Original Article

Pakistan Journal of Public Health
https://doi.org/10.32413/pjph.v14i3.1234
www.pjph.org

Investigating the Association Between Polycystic Ovary Syndrome (PCOS) and Poultry Chicken Consumption Among Females Aged 15–30 in District East Karachi

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Abstract

Background: This study aimed to explore the association between poultry chicken meat consumption and polycystic ovary syndrome (PCOS) among females aged 15–30 years, classified as youth in the Pakistani context as per Pakistan's National Human Development Report 2017.

Methodology: A retrospective analytical case-control study was conducted in the Outpatient Department of Jinnah Medical and Dental College Hospital, Korangi, Karachi, over six months. The study included a total of 110 age-matched females, comprising 55 PCOS patients (cases) and 55 healthy females (controls). Participants were enrolled based on the Rotterdam Criteria.

Results: Menstrual history, Body Mass Index (BMI), hirsutism, and acne scores were significantly associated with PCOS. Using the chi-square test, the frequency of poultry chicken consumption (<0.0001) and the quantity consumed (0.001) were found to be statistically significant in relation to PCOS.

Conclusion: This study identifies a significant association between poultry chicken consumption and PCOS. Additionally, PCOS was significantly associated with hirsutism, acne, menstrual irregularities, and obesity.

Keywords: Poultry chicken; polycystic ovary syndrome; reproductive age

How to cite this article: Parveen M, Shah N, Samina M, Bloach ZI, Bashir S, Awan MF, et al. Investigating the Association Between Polycystic Ovary Syndrome (PCOS) and Poultry Chicken Consumption Among Females Aged 15–30 in District East Karachi. Pak J Public Health 2024 Sep. 30;14(3):185-9.
Available from: https://pjph.org/pjph/article/view/1234 DOI: https://doi.org/10.32413/pjph.v14i3.1234

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Submitted: 07-06-2023
Revised: 13-06-2024, 27-06-2024,
Accepted: 14-07-2024
Published: 30-09-2024

Introduction

Polycystic Ovarian Syndrome (PCOS) is the most common endocrine disorder in the young women of reproductive age with the incidence rate as high as 5-10 % (1, 2). According to WHO estimation in 2012, 116 million women are affected by PCOS (3.4%) worldwide (3). Prevalence of PCOS in Saudi Arabian women is found 42.8% (2). Prevalence reported in south Asian females especially females belong to Pakistan is far more (52%) than in white women (20 - 25% in UK) (4). In Indian adolescence the prevalence of the disease was found 9.13 % (5). The prevalence of the disease is reported in Pakistan is 17.6 % (6). According to the Rotterdam criteria, a woman with PCOS must have at least two of the three findings: oligo-ovulation or anovulation. Anovulation refers to the lack or absence of ovulation. Hyperandrogenism and polycystic ovaries (7, 8).

Lifestyle modifications comprise well-balanced diet and adequate exercise to control weight gain are considered as an evident benefit in the management of polycystic ovarian syndrome (3, 9). Studies revealed that obesity and sedentary lifestyle considered as contributing factors for PCOS (10,11).

Managing obesity and diet would be well-thought-out the basic treatment of PCOS (10,12,13). White meat mainly chicken has natural steroids. In the poultry industries of Pakistan, poultry chickens are being fed rich in steroids, which is the cause of their rapid growth within one and a half month (14) The feed given to chicks is also added-on with many nutritional and non-nutritional products. Moreover the percentage of PCOS increased 5% to 10% in females of Pakistan who ate this polluted chicken (14) Literature supported that to lessen growing period, the poultry chickens are being given injectable bovine growth hormone that raises insulin like growth factor 1 (ILGF-1) in those individuals who have eaten that chicken. As a result, excessive insulin influences ovaries to produce excess androgen, which is the main cause of PCOS (15).

It may be a matter of concern that this type of chicken meat becomes harmful to the human who consumes it. Regular consumption of poultry chicken was seen 86% of hirsute women (clinical feature of PCOS) and 34% in control (16)

The intake of worldwide poultry meat in the year 2018 averaged 13.9 kg per capita. Asians consume chicken meat at it increases from 6.6 kg to 9.5 kg per capita per year (17). The intake of poultry chicken per capita has augmented in the people of our country over the past decades. Moreover, in 2017 Pakistani population consumed poultry at the rate of 4.4 kg/capita. It is anticipated that in 2025, this intake will be increased to approximately 4.68 kg/ individual per annum (17). Poultry chicken consumption was seen greater in patients of POCS as compared to the consumption in control. (15) Chicken with some other foods were identified as an important reason to deteriorate PCOS (19).

