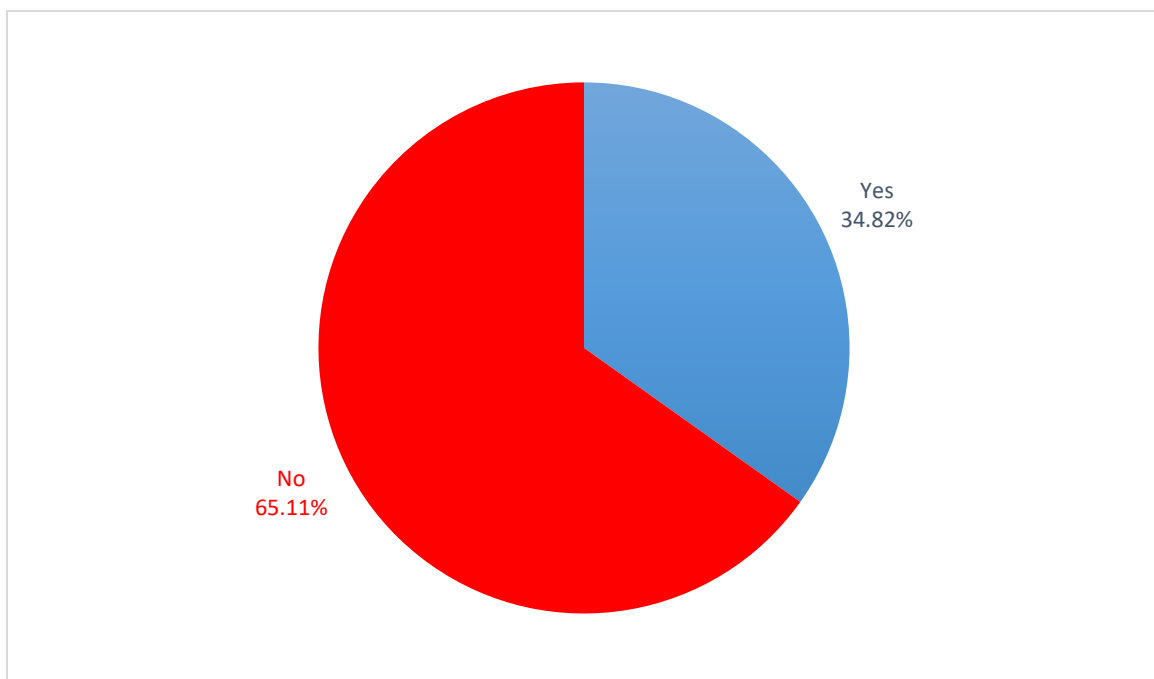
Figure 4: Prevalence of PCOS in women.

Variables	Categories	PCOS N (%)		Chi-Square (df)	p-value
		Diagnosed	Not Diagnosed		
Age	15- 30 years	101 (26.2)	208 (54)	3.098 (1)	0.078
	31- 45 years	33 (8.6)	43(11.2)		
Educational level	No Formal education	32 (8.4)	29 (12.7)	1.425 (2)	0.493
	Intermediate	53 (13.8)	113 (24.9)		
	Higher education	49 (12.7)	89 (23.1)		
Marital status	Married	69 (17.9)	115 (29.9)	1.128 (1)	0.288
	Unmarried	65 (16.9)	136 (35.3)		
Employment status	Employed	35 (9.1)	55 (14.3)	1.298 (2)	0.523
	Unemployed	67 (17.4)	140 (33.2)		
	Housewife	32 (8.3)	56 (14.5)		
House-hold Income	<50k	33 (8.6)	69 (17.9)	1.264 (2)	0.532
	50k-1lac	72 (18.7)	139 (36.1)		
	>1 lac	29 (7.5)	43 (11.2)		
Height (inches)	5.0-5.45	93 (24.2)	159 (41.3)	1.417 (1)	0.234
	5.46-5.49	41 (10.6)	92 (23.9)		
Weight	44-56	24 (6.2)	75 (19.5)	16.553 (1)	0.010*
	57-100	110 (28.6)	176 (45.7)		
Physical activity	Sedentary	51 (13.2)	70 (18.2)	9.010 (2)	0.011*
	Moderate	78 (20.3)	152 (39.5)		
	Active	5 (1.3)	29 (7.5)		
	Yes	42 (10.9)	75 (19.5)	0.088 (1)	0.766

Work demand PA	No	92 (23.9)	176 (45.7)		
Eat junk food	Yes	78 (20.3)	182 (47.3)	8.149 (1)	0.004*
	No	56 (14.5)	69 (17.9)		
Consider nutrients	Yes	12 (3.1)	52 (13.5)	8.720 (1)	0.003*
	No	122 (31.7)	199 (51.7)		
Regular health check-up	Yes	34 (8.8)	34 (8.8)	8.403 (1)	0.004*
	No	100 (26)	217 (56.4)		
All p-values marked with a * indicate a statistically significant association between the variables.					

Table 4: Association and sociodemographic factors and PCOS

4.2.2 PCOS association with Stress level

Out of 385 participants, 8.8% (n=34) of females were normal diagnosed to PCOS, while 14% (n= 54) had mild level of depression diagnosed to PCOS, 2.3% (n= 9) had moderate, 2.3% (n=9) had severe, and 1.3% (n= 5) was suffered from extremely severe level of depression diagnosed to PCOS (table 5). While 10.9% (n= 42) had mild level of depression didn't diagnose to PCOS, 22.9% (n= 88) had moderate, 7% (n=27) had severe, and 1.8% (n= 7) was suffered from extremely severe level of depression didn't diagnose to PCOS (figure 5). Chi-square test of association showed that there was non-significant association between the variables (x^2 (4) = 9.013, p-value = 0.061).

