Screening and Health Education Program about Polycystic Ovarian Syndrome among Students at Minia University Dorms

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Abstract:
Adolescent females are susceptible to polycystic ovarian syndrome, screening and education are crucial steps in managing PCOs. **Aim:** To assess the prevalence of PCOs among Students at Minia university dorms, evaluate the effect of health education program on their knowledge about PCOs and provide a management plan for confirmed cases. **Methods:** A cross-sectional research design with intervention was utilized. **Setting:** The research was conducted in Minia University dorms for female. **Sampling:** A purposive sample was used; 1083 female student were recruited according to inclusion and exclusion criteria. **Tools:** Four tools were used, 1st tool: personal data assessment tool: socio-demographic data and menstrual history; 2nd tool: diagnostic criteria for PCOs: risk factors assessment questionnaire, modified Ferriman–Gallwey score for hirsutism, and Rotterdam criteria 2003; 3rd tool: knowledge assessment tool about PCOs; and 4th tool: management plan assessment tool. **Results:** It showed that 6.7 % of students were diagnosed with PCOs, and 8.8 % of them were risky. Additionally, 8.3% of them had inadequate information about PCOs in the posttest, in comparison to 72.5% in the pretest. Also, there were significant improvements in all management interventions items and clinical features of PCOs for confirmed cases after educational program and follow-up. **Conclusion:** The prevalence of PCOs among Students at Minia university dorms was 6.7%, the total knowledge of students about PCOS was improved after educational intervention, and the clinical features of confirmed cases showed improvement after following management intervention. **Recommendation:** Conducting more screening programs among adolescents regarding PCOs in different localities for early detection and management to decrease the long-term health consequences linked to PCOs.

Keywords: Health Education Program, Polycystic Ovarian Syndrome & Screening.

Introduction

The term "Stein-Leventhal syndrome," which later became "polycystic ovary disease (PCOD)," was used before the term "polycystic ovarian syndrome" (PCOS) was coined. Women of childbearing age are adversely affected by this diverse, endocrine, and metabolic illness, which is characterized by ovarian cysts, oligo- or anovulation, and hyperandrogenism **(Goh et al., 2022)**. 8–13% of reproductive-age women have PCOs **(Pirotta et al., 2021)**.

Polycystic ovarian syndrome (PCOs) is caused by the interaction of hereditary and environmental variables that alter certain metabolic processes, such as insulin resistance, impaired neuroendocrinological gonadotropic secretion, androgen production in the ovaries. Luteinizing hormone (LH) and insulin resistance work together to promote the release of the androgen hormone from the ovaries. Anovulation is caused by aberrant hypothalamic gonadotropin-releasing hormone (GnRH) secretion that is influenced by hyperandrogenism. Elevated insulin

levels boost ovarian androgen production while also preventing the liver from synthesizing sex hormone binding globulin (SHBG), which raises the percentage of bioavailable free testosterone **(Minocha, 2020).**

Polycystic ovarian syndrome (PCOs) starts in adolescence, generally worsens throughout adulthood, and persists into menopause. Reproductive, metabolic, and psychological aspects fall into three categories that can be classified according to the recognized PCOS phenotype **(Pramodh, 2020).**

Polycystic ovarian syndrome (PCOs) has been linked to a wide range of clinical manifestations, including but not limited to signs and symptoms of hyperandrogenemia, such as hirsutism, acne, abnormal unintended weight gain, and male pattern baldness, signs and symptoms of anovulation, such as irregular heavy periods, oligomenorrhea, amenorrhea, and subfertility, and signs and symptoms of insulin resistance, such as darkening of skin folds and dyslipidemia **(Alshdaifat et al., 2021)**. As well as

metabolic characteristics are also present in PCOS (insulin resistance, obesity, metabolic syndrome, type 2 diabetes, and dyslipidemia) and are of great concern to those who have this condition (**Joham et al., 2022**). When a patient shows two of the three key signs or their related phenotypes, such as anovulation, polycystic ovaries, and hyperandrogenism, a diagnosis is frequently made (**Ashraf et al., 2019**).

Four types of PCOS characteristics can be formed based on the Rotterdam criteria: The first phenotype (H+O) is the integration of hyperandrogenism (H) and chronic anovulation (O) in the existence of normal ovaries; the second phenotype (H+P) is the integration of hyperandrogenism and polycystic ovaries with ovulatory cycles; the third phenotype contains an integration of chronic anovulation, whereas polycystic ovaries have no clinical or biochemical signs of hyperandrogenism (O+P); and the fourth phenotype involves the simultaneous existence of hyperandrogenism, chronic anovulation, and polycystic ovaries (H+O+P) (**Al Souheil & Chahine, 2022; Dasht et al., 2019**).

Type 2 diabetes, metabolic syndrome, and cardiovascular illnesses are more common in females with PCOS. Females with PCOS have a four- to seven-fold greater risk of having a heart attack than girls without PCOS in the same age group (**Jakhar et al., 2022**). PCOS therapy frequently entails medication adjustments. In addition to lifestyle changes as the first-line treatment for PCOS, androgen excess, oligo-ovulation, and insulin resistance may be targets for pharmaceutical treatment. Hence, a number of recommendations for the management of PCOS in women include calorie restriction and exercise therapy (**Kim & Lee, 2022 & AL Kurdi et al., 2021**).

Menstrual irregularities, symptoms of androgen excess, and related metabolic alterations are the main focus of PCOS treatments. The use of hormonal contraceptives for menstrual regulation and androgen suppression, antiandrogens as adjunctive therapies for the treatment of hirsutism, and insulin sensitizing drugs are typical therapeutic modalities (**Huddleston et al., 2020**)

Females with PCOS can benefit from the counseling and education provided by nurses. Additionally, nurses are in a good position to create and implement PCOS care regimens that are best communicated as comprehensive, lifelong health education programs. To encourage engagement, nurses might offer counseling with educational support in the form of electronic or textual materials. A successful plan would address nutrition education, meal planning, physical activity, mental and emotional health, and weight and stress reduction measures. (**Reda et al., 2022**).

Significance of the study:
The World Health Organization (WHO) estimated that 116 million women worldwide (3.4%) are affected by PCOS (**El Sayed et al., 2020 & Bulsara et al., 2021**) PCOS prevalence varies greatly across the world, from 2.2% to as high as 26%. While up to 70% of PCOS-suffering women go undiagnosed (**AL Kurdi et al., 2021**). In 2017, the age-standardized incidence rate of PCOS in women of reproductive age was 82.44 per 100,000 individuals, which was 1.45% higher than in 2007(**Motlagh et al., 2022**).

In Egypt, 6.6% of adolescent females have PCOS, and 12.6% of them are at high risk (**Maghraby et al., 2022**). In the obstetrics and dermatology outpatient clinics at Zagazig University Hospital, the prevalence of PCOs among young adults single females was 55.6% (**Siam et al., 2020**).

Early detection and treatment of PCOS in adolescents can help them avoid the syndrome's long-term reproductive, cardiometabolic, and emotional effects in the future. Polycystic ovarian syndrome is an increasing issue among young women who are fertile (**Asanidze et al., 2021**).

