

Incidence, Awareness and Association of Lifestyle Modification with Symptoms of Polycystic Ovaries (PCOs)

Zara Sami, Dania Farah, Hajra Naz

ABSTRACT

Objective: To determine incidence, awareness and association of Lifestyle modalities with symptoms of Polycystic Ovaries (PCOS) among females of two institutes

Study design and setting: It was a Pilot study based survey at University of Karachi and Bahria University, Pakistan.

Methodology: Following ethical approval, structured questionnaire was designed, validated and distributed as per convenient sampling.

Results: SPSS analysis for 196 responses revealed that 4.6% were PCOS afflicted while 26% of non-PCOS were vulnerable cases on account of suffering any two of the three criterion symptoms of PCOS namely: menstrual irregularities, hirsutism and acne. Chi-square based cross tabulations revealed that PCOS females were predominantly between 21-25 years and were lean singles who exhibited a tendency to exercise, consumed poultry, slept late at night and used plastics by large in daily routine. Females susceptible to PCOS significantly exhibited the criterion symptoms when associated to consumption of poultry chicken, passive smoking and plastic usage on regular basis. Significantly larger proportion (70%) of non-PCOS females were aware about this disease but symptomatic, diagnostic and treatment based knowledge was significantly less prevalent. A significant percentage of females (61.5%) associated PCOS to the occurrence of infertility.

Conclusion: Thus, concluding that imparting awareness about etiological factors, symptomatology and lifestyle triggers can enable females to ensure self-check and curb the chances of being prone to PCOS by avoiding plastics and smoking environment and incorporating weight management in their lifestyle.

Keywords: Life Style, Menstruation Disturbances, Polycystic Ovary Syndrome, Pilot Project, Pakistan, Questionnaires, Surveys, Universities.

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INTRODUCTION:

Polycystic ovarian syndrome (PCOS) occurs when the female hypothalamic pituitary ovarian axis is deregulated thus bestowing detrimental consequences on the life of 6-20% of women in their reproductive period¹ thus featuring infertility derangements in androgen and estrogen leading to diabetes mellitus, depression², anxiety, dyslipidemia cardiovascular complications and cancer.²

Guidelines published for the diagnosis of PCOS as indicated by Rotterdam criteria (2003) is the presence of 2 out of 3 findings such as hyperandrogenism, oligo or anovulation, multiple cyst on the ovaries; hyperandrogenism being the most prevalent. Various animal models ranging from rodents, sheep and nonhuman primates have been established³, keeping in view this criteria to explore the pathogenesis of PCOS and the role of interventions in these PCOS induced models.

A study conducted in China has elucidated the role of brain monoamines in DHEA- induced PCOS mice thus exhibiting depression like behavior.³ Other androgen-induced PCOS models have demonstrated modulated reproductive, endocrine and metabolic traits. A preclinical quest into the intersection of PCOS and gut microbiome, which initiated in 2016, was subsequently followed by clinical studies.⁴

Preclinical trials have also endorsed that environmental modulation can instill PCOS. Continuous prolonged exposure to light⁵ and chronic cold stress can exhibit PCOS like features and morphology. Authors have demonstrated that consumer products such as monosodium glutamate (a flavor enhancer) when administered to neonatal rodents, PCOS

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like morphology was exhibited in late adult period.⁶ Bisphenol A (BPA) found in plastics and nipples of bottles of babies could precipitate PCOS like phenotypes in neonatal rats.⁷

Clinical studies from Chinese women with PCOS have illustrated a 6 fold greater vulnerability of developing type 2 diabetes mellitus (T2DM) compared to non PCOS.⁸ Meta-analysis has revealed that PCOS inflicted women exhibited 2 fold increase in impaired glucose tolerance (IGT), T2DM, and metabolic syndrome (MetS). A follow-up of PCOS inflicted populations have demonstrated a rapid rise in T2DM.