20-25 % women who are the sufferers of this disorder are unaware of the disease as this may be asymptomatic. Even though, it is diagnosed with ultrasonic examination (14) There are a huge percentage of women with PCOS who were not diagnosed in spite of consulting number of health facilities (19).

Polycystic Ovarian Syndrome has become a very common disorder around the world. Food associated with PCOS has already been worked upon extensively; however, very few studies have been done to establish the association of boiler chicken meat consumption and development of PCOS. The current study paid much attention on the quantity of chicken meat consumption along with frequency. We included females with multiethnic background which would be helpful in creating awareness among young females regarding their dietary habits, causing PCOS and in turn will reduce the prevalence of the problem. This study will contribute to a great extent to prove the relationship between consumption of poultry chicken and development of PCOS.

Methodology

A Case Control Study was conducted to determine the association between polycystic ovarian syndrome and poultry chicken consumption in young females (15 to 30 years) of District East Karachi. It was conducted at the outpatients' departments (OPDs) of Jinnah Medical and Dental College Hospital (now Sohail Trust Hospital) Karachi. This study setting is appropriate because the hospital caters population approaches from diverse ethnic background. Participants were enrolled using Rotterdam Criteria. According to Rotterdam criteria, to identify a woman as a case of PCOS requires any two of the three findings i.e., Oligo-ovulation, hyperandrogenism and polycystic ovaries. We took two i.e., history of Oligo-ovulation and ultrasound confirmation of polycystic ovaries. Confirmed cases of PCOS are enrolled as cases and age matched females visiting at OPDs of the hospital were enrolled as control after confirmation of negative report of ultrasound and history of normal menstruation.

Females with any other endocrine disorder, pregnancy and not willing to participate were excluded.

This study was conducted in six months from June 2021 to November 2021. Non-probability, convenience-sampling technique was done.

Sample size was calculated using Open epi calculator using confidence interval of 95% with bound on error of 5% & 80% power. Taking 1:1 case control ratio with odd ratios of 4.1. The sample size comes total of 80 and with 10 % inflates, it becomes 88.

A self-structured questionnaire made in English and Urdu language was used as a data collection tool.

Pilot testing was done on 10% of the actual sample size, to examine the utility of the questionnaire, and to find out the problems that encountered with the use of the tool. After pilot testing the questioning techniques were appropriately revised. Furthermore, Face validity has been done by experts of both fields (gynae and public health) to test the validity and reliability of the tool. Pilot study participants were excluded from the actual study.

The data were entered and analyzed using statistical software SPSS version 22.0. Mean ± SD. Median was computed for all the quantitative variables like age, income, number of children, education, and socioeconomic status etc. Percentage was computed for all the categorical variables like gender, education, socioeconomic status. 95% confidence intervals were computed for the Odds Ratios and $p< 0.05$ was considered statistically significant.

Ethical Considerations:

This study was initiated after approval from Institutional Review Board (IRB) of Jinnah Sindh Medical University (JSMU) with approval No JSMU/IRB/2021/-416.

Approval from Ethical Review Committee of Sohail University was taken.

Permission for data collection was taken from administration of Jinnah Medical College Hospital, Sohail university along with the heads of gynae, and medicine departments. Informed consent from each participant was acquired.

Results

There were total of 110 study participants with mean age of 23.91 with standard deviation of 3.347.

Table 1: Association between demographic characteristics of the study participants and polycystic ovarian syndrome

		Cases	Control	P-values
		F (%)	F (%)	
Religion	Muslim	46 (54.8)	38 (45.2)	0.073
	non-Muslim	9 (34.6)	17 (65.4)	
Employee status	Housewife	23 (57.5)	17 (42.5)	0.268
	Employed	16 (40)	24 (60)	
	Student	16 (53.3)	14 (46.7)	
Ethnicity	Sindhi	7 (58.3)	5 (41.7)	0.208
	Punjabi	15 (38.5)	24 (61.5)	
	Pathan	7 (43.8)	9 (56.3)	
	Urdu	26 (60.5)	17 (39.5)	
Education	Primary	9 (52.9)	8 (47.1)	0.182
	Matric	13 (44.8)	16 (55.2)	
	Intermediate	16 (41)	23 (59)	
	Graduate	17 (68)	8 (32)	
Marital status	Married	32 (56.1)	25(43.9)	0.182
	Single	23 (43.4)	30 (56.6)	
Household income	<=30000	13 (44.8)	16 (55.2)	0.302
	30000-50000	29 (58)	21 (42)	
	>50000	13 (41.9)	18 (58.1)	
Menstrual history	Regular normal flow	0 (0)	33 (100)	< 0.0001*
	Irregular normal flow	17 (65.4)	9 (34.6)	
	Scanty flow	10 (66.7)	5 (33.3)	
	Amenorrhea	28 (77.8)	8 (22.2)	
Physical activity	Mild	14 (56)	11 (44)	0.495
	Moderate	41 (48.2)	44 (51.8)	
BMI	< 18.5 (underweight)	4 (26.7)	11 (73.3)	0.001*
	18.5--24.9 (normal)	20 (37.7)	33 (62.3)	
	25--29.5 (overweight)	25 (78.1)	7 (21.9)	
	30 or more (obesity)	6 (60)	4 (40)	
Hirsutism score	less than 8 (normal)	12 (21.8)	43 (78.2)	< 0.0001*
	Mild/moderate	43 (78.2)	12 (21.8)	
Acne score	Normal	14 (28)	36 (72)	< 0.0001*
	grade I	29 (63)	17 (37)	
	grade II and above	12 (85.7)	2 (14.3)	

