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The Impact of Depression and Dietary Practices on Polycystic Ovarian Syndrome Among Females of Northern Punjab, Pakistan

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ABSTRACT

Background: Polycystic Ovary Syndrome (PCOS) is a hormonal disorder affecting women of reproductive age, characterized by dysmenorrhea, amenorrhea, hyperandrogenism and cystic ovaries.

Objective: This study investigated the association between PCOS and physical activity, weight management, depression and eating practices among the women residing in northern Punjab, Pakistan.

Methods: A cross-sectional study was conducted in different regions of Lahore district, Punjab, Pakistan. Female participants aged 18-35 and diagnosed with PCOS were eligible for this study while lactating and post-menopausal women were excluded. The data were collected by a designed questionnaire communicated with participants via email or face-to-face interactions. To assess the dietary practices, 24-hour dietary recall and food frequency questionnaire was used. Furthermore, Patient Health Questionnaire-9 (PHQ-9) was employed to evaluate the presence of depressive symptoms. The collected data were analyzed statistically using IBM SPSS statistics for windows, version 21.

Result: The data of total 150 women revealed a high prevalence of weight management issues among participants. Additionally, majority of participants reported engaging in physical activity but up to insufficient levels. Furthermore, a significant association was observed between PCOS and depression ($p<0.05$) and eating practices ($p<0.05$). Among eating habits, the major indications were recorded in terms of skipping meals specifically the breakfast and increased consumption of sugary and processed foods.

Conclusion: In a nutshell, these findings suggest that multiple factors are contributing to progression of PCOS among women in northern Punjab. These outcomes necessitate a holistic approach targeting not only the physical health but the eating practices as well as mental well-being for effective management of PCOS.

Keywords
PCOS, Physical Activity, Depression, Dietary Practices, Northern Punjab.

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is a multifaceted endocrine and metabolic disorder affecting approximately 4-20% of women of reproductive age, globally[1]. PCOS is a complex condition characterized by clinical and biochemical ovarian dysfunction (oligo-anovulation), hyperandrogenism, and polycystic ovaries[2]. The PCOS encompasses clinical and biochemical aspects including menstrual abnormalities, reproductive challenges, and excessive hair growth and acne. This syndrome has long term metabolic implications in terms of increased risk of type 2 diabetes and various heart conditions often exacerbated with frequent weight gain[3]. The world health organization (WHO) report suggests that approximately 116 million women are affected by PCOS, worldwide and up to 70% of the women with hormonal dysregulation remain undiagnosed[4]. However, the prevalence rate fluctuates depending on the diagnostic criteria employed i.e., as per the NIH criteria, the prevalence remains constant between 5-8% while according to the Rotterdam criteria it is as high as up to 15% among women of reproductive age[5]. In Pakistan, infertility rate is approximately 22% and among 38.5% cases are attributed to PCOS. Moreover, a significantly higher prevalence of ~52% has been reported among Pakistani women[6,7].

The pathophysiology behind the occurrence of PCOS involves dysregulated release of gonadotropins due to compromised hypothalamic feedback in response to circulating gonadal steroids[8]. Moreover, hormonal imbalances such as increased luteinizing hormone (LH) and gonadotropin releasing hormone (GnRH) levels, dysregulated luteinizing/follicle-stimulating hormone (LH/FSH) ratio, elevated level of androgens in comparison to estrogen and insulin resistance have been observed in most cases. This hormonal imbalance is ultimately associated with manifestations of additional complications such as amenorrhea or oligo-amenorrhea, acne, hirsutism, infertility, diabetes and obesity *etc*.[9,10]

In normal ovaries, LH stimulates the production of androgens via ovarian cells, which are subsequently converted into estrogen via CYP19A1, also known asP450Aromatase, within the granulosa cells. In females suffering from PCOS, a sustained increase in GnRH secretion leads to an elevated release of LH over FSH, thus resulting in heightened LH/FSH ratio[11,12].

The etiology of PCOS remains elusive, though it is influenced by environmental stressors such as continuous physical activity, prolonged exposure to trauma, famine and infection. Furthermore, poor dietary habits such as consumption of foods rich in carbohydrates & proteins but poor in fat content along with the genetic factors contribute to its progression[13].