Figure 5: Prevalence of depression among women with & without PCOS

The study results found that 8.1% (n=31) females were normal diagnosed to PCOS, while 6.0% (n= 23) had mild level of anxiety diagnosed to PCOS, 12.5% (n= 48) had moderate, 4.7% (n=18) had severe, and 3.6% (n= 14) was suffered from extremely severe level of anxiety diagnosed to PCOS. While 9.6% (n= 37) had mild level of anxiety didn't diagnose to PCOS, 19.5% (n= 75) had moderate, 9.1% (n=35) had severe, and 8.1% (n= 31) was suffered from extremely severe level of anxiety didn't diagnose to PCOS (figure 6). Chi-square test of association showed that there was a non-significant association between the variables (x^2 (4) = 2.726, p-value = 0.605).

Figure 6: Prevalence of anxiety among women with & without PCOS

The study also found that 17.4% (n=67) females were normal diagnosed to PCOS, while 9.4% (n= 36) had mild level of stress diagnosed to PCOS, 7.0% (n= 27) had moderate, and 1.0% (n=4) had severe level of stress diagnosed to PCOS. On the other hand, 11.4% (n= 44) had mild level of stress, 10.4% (n= 40) had moderate, and 3.6% (n=14) had severe, and 0.3% (n=1) had extremely severe level of stress all didn't diagnose to PCOS. Chi-square test of association showed that there was a non-significant association between the variables (x^2 (4) = 8.057, p-value = 0.090).
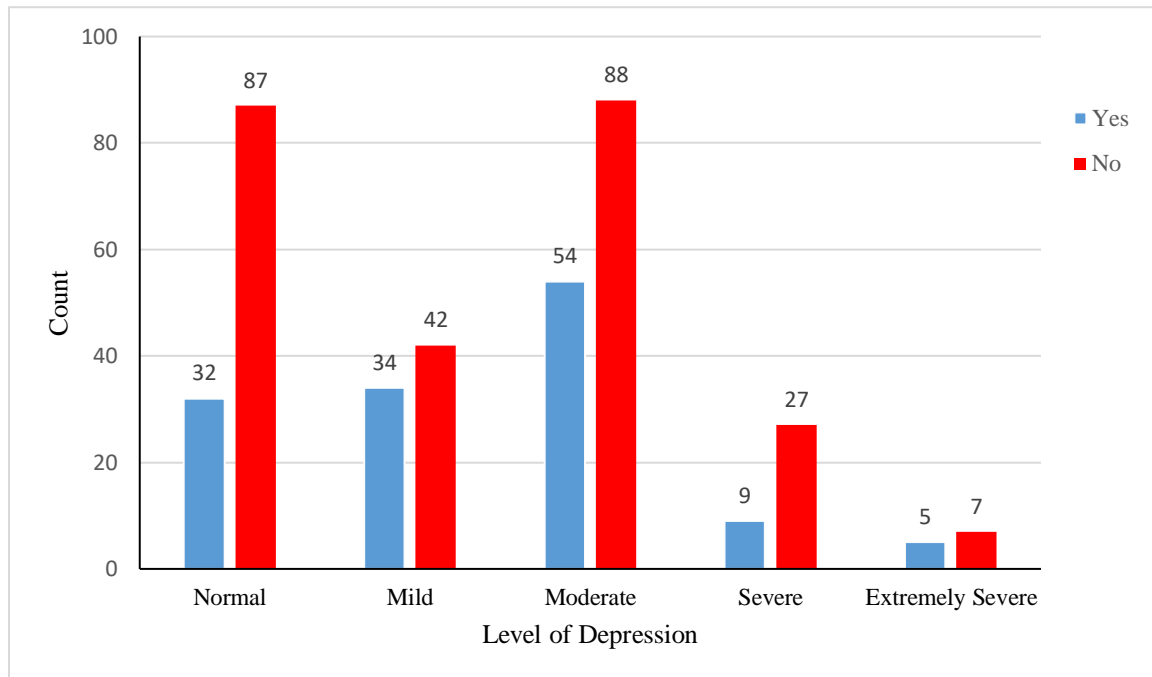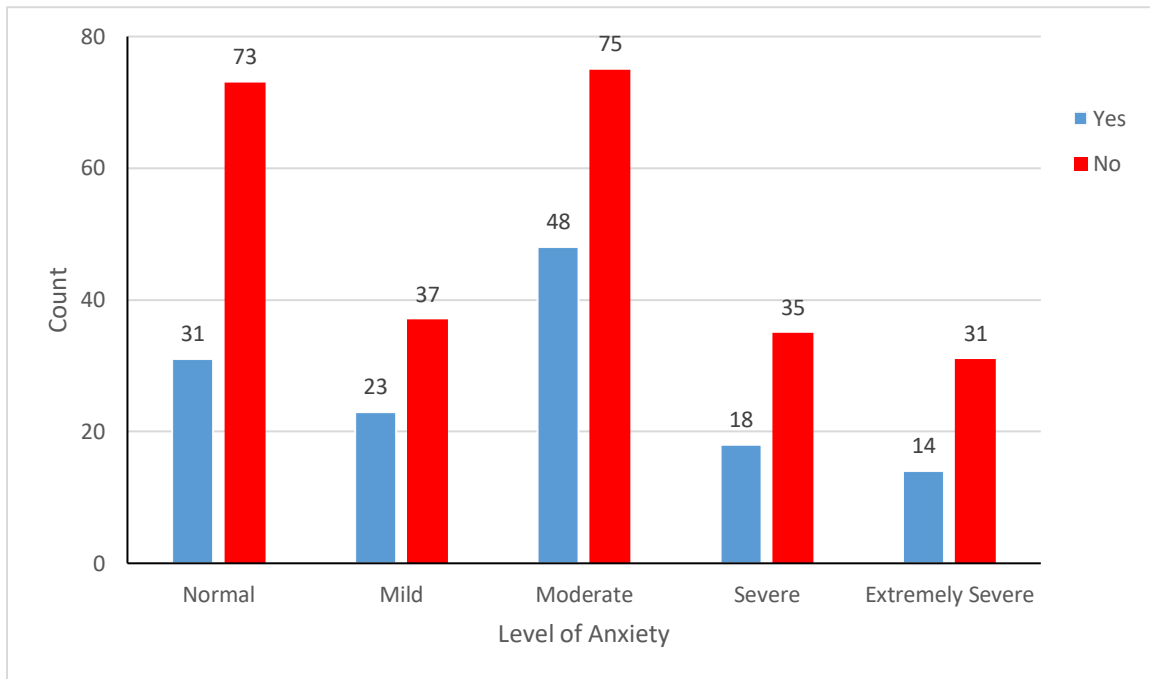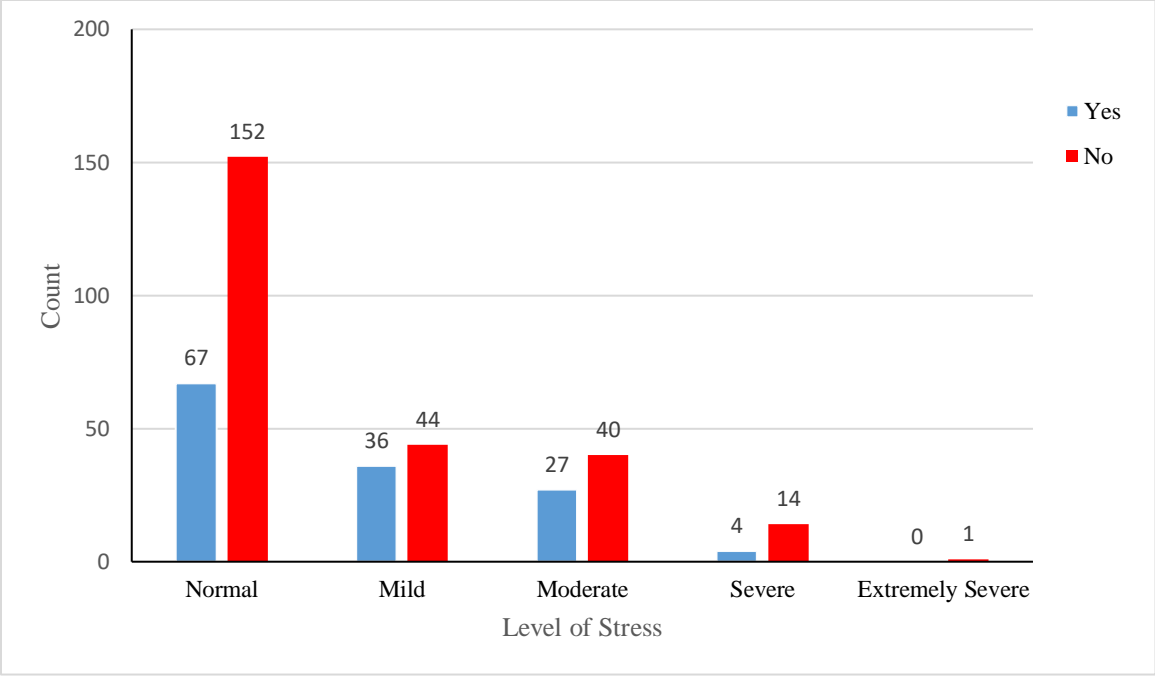
Figure 7: Prevalence of stress among women with & without PCOS