In Egypt, especially in Upper Egypt, there is a lack of research reports on PCO screening. However, many studies (**Mohamed & Moustafa, 2019, Alshdaifat, 2021, & Mohamed, 2022**) have concentrated only on evaluating the efficacy of educational programs on the degree of knowledge, attitude, quality of life, and lifestyle regarding polycystic ovarian syndrome and based on the recommendations mentioned in the previous research (**El Sayed et al., 2020 & AL Kurdi et al., 2021**) there is a need to a strategic planning for regular screening of Egyptian students and applying a screening program for PCOS in adolescents to decrease the long-term health consequences linked to PCOS. The first step in controlling PCOS is to raise awareness and get a proper diagnosis (**Thabet et al., 2021**).

Aims of the study:
1. To assess the prevalence of polycystic ovarian syndrome among Students at Minia university dorms,
2. To evaluate the effect of health education program on students' knowledge about PCOs and provide a management plan for confirmed cases of PCOs.

Research Hypothesis:
- The screening program will help in identifying the prevalence of PCOs among students at Minia university dorms.
- The educational program will help in improving the total knowledge score of students about PCOs after implementation of it.

- The Clinical features for confirmed cases will be improved after the implementation of a management plan intervention.

Subjects and Methods

Research design: A cross sectional research design with intervention was used to achieve the aim of the study.

Setting: The present study was carried out at Minia University Dorms for female.

Sample: A purposive sample was utilized in the current study. Female students who were presented in the Minia University Dorms 1400 but 1083 female who recruited according to inclusion and exclusion criteria.

Inclusion criteria: age range between 18 and 25 years, and free from any medical or gynecological problem. **Exclusion criteria**: students who refused to participate.

Research Tools

The following four tools were used in the current study to collect data:

The first tool: Personal data assessment tool (pretest): it is a self-administered questionnaire that the researchers developed after reviewing pertinent literature. It divided into 2 parts:

Part (I): Socio demographic information such as name, age, faculty, academic level, residence, mothers' educational attainment, mothers' employment, socioeconomic status, phone number, BMI (BMI of ≤17.9 kg/m2, 18-22.9 kg/m2, 23.0-24.9 kg/m2 and ≥ 25 kg/m2 were categorized as, underweight, normal, overweight, and obese respectively (**Weir & Jan, 2019).** If they heard about PCOs previously and the source of information they heard about it.

Part (II): Menstrual history including: menarche age, menstrual blood flow duration, menstrual cycle length and regularity, amount of menstruation, and menstrual pain.

The second tool: Diagnostic Criteria for PCOs (pretest): After revising a relevant literature, the researchers created self-administered questionnaires which include:

Part (I): The risk factors and symptoms suggesting PCOs based on their menstrual history such as (family history of PCOs , family history of diabetes mellitus, family history of infertility, over weight /obese with difficulty losing weight, secondary amenorrhea , presence of heavy menstrual bleeding (change pad nearly every hour), prolonged periods (more than 7 days), signs and symptoms of hyperandrogenism like the existence of hirsutism (an abnormal amount of hair growing in an unexpected place on the body, such as the upper lip, chin, abdomen, breast, or thighs), presence of moderate to severe acne or male pattern hair loss or alopecia, presence of discoloration or dark color patches on skin (acanthosis nigricans) and metabolic features (obesity, dyslipidemia).

Part (II): Hirsutism assessment tool (Modified Ferriman–Gallwey score): The modified Ferriman-Gallwey scoring model for quantifying the extent and severity of hair growth in women. Hair growth is graded using a scale from 0 (no terminal hair) to 4 (maximal growth) in nine different areas. The maximum score is 36.

Scoring system: no hirsute (<8 scores), mild hirsutism (8-16 scores), moderate hirsutism (17-25 scores), and sever hirsutism (>25 scores) **(Hatch et al. 1981).**
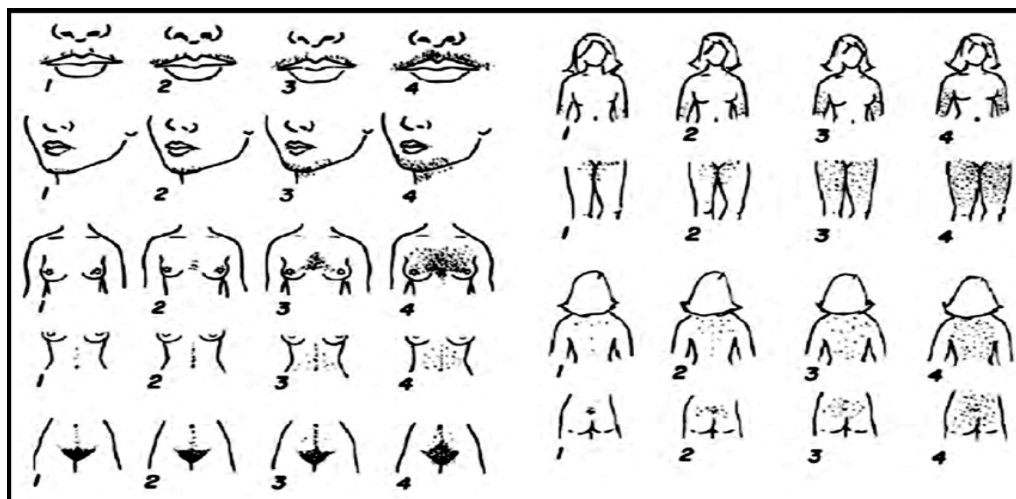
Ferriman–Gallwey scores for Hirsutism, (Hatch, et al. 1981).

Part (III): The Rotterdam criteria (2003) are the most widely used tool for diagnosing PCOS and include the following criteria: Oligomenorrhea (irregular menstrual periods) or amenorrhea (absence of menstrual periods), Hyperandrogenism (based on clinical body signs on the body and/or biochemical signs), Polycystic ovaries on the ultrasound (≥ 12 follicles measuring 2-9 mm in diameter). The diagnosis of PCOs was confirmed by the presence of at least two of the three criteria. **Scoring System:** > 2 criteria consider confirmed cases with PCO, < 2 criteria consider not confirmed case with PCO (**The Rotterdam criteria, 2003**).

The third tool: Knowledge assessment tool about PCOs (pre/post): it is a self-administered electronic questionnaire established by the researchers after reviewing related literatures. It included 10 questions to assess female students' awareness regarding PCOs on Google forms such as (definition, causes, risk factors, Rotterdam diagnostic criteria of PCOs, signs and symptoms, diagnosis, treatment and management, complication, prevention,…etc.). **Scoring system:** knowledge questions were assumed (scores 1, 2, and 3) for don't know answers, incomplete correct answers, and complete correct answers, respectively. The total knowledge score was classified as poor (<50%) (<15 scores), average (50–75%) (15-22 scores), or good (>75%) (>22 scores). (**Aarthi, 2019).**

The fourth tool: The management plan assessment tool for confirmed cases of PCOs (pre, post and follow up): it is a structured interviewing questionnaire established by the researchers after reviewing related literatures. It included 15 questions to assess the student's lifestyle modification for PCOs management. (Consumption of a healthy diet and proper food choices, physical exercise, weight reduction, sleep and rest, stress management, and drugs used to manage PCOs).

Content validity: The study tools were updated for correctness, relevance, inclusion, understanding, applicability, and simplicity by a five-person panel of professors from community health nursing, women health and obstetrics nursing, and obstetrics and gynecology medicine.

Reliability: The Alpha Cronbach test was used to gauge how consistently the instruments' internal consistency was maintained. It was (.965) for the assessments of diagnostic criteria scale, (.973) for the knowledge sheet and (.943) for risk factors. Hence, the sheets were found to be highly reliable.

