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POLYCYSTIC OVARIAN SYNDROME (PCOS) AND ITS IMPACT ON MENTAL HEALTH: A CROSS-SECTIONAL STUDY IN PESHAWAR, PAKISTAN

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Abstract

Background: Polycystic ovary syndrome (PCOS) is an endocrine disorder that significantly affects the quality of life of women in the child-bearing period. However, there are many signs of PCOS such as hirsutism, infertility, insulin resistance, but the underlying psychological aspect of the disorder is relatively unknown especially in the culturally conservative environment of Peshawar city in Pakistan. This study aims to quantify the levels of anxiety, depression and loneliness among females with PCOS in Peshawar to quantify the levels of anxiety, depression and loneliness among women With PCOS in Peshawar to determine socio-demographic and lifestyle correlates of these outcomes among females with PCOS in Peshawar.

Methods: Four hundred and ten women diagnosed with polycystic ovary syndrome (PCOS) from lady Reading Hospital Peshawar, participated in the study, which used a cross-sectional survey approach. The UCLA Loneliness Scale (V3), the Generalised Anxiety Disorder 7-item (GAD-7 scale), and the Patient Health Questionnaire 9 (PHQ-9) were utilised for screening patients' mental health state. Using SPSS version 26, we ran chi-square tests and logistic regression to see how different socio-demographic factors correlated with different lifestyle and mental health outcomes.

Results:

The findings of this research showed that 55% of the participants were lonely, 65% had anxiety symptoms which fall under the category of Generalized Anxiety Disorder, and 45% presented with depressive symptoms which belong to the Depressive Disorder category. Positive significant relationships to BMI, marital status, education, economic status and life style behavior of these mental

health problems were established. In logistic regression analysis, irregular meal pattern, junk food intake and less BMI were found to have influence in mental health. It was also noted that those who lived with their families or women with higher economic background tended to have anxiety.

Conclusions:

The results show the existing high rate of mental health issues among women managing PCOS in Peshawar. Multidimensional bio-psychosocial management of PCOS is recommended in order to enhance the treatment outcomes of these patients in this region.

Introduction

Polycystic ovary syndrome (PCOS) is an endocrinal anomaly identified through disorder in ovarian structure, hormones and functions, it profoundly influences the reproductive health of women, thus resulting in bodily, psychological and emotional changes. This results in formation of multiple cysts in the ovarian antral follicles through female sex hormones imbalance(1). Three primary symptoms often indicate the presence of PCOS: Hyperandrogenism, ovulation irregularity and multiple small cysts within an enlarged ovary; polycystic ovary syndrome (PCOS)(2). The primary genital or secondary somatic sign or symptom that is readily apparent includes excessive hair production on the face, body, obesity, distribution of fat in the waist, abdomen, hip, thigh and insured skin, baldness, elongated clitoris, big voice, seborrhoea, and acne(3). Another sign of PCOS is the Insulin resistance (IR), which makes the patient prone to develop type II Diabetes mellitus due to hyperinsulinemia(4). The final emphasized symptom of the PCOS is sleep apnoea caused by the disturbance of sex steroid levels. In fact, till date, no unanimous opinion has evolved regarding the origin of PCOS and the pathological connections existing between them. PCOS may have a variety of causes ranging from genetics to one's lifestyle(3). Another theory that has also been proposed in other research is if there is a weakness in the insulin function as a root of the disorder. Other factors associated with the formation of the PCOS are thyroid abnormalities, congenital adrenal hyperplasia, hyperprolactinemia, androgen-producing tumors, and Cushing's disease(5). According to the survey, the distribution of PCOS is diverse ranging at about 21 percent. 27% of women worldwide with incidence approximately 6–10% in the developed countries(6).

The females with PCOS in Pakistan, especially in Peshawar which is a conservative province of the country, suffers social, physical, emotional and psychological problems which affects their health-related quality of life in general. Most of these women undergo one form of social hostile communication such as teasing and lack of support from family members, hence developing high stress levels, discouragement, and social isolation(7). Physical features of PCOS, obesity, hirsutism, hair loss, irregular menstruation, and facial acne lead to low self-esteem and social rejection that in turn cause psychological problems. The inability to conceive by PCOS leads to feelings of shame and low self-esteem that contributes to divorce rates and strained marriages. Hence, PCOS affects psychological well-being of women by increasing anxiety, depression and loneliness (8).