Table 5: PCOS association with DASS-21

Variables	Categories	PCOS N (%)		Chi-Square (df)	p-value
		Diagnosed	**Not diagnosed**		
Level of Depression	Normal	32 (8.3)	87 (22.6)	9.013 (4)	0.061
	Mild	34 (8.8)	42 (10.9)		
	Moderate	54 (14)	88 (22.9)		
	Severe	9 (2.3)	27 (7)		
	Extremely severe	5 (1.3)	7 (1.8)		
Level of Anxiety	Normal	31 (8.1)	73 (19)	2.726 (4)	0.605
	Mild	23 (6)	37 (9.6)		
	Moderate	48 (12.5)	75 (19.5)		
	Severe	18 (4.7)	35 (9.1)		
	Extremely severe	14 (3.6)	31 (8.1)		
Level of Stress	Normal	67 (17.4)	152 (39.5)	8.057(4)	0.090
	Mild	36 (9.4)	44 (11.4)		
	Moderate	27 (7)	40 (10.4)		
	Severe	4 (1.0)	14 (3.6)		
	Extremely severe	0 (0)	1 (0.3)		
All p-values marked with a * indicate a statistically significant association between the variables.					

CHAPTER V: DISCUSSION

Polycystic ovarian syndrome was first described by Stein and Leventhel as presence of polycystic ovaries and oligo amenorrhea. It is often accompanied by obesity, acne and hirsutism (Rosenfiel & David, 2016). Patients of PCOS often exhibit menstrual abnormalities and hyperandrogenism. It could be diagnosed by ultrasonography. PCOS can be linked with female infertility (Khan, Ullah, & Basit, 2019) Hyperandrogenism is characterized by hirsutism, acne, and alopecia. The mainstays of PCOS management are lifestyle changes, medications, and surgery. PCOS has been linked to psychological distress. Several recent systematic reviews, meta-analyses, and studies have found that women with PCOS experience higher levels of emotional distress (Sulaiman et al.,2017).

Our study results showed only 34.81% of women diagnosed with PCOS, while the percentage of normal women with no PCOS was 65.19%. A study conducted in Multiethnic University showed that 28.5% of the women who responded had a formal diagnosis of PCOS, while (40.5%) of the women who had not been formally diagnosed had symptoms consistent with the Rotterdam diagnostic criteria for PCOS (Rao et al.,2020). A cross sectional study conducted in India reported that overall 41 (8.20%) girls had PCOS according to Rotterdam criteria, marking the prevalence at 8.20% (Gupta M et al., 2018).

46% of patients showed hirsutism compared to 59% reported by Saie Ghare Naz et al. and 76.9% by Sulaiman et al. Similarly prevalence of acne was reported to be 46% by Saie Ghare Naz et al. and 40.4% by Sulaiman et al. while our survey determine it to be 46.5%. (Saei Ghare Naz *et al.,* 2019; Sulaiman *et al*., 2017)

Our study reported prevalence of anxiety to be 73% while for depression it was 69.1% A study reported that, generalized anxiety disorder, and depressive disorder were estimated to be 88%, and 60%, respectively (Hasan M, *et al.,* 2022). One earlier meta-analysis reported that the prevalence of depression and anxiety were 36.6% and 41.9% among women suffering from PCOS (Cooney LG *et al.,* 2017)

Chi-square test of association showed that there was a non-significant association between the depression and anxiety with PCOS (x^2 (4) = 2.726, p-value = 0.605). The Chi-square test of

association showed that there was a non-significant association between the depression and anxiety without PCOS (x^2 (4) = 8.057, p-value = 0.090). A cross-sectional study was conducted on 120 adolescents with PCOS in Tehran, Iran in 2019. There was no significant association between PCOS with depression, anxiety, and stress (Saei Ghare Naz *et al.,* 2019). Nevertheless, the result of a study on adult Iranian women with PCOS showed a significant relationship between PCOS and depression (Bazarganipour F *et al.,* 2013).