Having discussed the aforementioned studies, it thus implies that PCOS induced heavy burdens are thus incurred on health care resources.⁹ The prevalence of PCOS is higher in Pakistani women (52%) than among Western Caucasian women.¹⁰ Unawareness might be one of the reasons of its high prevalence in Pakistan. It's prudent to estimate the prevalence of PCOS which in turn is connected to knowledge and awareness. Hence, the pilot survey is an effort to determine the occurrence of PCOS, its awareness and possible influence of lifestyle triggers, which include exercise, sleeping routine, poultry consumption, active/passive smoking and use of plastic containers, in inducing PCOS at two post graduate institutes of Karachi via a validated questionnaire.

METHODOLOGY:

It was a Pilot study based survey at University of Karachi and Bahria University, Pakistan.

The research proposal was approved by the Institutional Bioethical Committee of University of Karachi and IBCKU-147-2020 was assigned by the authorities. Questionnaire was formulated using the variables from literature. Its face validity¹¹ was established beginning with the completion of the questionnaire by one known case of PCOS with enough knowledge. She was also asked for suggestions of missing questions that were subsequently incorporated. A newly modified questionnaire was handed over to another participant with sound knowledge of PCOS for comprehension of the questions. Suggested propositions were also incorporated. This process was repeated with two new participants having sufficient knowledge of PCOS, contrary to the earlier evaluators. Thus, the face validity was established and the finalized questionnaire was then floated in the two institutes: University of Karachi and Bahria University. Convenient sampling considering the rule of thumb of sample size proposed by Browne¹² was adopted. Total 38 students from University of Karachi and 162 students from Bahria University voluntarily participated in the study. Investigator obtained permission from the students prior to data collection, assured confidentiality to the participants and explained the purpose of study. Along with demographics, variables used in the survey included hirsutism, a condition of unwanted male-pattern hair growth in women; Acne also known as *acne vulgaris*, a skin disease that occurs when hair follicles

are clogged with dead skin cells and oil from the skin and *Obesity*, a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health. Lifestyle variables, diet, chicken consumption, passive smoking, sleeping time, exercise and use of plastics were also examined.

Single and married females from puberty to menopause (categorized for analyses) were included in the pilot study and postmenopausal women, girls below puberty and females not willing to volunteer were excluded from the study.^{13,14}

Statistical analysis of survey was performed by SPSS version 23 for descriptive statistics and chi square based cross tabulations for categorical variables were obtained to assess the relationship between determining factors and existence of PCOS at significance level $p < 0.05$.

RESULTS:

The findings from the pilot study of 200 participants from University of Karachi and Bahria University, Pakistan have been classified into PCOS afflicted and probable PCOS cases based on Rotterdam criteria. Chi square based cross tabulations from 196 valid responses revealed that 4.6% females were PCOS as diagnosed by their personal doctors. It's interesting to note that only 33% of PCOS afflicted females exhibited the two out of the three Rotterdam criterion symptoms namely: irregularity of menses, hirsutism and/or acne. Whereas, approximately 26% of non-PCOS cases reported that they were facing at least 2 of the above stated symptoms of PCOS. Thus, they might be the probable cases of PCOS.

The relationship of diagnosis of PCOS and age was significant ($p < 0.01$) suggesting maximum (44.4%) cases in age group of 21-25 years. From the data of 6 PCOS females 5 were lean (BMI = 18.54-24.9) whereas, only one was overweight (BMI = 28.47). Total 8 females who responded to the variable of marital status in the questionnaire were single. From the available options of doctors in the questionnaire, all PCOS sufferers were consulting gynecologists and 3 reported a family history of PCOS.

Majority of PCOS sufferers had a regular exercise routine (77.8%) and were involved in some kind of household work like sweeping (66.7%). The diet composition of PCOS sufferers was a combination of vegetable and meat. All females with PCOS were consuming chicken at least once a week with majority consuming thrice or on daily basis. Total 88.9% of PCOS inflicted consumed poultry and ate at least one piece of chicken daily ($p < 0.05$). Total 22.2% of PCOS females tended to eat 4 pieces/ day. Chicken breast was the most liked (55.67%) amongst the PCOS afflicted. All PCOS sufferers did not exhibit a healthy lifestyle by sleeping late at night that is beyond 9pm. Coffee consumption was not a significant characteristic of PCOS females as 44.4% were using coffee occasionally and only 1 PCOS participant consumed 3 cups of coffee on daily basis. Usage

of plastic in daily life was a popular feature in PCOS cases, though not statistically significant.