Pilot study
After designing the tool, a pilot study on 10% of female students (108) was carried out to evaluate its clarity, validity, and turnaround time. The results of the pilot study were taken into consideration when

conducting the study, but no changes were made in light of the findings.

Ethical consideration
After explaining the purpose of the study to secure the assistance, support, and permission for the intervention, the faculty ethical committee and authorities' staff in Minia university dorms gave their administrative approval for the project's implementation. Then participants were informed that their participation was optional, and they could stop at any moment, informed that their data would be kept confidential, and the information would only be used for the current study.

Procedure
The current study was carried out through four phases: assessment (pretest), implementation (health education program), evaluation (posttest) and follow-up (management plan). The data was collected from the first of November 2022 to the end of April 2023 over a six-month period.

Assessment phase (pretest):
1. At first, coordination was made with the managers and the staff members of Minia University Dorms to decide the place, time, methods, media to be used in the study activities. The researchers attended the study setting to meet the students at the meeting room of the Minia university dorms, The researchers great the students and introduce themselves then provided an explanation of the study including its purpose, use of results and information of the questionnaire (Confidentiality), as well as let them know that their participation was optional and they had the choice to stop at any moment, all participants gave their consent verbally.

2. After receiving participants' permission to take part in the study, the researchers conducted the first session, the researcher presented an overview and example of the assessment tools, then invent the students to join a What's Application groups for PCOs screening and filled a self-administered questionnaire (pretest) via link of Google Forms to assess their sociodemographic characteristics, menstrual history, risk factors and symptoms suggesting PCOs, Rotterdam 2003 criteria for PCOs, and their knowledge regarding PCOs and management plan of PCO. It took about 25-30 minutes to finish filling out the survey. Number of students assessed/day was 100-150 according to student attendance rate.

Implementation phase (doing educational intervention):
1. In this phase, the researchers conducted the second session of intervention program with the females who agree to participate in the study in the form of a lecture by using audiovisual aids

(PowerPoints and brochures) for clarification, it took an hour. It included explaining all information about PCOs such as (concepts of PCOs, reasons, risk factors, criteria, signs and symptoms, diagnosis, complications, treatment, management, and prevention).

2. At the end of the lecture, the researchers permitted an open group discussion for any questions and feedback from all females was attained to confirm the maximum benefits were received.

3. Leaflets about PCOs were provided to the females at the end of lecture to accomplish its goal. It involved important knowledge about PCOs (concept, reasons, risk factors, criteria, signs and symptoms, diagnosis, complication, treatment, management, and prevention, …etc.). Moreover, the researchers encouraged the student to communicate at any time through phone or What's application groups of PCOs screening for commitment and support.

4. The diagnosis of PCOS was made according to the revised 2003 Rotterdam ESHRE/ASRM consensus criteria and the recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome along with the exclusion of related disorders **(Rotterdam, 2003 & Teede, 2018).** From the total number 1083 female students who participated in the study, about 168 students were suspicious to have risk factors and features of PCOS and were visited to a gynecologist specialist for further confirmation, after that 73 students were confirmed to have PCOs (identification of potential subjects who have more than five risk factors and two or more of Rotterdam diagnostic criteria (2003).

Evaluation phase (posttest):
In this phase, the researchers asked the students to fill the knowledge assessment tool after the conduction of the intervention program as a posttest (the same tool used in the pre-test) to evaluate their knowledge improvement regarding PCOs. It took about 15–20 minutes to complete. The effectiveness of health education program on students' knowledge regarding PCOs was assessed through pretest and posttest comparisons.

Follow-up phase (Management plan follow up):
In this phase, the researchers provided a management plan of PCOs for confirmed cases that included (Consumption of a healthy diet and proper food choices, physical exercise, weight reduction, sleep and rest, stress management, and drugs used to manage PCOs). Continuous contact was maintained with the confirmed cases to ensure their commitment and confirm that they followed the instructions of the management plan correctly. The follow-up continued for six months after receiving the intervention program. The effectiveness of the management plan of PCOs for confirmed cases was assessed through pretest and posttest and follow up comparisons

Statistical analysis
With the aid of the 2013-released statistical software for the social sciences (SPSS), the gathered data was arranged, categorized, and examined. Version 22.0 of IBM SPSS Statistics for Windows. IBM Corp, Armonk, New York. In order to present the data, descriptive statistics were used. For qualitative variables, frequencies and percentages were used, and for quantitative variables, means and standard deviations. The paired t test, $\chi 2$ test, and the ANOVA were the statistical tests that were used. When the P value was less than 0.05 and equal to 0.001, statistical significance was regarded to exist. When the P value was more than 0.05, no statistically significant difference was taken into consideration.
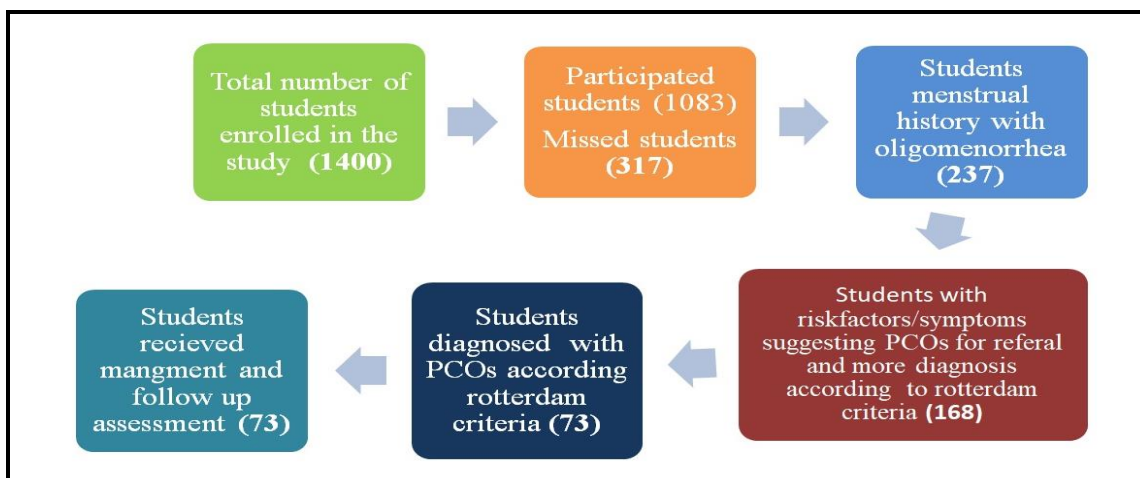
Recruitment participants chart

Results:

Table (1) Distribution of socio demographic characteristics among the studied sample (N = 1083)

| Sociodemographic Characteristics	Studied sample (1083)	
	No	%
Age		
18- <20	225	20.8
20 < 22	653	60.3
> 22	205	18.9
Mean ± SD	**20.45±1.145**	
Faculty		
Medical Faculties	293	27.1
Non-medical faculties	790	72.9
Academic level		
First year	32	3.0
Second year	523	48.3
Third year	400	36.9
Fourth year	128	11.8
Residence		
Urban	274	25.3
Rural	809	74.7
Mother's Level of Education		
Illiterate	314	29.0
Primary	136	12.6
Preparatory	18	1.7
Technical school	112	10.3
Secondary school	293	27.1
University	210	19.4
Mother's Occupation		
Employed	212	19.6
Housewife	871	80.4
Socioeconomic Status		
Enough	828	76.5
Not enough	255	23.5
Are you heard about Polycystic Ovarian Syndrome?		
Yes	27.6	299
No	72.4	784
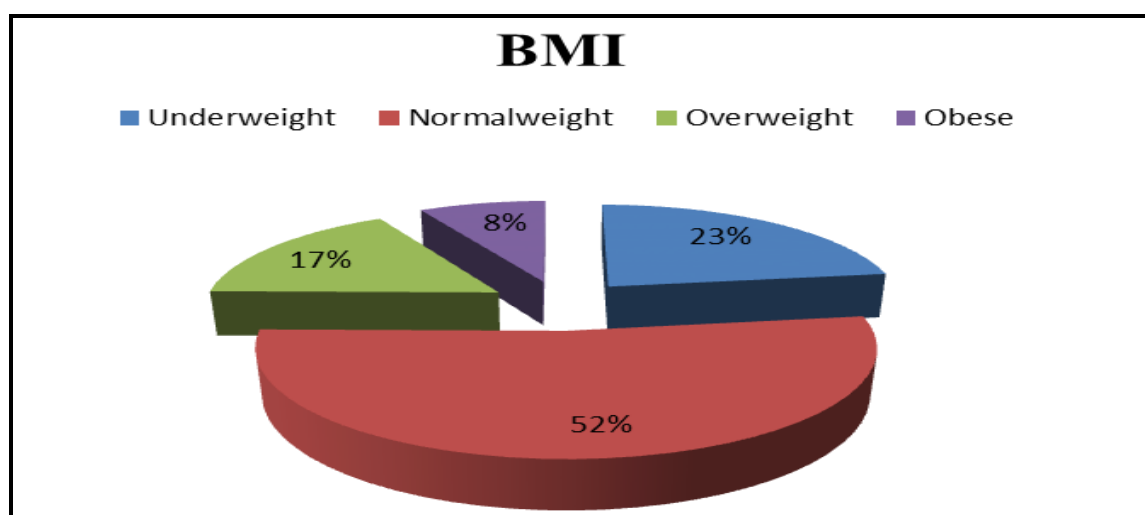
Figure (1): BMI among the studied sample (N= 1083)
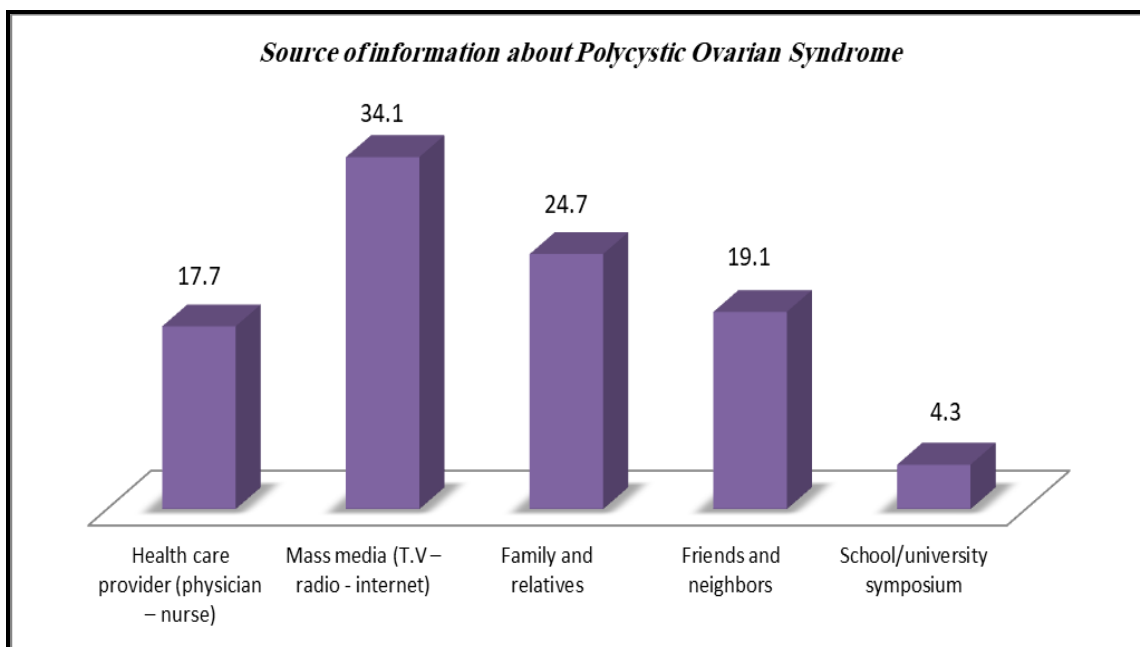
Figure (2): Sources of information about polycystic ovarian syndrome (N= 299)

Table (2): Menstrual history among the studied sample (n= 1083):

Menstrual history of participants	No.	%
Age at menarche		
≤ 12	618	57.1
13-14	323	29.8
≥15	142	13.1
Mean ± SD	**12.64 ± 1.78**	
Duration of menstrual blood flow		
≤ 3days	199	18.4
4-6 days	775	71.6
≥7 days	109	10.1
Mean ± SD	**4.75 ± 0.92**	
Menstrual cycle length		
≤ 21 days	162	15.0
21–34 days	684	63.2
≥ 35 days (**Oligomenorrhea**)	237	21.9
Mean ± SD	**26.35 ± 1.24**	
Menstrual Regularity		
Regular	678	62.6
Irregular	405	37.4
Amount of menstruation		
Scanty	186	17.2
Moderate	792	73.1
Sever	105	9.7
Presence of dysmenorrhea		
Yes	923	85.2
No	160	14.8

Table (3): Distribution of risk factors and symptoms suggesting PCOs among the studied sample suffering from Oligomenorrhea based on their menstrual history (n= 237):

| Risk factors and symptoms suggesting PCOs	Yes		No	
	No.	%	No.	%
Family history of PCOs	159	67.1	78	32.9
Family history of diabetes mellitus	205	86.5	32	13.5
Family history of infertility	168	70.9	69	29.1
Overweight /Obese with difficulty losing weight	198	83.5	39	16.5
Secondary Amenorrhea	163	68.8	74	31.2
Presence of heavy menstrual bleeding (change pad nearly every hour)	105	44.3	132	55.7
Prolonged periods (more than 7 days)	109	46.0	128	54.0
Signs and symptoms of hyperandrogenism	200	84.4	37	15.6
Presence of dark color patches or discoloration on skin (acanthosis nigricans)	188	79.3	49	20.7
Mean ± SD of risk factors and symptoms that suggest PCOs	**6.31 ± 3.237**			
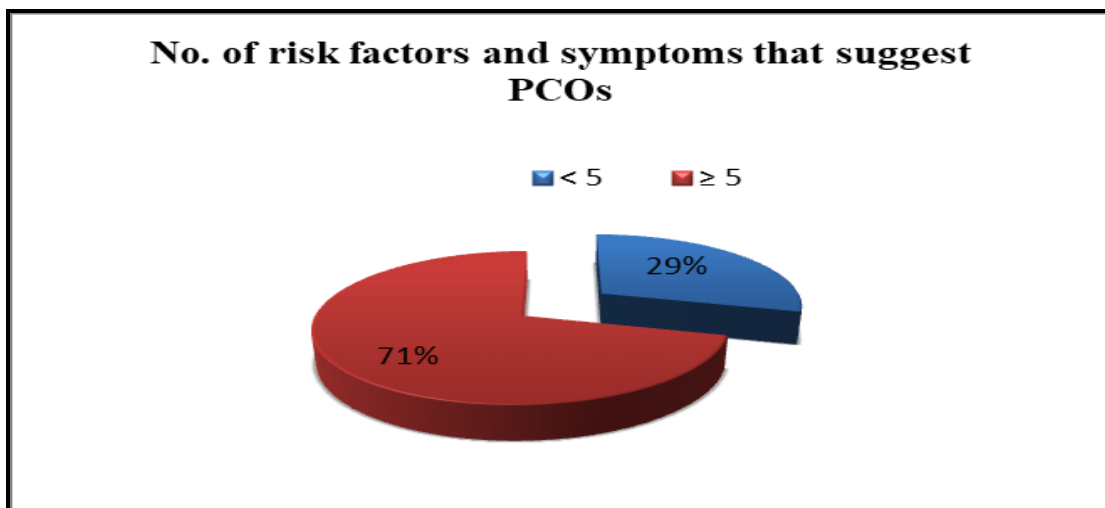
Figure (3): Distribution of studied students who are risky for PCOs according to risk assessment questionnaire (n = 237).

