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EFFECT OF PHYSICAL ACTIVITY AND DIETARY PATTERN IN DEVELOPMENT OF PCOS UPON ADOLESCENT GIRLS

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Abstract: Background: An endocrine condition known as polycystic ovarian syndrome (PCOS) affects around 7% of women who are of reproductive age. A heterogeneous condition is typified by anovulation characteristics mixed with excess androgen symptoms, and it often manifests throughout adolescence. The aim of this study was to identify the effect of physical activity and dietary pattern in development of PCOS upon adolescent girls.

Methodology: A nonprobability a purposive sample of (100) adolescent girls, who return to hospital suffering from polycystic ovary syndrome. This is the study group was chosen from Maternal Consultant depending on the diagnosis of managing doctor. In addition (100) healthy adolescent girls (free from disease) as control group; those who visit the Hospital without a history of polycystic ovary syndrome. Data gathering was done by applied the created instrument items with aid of planned interview techniques with the items as they were personality interviewed, the investigator used Arabic version of the instrument. The interview method spent about (15- 30) minutes for each girls. The questionnaire form is composed of (4) parts (demographic, reproductive characteristics, dietary pattern and physical activity).

Results: The results showed that there were no statistically differences in all items P-value ($P > 0.05$), except for the fatty food item, were significant differences appeared between the two groups, P-value was ($P < 0.05$). Also showed that there were statistically differences in all items regarding to physical activity ($P < 0.05$), except for item (Running) in which no statistically differences appeared ($P > 0.05$). Results illustrates that the type of physical activity and dietary pattern (fatty food) effect were contributed in PCOS.

Conclusion: the findings of this study indicated that physical activity and dietary patterns play a significant role in the development of PCOS among adolescent girls.

Recommendation:

1. Encourage regular physical activity: Promote regular exercise and physical activity among adolescents to help manage weight and reduce the risk of developing polycystic ovarian syndrome (PCOS).

2. Provide education on healthy eating habits: Offer nutritional counseling and education on healthy eating habits to adolescents to help prevent obesity and insulin resistance, both of which are risk factors for PCOS.

Introduction

Stein and Leventhal first identified polycystic ovarian syndrome in 1935. They observed that women with the illness also had irregular menstruation, obesity, and ovarian cysts (Choudhary et al., 2019). Menstrual abnormalities, hirutatism, acne, and obesity are common signs of PCOS, a gynecological endocrinopathy

that affects women in their reproductive age. Other common traits include increased insulin resistance, biochemical signs of hyperandrogenism, raised blood LH levels, and acanthosisn igricans. Some people have no symptoms at all **(Kenny & Bickerstaff, 2017).** Numerous ideas have been proposed to date to explain how PCOS develops. This hormone imbalance can be attributed to both inherited and environmental causes. Furthermore, PCOS is increased by obesity, which is exacerbated by poor diet and inactivity **(Abdalhassan et al., 2022; Escobar-Morreale, 2018).**

According to data, PCOS affects over 116 million women worldwide (3.4%) (Bulsara et al., 2021). There is still some uncertainty regarding the exact causes of PCOS development. However, according to some earlier research, PCOS may be related to a number of inherited, behavioral, and environmental variables, such as obesity, stress, early puberty, early fetal development, a family history of the condition in first-degree relatives, and physical inactivity **(Heidarzadehpilehrood et al., 2022; Parker et al., 2022).**

Diets heavy in calories and sedentary lifestyles may be contributing factors to PCOS aggravation. Due to changes in gut flora, persistent inflammation, increased insulin resistance, and increased androgen production, high-sugar diets may be a factor in PCOS. Gaining weight and becoming obese exacerbate the syndrome's characteristic traits **(Seneschal et al., 2021).**

Obesity and PCOS are strongly associated, as demonstrated by epidemiological data and, more recently, by genetic research **(Barber et al., 2019)**. Obesity exacerbates PCOS mainly by increasing insulin resistance (IR). Obesity exacerbates PCOS mainly by increasing insulin resistance (IR). Obesity promotes the synthesis of androgens by increasing LH, which leads to hyperandrogenism (Glueck & Goldenberg, 2019).