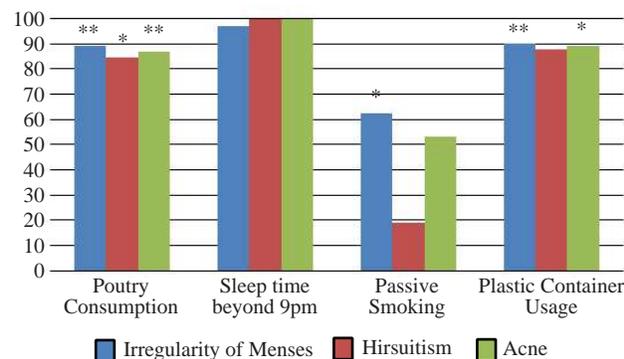
Demographic And Lifestyle Characteristics With Respect To Symptomatology Of Pcos In Vulnerable Cases

In the present pilot study, 68.4% of females suffering from irregularity of menses ($p < 0.0001$) and 73.6% of acne sufferers ($p < 0.05$) belonged to the age bracket of 15-20 years as per likelihood ratio test. 66% PCOS vulnerable females had normal BMI ranging between 18.5-24.9. 93.75% of these probable PCOS females reported single marital status.

The findings for type of diet in vulnerable cases were similar to the diagnosed cases as 93.75% consumed a combination of vegetarian and non-vegetarian. Consumption of poultry chicken was significantly prevalent in more than 80% of females having the three individual criterion symptoms of PCOS though not diagnosed with the disease (figure 1). Amongst the non-PCOS; 77.9% females having irregularity of menses, 85.2% hirsutism and 83% acne sufferers were consuming chicken more than once in a week. 43.2% of non-PCOS females having irregularity of menses and 37% of hirsutism sufferers liked breast piece ($p > 0.05$). Whereas, 47.2% of non-PCOS acne afflicted females expressed likeness of leg piece. The highest frequency of chicken consumption was thrice a week (43.75%) with majority consuming one piece per meal and showing greater likeness for leg piece 45.6%.

Passive smoking was significantly associated to occurrence of irregularity of menses and acne as compared to hirsutism. 62.5% of females belonging to the family having chain smokers suffered from irregularity of menses ($p < 0.05$). Similarly 53.1% female passive smokers reported the problem of acne ($p < 0.05$) with 50% identifying father/brother/husband as smoking family members. Hirsutism was not associated to the chain smoking in the family as only 18.8% passive smoking females reported this characteristic feature of PCOS ($p > 0.05$). A significant majority of females suffering from irregularity of menses (90.3%, $p < 0.01$) and acne (85.7%, $p < 0.05$) were users of plastic bottles in daily routine.

Figure 1 shows the occurrence of symptoms of PCOS with respect to lifestyle variables in non-PCOS females such that $p < 0.01$ and $p < 0.05$



Knowledge About PCOS Amongst Non-PCOS In Pilot Study.

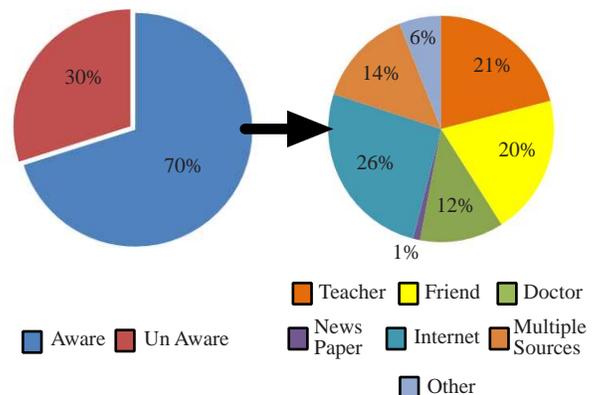
A significant majority (70%, $p < 0.01$) of non-PCOS females were aware about this disease and internet was the popular source of information (26%, $p < 0.01$) as evident from figure 2. From 30% of those who were unaware, age-wise comparison showed that majority of unaware females belonged to age group of 15 to 20 years (63.2% of 30%).