Table (4): Distribution of hirsutism among the studied sample suffering from oligomenorrhea (237)

Site	Complete lack of terminal hair (0)	Minimal presence of terminal hairs (1)	More than minimal terminal hairs (2)	Not too large hairs (3)	Presence of terminal hairs (4)
Upper lip	12 (5.1%)	148(62.4%)	28(11.8%)	26(11.0%)	23(9.7%)
Chin	4(1.7%)	151(63.7%)	30(12.7%)	27(11.4%)	25(10.5%)
Chest	2(.8%)	170(71.7%)	32(13.5%)	7(3.0%)	26(11.0%)
Upper abdomen	3(1.3%)	208(87.8%)	13(5.5%)	8(3.4%)	5(2.1%)
Lower abdomen	5(2.1%)	207(87.3%)	10(4.2%)	10(4.2%)	5(2.1%)
Arms	2(.8%)	210(88.6%)	14(5.9%)	8(3.4%)	3(1.3%)
Thigh	62(26.2%)	150(63.3%)	13(5.5%)	7(3.0%)	5(2.1%)
Upper back	37(15.6%)	155(65.4%)	13(5.5%)	7(3.0%)	25(10.5%)
Lower back	41(17.3%)	118(49.8%)	28(11.8%)	27(11.4%)	23(9.7%)
Mean ± SD	**11.90 ± 6.668**				

Table (5): Ferriman–Gallwey total score for hirsutism among the studied sample suffering from oligomenorrhea based on their menstrual history (237).

Grades of hirsutism	Studied sample (237)	
	Yes	**N%**
No hirsute (<8)	37	15.6
Mild hirsutism (8-16)	154	65.0
Moderate hirsutism (17-25)	35	14.8
Sever hirsutism (>25)	11	4.6
Mean ± SD	**11.90 ± 6.668**	

Table (6): Distribution of the referred studied sample regarding Rotterdam diagnostic criteria for PCOs (n= 168)

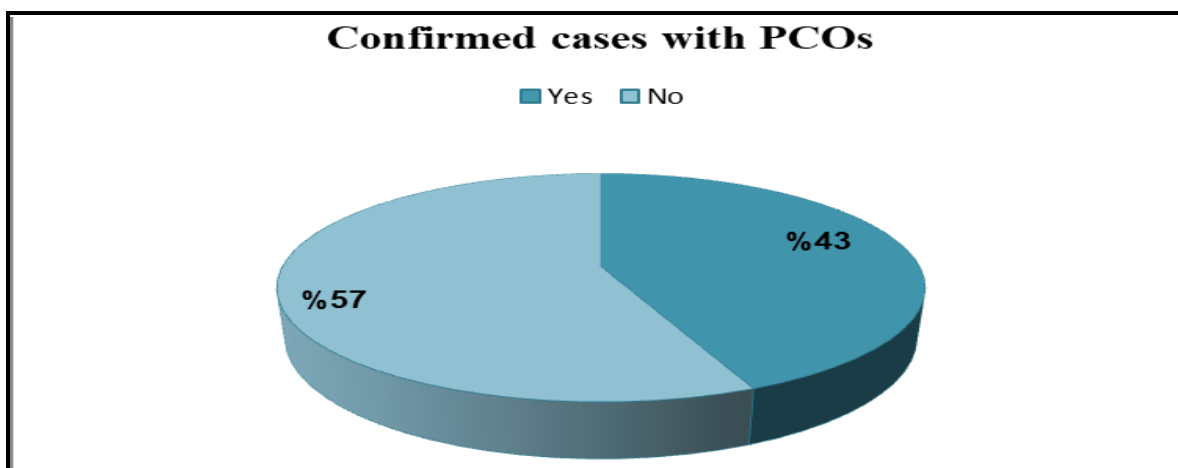| Rotterdam diagnostic criteria for PCOs	Studied sample (168)			
	Yes	**N%**	**No**	**N%**
Oligo-anovulation,	168	100	0	0
Hyperandrogenism (abnormal hormonal assay)	73	43.5	95	56.5
Ultrasonography (Polycystic ovaries (≥ 12 follicles measuring 2-9 mm in diameter)	55	32.7	113	67.3
Mean ± SD	**1.76 ± 0.917**			

Figure (4): Distribution of the confirmed cases with PCOs according to Rotterdam diagnostic criteria. (n=168).

Table (7): Relationship between grades of hirsutism and BMI with confirmed and non- confirmed cases with PCOs (n= 168):

Items	Studied sample (168)			
	Confirmed cases with PCOs. (73)		Non- confirmed cases with PCOs. (95)	
	N	**%**	**N**	**%**
Grades of hirsutism				
No hirsute (<8) (No=16)	3	18.8	13	81..3
Mild hirsutism (8-16) (No=106)	37	34.9	69	65.1
Moderate hirsutism (17-25) (No=35)	24	68.6	11	31.4
Sever hirsutism (>25) (No=11)	9	81.8	2	18.2
X^2 (P – value)	**22.702 (0.001) ****			
BMI				
Underweight (No=32)	4	12.5	28	87.5
Normal (No=67)	13	19.4	54	80.6
Overweight (No=44)	38	86.4	6	13.6
Obese (No=25)	18	72.0	7	28.0
X^2 (P – value)	**69.513 (0.001) ****			

Table (8): Distribution of Knowledge regarding PCOs among the studied sample (Pre and posttest) (n=1083).