Hormones that control hunger, such glucagon and ghrelin, may change as a result of low-GI meals **(Barber et al., 2020; Szczuko et al., 2019)**. Low-GI meals increased glucagon and decreased ghrelin in women with PCOS **(Hoover et al., 2021)**. A KD improves the menstrual cycle, decreases blood sugar and body weight, enhances liver function, and treats fatty liver in obese women with PCOS and liver dysfunction **(Shishehgar et al., 2019)**. Paoli et al. found even more fascinating outcomes in PCOS-afflicted women after using KDs for 12 weeks **(Paoli et al., 2020).**

Improving maternal health is one of the eight millennium developing goals, this can be done by various activity like providing quality care to girl’s pre pregnancy and increasing awareness regarding care during these period.

The Researcher chose this problem because a great danger on adolescence in future lead to prevent pregnancy and some disorder on menstrual cycle and felt the need to identify the risk factors to improve knowledge about this syndrome.

Methodology

Study Design

A descriptive case control study is conducted in order to identify effect of the physical activity and dietary pattern upon adolescents who diagnostic with PCOS during the period from 1Nov. 2023 until 15 Feb. 2024.

Administrative Arrangement & Ethical consideration

1. After obtaining permission to perform the research from the council of the College Of Health And Medical Techniques\Al-Furat Al-Awsat Technical University
2. Agreement from Babil Health directorate for obtaining official permission, perform the study in Hospitals mention above for Ethical consideration
3. The researcher obtains agreement from each one of girls

Study Setting

The study is conducted in (Babil Teaching Hospital for maternity and Children, Imam Sadiq Teaching Hospital, Merjan Teaching Hospital) from maternal consistent unite, during the period from 1 Nov. 2023 until 15 Feb. 2024

Study Sampling

A nonprobability a purposive sample of (100) adolescent girls, who return to Hospital suffering from polycystic ovary syndrome. This is the study group was chosen from Maternal Consultant depending on the diagnosis of managing doctor. and (100) healthy adolescent girls (free from disease) as control group; those who visits the Hospital without a history of polycystic ovary syndrome.

Inclusion Criteria

The samples are selected according to the following criteria:

1. All participants in adolescent age.
2. All participants' Unmarried girls.
3. case group, adolescent girls who are diagnosed with Polycystic Ovary syndrome.
4. control groups adolescent girls without of Polycystic ovary syndrome.
5. Those who are voluntary participated.

Exclusion Criteria

✓ Married Girls

Tools and methods of data collection

The tools was generated and constructed by researcher after reviewing literature and past researches. Data gathering was done by applied the created instrument items with aid of planned interview techniques with the items as they were personality interviewed, the investigator used Arabic version of the instrument. Date gathering procedure began from **1 Nov. 2023 to 15 Feb. 2024**. The interview method spent about (15- 30) minutes for each girls .The questionnaire form is composed of (4) parts (demographic, reproductive characteristics, dietary pattern and physical activity).

Part one: Demographic such as (age, level of educational, residency, smoking, and family income).

Part two: Reproductive characteristics such as (age of menarche, menstrual cycle, dysmenorrhea, age of diagnosis of PCOS).

Part three: Dietary pattern such as (canned food, processed meat, sweets and sugars, fatty food, fast food, fruit and vegetable, bread and cereals, milk and dairy products).

Part four: Physical activity such as (number of hours sleeping daily, House cleaning, cooking, walking for long distance, shopping, washing clothes, running)

Statistical Analysis

Data of studied sample were prepared, organized grouped, 9 encoded entered and analyzed using the (SPSS) version 25 was used for date analysis, and analysis included the two types of statistics:

1. Descriptive statistics: presented as mean, frequency and percentages = freq./ sample size x 100.

1. Inferential Statistics: Statistical exams were applied according to the distribution and types of variables. Chi-square test was used to compare frequency. Bivariate Pearson's correlation test was used for assessing the correlations.

Results

Table 1: Statistical distribution and difference in demographic data between study and control groups.