Analysis of sociodemographic variables of women with and without PCOS clearly indicates that those women who were going to regular health checkups made up 8.8% (n=) of total diagnosed PCOS cases while 26% (n=100) of the diagnosed cases were found in those who don't go for a regular health checkup. There was the only significant association found between these two variables (x^2 (1) = 8.403, p-value = 0.004), as evidenced by the chi-square test of association. Those women with weighting 44-56kg made up 6.2% (n=24) of total diagnosed PCOS cases while 28.6% (n=110) of the diagnosed cases were found in those who had 57-100kg weight. There was a significant association found between these two variables (x^2 (1) = 6.553, p-value = 0.010). While physical activity, consider nutrients, and eat junk food was also significantly associated with PCOS (x^2 (2) = 79.010, p-value = 0.011), (x^2 (1) = 8.720, p-value = 0.003) and (x^2 (1) = 8.149, p-value = 0.004) respectively. The analysis of remaining sociodemographic variables of women with and without PCOS indicates that age, educational levels, marital status, employment status, household income etc. were had a non-significant association. A similar comparative cross-sectional study in India. Their results demonstrate that analysis of the sociodemographic variables of women with and without PCOS clearly showed Age, marital status, education, and employment status were not significant (Bhattacharya and Jha, 2010).

CHAPTER VI: CONCLUSIONS AND WAY FORWARD

The present study focused on women of reproductive age visiting rehab facilities of Islamabad and aimed to assess the level of polycystic ovarian syndrome (PCOS) among women and its association with psychological orders. The results of the study found various socio-demographic factors to be significantly associated with polycystic ovarian syndrome (PCOS). The overall prevalence of polycystic ovarian syndrome (PCOS) in our study was 34.82%. Factors significantly associated with PCOS in our study were weight, physical activity, eating junk food, consider nutrients, and regular health checkup. We found the overall depression, anxiety, and stress were estimated to be 69.1%, 73%, and 43.2% respectively. But we were failed to find any significant association between levels of depression, anxiety, and stress with & without PCOS. Meanwhile, our study also found that the percentage of depression, anxiety, and stress with PCOS was low as compared to without PCOS.

6.1   Strength

- Highlighted the socioeconomic factors that contribute to PCOS
- Only study that determined the association of stress in women with and without PCOS.
- Wide and varied sample
- The study revealed the growing prevalence of PCOS and provide the basis of intervention.

6.2   Limitation

The study's shortcomings should be discussed.
- The use of Google forms for self-reporting surveys has the possibility of introducing bias.
- Furthermore, those who do not have access to the internet are not included in this survey.
- The language use in the DASS tool is difficult to understand.
- Time constraints in data collection.
- Reluctance when answering questions regarding menstrual cycle.

6.3   Recommendation

The current findings of this study have many implications.

- There is a greater need for increased effort in establishing and implementing education programs aimed at empowering people about PCOS and psychological disorders.

- Although we failed to find the significant association between psychological disorders and PCOS, but several studies showed that depression, anxiety, and stress have been linked to PCOS among women. The key sociodemographic and lifestyle-related factors that could have contributed to the emergence of such mental health issues can be easily recognized.

- While physicians provide proper care to women with PCOS, the healthcare authority must pay attention to the development of recommendations that may converge their physical and psychological health.

- These findings may be useful for healthcare professionals who are targeting women at risk of PCOS. More intensive population-based studies with larger sample sizes and the inclusion of additional variables are required to investigate the relationship between PCOS and psychological disturbances.

- In addition to efficient medical treatments aimed at improving PCOS-related symptoms and, as a result, reducing psychological distress, it is worthwhile to consider implementing psychological counseling in primary health centers   and clinics to improve the quality of life of women with PCOS.

References

A.P.Nácul, Andrade, C., P.Schwarza, Jr, P. H., & P.M.Spritzer. (2007). Nitric oxide and fibrinogen in polycystic ovary syndrome: Associations with insulin resistance and obesity. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 191-196.

A.Wild, R. (2012). Dyslipidemia in PCOS. *Steroids*, 295-299.

Apridonidze, T., Essah, P. A., Iuorno, M. J., & Nestler, J. E. (2005). Prevalence and Characteristics of the Metabolic Syndrome in Women with Polycystic Ovary Syndrome. *The Journal of Clinical Endocrinology & Metabolism*, 1929-1935.

Arain, F., Arif, N., & Halepota, H. (2015). Frequency and outcome of treatment in polycystic ovaries related infertility. *Pak J Med Sci*, 6947-699.

Asghari, K. M., Nejadghaderi, S. A., Alizadeh, M., Sanaie, S., Sullman, M. J., Kolahi, A.-A., . . . Safiri, S. (2022). Burden of polycystic ovary syndrome in the Middle East and North Africa region, 1990–2019. *Scientific Reports*, 1-11.

Asgharnia, M., & Soltani, F. M. (2011). The Prevalence of Polycystic Ovary Syndrome (PCOS) in High School Students in Rasht in 2009 According to NIH Criteria. *Int J Fertil Steril*, 156-159.

Asunción, M., Calvo, R. M., Millán, J. L., Sancho, J., Avila, S., & Escobar-Morreale, H. F. (2000). A Prospective Study of the Prevalence of the Polycystic Ovary Syndrome in Unselected Caucasian Women from Spain. *The Journal of Clinical Endocrinology & Metabolism*, 2434–2438.

Azziz, R., Carmina, E., & Sawaya, M. E. (2000). Idiopathic Hirsutism. *Endocrine Reviews*, 347-362.