Effective for consideration, research evidence relates to the fact that PCOS patients are often characterized by a prediabetic state, increased levels of anxiety and depression, and worsening of their condition due to weight gain. Some previous research has revealed that physical obesity is positively associated with depressive symptoms in women with PCOS. Depression and anxiety disorders are known to be present in women with PCOS and the severity of the symptoms are related to hyperinsulinemia and hyperandrogenism that are the known causes of the illness. These dysfunctions lead to additional hormonal imbalances in women with PCOS, which in turn provoke the development of anxiety, thereby increasing the intensity of depressive disorders. It makes sense to speak about the association between PCOS and psychological disorders, urging for proper individual support concerning the problem(9–12).

Hence, this study adopted the socio-cultural perspective to evaluate the level of mental health of women with PCOS in Peshawar – Pakistan. Thus, the generalizability of the identified PCOS symptoms and the association with mental health deficits and disorder are still uncertain in terms of the Pakistani population. Hence, the aim of the current study is to assess the psychological well-being of the women with PCOS in Peshawar city and the potential Risk Factors associated with Poor

Psychological well-being. It is believed that this study will add to the current understanding of the psychological characteristics of PCOS in this population and therefore holds potential to enhance the treatment outcomes and the overall quality of life of women with PCOS.

Materials and Methods

Study Design and Participants

This was a cross-sectional descriptive study which took place in Lady Reading Hospital Peshawar Pakistan between January 2019, and June 2019. The study tools included an online structured questionnaire. We used a confidence level of 95%, and a margin of error of 5% and tests were distributed 50/50; thus, we needed at least 384 completed responses to give at least 80% statistical power. Altogether the first wave of survey received 450 responses however 41 responses were incomplete hence excluded and thus the total number of usable responses were 409. The study participants comprised women diagnosed with PCOS; aged between 18 and 45 residing in Peshawar at the time of data collection. Participants were also informed of the study aim and procedures besides getting their electronic informed consent before enlisting them in the study. These included patients below 18 years of age, above 45 years of age, post-menopausal or perimenopausal or without a confirmed PCOS diagnosis. Participation was entirely voluntary.

Data Collection and Instruments

The study explored the relationship between participants information regarding the demographical features of the participants alongside the self-identified lifestyle characteristics were obtained and analyzed, and the impact on the mental health in women with PCOS was explored and contrasted. Mental health was assessed from patients' own perspective using the PHQ-9 for depressive disorder (13), GAD-7 for anxiety (14) and UCLA Loneliness Scale (Version 3) (15). The questionnaires were originally in English followed by translation by two bilingual proficient natives in English and Urdu. A professional translator later on translated the Urdu version into English in other to cross check and make sure it was correct. They were removed and answered by a third-party researcher each question was pilot tested on a small sample to check on the comprehensiveness of the questions. The last questionnaires were self-completed in Urdu and English so that all the participants could understand. The survey was accessed using links that came in an email or a WhatsApp message or a post on social media; participants were free to contact the researchers through video or a telephone if needed.

Socio-Demographic and Biophysical Measures

Marital status, BMI, age, level of education, economic status, area where they live, the type of house they live in, smoking habits and history of PCOS in their families were among the socio-demographic data collected. These variables were chosen since they are likely to influence the status of mental health among women with PCOS.

Mental Health Assessments

The depression assessment tool utilised was the PHQ-9, which yielded scores between 0 and 27. Mild depression was defined as 0–9, moderate as 10–14, moderately severe as 15–19, and severe as 20–27. There are four degrees of anxiety measured by the GAD-7 scales: 0–4 (no anxiety), 5–9 (mild anxiety), 10–14 (moderate anxiety), and 15–27 (severe anxiety). Scores on the measures can range from 0–27. The UCLA Loneliness Scale (Version 3) was used to measure loneliness; it has 20 items and is assessed on a 4-point scale, where higher scores indicate more loneliness.

Data Analysis

The analysis of the data was conducted using Statistical Packages for Social Sciences (IBM SPSS) Version 26.0. A summary of the characteristics of the study participants was obtained using descriptive statistics. Group differences were examined using chi-square tests, and an analysis of binary logistic regression was performed to uncover socio-demographic and lifestyle factors linked to mental health outcomes. A statistical significance level was defined as a p-value below 0.05.