Items	Sub-groups	study group Total= 100		Control group Total= 100		P-Value
		Freq.	%	Freq.	%	
Age/Years	15	1	1.0	1	1.0	0.873
	16	2	2.0	2	2.0	
	17	16	16.0	15	15.0	
	18	25	25.0	25	25.0	
	19	56	56.0	57	57.0	
Level Of Educational	Illiterate	2	2.0	3	3.0	0.425
	Reads and write	4	4.0	3	3.0	
	Primary	9	9.0	9	9.0	
	Secondary	47	47.0	56	56.0	
	Institute & Above	38	38.0	29	29.0	
Residency	Urban	62	62.0	72	72.0	0.134
	Rural	38	38.0	28	28.0	
Smoking	Active	2	2.0	0	0.0	0.157
	passive	98	98.0	100	100.0	
Family Income	Sufficient	56	56.0	60	60.0	0.699
	Barely sufficient	12	12.0	9	9.0	
	insufficient	32	32.0	31	31.0	

Table 1 shows that more than half percentage for both groups at age 19 year, (56%) in study group and (57%) in control group. The Sam table shows that educational level for both group, the highest percentage (47%) of girls is in the secondary school level, and (56%) for the control group in the same educational level. For residency, the high percentage (62%) of the case group in the urban residence category, this is matched by (72%) of the control group who reside in urban areas as well. For smoking, the same table shows the majority (98%) of cases are passive smokers, compared to a full percentage (100%) of the control group of passive smokers. For family Income more than half of the case group and (60%) for control group are with sufficient income.

Table 2: Statistical distribution and difference according to reproductive characteristics between study and control groups.

Items	Sub-groups	study group Total= 100		Control group Total= 100		P-Value
		Freq.	%	Freq.	%	
Age Of Menarche	11	21	21.0	25	25.0	0.236
	12	30	30.0	39	39.0	

	13	43	43.0	28	28.0	
	14	6	6	8	8.0	
Menstrual Cycle	regular	19	19.0	93	93.0	0.000
	irregular	81	81.0	7	7.0	
Dysmenorrhea	Yes	73	73.0	5	5.0	0.000
	No	27	27.0	95	95.0	
Age of diagnosis of PCOS	15	1	1.0	NIL	0.0	0.000
	16	3	3.0			
	17	25	25.0			
	18	28	28.0			
	19	43	43.0			

Table two shows that age of menarche shows that the high percentage (43%) of the case group was 13 years old at menstruation, while the high percentage (39%) of the control group was 12 years old at menstruation. In addition, the menstrual cycle indicate that the majority (81%) of the case group are irregular menstrual Cycle girls, while the majority (93%) of the control group are regular menstrual cycle girls. For dysmenorrhea, the majority of sample (73%) of the case group had dysmenorrhea, for control group (95%) are dysmenorrhea Menstruation. In addition, for age of diagnosis of it shows that the high percentage (43%) of the case group was diagnosed at the age of 19 years, for control group it is free from PCOS

Table 3: Statistical distribution and difference in dietary pattern between study and control groups.

Items	**Sub-groups**	**study group Total= 100**		**Control group Total= 100**		**P-Value**
		Freq.	**%**	**Freq.**	**%**	
Canned Food	Non	7	7.0	13	13.0	0.098
	1 weekly	50	50.0	54	54.0	
	2-3 weekly	34	34.0	26	26.0	
	More than 3	9	9.0	7	7.0	
Processed meat	Non	15	15.0	20	20.0	0.629
	1 time weekly	40	40.0	34	34.0	
	2-3 times weekly	31	31.0	34	34.0	
	More than 3	14	14.0	12	12.0	
Sweets And Sugars	Non	0	0.0	0	0.0	1.0
	1 weekly	0	0.0	0	0.0	
	2-3 weekly	0	0.0	0	0.0	
	More than 3	100	100.0	100	100.0	
Fatty Food	Non	0	0.0	0	0.0	0.030
	1 weekly	4	4.0	14	14.0	
	2-3 weekly	23	23.0	23	23.0	
	More than 3	73	73.0	63	63.0	
fast food	Non	2	2.0	8	8.0	0.366
	1 weekly	55	55.0	37	37.0	
	2-3 weekly	32	32.0	40	40.0	
	More than 3	11	11.0	15	15.0	
fruit and vegetable	Non	0	0.0	0	0.0	0.134
	1 weekly	0	0.0	0	0.0	
	2-3 weekly	12	12.0	6	6.0	

	More than 3	88	88.0	94	94.0	
bread and cereals	Non	0	0.0	0	0.0	1.0
	1 weekly	0	0.0	0	0.0	
	2-3 weekly	0	0.0	0	0.0	
	More than 3	100	100.0	100	100.0	
milk and dairy products	Non	3	3.0	2	2.0	0.294
	1 weekly	11	11.0	9	9.0	
	2-3 weekly	42	42.0	38	38.0	
	More than 3	44	44.0	51	51.0	

Table 3 shows that the statistical distribution and differences in dietary pattern between case study and control.