Table 1 exhibits association between demographic characteristics of the study participants and PCOS. It was found that variables menstrual history, BMI, Hirsutism and Acne scores were statistically significant associated with polycystic ovarian syndrome p-values ≤ 0.05.

Table 2: Univariable logistic regression analysis

		Odds Ratio	P-values	C.I
Religion	Muslim	1	0.076	0.175-1.092
	non-Muslim	0.473		
Employee status	Housewife	1	0.272	
	Employed	0.493		0.202-1.201
	Student	0.845		0.326-2.190
Ethnicity	Sindhi	1	0.215	
	Punjabi	0.446		0.120-1.665
	Pathan	0.556		0.122--2.525
	Urdu	1.092		0.298-4.010
Education	Primary	1	0.195	
	Matric	0.722		0.217--2.40
	Intermediate	0.618		0.197-1.946
	Graduate	1.889		0.530-6.727
Marital status	Married	1	0.183	
	Single	0.599		0.282-1.273
Household income	<=30000	1	0.305	
	30000-50000	1.7		0.676--4.275
	>50000	0.889		0.320-2.470
Physical activity	Mild	1	0.496	
	Moderate	0.732		0.299-1.795
BMI	< 18.5 (underweight)	1	0.002*	
	18.5--24.9 (normal)	1.667		0.467-5.947
	25--29.5 (overweight)	9.821		2.378-40.570
	30 or more (obesity)	4.125		0.749-22.174
Hirsutism score	less than 8 (normal)	1	<0.0001*	
	Mild/moderate	12.84		5.195-31.738
Acne score	Normal	1	<0.0001*	
	grade I	4.387		1.856-10.366
	grade II and above	15.429		3.056-77.903

Table 2 exhibits univariable logistic regression analysis to identify the risk of polycystic ovarian syndrome. There are three variables, BMI, Hirsutism and Acne scores that have significant odds ratios. It was found that overweight females were almost 10 times (OR: 9.821, CI: 2.378--40.570) more likely to have polycystic ovarian syndrome as compared to underweight females. Similarly overweight females had 4 times higher likelihood of ovarian syndrome (OR: 4.124, CI: 2.378--40.570). It was found that females had mild/moderate Hirsutism score have almost 13 times more chance to have syndrome (OR: 12.84, CI: 5.195--31.738). Similarly, Females had Acne score grade II and above found to be 15 times more on risk of syndrome (OR: 15.429, CI: 3.056--77.903).

Table 3: Association between frequency and quantity of poultry chicken and polycystic ovarian syndrome

		Cases	Control	P Values
		F(%)	F(%)	
Frequency of poultry chicken consumption	almost twice a month/not eating	1 (7.7)	12 (92.3)	<0.0001 *
	once a week	5 (25)	15 (75)	
	twice a week	49 (63.6)	28 (38.5)	
Quantity of chicken consumed	Not eating	1 (9.1)	10 (90.9)	0.001*
	3 oz	2 (16.7)	10 (83.3)	
	4 oz	13 (52)	12 (48)	
	>= 5 oz	39 (62.9)	23 (37.1)	

Table 3 shows association between poultry chicken consumption and quantity with polycystic ovarian syndrome. Among all women who used poultry chicken twice a week 63.6% were case and rest were controls. Similarly, those females who used chicken once a week the percentage of control females were three times less than cases. Among females who consumed chicken 5 or more Oz cases females were highlighted than controls. With the help of chi-square test it was found that both variables frequency and quantity of the chicken were statistically significant with polycystic ovarian syndrome.