Food habits, socioeconomic status, psychological factors, and environmental variables collectively play significant role in development of PCOS in women[14,15]. It has been suggested that antidiabetic drugs have been prescribed to women suffering from PCOS as an additional therapy to metformin[16]. Depression and maladaptive eating behaviour are the detrimental disorders that affect the health and overall well-being of the young population. Imbalanced physiology of neurotransmitters could exert a significant psychological influence, that has been commonly observed among women with PCOS. Numerous studies have reported the elevated incidence of depression up to 40% in women with PCOS compared to a prevalence of depression of 10% in control women. Women suffering from PCOS have also been identified to be at heightened risk of developing anxiety (15%) and eating disorders (14%). Considering the pervasive prevalence of PCOS, its management necessitates self-efficacy, self-motivation, and lifestyle changes. Moreover, addressing associated issues like depression is pivotal to achieving optimized outcomes with the therapeutic approaches being employed[17,18]. Keeping in mind the elevated prevalence of PCOS among Pakistani women, it became imperative to explore the major factors behind its progression. Identification of contributing factors could help in creating awareness among the affected population as well as healthcare practitioners so that the quality of life of sufferers could be enhanced along with minimizing the incidence of PCOS in country. Therefore, the current study was designed with the objective to examine the impact of dietary patterns in conjunction with depression, on the development of PCOS in females from northern Punjab.

MATERIALS AND METHODOLOGY

Research Design

The present research was conducted in rural and urban areas of the Lahore District in the province of Punjab, Pakistan. The research design aimed to investigate the impact of depression and dietary patterns on the development of PCOS, employing a combination of quantitative and qualitative research methods, such as surveys, in-person interviews, and examination of participants. The study duration was of two months, from March 1st, 2022 to April 30th, 2022. A total of 150 women participates in our study, amongst 75 were recruited from urban areas of Lahore and 75 were from rural areas.

Inclusion Criteria

The inclusion criteria of current study consisted of Pre-menopausal women 18-35 years old; diagnosed with PCOS; currently undergoing any treatment regimen for PCOS; suffering from depression (assessed using questionnaire) and participants willing to participate in the study.

Exclusion Criteria

The exclusion criteria included participants aged below 18 and above 35 years; females with regular periods; lactating and pregnant mothers; females with medical problems like osteoporosis, diabetes, and hypertension; participants not willing to participate in the study.

Ethical Consideration

All the study protocols were approved by "The Bioethical Committee" of the University of Agriculture Faisalabad. Following ethical approval, volunteers were recruited from rural and urban areas of Lahore for participation in current research. Subsequently, after providing the overview of study objectives and procedure, all participants were required to sign a written consent form which was explained to them. Furthermore, the participants were also aware that they can withdraw whenever they want.

Research Questionnaire

To conduct this study, the questionnaire was designed under the supervision of National Institute of Food Science and Technology at the University of Agriculture Faisalabad. Participants in the survey were questioned about their eating habits associated with PCOS. In addition, the Patient Healthcare Questionnaire-9 (PHQ-9) tool, a reasonable tool to asses the depression levels, was used to evaluate the depression symptoms of the participants. Moreover, supplementary information including sociodemographic features, health history of any previous disease, anthropometric profile i.e., Body Mass Index kg/m^2, Basal Metabolic Rate and waist to hip ratio were measured[19,20].

PHQ-9 Questionnaire

The PHQ-9 is a quick and accurate depression screening tool which is used to assess the therapeutic progress and positive outcomes of any antidepressant regimen. It is a validated questionnaire which evaluates nine basic symptoms associated with depression employing the criteria expressed in Diagnostic and Statistical Manual (DSM) for major depression[21].

Major depression is diagnosed if a person in experiencing five or more of basic nine symptoms for atleaset 8-10 days in past two weeks. Notably, presence of poor mood or anhedonia is must required among these symptoms. Other types of depression are diagnosed when individuals have two, three, or four depressive symptoms, including poor mood or anhedonia, for at least "more than half the days" in the past two weeks. Because each of the nine questions on the PHQ-9 may be scored anywhere from 0 (not at all) to 3 (extremely severe), the total possible range for the PHQ-9 score when used as a severity measure is 0 to 27[22].