The results showed that there were no statistically significant differences in all items in relation to the P-value ($P > 0.05$), except for the fatty food item, in which simple statistically significant differences appeared between the two groups, and the P-value was ($P < 0.05$).

Table 4: Statistical distribution and difference in type of physical activity between study and control groups.

Items	**Sub-groups**	**study group Total= 100**		**Control group Total= 100**		**P-Value**
		Freq.	%	Freq.	%	
1-number of hours sleeping daily	4-5 hr	13	13.0	6	6.0	0.019
	6-7 hr	54	54.0	47	47.0	
	8-9 hr	33	33.0	47	47.0	
2-House Cleaning	Non	27	27.0	12	12.0	0.000
	< 1 hours	43	43.0	28	28.0	
	1-2 hours	23	23.0	38	38.0	
	> 3 hours	7	7.0	22	22.0	
3-Cooking	Non	19	19.0	14	14.0	0.043
	< 1 hours	51	51.0	39	39.0	
	1-2 hours	21	21.0	35	35.0	
	> 3 hours	9	9.0	12	12.0	
4-Walking For Long Distance	Non	5	5.0	7	7.0	0.005
	< 1 hours	59	59.0	28	28.0	
	1-2 hours	21	21.0	43	43.0	
	> 3 hours	15	15.0	22	22.0	
5-Shopping	Non	77	77.0	63	63.0	0.031
	< 1 hours	23	23.0	37	37.0	
	1-2 hours	0	0.0	0	0.0	
	> 3 hours	0	0.0	0	0.0	
6-Washing Clothes	Non	57	57.0	41	41.0	0.010
	< 1 hours	30	30.0	34	34.0	
	1-2 hours	10	10.0	18	18.0	
	> 3 hours	3	3.0	7	7.0	
7-Running	Non	85	85.0	77	77.0	0.097
	< 1 hours	15	15.0	21	21.0	
	1-2 hours	0	0.0	2	2.0	

	> 3 hours	0	0.0	0	0.0	

Table 4 indicate that the statistical distribution and differences in type of physical activity between study and control groups. The results showed that there were highly statistically significant differences in all items in relation to the P-value ($P < 0.05$), except for item (Running) in which no statistically significant differences appeared between the two groups, and the P-value was ($P > 0.05$).

Table 5: summary of PCOS by using stepwise regressions for items dietary pattern and physical activity.

Items	Beta	T	Sig.		
			Chi- square	P-Value	
Dietary pattern (Fatty Food)	-0.154	-2.192	6.29	0.030	S
Type of physical Activity	0.165	2.561	10.638	0.025	S

Table 5 illustrates that the two variables were contributed as a risk factors in PCOS and these variables come in order of importance as fallow: type of physical activity, dietary pattern (fatty food).

Discussion

Part I: Discussion of demographic characteristic

In the present study, our research was found that the highest percentage of diagnoses is at the **age of 19 age years** (56%). This result disagree with the results of (**Pourhoseini et al., 2022)** shows that the mean age of adolescent girls was 16.73±3.4 years with median of 17 years. There was study on polycystic ovaries in adolescent girls. This definition includes females between the ages of 10 and 19. Along with the use of pelvic ultrasonography in the diagnosis of PCOS, it also discusses recommendations regarding gynecological age, specifically 8 years post menarche, and the reevaluation of girls who do not meet the diagnostic criteria in adolescence but are thought to be "at increased risk" of PCOS **(Peña et al., 2020**).

From educational levels, our study showed that less than half of the total percentage of girls diagnosed are in the secondary stage, and this is the highest percentage compared to the group of cases. More than half of the total percentage are in the same educational category. Besides, as suggested by the data, knowledge of PCOS was significantly influenced by educational level. This finding indicated that the higher the educational level of Malaysian women, the higher their knowledge of PCOS **(Abu-Taha et al., 2020; Alruwaili et al., 2020).**

Regarding the **residential area**, the results of our study show that the largest percentage of people live in an urban residential area. Our results were agree to other studies such as: **(Priyanka et al., 2018**).