Items	Pretest Mean ±SD	Posttest Mean ±SD	T	P
Definition of PCOs	1.47±.642	2.68±.619	48.117	0.001**
Causes of PCOs	1.41±.637	2.66±.650	48.431	0.001**
Risk factors of PCOs	1.39±.632	2.71±.635	49.528	0.001**
Rotterdam diagnostic criteria of PCOs	1.32±.563	2.75±.596	55.741	0.001**
Signs and symptoms PCOs	1.30±.536	2.66±.624	56.495	0.001**
Diagnosis of PCOs	1.23±.473	2.38±.634	46.260	0.001**
Complications of PCOs	1.23±.473	2.38±.634	46.260	0.001**
Treatment of PCOs	1.22±.464	2.38±.634	46.365	0.001**
Management of PCOs	1.25±.481	2.28±.633	39.207	0.001**
Prevention of PCOs	1.25±.481	2.01±.667	32.196	0.001**
Total knowledge	**13.08±4.871**	**24.91±.5.415**	**65.071**	**0.001****

*Test used: paired sample T test.   **Highly statistically significant at P value less than or equal to 0.01.*

Table (9): Total knowledge score regarding PCOS among the studied sample (Pre and posttest) (n= 1083)

Total Knowledge score	Pretest No	Pretest %	Posttest No	Posttest %	T	P- Value
Poor < (50%) (<15 scores)	785	72.5	90	8.3		
Average (50- 75%) (15-22 scores)	262	24.2	111	10.2	65.071	0.001**
Good > (75%) (>22 scores)	36	3.3	882	81.4		
Mean ± SD	**13.08±4.871**		**24.91±.5.415**			

*Test used: paired sample T test.   **Highly statistically significant at P value less than or equal to 0.01.*

Table (10): Total knowledge scores association with selected socio-demographic in pre and posttest (N=1083)

Variables	Pretest Poor No (785)	Pretest Average No (262)	Pretest Good No (36)	Posttest Poor No (90)	Posttest Average No (111)	Posttest Good No (882)
Age						
18-<20 years (No= 225)	158	57	10	15	23	187
20-<22 years (No = 653)	486	152	15	55	66	532
>22 years (No = 205)	141	53	11	20	22	163
X^2 (P – value)	6.960(.138) NS			1.487(.829) NS		
Faculty						
Medical Faculties (No = 293)	58	205	30	24	29	240
Non-Medical Faculties (No=790)	727	57	6	66	82	642
X^2 (P – value)	559.495(.001)**			0.66(.967) NS		
Residence						
Urban (No = 274)	176	82	16	19	32	223
Rural (No = 809)	609	180	20	71	79	659
X^2 (P – value)	15.413(.001)**			1.567(.457) NS		

*Test used: Chi square test.   * Statistically significant at P – value ≤ .05*
*NS= Not statistically significance   ** Highly statistically significant at P – value ≤ .01.*

Table (11): The frequency distributions of management intervention among confirmed cases as compared to the educational program pre-, post-, and follow-up (n= 73).

Management intervention	Pre intervention N	Pre intervention %	Post intervention N	Post intervention %	Follow up N	Follow up %	F	P-value
Lifestyle change								
• Healthy diet	9	12.3	53	72.6	60	82.2	87.095	0.001**
• Structured exercise	7	9.5	49	67.1	62	84.9	76.934	0.001**
• 5–10% weight loss	3	4.1	45	61.6	56	76.7	69.770	0.001**

Management intervention	Pre intervention		Post intervention		Follow up		F	P-value
	N	%	N	%	N	%		
Prescribed drugs usage								
• Combined oral contraceptive pill	2	2.7	58	79.5	61	83.6	136.775	0.001**
• Cyclic Progestins	3	4.1	55	75.3	59	80.8	104.055	0.001**
• Metformin	5	6.8	65	89.0	70	95.9	264.112	0.001**

*Test used: ANOVA.   **Highly statistically significant at P value less than or equal to 0.01.*
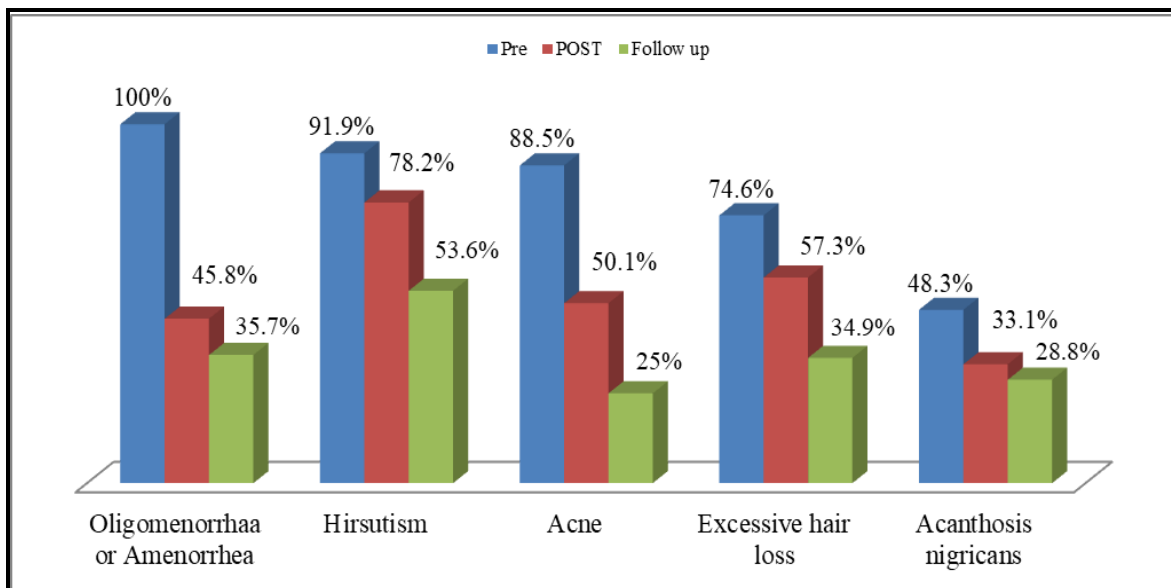
Figure (5): Comparison of the clinical features among confirmed cases in pre, post and follow up the educational intervention. (n=73).
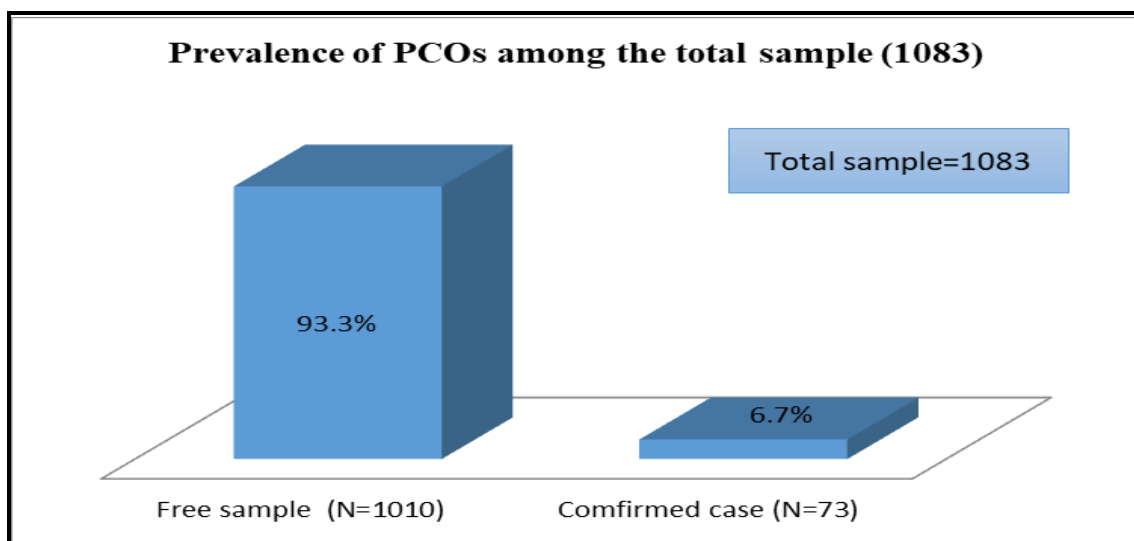
Figure (6): prevalence of PCOs among the total sample

Table (1): Illustrates sociodemographic characteristics among the studied sample, it shows that 60.3% of the sample were between the ages of 20- and 22, with Mean and SD 20.45±1.145 years. 72.9% of them belonged to non-medical faculties and 48.3% of them were in the second academic year also 74.7% were from rural area. Concerning their mother's education and occupation, 29.0% of them were illiterate and 80.4% were housewife. Concerning previous hearing about polycystic ovarian syndrome, 72.4% of studied sample weren't heard about PCOs and only 27.6% were heard about it.