Food Frequency Questionnaire

The specific questionnaire designed for this research also incorporated a food frequency questionnaire. This questionnaire was developed including questions sourced from previously published research[19,23,24].

Statitical Analysis

IBM SPSS statistics for windows, version 21.0 was used to examine all the collected data. The categorical data were presented as frequencies and percentages. Pearson-Chi Square test was performed to investigate the association between poor dietary habits and depressive symptoms with PCOS. A P-value below 0.05 was considered statistically significant[24].

RESULT

Socioeconomic Details

The socioeconomic status of women with PCOS has been delineated in Table **1**. A total of 150 women aged 18-35 participated in the study, comprising 91 (60.7%) students, 39 (26%) working women and 20 (13.3%) homemakers. The education level of the participants was diverse with only 3.3% (n=5) as illiterate, 3.3% (n=5) had completed their middle school, 8 (n=5.3) having bachelor's degree, 79.3% graduates, and 5.3% (n=8) with postgraduate education. Out of 150 women, 131 (87.3%) were single and 19 (12.7%) were married. The total number of earning hands within the participant's family were explored to assess the socioeconomic status. Most participants claimed a single earning member while 16.7% (n=25) reported zero earners and 4% (n=6) had six members who were making money for living. Additionally, 89.34% females had no kids, 7.34% with one kid, and 1.34% (n=2) were with more than 3 kids. Regarding monthly expenditure on food, 23.3% (n=35) of participants spent >20000 rupees on food, and 14.7% spent <5000 rupees in one month. Moreover, it was observed that most of the participants relied on mothers for shopping and other basic chores.

Table 1. Sociodemographic Details of Participants.

Features	Frequency (n=150)	Percentage (%)
Occupation		
Housewife	20	13.3
Working	39	60.7
Students	91	26
Education Level		
Illiterate	5	3.3
Middle	5	3.3
Matric	5	3.3
Bachelor	8	5.3
Graduation	119	79.3
M.Phil.	8	5.3
Marital Status		
Single	131	87.3
Married	19	12.7
Number of Earning Hands		
Zero	25	16.7
One	92	61.3
Two	20	13.3
Three	7	4.7
Four	6	4
No. of Children		
No	134	89.34
1	11	7.34
2-3	3	2
>3	2	1.34
Approx. Money Spent on Food		
<5000	22	14.7
5000-10000	36	24
10000-20000	57	38
>20000	35	23.3
Who does the Food Shopping for a Home		
Husband	14	9.5
Mother	46	30.6
Brother	22	14.6
Father	23	15.3
Self	45	30

Table 2. Physical Activity Status of Participants.

Characteristics	Frequency (n=150)	Percentage (%)
Physical Activity		
Yes	88	58.7
No	62	41.3
Type of Exercise		
Brisk walking	46	30.7
Running	7	4.7
Cycling	0	0
Sports	8	5.3
Others	89	59.3
Exercise Routine		
1 time/day	96	64
2 times/day	33	22
3 times/week	0	0

4 times/week	21	14
Screen Time/Day		
<2 hours	28	18.7
2-3 hours	30	20
5 hours	66	44
>5 hours	26	17.3

Table 3. Disease History of Participants.

Characteristics	Frequency (n=150)	Percentage (%)
Family Disease History		
Yes	56	37.3
No	94	62.7
Excessive Hair		
Yes	46	30.7
No	104	69.3
Irregular Menses		
Yes	50	33.3
No	100	66.7
Skin Problem		
Yes	51	34
No	99	66
Weight Problem		
Yes	95	63.3
No	55	36.7
Infertility		
Yes	12	8
No	138	92

Physical Activity

As presented in Table **2**, 58.7% participants responded regarding their involvement in one or more type of physical activity on daily basis. Amongst, majority of the participants i.e., 59.3% did not specified a particular type of physical activity while 30.7% indicated engaging in brisk walking followed by participation in sports and running. Moreover, approximately 64% respondents reported spending time on exercising once a day, 22% performing their activity twice a day and 21% reported thrice a day. In case of screen time, 44% of participants had screen time of more than 5 hours subsequently, 20% reported 2-3 hours and 18.7% having <2 hours of screen time daily.