Ethics

The study protocol was reviewed and approved by the Research Ethics Committee of Lady Reading Hospital in Peshawar, Pakistan (145-021-LRH). The study adhered to the ethical principles outlined in the Declaration of Helsinki. Informed consent was obtained electronically from all participants before the survey commenced

Results

Respondents Characteristics

The socio-demographic characteristics of the respondents are summarized in Table 1. Out of 409 women included in the study, a majority (61%) were aged between 18-25 years, 33% were aged 26-35 years, and 6% were aged 36-45 years. Over half of the respondents (54%) were married, while 46% were unmarried. Regarding education, 68% had completed graduate-level education, and the rest had a lower level of education. Most of the respondents (60%) reported having a low economic background, and 94% were non-smokers. Additionally, 85% of the participants lived with their families, and 22% resided in rural areas.

Table 1. Analysis of the distribution of socio-demographic variables and their correlation with mental health issues in patients diagnosed with PCOS.

Variable	Percentage (%)	Loneliness (%)	Anxiety (%)	Depression (%)
Age (years)				
18-25	61	55	67	47
26-35	33	52	64	45
36-45	6	48	60	42
Marital Status				
Married	54	49	51	50
Unmarried	46	51	49	50
Education				
Graduate	68	65	63	64
Non-Graduate	32	35	37	36
Economic Background				
Low	60	58	61	60
High	40	42	39	40
Smoking Status				
Smoker	6	4	5	5
Non-Smoker	94	96	95	95
Residence				
Urban	78	76	75	76
Rural	22	24	25	24

Lifestyle-Related Factors

The elements pertaining to the respondents' lifestyles are displayed in Table 2. The majority of the individuals (75%) exercised for less than 30 minutes daily, and only 25% were regular exercisers. Not only that, but 92% of people who took the survey ate a variety of foods, and 22% of those people regularly ate junk food. Among those who reported irregular eating habits, 10% did it on a regular basis, 35% did it occasionally, and 55% did not adhere to any kind of meal plan at all. Only a quarter of people drank more than eight glasses of water daily; twenty-eight percent utilised a method of birth control; and sixteen percent used oral contraceptives.

Table 2. Distribution of Lifestyle-Related Factors and Their Association with Mental Health Problems among Patients with PCOS.

Lifestyle Factor	Percentage (%)	Loneliness (%)	Anxiety (%)	Depression (%)
Physical Activity				
Regular	25	25	26	25
Irregular	75	75	74	75
Junk Food Consumption				
Frequent	22	30	28	27
Occasional	78	70	72	73
Meal Schedule				
Regular	55	44	46	43
Irregular	45	56	54	57
Water Consumption				
Less than 8 Glasses	76	58	60	59
More than 8 Glasses	24	42	40	41
Birth Control Method				
Yes	28	27	26	24
No	72	73	74	76
Oral Contraceptive Pills				
Yes	16	17	16	15
No	84	83	84	85

Psychometric Parameters

The prevalence of loneliness, generalized anxiety disorder, and depressive disorder was found to be 55%, 65%, and 45% respectively (Figure 1). The relationships between these mental health conditions and socio-demographic as well as lifestyle factors are further elaborated in Tables 1 and 2. Loneliness was more prevalent among those with a BMI within the normal range, those who were married, and those with a higher education level. Generalized anxiety disorder was observed more frequently in married women, those with a lower economic background, and those who lived with family members. Depressive disorders were more common among women with lower BMI, those from lower economic backgrounds, and those who consumed less than 8 glasses of water per day.