Azziz, R., Carmina, E., Dewailly, D., Kandarakis, E. D., Escobar-Morreale, H. F., Futterweit, W., . . . Witchel, S. F. (2009). The Androgen Excess and PCOS Society criteria for the polycystic ovary syndrome: the complete task force report. *Fertility and Sterility*, 458-488.

Azziz, R., Woods, K. S., Reyna, R., Key, T. J., Knochenhauer, E. S., & Yildiz, B. O. (2004). The Prevalence and Features of the Polycystic Ovary Syndrome in an Unselected Population. *The Journal of Clinical Endocrinology & Metabolism*, 2745-2749.

Barber, T. M., McCarthy, M. I., Wass, J. A., & Franks, S. (2006). Obesity and polycystic ovary syndrome. *Clinical Endocrinology*, 137-145.

Baskol, G., Aygen, E., Erdem, F., Caniklioglu, A., Narin, F., Şahin, Y., & Kaya, T. (2012). Assessment of paraoxonase 1, xanthine oxidase and glutathione peroxidase activities, nitric oxide and thiol levels in women with polycystic ovary syndrome. *Acta Obstetricia et Gynecologica Scandinavica,*, 326-330.

Bharathi, R., Swetha, S., Neerajaa, J., Madhavica, J., Janani, D. M., Rekha, S. N., . . . Ushaa, B. (2017). An epidemiological survey: Effect of predisposing factors for PCOS in Indian urban and rural population. *Middle East Fertility Society Journal*, 313-316.

Bhuvanashree, N., Gupta, S., Anitha, M., & Venkatarao, E. (2013). Polycystic ovarian syndrome: Prevalence and its correlates among. *Annals of Tropical Medicine & Public Health*.

Bilal, M., Haseeb, A., & Rehman, A. (2018). Relationship of Polycystic Ovarian Syndrome with Cardiovascular Risk Factors. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 375-380.

Bode, D., Seehusen, D. A., & Baird, D. (2012). Hirsutism in Women. *American family physician*, 373-380.

Carreau, A.-M., & Baillargeon, J.-P. (2015). PCOS in Adolescence and Type 2 Diabetes. *Current Diabetes Reports*.

Cela, E., Robertson, C., Rush, K., Kousta, E., White, D. M., Wilson, H., . . . Kingsley, P. (2003). Prevalence of polycystic ovaries in women with. *European Journal of Endocrinology*, 439-442.

Chae, S. J., Kim, J. J., Choi, Y. M., Hwang, K. R., Jee, B. C., Ku, S. Y., . . . Moon, S. Y. (2008). Clinical and biochemical characteristics of polycystic ovary syndrome in Korean women. *Hum Reprod.*, 1924–1931.

Chen, X., Yang, D., Mo, Y., Li, L., Chen, Y., & Huang, Y. (2008). Prevalence of polycystic ovary syndrome in unselected women from southern China. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 59-64.

Conn, J. J., Jacobs, H. S., & Conway, G. S. (2001). The prevalence of polycystic ovaries in women with type 2 diabetes mellitus. *Clinical Endocrinology*.

Damone, A. L., Joham, A. E., Loxton, D., Earnest, A., Teede, H. J., & Moran, L. J. (2019). Depression, anxiety and perceived stress in women with and without PCOS: a community-based study. *Psychological Medicine*, 1510-1520.

Das, A., Datta, D., Kassir, M., Wollina, U., Galadari, H., Lotti, T., . . . Goldust, M. (2020). Acanthosis nigricans: A review. *Journal of Cosmetic Dermatology*.

Desai, N. A., Tiwari, R. Y., & Patel, S. S. (2018). Prevalence of Polycystic Ovary Syndrome and its Associated Risk Factors among Adolescent and Young Girls in Ahmedabad Region . *Indian Journal of Pharmacy Practice*.

DeUgarte, C. M., A.Bartolucci, A., & RicardoAzziz. (2005). Prevalence of insulin resistance in the polycystic ovary syndrome using the homeostasis model assessment. *Fertility and Sterility*, 1456-1460.

Diamanti-Kandarakis, E., Kouli, C. R., Bergiele, A. T., Filandra, F. A., Tsianateli, T. C., Spina, G. G., . . . Bartzis, M. I. (1999). A Survey of the Polycystic Ovary Syndrome in the Greek Island of Lesbos: Hormonal and Metabolic Profile. *The Journal of Clinical Endocrinology & Metabolism*, 4006-4011.

Diamanti-Kandarakis, E., Piperi, C., Kalofoutis, A., & Creatsas, G. (2005). Increased levels of serum advanced glycation end-products in women with polycystic ovary syndrome. *Clinical endocrinology*, 37-43.

Dunaif, A., & Zawadzki, J. (1992). Current issues in endocrinology and metabolism: Polycystic ovary syndrome. *MA: Blackwell Scientific Publications Cambridge.*

Ehrmann, D. A., Liljenquist, D. R., Kasza, K., Azziz, R., Legro, R. S., & Ghazzi, M. N. (2006). Prevalence and Predictors of the Metabolic Syndrome in Women with Polycystic Ovary Syndrome. *The Journal of Clinical Endocrinology & Metabolism*, 48-53.

Escobar-Morreale, & F., H. (2018). Polycystic ovary syndrome: definition, aetiology, diagnosis and treatment. *Nature Reviews Endocrinology*, 270-280.

Escobar-Morreale, H. F., Roldán, B., Barrio, R., Alonso, M., Sancho, J., Calle, H. d., & GarcÍa-Robles, R. (2000). High Prevalence of the Polycystic Ovary Syndrome and Hirsutism in Women with Type 1 Diabetes Mellitus. *The Journal of Clinical Endocrinology & Metabolism*, 4182-4187.

Fatima, S. H., Naeem, M. A., Ali, A., & Asfar, R. (2022). Prevalence of PCOS in Reproductive Age Women in Gujrat City. *EAS Journal of Radiology and Imaging Technology*, 41-44.

Gabrielli, L., & Aquino, E. M. (2012). Polycystic ovary syndrome in Salvador, Brazil: a prevalence study in primary healthcare. *Reproductive Biology and Endocrinology*, 1-10.