Figure (1): Demonstrates body mass index among the studied sample. It reveals that 52%, 23%, 17% and 8% of them had a normal weight, underweight, overweight, and obese respectively.

Figure (2): Represents source of information about polycystic ovarian syndrome; it shows that 34.1% of studied sample their source of information about PCOs from mass media as (T.V, radio, and internet).

Table (2): Menstrual history among the studied sample, it illustrates that 57.1% of studied students their age at menarche less than or equal 12 years, with mean age 12.64 ± 1.78 years, 21.9% of them had oligomenorrhea, 62.6% of them reported regular menses and 85.2% of them had dysmenorrhea.

Table (3): Distribution of risk factors and symptoms suggesting PCOs among the studied sample suffering from Oligomenorrhea based on their menstrual history, it shows that 86.5%, 84.4%, 83.5%, 79.3% and 70.9% of the sample had a family history of diabetes mellitus, signs and symptoms of hyperandrogenism, overweight /Obese with difficulty losing weight, presence of discoloration or dark color patches on skin (acanthosis nigricans) and family history of infertility respectively. Mean ± SD of risk factors and symptoms that suggest PCOs was 6.31 ± 3.237.

Figure (3): Distribution of studied students who are risky for PCOs according to risk assessment questionnaire, it revealed that out of 237 students, 69 students 29% were have < 5 risk factors and symptoms that suggest PCOs, and 168 students 71% were have ≥ 5 risk factors and symptoms that suggest PCOs and consequently, they who were referred for physician consultation and diagnosis.

Table (4): Illustrates distribution of hirsutism among the studied sample suffering from oligomenorrhea, it shows that there was a minimal presence of terminal hairs in different site of the body like arms, upper abdomen, lower abdomen, and upper back, 88.6%, 87.8%, 87.3% and 65.4% respectively.

Table (5): Demonstrates Ferriman–Gallwey total score for hirsutism among the studied sample suffering from oligomenorrhea based on their menstrual history. It reveals that 65.0% of them had a mild Hirsutism where Mean ± SD were 11.90 ± 6.668.

Table (6): Distribution of the referred studied sample regarding Rotterdam diagnostic criteria for PCOs, it shows that 100%, 43.5%, 32.7% of them had Oligo-anovulation, Hyperandrogenism (abnormal hormonal assay) and Ultrasonography (polycystic ovaries (≥ 12 follicles measuring 2-9 mm in diameter) respectively.

Figure (4): Distribution of the referred students who are risky for PCOs according to risk assessment questionnaire to physician consultation and diagnosis,

it is noticed that out of 168 risky students 73 of them 43 % were diagnosed with PCOs.

Table (7): Illustrates relationship between grades of hirsutism and BMI with confirmed and non-confirmed cases with PCOs, it reveals that 81.8%, 68.6% of the confirmed cases with PCOs suffering from sever to moderate hirsutism respectively. Regarding BMI 86.4% and 72.0% were overweight and obese respectively with a high statistically difference where P<0.001.

Table (8): Illustrates knowledge regarding PCOS among the studied sample. It shows that after the educational program, there was a highly statistically significant improvement in each participant's knowledge parameter (where the p-value for each one was 0.001), demonstrating a significant increase in all of the participants' knowledge regarding PCOS.

Table (9): Demonstrates total knowledge score regarding PCOS among the studied sample, it demonstrates that 8.3% of the studied sample had poor knowledge in posttest which decreased from 72.5 % in pretest. The mean score of their knowledge was 13.08±4.871in pretest, increased to 24.91±5.415 in posttest with highly statistically significant improvements in their knowledge level.

Table (10): Illustrates total knowledge scores association with selected socio-demographic in pre and posttest. It demonstrates that there was a highly statistically significant relationship between the studied sample's total knowledge of PCOs and their faculty, as well as residence, in the pretest (P-value = 0.001) but not in the posttest. In pre and posttest with P-values of >.05., there was no statistically significant relationship between the studied sample's total knowledge and their age.

Table (11): The frequency distributions of management intervention among confirmed cases as compared to the educational program pre-, post-, and follow-up. It shows that there was significant difference in all items related to lifestyle change and prescribed drugs usage with highly statistically significant improvement in all management intervention as compared to the educational program pre-, post-, and follow-up (where p-value = 0.001 in each one)

Figure (5): Comparison of the clinical features among confirmed cases in pre, post and follow up the educational intervention. It illustrates the improvement in clinical features between the educational intervention's pre-, post-, and follow-up periods.

Figure (6): Prevalence of PCOs among the total sample. It showed that out of 1083 students 73 (6.7%) were detected with PCOS based to Rotterdam diagnostic criteria for PCOs.

Discussion

Screening programs for adolescence is essential efforts for early detecting the risk factors, promoting the healthy lifestyle, and providing intervention as early as possible to avoid the future occurrence of PCOS, (**El Sayed et al., 2020**). Accordingly, increasing awareness regarding the prevalence of PCOS among adolescents could assist in the detection and management of PCOS as early as possible (**Coffin et al., 2023).**

Prevention of PCOs and its complication depend on increasing awareness at an early age of life (**Jakhar et al., 2022**). Therefore, the current study aimed to assess the prevalence of polycystic ovarian syndrome among Minia university students, evaluate the effect of health education program on their knowledge about PCOs and provide a management plan for confirmed cases. Out of 1083 students 73 (6.7%) were detected with PCOS based to Rotterdam diagnostic criteria for PCOs.

Concerning socio-demographic characteristics of participants, the present study showed that about two thirds of them their age was between 20-22 years, with Mean and SD 20.45±1.145 years, less than half of them were in the second academic year. Also, about three quarters of them belonged to non-medical faculties, three quarters of them were from rural area. These findings were supported by findings of **El Sayed et al., 2020** in Egypt who described that most of students were within the 21-23 years age group. Nearly half of them were from non-medical faculties and about two thirds of them were from rural areas. Also, this was in agree with a study of **AL-Kurdi et al., 2021** in Egypt who showed that more than two thirds of the participants were within the 18-20 years and more than one third had 2nd grade.

On the other hand, a study of **Kiran et al., 2023** in Lahore, India reported that most of studied females were belonging to the age of 17-20 years and come from urban areas. Also, results of **Monterio et al., 2021** in Mangaluru showed that all participants were aged between 16-17 years, most of them were from urban areas. This variance in findings may be attributed to the difference in study population and setting.

Concerning sources of information about PCOs, these findings showed that mass media were the main source of information among one third of studied sample. It might be attributed to that students at this age group are more interested with using social media and internet and they spent most of their time using it. Additionally, most of their mothers were illiterate and might be unaware about such health problems that cannot provide them with essential knowledge regarding it.