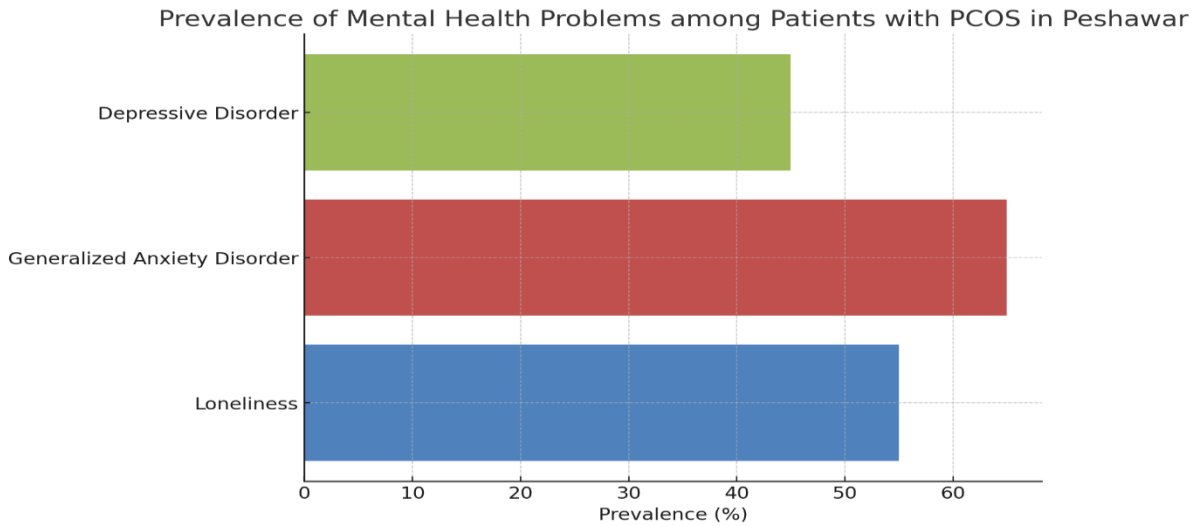

Figure 1. Prevalence and Distribution of Mental Health Problems among Patients with PCOS in Peshawar.

Regression Analysis

Table 3 shows that there were substantial associations between socio-demographic characteristics and mental health outcomes when using binary logistic regression analysis. Compared to obese women, women whose body mass index was less than 18.5 were 1.5 times less likely to experience depressive disorders (OR = 1.5, 95% CI 0.98-2.34, p = 0.052). Generalised anxiety disorder was 1.7 times more common among those who lived with their families compared to those who lived alone (OR = 1.7, 95% CI 0.98-2.96, p = 0.058). Furthermore, anxiety was 1.8 times more common among those from higher-income backgrounds than those from lower-income backgrounds (OR = 1.8, 95% CI 1.05-3.11, p = 0.062).

Women who exercised frequently had a lower risk of depressive disorders, according to the regression analysis of lifestyle-related variables (Table 4). Higher rates of depression were positively connected with junk food consumption and irregular meal timings.

Table 3. Regression Analysis of Socio-Demographic Variables and Their Association with Mental Health Problems among Patients with PCOS.

Variable	Odds Ratio (OR)	95% CI	p-Value
BMI < 18.5	1.5	0.98–2.34	0.052
Living with Family	1.7	0.98–2.96	0.058
High Economic Background	1.8	1.05–3.11	0.062

Table 4. Regression Analysis of Lifestyle-Related Factors and Their Association with Mental Health Problems among Patients with PCOS.

Lifestyle Factor	Odds Ratio (OR)	95% CI	p-Value
Regular Physical Activity	0.8	0.56–1.12	0.074
Frequent Junk Food	1.4	1.02–2.31	0.078
Irregular Meal Schedule	1.5	1.12–2.34	0.032

Discussion

Polycystic Ovary Syndrome (PCOS) is acknowledged as one of the frequently seen causes of ovarian dysfunction with increased estrogen production in females. This condition is often accompanied by chronic anovulation, hyperandrogenism and different metabolic disorders – insulin resistance (IR) which precedes glucose intolerance and obesity(3). In the recent past, several investigations have proposed that HA and IR are two main key factors in PCOS, especially in most cases HA and IR are known act synergistically to worsen the condition(4). That is why it is also pertinent to note that the women with PCOS have different physical characteristics such as obesity, acne and excessive hair growth, and irregular menstrual cycles. These physical complications are worsened by many psychosocial stressors thus high incidence of psychiatric illnesses such as depression and generalised anxiety disorder(8,12).

The current research was therefore conducted with the aim of identifying the prevalence of the mental health difficulties including loneliness, generalised anxiety disorder, and depressive disorder among women with PCOS in Peshawar, Pakistan. There is evidence from our study that anthropometric characteristics, marital status, education level, economic status and family history of PCOS might contribute to Mental health disorders in this group of patients (16,17). In the light of current and past research exploring the role of lifestyle changes in management of PCOS these finding depicted a true picture(8).

The findings from this study indicated that there is a positive regression with the respondents' level of educations, loneliness, anxiety, and depression(9). About higher education, female participants with graduate level and above revealed higher level of mental health problems than their counterparts with lesser education. Further, there was direct relationship between economic status and psychological wellbeing, where the people belonging to low-income category had higher score on Lipp's psychological distress scale. The majority of respondents lived with their families, which also

appeared to influence their mental health, as nearly all participants reported experiencing some form of mental health issue.