Lack of exercise was reported by 49% vulnerable PCOS females. Similarly, 36.17% of them reported lack of performance of household work like sweeping. With respect to symptoms of PCOS; 41.6% females with irregularity of menses, 38.5% hirsutism sufferers and 36.5% acne sufferers reported that they never performed exercise but there was a likelihood to perform household work like sweeping very often in females with irregularity of menses (45.3%), hirsutism (44.9%) and acne (49.1%) though the associations were not significant ($p > 0.05$) as asked in a separate question.

The unhealthy sleeping routine of females exhibiting symptoms of PCOS was comparable to the diagnosed cases as 97.3% females with irregular menses slept after 9 pm whereas, all females suffering from hirsutism and acne slept beyond 9 pm (figure 1).

Knowledge in terms of symptoms was significantly less prevalent (table 1) as 26.4% of non-PCOS reported that menstrual problem was a symptom of PCOS ($p < 0.001$). Similarly 7.1% ($p < 0.001$), 24.2% ($p < 0.01$) and 20.9% ($p < 0.05$) were aware about obesity, acne and depression as symptoms of PCOS respectively. Knowledge was also gauged by asking about the diagnostic tests and treatments for PCOS and infertility as prominent consequence of PCOS. Probing into the diagnostic and treatment relevant knowledge revealed that Pelvic Ultrasound (44.3%) was most popularly and significantly ($p < 0.01$) known diagnostic test in undiagnosed PCOS (table 2). Similarly, very few reported weight loss and diet adjustment (37%, $p < 0.01$) and Glucophage (12%, $p < 0.05$) as treatments for PCOS (table 2). Awareness about infertility as a consequence of PCOS

Figure 2: Shows the awareness in non-PCOS females and sources of knowledge



DISCUSSION:

Approximately 100% of diagnosed PCOS cases in the conducted survey reported irregularity of menses ($p < 0.001$) which can be supported by a survey conducted in Tamil Nadu where the student exhibited PCOS induced oligomenorrhea.¹³ In addition to this the PCOS afflicted, 88.9% reported acne ($p < 0.001$) and 55.5% reported hirsutism ($p < 0.01$) in the current study. Previous researches have also shed light to such findings where survey conducted in India, showed that 70% students had oligomenorrhea and polycystic ovaries, 13.3% had hirsutism and polycystic ovaries, 3.3% had oligomenorrhea and hirsutism and 13.3% had all the three features.¹³ Hirsutism, acne and irregularity of menses can lead to poor self-confidence; thus, precipitating psychological stress. Studies have reported that nearly 50% women in the previous studies and 63.3% (irrespective of whether they were PCO sufferers or not) in the current study significantly ($p < 0.05$ as per likely hood ratio) believed that PCOS is a known cause of infertility and miscarriage which in turn can lead to psychological problems¹⁴ as also evident from the present study where concurrence of depression and occurrence of PCOS as per the knowledge of participants was also significant ($p < 0.05$), though reported by only 22.5%.

This study showed that 33.3% of subjects suffering from PCOS belonged to 15-20 age bracket and 44.4% belonged to 21-25 age bracket. Findings are in concordance with the studies of India showing that 46.50% infertile women were suffering from PCOS and majority belonged to the age group 21-30 years (71.53%).¹⁵ A similar study conducted

in India reported 30% cases diagnosed with PCOS are in 15-20 years of age and 35% cases in 21-25 years.¹⁵ This, thus, summarizes the existence of the signs and symptoms related to PCOS start appearing in young menstrual life which stresses the importance of evaluation of young girls at an early age in order to prevent them from serious problems like impaired glucose tolerance, type 2 diabetes, hyperlipidemia, CV diseases and increased risk of endometrial cancer in the later ages.²

Results showed that 66.7% of PCOS sufferers suggested that doctor was the most suitable source of information ($p < 0.01$) that are in accordance to the findings of Taylor and co-authors.¹⁶ However, are different from Avery¹⁷ who reported Internet as the preferential source. Avery's¹⁷ findings are parallel to the present study for Non-PCOS females in particular as they reported internet as the most significantly popular source of information.