Gambineri, A., Patton, L., Altieri, P., Pagotto, U., Pizzi, C., Manzoli, L., & Pasquali, R. (2012). Polycystic Ovary Syndrome Is a Risk Factor for Type 2 Diabetes: Results From a Long-Term Prospective Study. *Diabetes*, 2369-2374.

Ganie, M. A., Rashid, A., Sahu, D., Nisar, S., Wani, I. A., & Khan, J. (2020). Prevalence of polycystic ovary syndrome (PCOS) among reproductive age women from Kashmir valley: A cross-sectional study. *International Journal of Gynecology & Obstetrics*, 231-236.

Goldzieher, J., & Green, J. (1962). The polycystic ovary. I. Clinical and histologic features. *The Journal of Clinical Endocrinology & Metabolism*, 325-338.

Gul, S. (2014). PCOS: Symptoms and Awareness in Urban Pakistani Women. *Int J Pharma Res Health*, 356-360.

Habibullah, Noor, K., & Aziz, A. (2022). Prevalence of Pre-diabetes and Diabetes Mellitus in Polycystic Ovarian Syndrome (PCOS). *Pakistan Journal of Medical & Health Sciences*, 36.

Hanif, F., Qamar, T., & Kirn-e-Muneera. (2015). Association of Body Mass Index, Polycystic Ovarian Syndrome and its Clinical Presentation. *Ann. Pak. Inst. Med. Sci*, 129-132.

Haq, N., Khan, Z., Riaz, S., Nasim, A., Shahwani, R., & Tahir, M. (2017). Prevalence and Knowledge of Polycystic Ovary Syndrome (PCOS) Among Female Science Students of Different Public Universities of Quetta, Pakistan. *Imperial Journal of Interdisciplinary Research*, 385-392.

Hart, R., Hickey, M., & Franks, S. (2004). Definitions, prevalence and symptoms of polycystic ovaries and polycystic ovary syndrome. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 671-683.

Isık, H., Aynıoglu, O., Tımur, H., Sahbaz, A., Harma, M., Can, M., . . . Kokturk, F. (2016). Is Xanthine oxidase activity in polycystic ovary syndrome associated with inflammatory and cardiovascular risk factors? *Journal of Reproductive Immunology*, 98-103.

J, M., & Munsch, S. (2011). Obesity in children and adolescents. Risks, causes, and therapy from a psychological perspective. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz*, 548-554.

Jabeen, S., Asad, F., Rani, Z., Khurshid, K., & Pal, S. S. (2018). Frequency of polycystic ovarian syndrome among patients presenting with acne. *Journal of Pakistan Association of Dermatologists*, 329-332.

Khaduri, M. A., Farsi, Y., Najjar, T. A., & Gowria, V. (2014). Hospital-based prevalence of polycystic ovarian syndrome among Omani women. *Middle East Fertility Society Journal*, 135-138.

Kim, J. J., & Choi, Y. M. (2013). Dyslipidemia in women with polycystic ovary syndrome. *Obstetrics & Gynecology Science*, 137-142.

Knochenhauer, E. S., Key, T. J., Kahsar-Miller, M., Waggoner, W., Boots, L. R., & Azziz, R. (1998). Prevalence of the Polycystic Ovary Syndrome in Unselected Black and White Women of the Southeastern United States: A Prospective Study. *The Journal of Clinical Endocrinology & Metabolism*, 3078–3082.

Kuşçu, N. K., & Var, A. (2009). Oxidative stress but not endothelial dysfunction exists in non-obese, young group of patients with polycystic ovary syndrome. *Acta obstetricia et gynecologica Scandinavica*, 612-617.

Lauritsen, M., Bentzen, J., Pinborg, A., Loft, A., Forman, J., Thuesen, L., . . . Andersen, A. N. (2014). The prevalence of polycystic ovary syndrome in a normal population according to the Rotterdam criteria versus revised criteria including anti-Müllerian hormone. *Human Reproduction*, 791-801.

Lennon, S. V., Martin, S. J., & Cotter, T. G. (1991). Dose-dependent induction of apoptosis in human tumour cell lines by widely diverging stimuli. *Cell proliferation*, 203-214.

Li, R., Zhang, Q., Yang, D., Li, S., Lu, S., Wu, X., . . . Qiao, J. (2013). Prevalence of polycystic ovary syndrome in women in China: a large community-based study. *Human Reproduction*, 2562-2569.

Lolli, F., Pallotti, F., Rossi, A., Fortuna, M. C., Caro, G., Lenzi, A., . . . Lombardo, F. (2017). Androgenetic alopecia: a review. *Endocrine*, 9-17.

Lowe, P., Kovacs, G., & Howlett, D. (2005). Incidence of polycystic ovaries and polycystic ovary syndrome amongst women in Melbourne, Australia. *ANZJOG*, 179-19.

March, W. A., Moore, V. M., Willson, K. J., Phillips, D. I., Norman, R. J., & Davies, M. J. (2010). The prevalence of polycystic ovary syndrome in a community sample assessed under contrasting diagnostic criteria. *Human Reproduction*, 544-551.

Memon, T. F., Channar, M., Shah, S. A., Shiekh, A., Batool, M., & Shri, N. (2020). POLYCYSTIC OVARY SYNDROME: RISK FACTORS AND ASSOCIATED FEATURES AMONG UNIVERSITY STUDENTS IN PAKISTAN. *Journal of Peoples University of Medical & Health Sciences Nawabshah*.

Memon, T. F., Meghji, K. A., Rajar, A. B., Khowaja, S., Azam, A., & Khatoon, S. (2020). Clinical, hormonal and metabolic factors associated with polycystic ovary syndrome among Pakistani women. *Rawal Medical Journal*, 817.

Miazgowski, T., Martopullo, I., Widecka, J., Miazgowski, B., & Brodowska, A. (2019). National and regional trends in the prevalence of polycystic ovary syndrome since 1990 within Europe: the modeled estimates from the Global Burden of Disease Study 2016. *Arch Med Sci.*, 343-351.