Because of the nature of the social and religious system in Iraq and because of tribal customs, our study produced almost complete relative results that the girls diagnosed were in the category of **passive smoking**. Disagree to what was reported in one study **(Tao et al., 2021).**

Our study presented the financial situation, such as the monthly **family income**. We found that more than half of the cases had sufficient monthly income, and there are no significant differences from the control group. While other studies have shown that low socioeconomic status (SES) may be associated with an increased risk of developing polycystic ovary syndrome (PCOS) and vice versa so our study disagree with it **(Rubin et al., 2019).**

Part II: Discussion of reproductive characteristics

According to the reproductive characteristics, the statistical distribution in our study of the **age of**

menstruation was that we found that less than half of the percentage, which is the highest percentage, for those diagnosed with PCOS is at the age of 13. While the highest percentage for the control group is at the age of 12, and there were no statistically significant differences between the two groups. While high statistical differences were found with regard to the menstrual cycle, as the majority of the affected group had an **irregular cycle** compared to the vast majority of the control group, which was regular. Our results agree the findings of some studies, **(Desai et al., 2018; Pourhoseini et al., 2022).**

For **dysmenorrhea**, the highest percentage of those diagnosed with the disease are have this sign, compared to the control group who have almost completely normal menstruation. Our study is agree with other studies **(Martin et al., 2017)** qualitative interview studies have identified pain in various forms as being part of the patient experience with PCOS, including bodily, abdominal, pelvic or belly pain, sexual pain and headaches.

Regarding the **age of diagnosis** of polycystic ovary syndrome, our results showed that less than half which is the highest of the total percentage were diagnosed at the age of 19. The reason for this delay in diagnosing the late age of adolescent girls may be as a result of the three sets of criteria have been developed for the diagnosis of PCOS: The National Institutes of Health criteria (1992), Rotterdam criteria (2003), and Androgen excess society criteria (2006). All three categories include polycystic ovarian morphology on trans vaginal ultrasound (Pelvic ultrasound not recommended for diagnosis of PCOS within 8 years post menarche) **(Peña et al., 2020)**, clinical and/or biochemical hyperandrogenism, and chronic oligo/anovulation, or different combinations of these disorder **(Varanasi et al., 2018)**.

Part III: Discussion of dietary patterns

The effect of dietary pattern on polycystic ovary syndrome in our study was attributed to fatty food, as it showed statistical differences from the control group without the rest of the types of dietary patterns, mainly **fatty food**, which is one of the nutritional problems of a large group of other diseases. Food insecurity (FI) and unhealthy **dietary patterns** can negatively affect reproductive health and this study agree with our results **(Badri-Fariman et al., 2021).**

Part IV: Discussion of physical activity

For physical activity our results confirmed a lower rate of **physical activity** in all activities except (running), which are agree with this study **(Mizgier et al., 2021).**

The main **risk factors** for PCOS were evaluated using stepwise regressions in the table (5). The table shows that two variables included (type of physical Activity, dietary pattern (fatty food)), were found to be highly significant predict of PCOS which came in order of importance.

The first order of importance of variables of PCOS was **type of physical Activity**. (Mizgier et al., 2021) who report that a significantly higher percentage of PCOS patients consumed high and medium glycemic index (GI) foods and represented a low level of PA. The second order of importance of variables of PCOS was **dietary pattern (fatty food)**. This results was agreed with the findings of (Badri-Fariman et al., 2021), who report that the dietary patterns, low economic levels, and waist circumference were significantly associated with the higher risk of PCOS.

Conclusion

The study conclude that physical activity and dietary patterns play a significant role in the development of PCOS among adolescent girls.

Recommendation:

1. Encourage regular physical activity: Promote regular exercise and physical activity among adolescents to help manage weight and reduce the risk of developing polycystic ovarian syndrome (PCOS).

2. Provide education on healthy eating habits: Offer nutritional counseling and education on healthy eating habits to adolescents to help prevent obesity and insulin resistance, both of which are risk factors for PCOS.

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