This was agreed with a study conducted in Indonesia by **Ariani et al., 2022** which detailed that most of the information obtained from the internet/social media, also it agreed with **Jakhar et al., 2022** which revealed that internet was the main source of information about PCOs. On the other side, it was contradictory to findings of a study conducted by **Salama & Elbana, 2019** in Benha, Egypt which showed that health team was the main source of participants information about PCOs.

Additionally, the current study illustrated that the mean age at menarche of participants was 12.64 ± 1.78 years, less than one quarter of them had oligomenorrhea, about two thirds of them had regular menstruation and majority of them reported dysmenorrhea. It was supported by a study of **Ibrahim et al., 2023** in Egypt which reported that the age of menarche was 13 years among participants, but it didn't match the findings of **Ariani et al., 2022** who reported that respondents age of menarche was between 13-15 years. Most of them experienced irregular menstruation and more than one third of them reported dysmenorrhea.

Also, it contradicted with a study of **Al Souheil & Chahine, 2022** in Beirut, Lebanon which showed that about two thirds of participants had a normal interval of menstruation. This variance in findings may be attributed to the difference in study population and setting.

Regarding to risk factors and symptoms that suggest PCOs, the present results demonstrated that majority of the studied sample had a family history of diabetes mellitus, signs and symptoms of hyperandrogenism, overweight/Obese with difficulty losing weight, presence of discoloration or dark color patches on skin and family history of infertility. It was in agreement with findings of **Ibrahim et al., 2023** in Egypt which reported that family history of PCOS, overweight /Obesity and family history of infertility were the most common risk factors for PCOS. Also, it was consistent with a study of **Barrea et al., 2022** which demonstrates that individuals with obesity are at higher risk of PCOS.

The existing study showed that two thirds of participants suffering from oligomenorrhea were risky for PCOs out of them; more than two fifth were diagnosed with PCOs (6.7% of total screened students) according to Rotterdam criteria. This might be attributed to the fact that the majority of them did not have any knowledge about those disease or were not capable to modify lifestyle accordingly to prevent its development. In addition to exposure to stress, their sedentary lifestyle and of regular exercise lack or physical activity which might increase prevalence of overweight /Obesity among them and majority of

them were had a family history of disease which predispose to PCOs occurrence.

Furthermore, this finding was within global prevalence according to **Arora et al., 2021** who stated that PCOs affecting between 4% and 18% of women of reproductive age globally. These findings were matched with **AL-Kurdi et al., 2021** which showed that more than nine percent of screened participants were diagnosed with PCOS.

The present study illustrated that there was a highly statistically significant relation between confirmed cases with PCOs and their BMI and with degree of hirsutism. The majority of confirmed cases with PCOs were overweight or obese. This might be explained as BMI and PCOS affect each other, obesity is one of risk factors for PCOS and PCOS causes further metabolic disorders that might leads to weight gain and prevent weight loss **(Coffin et al., 2023)**.

This finding agreed with **Pesonen et al., 2023** who highlighted that up to seventy percent of women with PCOS have underweight or obesity. Also, with **Rizvi et al., 2023** who reported that developing PCOS was higher among obese participants and who having excessive hirsutism (moderate to severe hirsutism) were 4 times more likely to have PCOS. Similarly, it congruent with **Ibrahim et al., 2023** who concluded that BMI was statistically significantly higher in the PCOS group.

The current study highlighted that there was a statistically significant increase in all participants knowledge items concerning PCOS after the educational program with highly statistically significant improvement in each knowledge parameter. These results could be attributed to the great effectiveness of educational programs and the clarity of instructions in increasing participants' awareness regarding PCOs.

It was in the same line with findings of **Abraham et al., 2022** which reported that the posttest mean score of students' knowledges was significantly greater than the pretest knowledge score and with **Valarmathi & Metilda, 2022** which concluded that girl's knowledge on PCOs was improved after the video assisted teaching program. In addition to the findings of **Arora et al., 2021** which highlighted increased adolescents' knowledge score regarding PCOS after educational program. Also, with **Mala et al., 2019** and **Almukhtar, 2019** which reported improvement in participants knowledge scores about all knowledge categories related to PCOs after the educational intervention.

The present study reported that there was statistically significant association between participants knowledge regarding PCOs and their faculty and residence in pretest. The higher score of knowledge was among students of medical faculties. Reasonably, it is logical that students of medical faculties were supposed to studying different medical curriculum that is designed to include information regarding women health, adolescent health, health problems and diseases related to them such as PCOS.

This was in matching with findings of **Rizvi et al., 2023** which revealed that the mean score of PCOs knowledge among participants of medical faculties was higher than the mean score among participants of non-medical faculties. Also, with **El Sayed et al., 2020** who revealed that there was a statistically significant association between students' residence and PCOS knowledge.

Additionally, the current study illustrated that there was not a statistically significant relation between participants total knowledge about PCOs and their age in pre and posttest. It can be attributed to the smallest differences between the age categories of participants as the range of their age was 18-22 years. These findings were in congruency with findings of **Abraham et al., 2022 & Mala et al., 2019** which revealed that age was not associated with participants knowledge score about PCOs. In contrast, **Al Souheil & Chahine, 2021** highlighted that older age was negatively associated with good PCOS knowledge.

Furthermore, the result of this study highlighted that there was significant difference in all lifestyle pattern and prescribed drugs related to usage among the confirmed cases of PCOs. It reflected a significant improvement in all management intervention after conducting the educational program which might be due to the positive effect of this program in encouraging participants to modify their unhealthy behaviors, adopt healthy lifestyle as healthy diet, exercise, weight loss and to follow management instruction.

This agreed with **AL- Kurdi et al., 2021** which revealed that there was significant difference in participants' lifestyle pattern after implementing the educational program. Also, with **Salama & Elbana, 2019** who revealed that there was statistically significant difference among total healthy behaviors scores concerning PCOS in pre and post implementing the program.

Finally, the current study revealed that there was a statistically significant clinical features improvement among the confirmed cases of PCOs. This might be owing to the positive effect of the educational program and the prescribed drugs in improving these clinical features. These findings were in consistency with **AL- Kurdi et al., 2021** which revealed that there was a highly significant improvement in participants' physical characteristics after implementing the educational program.

Conclusion:

The current study revealed that 6.7 percent of female university students were diagnosed with PCOS, and 8.8% of them were risky according to the Rotterdam diagnostic criteria for PCOs. Additionally, 72.5% of them had poor knowledge about PCOS in the pretest, which decreased to 8.3% in the posttest. Also, there was a significant difference in all items related to lifestyle change and prescribed drug usage, with a highly statistically significant improvement in all management interventions as compared to the pre-, post-, and follow-up educational programs. The clinical features of confirmed cases showed improvement as compared to pre-, post-, and follow-up educational interventions.

Recommendation:

- Conducting a health education program about PCO in all faculties to raise awareness of this disorder.
- Conducting more screening program among adolescents about PCO in different localities in Egypt for early detection and management to decrease the long-term health consequences linked to PCOS, screening and treatment are essential.
- It is advised to include PCOS as a topic in the student's academic studies.
- Providing continuous health education programs and counseling for students with PCOS and their families to help them how to manage it.
- Replication of the current study with a larger representative probability sample size at various institutions would allow the findings to be more generally applicable.

Limitations:

- Difficulties in the availability of a suitable place and facilities needed to conduct the program.
- Dropout due to lack of interest.

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