In terms of the profile of lifestyle factors, the proposed paper revealed that only physical activity, diet and water intake affected MH. Women who engaged in regular physical activity, adhered to a balanced diet, and maintained adequate hydration reported better mental health compared to those with less healthy lifestyles(18). Interestingly, the use of contraceptive pills and birth control methods was also associated with mental health outcomes, with women not using these methods reporting more mental health issues(19).

While previous studies have explored the mental health challenges faced by women with PCOS, few have focused on the specific socio-demographic and lifestyle factors that contribute to these issues in the context of Peshawar, Pakistan (20). The results of this study emphasize the necessity of taking into account both physical and mental conditions in dealing with the disease PCOS. In line with previous studies, we further observed that women with PCOS exhibit an increased susceptibility for depression and anxiety disorders(21). Furthermore, depression in PCOS women and higher BMI has been evident in other studies, our our study did not determine that the BMI affected the mental health of such ladies considerably.

To the author's knowledge this is the first study which aimed to investigate socio demographic and lifestyle factors in relation to mental health problems of women with PCOS in Peshawar. Demographics including education, income, marital status, family history of PCOS, physical activity, diet, and hydration level were determined as crucial indicators of loneliness, anxiety, and depression in women with PCOS. Since the cause of PCOS is still unknown lifestyle modification may have significant potential in enhancing mental health of women with PCOS(22). Our study showed that 72% 87% and 61% 57% of participants interviewed had experienced loneliness, anxiety and depression respectively and the odds of having the later three mental health challenges were significantly associated with socio-demography and lifestyle factors. Isberg et al., in their meta-analyses, have revealed that the rates of depression and anxiety among women with PCOS are as high as 36 percent. undefined 9%, respectively; therefore, it can be concluded that PCOS leads to an enhanced risk of mental health issues(22).

Potential Limitations of the Study

The following are some of the limitations of this study that need to be stated. The use of online self-report surveys, such as Google Forms, may introduce selection bias, as participants without internet access were excluded from the study. However, the present research was a cross-sectional study, which does not allow pinpointing a causal relationship between PCOS and mental health. In addition, the clinical diagnosis of PCOS was made by the physicians before data collection with no cross verification of diagnoses during the study period. This limitation may affect the accuracy of the data. Thus, this limitation may limit the extent of the data accuracy. Last but not the least, lack of casualization because the study employs cross-sectional snapshot of public health is another limitation that should be considered.

Practical Implications

This study may help those in practice of health care in Peshawar to do understand the need and the situations those women of this region are confronting. Being lonely, suffering from generalized anxiety disorder, or having depressive disorder with PCOS is established in women of Peshawar. The evaluation of socio-demographic and lifestyle patterns that increase the risk of mental health disorders is useful for developing preventive measures. Local healthcare authorities should possibly attempt at formulating policies that include the psychological as well as the physical wellbeing of women who have PCOS. Furthermore, it can be helpful to modify international discourse about females with PCOS, focusing on the mental health importance of some treatment approaches.

Conclusion

The experiences of the women with PCOS in Peshawar suggest that these women and others with similar complaints are potential candidates for mental disorders like loneliness, anxiety and

depression. These extra mental health issues are partly due to several factors: concerning sociodemographic characteristics and aspects of daily living as well as personal well-being. To minimize these risks, therapeutic treatments, enhancing the community awareness and prompt adherence to proper diet and exercise regimen in women with PCOS ought to be offered. More research should be conducted regarding the levels of loneliness, anxiety and depression in the population of women diagnosed with PCOS in order to assess the impact of this disease more globally.