Mohammadi, M. (2019). Oxidative Stress and Polycystic Ovary Syndrome: A Brief Review. *International Journal for Preventive Medicine*.

Musmar, S., Afaneh, A., & Mo'alla, H. (2013). Epidemiology of polycystic ovary syndrome: a cross sectional study of university students at An-Najah national university-Palestine. *Reproductive Biology and Endocrinology*, 1-6.

Quinn, M., Shinkai, K., Pasch, L., Kuzmich, L., Cedars, M., & Huddleston, H. (2014). Prevalence of androgenic alopecia in patients with polycystic ovary syndrome and characterization of associated clinical and biochemical features. *Fertility and Sterility*, 1129-1134.

Rao, M., Broughton, K. S., & LeMieux, M. J. (2020). Cross-sectional Study on the Knowledge and Prevalence of PCOS at a Multiethnic University. *Progress in Preventive Medicine*.

Rasool, S., Dar, L. R., & Hameed, A. (2011). Prevalence of polycystic ovaries among patients with hirsutism and menstrual abnormalities. *Journal of Pakistan Association of Dermatologists*, 174-178.

Riaz, Y., & Parekh, U. (2021). Oligomenorrhea. *StatPearls*.

Rizvi, M., Abbas, A., S. T., Sabah, A., Ali, Z. M., Sundrani, M. M., . . . Mir, H. A. (2014). PERCEPTION AND ATTITUDE OF PATIENTS REGARDING POLYCYSTIC OVARIAN SYNDROME (PCOS) IN TERTIARY CARE HOSPITALS OF PAKISTAN - A SURVEY BASED STUDY. *International Journal of Pharmacy & Therapeutics*, 147-152.

Rogol., G. N. (2022). Amenorrhea. *StatsPearl*.

Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. (2004). Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome (PCOS). *Human Reproduction*, 41-47.

S.Archer, J., & Chang, J. (2004). Hirsutism and acne in polycystic ovary syndrome. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 737-754.

Sam, S. (2007). Obesity and Polycystic Ovary Syndrome. *Obesity Management*.

Schwartz, R. A. (1994). Acanthosis nigricans. *Journal of the American Academy of DERMATOLOGY*.

Sharquie, K. E., Al-Bayatti, A., Al-Bahar, A. J., & Al-Zaidi, Q. M. (2004). Acanthosis nigricans as skin manifestation of polycystic ovaries syndrome in primary infertile females. *Middle East Fertility Society Journal*.

Sheehan, M. T. (2004). Polycystic Ovarian Syndrome: Diagnosis and Management. *Clinical Medicine & Research*, 13-27.

Shinkai, Kamangar, F., & Kanade. (2012). Acne in the adult female patient: a practical approach. *International Journal of Dermatology*, 1162-1174.

Sidra, S., tariq, M. H., Farukh, M. J., & Mohsin, M. (2019). Evaluation of clinical manifestations, health risks, and quality of life among women with polycystic ovary syndrome. *PLoS ONE*.

Stein, I. F. (1935). Amenorrhea associated with bilateral polycystic ovaries. *Am J Obstet Gynecol*, 181-191.

Tabassum, R., Imtiaz, F., Sharafat, S., Shukar-ud-din, S., & Nusrat, U. (2013). Prevalence and clinical profile of insulin resistance in young women of poly cystic ovary syndrome: A study from Pakistan. *Pak J Med Sc*, 593-596.

Tehrani, F. R., Rashidi, H., & Azizi, F. (2011). The prevalence of idiopathic hirsutism and polycystic ovary syndrome in the Tehran Lipid and Glucose Study. *Reproductive Biology and Endocrinology*, 1-8.

Toulis, K. A., Goulis, D. G., Mintziori, G., Kintiraki, E., Eukarpidis, E., Mouratoglou, S.-A., . . . Makedos, A. (2011). Meta-analysis of cardiovascular disease risk markers in women with polycystic ovary syndrome. *Human Reproduction*, 741-760.

Varanasi, L. C., Subasinghe, A., Jayasinghe, Y. L., Callegari, E. T., Garland, S. M., Gorelik, A., & Wark, J. D. (2014). Polycystic ovarian syndrome: Prevalence and impact on the wellbeing of Australian women aged 16–29 years. *ANZJOG*, 222-233.

Vera, H. P. (2003). Androgenetic Alopecia in Women. *Journal of Investigative Dermatology Symposium Proceedings*, 24-27.

Vrbikova, J., & Hainer, V. (2009). Obesity and Polycystic Ovary Syndrome. *Obes Facts*, 26-35.

W.Bates, G., & S.Legro, R. (2013). Longterm management of Polycystic Ovarian Syndrome (PCOS). *Molecular and Cellular Endocrinology*, 31-37.

Yazdani, A. (1996). Polycystic Ovarian Syndrome. In J. G. Flynn, *Examination Obstetrics & Gynaecology* (p. 21). Queensland: Churchill Livingstone.

Ye, W., Xie, T., Song, Y., & Zhou, L. (2020). The role of androgen and its related signals in PCOS. *Journal of Cellular and Molecular Medicine*, 1825-1837.

YueZhao, & JieQiao. (2013). Ethnic differences in the phenotypic expression of polycystic ovary syndrome. *Steroids*, 755-760.

Zafar, U., Memon, Z., Moin, K., Agha, S., Hassan, J. A., & Zehra, D. (2019). Prevalence of PCOS with Associated Symptoms and Complications at Tertiary Care Hospital of Karachi. *Journal of Advances in Medicine and Medical Research*, 1-9.

Zehra, S., Arif, A., Anjum, N., Azhar, A., & Quershi, M. (2015). Depression and anxiety in women with polycystic ovary syndrome from Pakistan. *Life Sci J*, 1-4.

Zhang, B., Wang, J., Shen, S., Liu, J., Sun, J., Gu, T., . . . Bi, Y. (2018). Association of Androgen Excess with Glucose Intolerance in Women with Polycystic Ovary Syndrome. *BioMed Research International*.

Appendix A – Consent Form

TITLE OF THE RESEARCH

PREVALENCE OF PCOS AND ITS ASSOCIATION WITH PSYCHOLOGICAL DISORDERS AMONG WOMEN OF REPRODUCTIVE AGE VISITING REHAB FACILITIES OF ISLAMABAD.