Life style modulations might play a crucial role in the occurrence of PCOS. Total 10 items from the questionnaire focused on the prevalent life style which was with reference to chicken consumption; its quantity and type of meat selected, exercise, sleeping habits, and presence of chain smokers, coffee consumption, and storage of food in plastic containers.

A study conducted in Rawalpindi has demonstrated a strong association of PCOS with regular intake of broiler chicken¹⁸ similar to the present survey. In addition the probable cases also consumed poultry thus it could be the causative agent in the precipitation of PCOS in both vulnerable and known cases: while the probable cases exhibited a greater likeness towards the leg piece and the known towards the breast piece and this could be due to the reason that commercial chicken reared on commercial feed causes increased synthesis of estradiol and disrupts the irregularity of menstrual cycle leading to a disturbed reproductive cycle causing infertility. Frequency of chicken consumption alters estradiol levels that could lead to obesity.¹⁹

Probable cases also exhibited lack of exercise which is a

Table 1: Shows the awareness in non-PCOS females regarding the symptoms of PCOS

| | Known (n) | Not Known (n) | |
|-------------------|-----------|---------------|-------------|
| Menstrual Problem | 48 | 134 | $p < 0.001$ |
| Obesity | 13 | 169 | $p < 0.001$ |
| Acne | 44 | 138 | $p < 0.01$ |
| Depression | 38 | 144 | $p < 0.05$ |

Table 2 shows the frequency (n) of non-PCOS females having knowledge about diagnostic tests and treatments for PCOS

| | | Known (n) | Not Known (n) | |
|------------------------|---------------------------------|-----------|---------------|------------|
| Diagnostic Test | Pelvic Ultrasound | 82 | 103 | $p < 0.01$ |
| | Sonography | 29 | 156 | $p > 0.05$ |
| | Laparoscopy | 08 | 177 | $p > 0.05$ |
| | Serum Androgen Test | 27 | 158 | $p > 0.05$ |
| PCOS Treatment | Oral Contraceptives | 32 | 145 | $p > 0.05$ |
| | Clomiphene, Leuprolide | 09 | 168 | $p > 0.05$ |
| | Weight Loss and Diet Management | 65 | 112 | $p < 0.01$ |
| | Surgery | 131 | 46 | $p > 0.05$ |
| | Glucophage | 21 | 156 | $p < 0.05$ |

fine line of treatment and in the management of PCOS.²⁰ Weight loss improves every aspect of PCOS from ovulation to pregnancy rates. It lowers testosterone levels and improves psychological anomalies as well.²¹

Passive smoking environment could instate irregularity in menses and acne as reported in the current findings which could be supported from the findings that second hand smoke could induce a high risk of metabolic syndrome and reduce conception rates in PCOS.²² A greater percentage of surveyed population is using plastic storage boxes and bottles. Research has established that bisphenol A (BPA) present in the plastics can act as hormone disruptor and be a cause of Polycystic ovaries.²³ PCOS sufferers and probable cases exhibited delayed sleep. Our results exhibit consistency with the previous authors that women with PCOS demonstrate poor sleeping habits^{24,25} while to add to it women with one or two symptoms of PCOS exhibited inappropriate sleeping habits in the current survey.

Thus, it is prudent to take care of the signs and symptoms of PCOS and modulate life styles which are also acting as determinants of PCOS.

The limitations of the present study could include the diversification of the sample that is the questionnaire could have been floated to the girls of similar age group having less education. Thus, it then becomes prudent to translate the questionnaire in Urdu and other languages to get a better outlook regarding awareness. Many other lifestyle modifications could be also incorporated in the questionnaire.

CONCLUSION:

Dissemination of awareness of the underlying features of PCOS would be imperative in reducing PCOS induced psychological stress and to resort to immediate medical treatments; hence, reducing the burden on economy. Moreover unhealthy lifestyle modulation could be a contributing factor which could be; otherwise, avoided to minimize or alleviate PCOS associated pathologies.

Authors Contribution:

Zara Sami: Conception and design

Dania Farah: Analysis and Interpretation of data

Hajra Naz: Intellectual design and interpretation

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