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References

1. Azziz R, Carmina E, Chen Z, Dunaif A, Laven JSE, Legro RS, et al. Polycystic ovary syndrome. Nat Rev Dis Primers. 2016 Aug 11;2.
2. Zeng X, Xie Y jie, Liu Y ting, Long S lian, Mo Z cheng. Polycystic Ovarian Syndrome: Correlation Between Hyperandrogenism, Insulin Resistance and Obesity. Clin Chim Acta. 2019 Mar 1;502:214–21.
3. Dumesic DA, Oberfield SE, Stener-Victorin E, Marshall JC, Laven JS, Legro RS. Scientific statement on the diagnostic criteria, epidemiology, pathophysiology, and molecular genetics of polycystic ovary syndrome. Endocr Rev. 2015;36(5):487–525.
4. Uthman OA. Global, regional, and national disability-adjusted life years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990-2015: a systematic analysis for the Global Burden of Diseases, Injuries, and Risk Factors (GBD) 2015 Study. Lancet. 2016 Oct 8;388(10053):1603-58.
5. Sidra S, Tariq MH, Farrukh MJ, Mohsin M. Evaluation of clinical manifestations, health risks, and quality of life among women with polycystic ovary syndrome. PLoS One. 2019 Oct 1;14(10).
6. Damone AL, Joham AE, Loxton D, Earnest A, Teede HJ, Moran LJ. Depression, anxiety and perceived stress in women with and without PCOS: a community-based study. Psychol Med. 2018 Jul 1;49(9):1510–20.
7. Karjula S, Morin-Papunen L, Auvinen J, Ruokonen A, Puukka K, Franks S, et al. Psychological Distress Is More Prevalent in Fertile Age and Premenopausal Women With PCOS Symptoms: 15-Year Follow-Up. Journal of Clinical Endocrinology and Metabolism. 2017 Jun 1;102(6):1861–9.
8. Yin X, Ji Y, Chan CLW, Chan CHY. The mental health of women with polycystic ovary syndrome: a systematic review and meta-analysis. Arch Womens Ment Health. 2020 Feb 1;24(1):11–27.
9. Mitchell AJ, Yadegarfar M, Gill J, Stubbs B. Case finding and screening clinical utility of the Patient Health Questionnaire (PHQ-9 and PHQ-2) for depression in primary care: a diagnostic meta-analysis of 40 studies. BJPsych Open. 2016 Mar;2(2):127–38.
10. Löwe B, Decker O, Müller S, Brähler E, Schellberg D, Herzog W, et al. Validation and Standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the General Population. Med Care. 2008 Feb;46(3):266–74.
11. Russell DW. UCLA Loneliness Scale (Version 3): reliability, validity, and factor structure. J Pers Assess. 1996;66(1):20–40.
12. Sadeeqa S, Mustafa T, Latif S. Polycystic ovarian syndrome–related depression in adolescent girls: a review. Journal of Pharmacy and Bioallied Sciences. 2018 Apr 1;10(2):55-9.
13. Tan J, Wang QY, Feng GM, Li XY, Huang W. Increased risk of psychiatric disorders in women with polycystic ovary syndrome in Southwest China. Chinese medical journal. 2017 Feb 5;130(03):262-6.
14. Conte F, Banting L, Teede HJ, Stepto NK. Mental Health and Physical Activity in Women with Polycystic Ovary Syndrome: A Brief Review. Sports Medicine. 2015 Apr 1;45(4):497–504.

15. Dokras A, Sarwer DB, Allison KC, Milman L, Kris-Etherton PM, Kunselman AR, et al. Weight Loss and Lowering Androgens Predict Improvements in Health-Related Quality of Life in Women With PCOS. Journal of Clinical Endocrinology and Metabolism. 2016 Aug 1;101(8):2966–74.
16. Greenwood EA, Pasch LA, Shinkai K, Cedars MI, Huddleston HG. Clinical course of depression symptoms and predictors of enduring depression risk in women with polycystic ovary syndrome: Results of a longitudinal study. Fertil Steril. 2019 Jan 1;111(1):147–56.
17. Benson S, Janssen OE, Hahn S, Tan S, Dietz T, Mann K, et al. Obesity, depression, and chronic low-grade inflammation in women with polycystic ovary syndrome. Brain Behav Immun. 2008 Feb;22(2):177–84.
18. Conte F, Banting L, Teede HJ, Stepto NK. Mental Health and Physical Activity in Women with Polycystic Ovary Syndrome: A Brief Review. Sports Medicine. 2015 Apr 1;45(4):497–504.
19. Cheslack-Postava K, Keyes KM, Lowe SR, Koenen KC. Oral contraceptive use and psychiatric disorders in a nationally representative sample of women. Archives of women's mental health. 2015 Feb;18:103-11.
20. Shammi MN. A Study On Knowledge & Awareness Of Polycystic Ovarian Syndrome Among Female Students Of Public And Private Medical Colleges In Dhaka (Doctoral dissertation, East West University).
21. Brutocao C, Zaiem F, Alsawas M, Morrow AS, Murad MH, Javed A. Psychiatric disorders in women with polycystic ovary syndrome: a systematic review and meta-analysis. Endocrine. 2018 Nov;62:318-25.
22. Palomba S, Santagni S, Falbo A, La Sala GB. Complications and challenges associated with polycystic ovary syndrome: current perspectives. International journal of women's health. 2015 Jul 31:745-63.