Areeba Tayyab

Al-Shifa School of Public Health

CONTACT INFORMATION

Email id: areebaqureshi42@gmail.com

Contact Number: 03344242725

PURPOSE OF THE STUDY

This study is an effort to determine the prevalence of PCOS and its association with psychological disorder among women of reproductive age.

STUDY PROCEDURE

The study will involve collecting data from adults visiting the rehabilitation centers. Consent will be taken from the rehab centers and the clients as well after which only the consented adults will be asked to fill in the questionnaire. The study will take place from March 2022 to August 2022 in Rawalpindi.

RISK

There is no foreseeable risk posed by the study. All the participants will have free will to participate and those refusing to take part in the study will suffer no consequences.

BENEFITS

This will help develop a clear picture of the burden of PCOS in the study population and will also help determine that what impacts on women psychological health. The findings may serve to be beneficial for future management. The finding may also be used to design schemes that promote healthcare especially for improving PCOS symptoms.

CONFIDENTIALITY

All data collected will be kept confidential and no data sharing with anyone other than the research team will be done. The identities of all participants will be kept anonymous and their privacy will be strictly maintained.

VOLUNTARY PARTICIPATION

Participation in this study will be completely voluntary and of free will. The participants can refuse to participate at any point in the study with no harm or consequences.

CONSENT CERTIFICATE

I have read the foregoing information or it has been read to me. I have been given sufficient opportunity to ask questions and all my ambiguities have been answered to my satisfaction. I voluntarily consent to participate in this study as a participant/to allow my child/student to participate in this study.

Participant/ Teacher/ Guardian Signature: Date:

_____

Researcher's Signature: Date:

_____

Appendix B – QUESTIONNAIRE

Section-A - Socio-Demographic factors

1. Height (ft.): _____

2. Weight (Kgs): _____

4. What is your age?

- 15 to 30 years
- 31 to 45 years

5. Marital status:

- Married
- Unmarried

6. What is your education level?

- No formal education
- Intermediate
- Higher education

7. Employment status:

- Employed
- Unemployed
- Housewife

8. What is your household income per month?

- Less than 50,000 Rs
- 50,000 to 100,000 Rs
- More than 100,000 Rs

9. What is your physical activity level?

- Sedentary (no workout at all)
- Moderate (30 min workout daily)

- Active (1 hour workout daily)

10. Does your work demand physical activity?

- Yes
- No

11. Do you eat junk food?

- Yes
- No

12. Do you consider nutrients of your food while eating?

- Yes
- No

13. Do you get regular health checkup every 6 months?

- Yes
- No

Section – B- Assessment of PCOS

1. Waist circumference:

- < 80 cm
- 80-90 cm
- 90-100 cm
- >100 cm

2. Do you have irregular periods?

- Yes
- No

3. Cysts diagnosed by ultrasound?

- Yes
- No

4. Testosterone levels?

- 6-58 ng/dL
- > 58 ng/dL

5. Skin Discoloration?

- Yes
- No

6. Excess hair on face?

- Yes
- No

7. Acne:

- Yes
- No

8. Alopecia (hair Loss)

- Yes

- No

9. Mood swings

- Yes

- No

Section C - DASS21

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0   Did not apply to me at all

1   Applied to me to some degree, or some of the time

2   Applied to me to a considerable degree or a good part of time

3   Applied to me very much or most of the time

1 (s)	I found it hard to wind down	0	1	2	3
2 (a)	I was aware of dryness of my mouth	0	1	2	3
3 (d)	I couldn't seem to experience any positive feeling at all	0	1	2	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d)	I found it difficult to work up the initiative to do things	0	1	2	3
6 (s)	I tended to over-react to situations	0	1	2	3
7 (a)	I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s)	I felt that I was using a lot of nervous energy	0	1	2	3
9 (a)	I was worried about situations in which I might panic and make a	0	1	2	3

fool of myself

10 (d)	I felt that I had nothing to look forward to	0	1	2	3
11 (s)	I found myself getting agitated	0	1	2	3
12 (s)	I found it difficult to relax	0	1	2	3
13 (d)	I felt down-hearted and blue	0	1	2	3
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a)	I felt I was close to panic	0	1	2	3
16 (d)	I was unable to become enthusiastic about anything	0	1	2	3
17 (d)	I felt I wasn't worth much as a person	0	1	2	3
18 (s)	I felt that I was rather touchy	0	1	2	3
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a)	I felt scared without any good reason	0	1	2	3
21 (d)	I felt that life was meaningless	0	1	2	3

Appendix C – Gantt chart

Research Activities	February 2022	March 2022	April 2022	May 2022	June 2022	July 2022	August 2022	September 2022
Literature review	▓	▓	▓	▓	▓			
Proposal submission	▓							
Proposal defense/IRB		▓						
Pilot study		▓						
Data collection		▓	▓	▓				
Data analysis					▓			
Thesis writing			▓	▓	▓			
Thesis draft submission						▓		
Research article submission						▓		
Thesis defense							▓	
Final thesis defense								▓

Appendix D – Budget

Sr. No	Items	Resource	Unit	Cost/unit	Total amount
01	Literature search	- Internet - Library - Supervisor discussions	01 01	1000/- 500/-	1500/-
02	IRB	Transport	01	800/-	800/-
03	Field visit	Transport	15 visits	1000/-	15000/-
04	Pilot study	- Questionnaire printing - Transport	20 2 visits	20/- 1000/-	400/- 2000/-
05	Data collection	- Questionnaire printing - Transport	300 8 visits	30/- 1000/-	9000/- 8000/-
06	Data analysis	Internet		1500/-	1500/-
07	Thesis printing	Paper	3 copies	2000/-	6000/-

08	Thesis binding	Hardcover	3 copies	2500/-	7500/-
09	Miscellaneous	- Food expenses - Stationary	-	5000/-	5000/-
10	Total amount		-		56,700/-

Appendix E – Official Permission Letters

Copies of letters obtained from Al-Shifa and both fitness and rehabilitation centers included in the study are attached ahead.