Disease History and PCOS Related Symptoms

Table **3** represents the medical history of women suffering from PCOS. Among all the participants, 62.7% (n=94) claimed no family history of any disorder while 37.7% (n=56) reported family history of several disease including, arthritis, hypertension, diabetes etc. Excessive hair growth was experienced by 30.7% (n=46) women while 69.3% (n=104) had average hair growth. Majority of the participants i.e., 63.3 % (n=95) informed regarding weight related issues. Approximately 33.50% women had irregular menstrual history and 12 (8%) participants documented the presence of infertility and associated complications. Furthermore, skin problems were stated by 34% (n=51) participants.

Nutritional Status

Nutritional status of the women participating in current study has been illustrated in Table **4**. Healthy weight was the most common nutritional status observed in 69 (46%) of participants, followed by underweight, which comprised 44 (29.33%) of the participants, obese and overweight accounting for 19 (12.67) and 18 (12%) of the respondents.

Depression

The Patient Health Questionnaire PHQ-9 revealed that 46% of the participants were suffering from depression. Furthermore, the relationship between depression and its impact on eating practices was statistically investigated. Distribution of depression symptoms and its severity among the participants has been displayed in Table **5.** The data represents the frequency of symptoms experienced in past two weeks only. Results reported significant prevalence of anhedonia i.e., loss of interest and pleasure among the participants. Nearly half (48.7%, n=73) of the women reported feeling of little interest and pleasure in

doing daily chores several times a day while 29.3% (n=44) reported no experience of anhedonia. Notably, concerning finding is that 4.7% (n=7) reported less interest and pleasure almost half of the day and 17.3% (n=26) indicated experiencing these symptoms in doing work all the day representing severe functional impairments. Regarding the feeling down and hopeless over the day, 45.30% women did not experience these feelings at all. While 34.7% reported feeling down and hopeless many times a day. A significant proportion of participants (15.3%) reported feeling depressed more than half of the day and remaining 4.7% were experiencing presence of such feelings nearly all the day.

Table 4. Nutrition Standing of Individuals.

Nutritional status	Frequency (n=150)	Percentage (%)
Underweight	44	29.33
Healthy weight	69	46
Overweight	18	12
Obese	19	12.67

Table 5. Depression Level of Participants.

Characteristics	Frequency (n=150)	Percentage (%)
Little interest or pleasure in doing things		
Not at all	44	29.3
Several times a day	73	48.7
More than half a day	7	4.7
Nearly all the day	26	17.3
Feeling down, depressed, or hopeless		
Not at all	68	45.3
Several times a day	52	34.7
More than half a day	23	15.3
Nearly all the day	7	4.7
Feeling tired or having little energy		
Not at all	49	32.7
Several times a day	52	34.7
More than half a day	25	16.7
Nearly all the day	24	16
Poor appetite or overeating		
Not at all	67	44.7
Several times a day	49	32.7
More than half a day	10	6.7
Nearly all the day	24	16
Feeling bad about yourself or that you are a failure or have let yourself or your family down		
Not at all	91	60.7
Several times a day	31	20.7
More than half a day	9	6
Nearly all the day	19	12.7
Trouble concentrating on things, such as reading the newspaper or watching television		
Not at all	93	62
Several times a day	27	18
More than half a day	16	10.7
Nearly all the day	14	9.3
Moving or speaking so slowly that other people could have noticed. Or the opposite being so fidgety or restless that you have been moving around a lot more than usual		
Not at all	125	83.3
Several times a day	2	1.3
More than half a day	13	8.7
Nearly all the day	10	6.7

Thoughts that you would be better off dead, or hurting yourself		
Not at all	107	71.3
Several times a day	27	18
More than half a day	14	9.3
Nearly all the day	2	1.3

Table 6. Depression Impact on Eating Practices of Participants.