Table 4. Univariable logistic regression analysis

			P values	C.I
Frequency of poultry chicken consumption	almost twice a month/not eating	1	<0.001*	
	once a week	4		0.410-39.0
	twice a week	21		2.592-170.152
Quantity of chicken consumed	Not eating	1	0.005*	
	3 oz	2		0.155-25.755
	4 oz	10.833		1.20-97.798
	>= 5 oz	16.957		2.037-141.158

Table 4 also shows univariable logistic regression analysis with frequency and quantity of chicken usage to identify the risk of polycystic ovarian syndrome. It was found that females who used chicken twice a week were 21 time more on risk of syndrome as compared to females with no frequency of chicken consumption (OR: 21, CI: 2.592--170.152). Females with quantity of chicken more than and equal to 5oz have almost 17 times greater likelihood of syndrome as compared to females who used chicken quantity 3oz (OR: 16.957, CI: 2.037--141.158). Females with quantity of chicken 4oz have almost 11 times greater likelihood of syndrome as compared to females who used chicken quantity 3oz (OR: 10.833, CI: 1.20--97.798).

Discussion

In the current study the association between demographic attributes of reproductive age females and PCOS were observed. Furthermore, it was found through clinical assessment and ultrasound confirmation that the frequency and quantity of poultry chicken consumption are associated with the polycystic ovarian syndrome.

A study done in Lahore supports our findings for the factors associated with PCOs that are included overweight and unhealthy dietary habits (4). Likewise in the present study participants were divided into cases and controls and then the demographic characteristics were observed and reported in each group, after that the association was reported between these characteristics of the participants with PCOS.

An Indian study was conducted to find the prevalence of PCOS in Indian female adolescents. The patients of PCOS were evaluated through clinical and lab investigations. Out of 460 females, 72 had symptoms of PCOS. Out of 55 females who went for ultrasound, 44 had PCOS (5). Our study was focused on the association of demographic attributes and diet with PCOS. However, we enrolled the cases after ultrasonic confirmation of PCOS.

A cross-sectional study was conducted in Lattakia, Syria, revealed that acne is more prevalent in the patients of PCOS (7). Similarly, we found that acne score has statistically significant associated with polycystic ovarian syndrome p-values ≤ 0.05.

A study was conducted among south Indian female teenagers having PCOS, obesity reported as a most prevalent symptom (10). Consistent to that, in our study it was seen that overweight females had 4 times higher likelihood of ovarian syndrome.

In our study 63.6% of females suffering from PCOS consumed poultry chicken twice a week and the quantity of poultry was reported as 5 or more Oz in cases. Similarly, it was also found in a pilot study conducted at Karachi that the females suffering from PCOS, 89% of them have at least one piece of chicken in their diet daily (13).

It was reported in a study that 100% of the PCO patients had irregular menses, in addition to this 89% and 55.5% reported acne and hirsutism respectively (13). Somewhat same findings are revealed in the present study. It was found that variables Menstrual history, BMI, Hirsutism and Acne scores were statistically significant associated with polycystic ovarian syndrome p-values ≤ 0.05.

A study conducted at Baqai Medical University on albino rats. It was concluded that the rats those were fed on market available chicken meat had raised cholesterol, steroidal hormone levels were imbalanced, increased ovarian weight and cysts formation (14). Its finding is also somewhat consistent with the current study. These are also the signs of PCOD in females of reproductive age.

Similar study was done in Rawalpindi in the year 2020, which reported that out of 50 PCOD participants, 31(62%) had regular poultry chicken intake and 19 (38%) had irregular chicken intake. Poultry chicken consumption and PCOD are stated statistically significant association with a p value of 0.01 (15). Our study also demonstrates that among all the women who consumed poultry chicken twice a week, 63.6% were cases.

Presented in a study poultry chicken is linked with hirsutism in women that is one of the signs of Polycystic

ovarian disorder (16). It is quite similar with the results of our study that shows the hirsutism has statistically significant associated with polycystic ovarian syndrome p-values ≤ 0.05.

Conclusion

PCOS is prevalent among young females worldwide with high prevalence rate, which affects the health and lifestyle in women of reproductive age. The present study concludes that there is a positive association between polycystic ovarian syndrome and poultry chicken meat (frequency and quantity) consumption. These finding would be helpful to create awareness among young women regarding the health hazards of consuming poultry chicken.

Considering the demographic data, a significant association of PCOs with hirsutism, acne, menstrual irregularities and obesity was also found.

Acknowledgement:

We acknowledge the Gynae Department of Sohail Trust Hospital for the provision in data collection.

Ethical Approval:

This study was approved by Institutional Review Board (IRB) of Jinnah Sindh Medical University (JSMU)
Ref. No. JSMU/IRB/2021/-146 Date: 07-05-2021

Financial support and sponsorship: None

Conflict of interest: None declared.

Authors' Contribution:

MP: Conceptualization, writing the original draft, Questionnaire development and data collection
NS: Supervision and study design
MS: Questionnaire development and drafting of the article
ZI: Review and editing.
SB: Questionnaire development
FA: Review and editing final manuscript
UPH: Data curation and analysis

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