Characteristics	Frequency (n=150)	Percentage (%)
Impact on food intake		
Increase	52	34.67
Decrease	39	26
No change	59	39.33
Effect on vegetable intake		
Increase	13	8.67
Decrease	59	39.33
No change	78	52
Effect on fruit intake		
Increase	40	26.67
Decrease	35	23.33
No change	75	50
Effect on meat intake		
Increase	20	13.33
Decrease	52	34.67
No change	78	52
Effect on processed food intake		
Increase	40	36.67
Decrease	52	34.67
No change	58	38.67
Effect on sugar intake		
Increase	28	18.67
Decrease	38	25.33
No change	84	56

Fatigues was also reported for several times a day by 34.7% (n=52) women while 16.7% (n=25) and 16% (n=24) reported experiencing fatigue and low energy for more than half of day and nearly all the time, respectively. Though majority of the participants (44.7%, n=67) experienced no change in appetite however, a significant number of participants (34.7%, n=52) reported symptoms of poor appetite and overeating several times in a day. Feeling of worthlessness and failure was present for several times a day and almost all the times among 20.7 (n=31) and 12.7% (n=19) of respondents, respectively. Furthermore, 18% women reported difficulty in concentrating while reading newspapers or watching television few times a day and 6.7% experienced psychomotor agitations i.e., difficulty in speaking and feeling of restless nearly all the times. Interestingly, a positive outcome was observed in case of thoughts of death and self-harm for majority of women (71.3%, n=107). However, an alarming ratio of women (18%, n=27) reported experiencing such thoughts at least once a day highlighting the severity of few cases.

Data represented in Table **6**, elaborates the modified eating habits of participants associated with depression. Over half of participants (52%) reported an increase in food intake due to depression, while 39.33% women indicated depression associated decreased intake of vegetables. However, depression had differential effects on different food groups such that the intake of fruits was increased in 26.67% of participants and likewise increase in meat intake was also reported by 13.33% of respondents. Interestingly, majority of the study participants (56%) reported no change in consumption of sugar and processed foods.

Association Between Depression and PCOS

The deta (Table **7**) revealed significant association ($p<0.05$) between depression and PCOS. Among the 150 participants diagnosed with PCOS, the severity of depression was categorized as no depression (28%, n=42), mild depression (40.67%, n=61), moderate depression (23.33%, n=35), moderately severe depression (4.67%, n=7) and severe depression (2.67%, n=4).

Association Between Depression and Meal Intake

Table **8** details the data of meal intake of participants categorized by severity of depression as no depression, mild, moderate, moderately severe and severe. Breakfast intake significantly ($p<0.05$) varied with degree of depression. Among participants with no depression (n=42). 88.1% (n=37) reported regular intake of breakfast while 11.9% (n=5) skipped breakfast. Similarly, women with moderate depression (n=61), 93.4% (n=57) consumed breakfast regularly. Only 65.7% (n=23) participants with moderate depression (n=35) had regular consumption of breakfast while 34.3% (n=12) skipped it. All participants suffering from moderately severe (n=7) depression reported regular intake of breakfast conversely, all women with severe depression (n=5) skipped breakfast.

Table 7. Association Between Depression and PCOS Development.

Characteristics	N=150	Chi Square Value	P-value
No	42	15.73	0.046*
Mild	61		
Moderate	35		
Severely Moderate	7		
Severe	5		

*= Significant

Table 8. Association Between Depression and Meal Intake.

Characteristics	None (n=42)	Mild (n=61)	Moderate (n=35)	Moderately Severe (n=7)	Severe (n=5)	P-value
Breakfast						0.000*
Yes	37	57	23	7	0	
No	5	4	12	0	5	
Snack						0.100NS
Yes	27	57	15	7	5	
No	15	4	20	0	0	
Lunch						0.011*
Yes	35	58	25	7	5	
No	7	3	10	0	0	
Snack						0.383NS
Yes	37	58	30	7	5	
No	5	3	5	0	0	
Dinner						0.029*
Yes	35	39	20	3	2	
No	7	22	15	4	3	
Before bed						0.209NS
Yes	35	58	29	7	5	
No	7	3	6	0	0	

* = Significant
NS = non-significant

Mixed snacking habits were reported with different severity levels of depression. A non-significant ($p>0.05$) effect of depression was recorded on snack intake however, few modifications were observed with varying severity of depression. Women with no depression reported greater intake of snacks with 64.3% (n=27) consuming morning snacks while 88.1% (n=37) having evening snacks. Same pattern persisted for participants with mild depression, with 93.4% (n=57) and 95.1% (n=58) consuming morning and evening snacks, respectively. However, only 42.9% (n=15%) women with moderate depression reported eating morning snacks and 85.7% (n=30) used to have evening

snacks. Simultaneously, all women with moderately severe and severe depression reported consuming both morning and evening snacks.

Consumption of lunch and dinner was significantly ($p<0.05$) influenced by depression. Women with no depression had higher frequencies of lunch (83.33%, n=35) and dinner (83.33%, n=35) intake on regular basis. However, a decline for lunch intake was observed (72.42%, n=25) among women with moderate depression. Likewise, intake of dinner meal was decreased to 57% (n=20) in participants with moderate depression. All the participants reported regular intake of lunch while 52% (n=3) and 40% (n=2) reported consuming dinner with moderately severe and severe depression, respectively. Depression had insignificant ($p>0.05$) impact on bed-time snacking. The current outcomes suggest potential relationship between severity of depression and regular meal intake specifically for breakfast, lunch and dinner.

Association Between Dietary Practices and PCOS

In this study, we investigated the impact of eating habits of women with PCOS on the disease development (Table **9**). A significant association ($p<0.05$) was observed between dietary patterns and development of PCOS. Among the 150 participants, 46% (n=69) reported regular intake of breakfast while 54% (n=81) were skipping it. Snacking habits for morning and evening revealed a major difference such that the majority (74%, n=111) were consuming morning snacks while only 9.3% (n=14) reported intake of evening snacks. Regarding lunch and dinner, 60% (n=90) and 76.7% (n=115) women were consuming these meals on regular basis, respectively. The least frequent eating habit was reported in terms of bed-snacking i.e., only 10.7% (n=16) women reported consuming bed-time snacks.

Table 9. Association of Dietary Practices and PCOS.

Characteristics		Test Statistics	
	PCOS	Chi-Square Value	p-value
Breakfast		$x^2 = 2.19$	0.035*
Yes	69		
No	81		
Snack		$x^2 = 3.03$	0.029*
Yes	111		
No	39		
Lunch		$x^2 = 0.742$	0.00*
Yes	90		
No	60		
Snack		$x^2 = 0.268$	0.875^{NS}
Yes	14		
No	136		
Dinner		$x^2 = 1.62$	0.001*
Yes	115		
No	35		
Before bed		$x^2 = 0.794$	0.672^{NS}
Yes	16		
No	134		

*= significant
NS= non-significant

DISCUSSION

The outcomes of current research revealed that the majority of participants were young women primarily single students with graduation. Although these features could be associated with selection criteria of the participants but yet numerous findings have reported the more cases of PCOS in young women compared to elder ones[9]. Likewise, Bilal and his peers conducted a comprehensive review from distinct regions over the globe, in order to identify the specific age group with higher incidence of PCOS. Their findings revealed that the vulnerable age range for occurrence and progression of PCOS is 12-25 years, primarily the reproductive age[25]. Majority of participants in this study reported engaging in physical activity but intensity and duration may not have met the required levels and 64% of participants struggled with weight management, reinforcing the established association of body weight with PCOS. Studies have reported that PCOS negatively effects the engagement in physical activities i.e., it may lead to declined muscular strength and fitness alongside the influence of emotional barriers i.e., fear of injury and lack of confidence[26].

Regarding weight management, our findings support the previously established strong association of obesity/overweight with PCOS. Approximately, 24% of participants in our research fell in the category of overweight and obesity similar to those These outcomes are in line with those reported by Ezeh and his co-workers who explored the prevalence of obesity in PCOS patients and reported that ~28% of women suffering from PCOS were obese[27]. Additionally, a local study conducted in hospital settings of Karachi, Pakistan revealed higher prevalence of menstrual irregularities i.e., amenorrhea, dysmenorrhea, irregular cycle, menorrhagia and polymenorrhagia in obese females compared to non-obese women[28]. On the other hand, we also observed a significant number of cases ~30% of PCOS among underweight participants. Healthy process of reproduction needs energy and prolonged deficiency of energy due to decreased food intake, intensive exercise and stress can disrupt the functioning of hypothalamic pituitary gonadal axis (regulator of reproduction and fertility via numerous hormones) resulting in anovulation[29]. Hence, these outcomes necessitates the holistic approach of weight management instead of just focusing on weight loss.

Furthermore, we investigated the co-occurrence of depression with PCOS demonstrating that 72% of the participants were suffering from depression with varying degree of severity. These findings represent a strong correlation between PCOS and progression of depression and vice versa. Like our outcomes, 50% prevalence of psychiatric morbidity among PCOS patients, has been reported by Chaudhari, AP. *et al.*[30]. Moreover, Damone and co-workers recorded the prevalence of clinical depression in 27.3% and anxiety in 50% cases of PCOS, in a community based study[31]. The exact aetiology of depression prevalence in PCOS patients is not clear yet however, certain explainatory factors that have been explored in previous conducts include prevalence of obesity, hyperandrogenism, and infertility associated demoralization imposed by society which in severe cases lead to social withdrawal alongwith the fear regarding living with longterm health complications[31,32]. Apart from this, studies have reported hormonal disturbance in PCOS such as increased GnRH and LH/FSH ratio which has been observed to be associated with decreased levels of monoamines i.e., epinephrine, norepinephrine, dopamine and serotonin levels in pituitary glands and hypothalamus of PCOS rat models[33,34].

Numerous studies have revealed a strong association of poor eating patterns with progression of depression. However, in current study we investigated the influence of depression on eating practices and our observation revealed a negative impact of depression on dietary practices. Particpants with depression reported an increase in consumption of sugars and processed foods coupled with decrease in intake of vegetable and fruits. These findings aligns with previous studies documenting change in appetite in response to severity of depression. However, heterogeneity has been observed in change of appeteite i.e., few people responded an overall increased food consumption while few reported decrease in consumption of egula meals partuclarly break fast and dinner. This heterogeneity is consistent with previous reports suggesting ~48% of patients with depression exhibiting decreased appetite while 35% experienced depression assocaited increase in appetite[35]. These change in appetite among depressive patients could be attributed to structural and functional modifications in neuricicuits of brain regions i.e., orbitofrontal cortex, amygdala insula etc. which are involved in governing the appetite responses. Furthermore, the hypoactivation and hyperactivation of these regions in response to food stimuli underlies the outcomes i.e., decrease or increase in appetite in depression[36,37].

Regarding association of dietary patterns with PCOS, we found that majority of participants akipped regular meals specially breakfast and lunch coupled with increased intake of morning snacks. The most common reasons behind skipping the breakfast among young girls have been identified as not feeling hungry, not enjoying eating

early or not having time for breakfast[38]. In a study conducted to explore association of dietary practices and PCOs among Iranian adolescents, it was reported that skipping regular meal either due to shortage of time or resultant to weight loss strategy, contributed to development and progression of PCOS[39]. Moreover, another study reported increased incidence of dysmenorrhea among girls with habits of skipping meals[40]. Skipping earlier meal of the day could impart detrimental influences on energy levels and enhances the cravings for intake of readily available, high calorie sncaks. These dietary preferences could temporarirly boost energy but ultimately will lead to weight gain and PCOS progression[41]. Moreover, results of a study conducted in Brazil reported that women who were skipping any main meal of the day had lower quality of diet in comparison to the non-skippers[42].

CONCLUSION

In conclusion, our study highlights a complex interplay of PCOS, eating practices, weight management, physical activity and depression. Our findings reinforce the previous associations of PCOS with various factors i.e., overweight/obesity, irregular physical activity, depression and unhealthy eating habits particularly. Considering the comorbidity of these ailments among women in northern Punjab, Pakistan highlights the need of region specific interventions in terms of awareness addressing the importance of physical activity, healthy eating patterns and mental well-being in promotion of healthy lifestyle. Furthermore, these observation underscores the need to explore the diversity of etiological, cultural and lifestyle factors contributing to PCOS as well as opens up avenues for establishment of new therapeutic regimen.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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None

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