The Prevalence of Polycystic Ovary Syndrome Knowledge and Awareness Among Medical Students

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Abstract

Polycystic Ovary Syndrome (PCOS) is an endocrine disorder which affects the adolescent girls. In PCOS, woman's hormones are out of balance. If it's not treated over time it can lead to serious health conditions, such as diabetes and heart disease. Early diagnosis is necessary for advanced interventions to minimize the immediate and chronic consequences. This study is to assess the knowledge and awareness of PCOS among medical students in Manipal University College Malaysia (MUCM). A cross-sectional study was conducted on undergraduate medical students of Manipal University College Malaysia (MUCM). The sampling method used was purposive sampling. A validated questionnaire was taken from previous studies and was distributed to the sample via electronic survey form. The students were asked to respond to the questionnaire in terms of yes/no/I don't know format depending on the personal extent. The analysis included frequency, percentages, mean, standard deviation, 95% CI and p value with the level of significance of 5%. Unpaired T-test, Chi square test and ANOVA test were used in data analysis. The electronic questionnaire consisting of 43 questions was given out to the medical students of Manipal University College Malaysia (MUCM) and a total of 140 responses were received. A total of 140 responses were received with a mean age of 21.4. Finding revealed that 87.1% of participants have heard of PCOS and 63.5% have high level of awareness about this syndrome. However, only 17.1% participants have good knowledge regarding PCOS. The study found association between age, gender and education with both awareness and knowledge of PCOS. Participant age 22 and above, female and those in clinical phase of education are found to have higher level or awareness and knowledge regarding PCOS. The present study is only an initial step to evaluate the knowledge and awareness of PCOS among the medical students. Future research may enlarge on this topic in several directions such as more in-depth studies are needed to determine the relations between this syndrome and other factors for treatment services and management for individuals with PCOS which benefit both the future doctors and the patient.

Keywords

1. Introduction

Polycystic ovarian syndrome (PCOS) is one of the more common endocrine syndromes that is seen in women of reproductive age group. [1] It is the condition where either one or two ovaries will be enlarged and may contain many fluids filled vesicles. [2] There is no any exact reason why PCOS occur but it is commonly run-in families, obesity and

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if our body produce more insulin. [2] One of the major problems of PCOS is increase in androgen activity and disruption in ovulation. [3] Increased androgen level can be seen in the form of excess facial body and facial hair which is known as hirsutism and male pattern baldness. [2] When there is disruption of ovulation, it is known as menstrual irregularity where the menstrual cycle will be not frequent and irregular. PCOS has been seen to be accompanied with presentation of obesity, impaired glucose tolerance, metabolic syndrome and even associated with psychological disorders. [1] The most complication of woman with PCOS is early pregnancy loss, endometrial cancer, preeclampsia, and increase risk of infertility. [4] PCOS woman will have increased risk of endometrial cancer compared to women without PCOS especially during fertility phase. [4] Diagnosis of PCOS is usually made based on Rotterdam criteria that require positive two criteria out of three which is polycystic ovaries, high level of androgen and anovulation/irregular periods after excluding related disorder. [2, 6] These criteria which is endorsed by the international evidence-based guidelines so that it will be helpful in diagnosis and management of PCOS. [5] In adults if menstrual irregularity and increase level of androgen are present, ultrasound might not be required in this case. [6] We need to assess for depressive and anxiety symptoms, and any other associate condition because if presents, it can affect the quality of life. [6]

According to the World Health Organization (WHO), statistics revealed over 116 million women (3.4%) are affected by PCOS worldwide. [7] Globally, estimated PCOS prevalence ranges between 5% and 15%. [8] Earlier efforts to inspect the PCOS epidemic mainly focussed on stating the disease prevalence. However, the yearly incidence of PCOS, defined as the rate of newly identified cases per year, provides a better assessment of the epidemiology changes associated with the disease. [8] There was a study conducted in 2017, where 1.55 million cases of PCOS were reported globally, representing an increase of 4.47% from 2007 to 2017 among women of reproductive age between 15 to 49. [8] There was another study conducted by faculties of Universiti Putra Malaysia, Selangor, Malaysia among the Malaysian Female University Staff in 2018. The results showed 85 (12.6%) out of 675 participants were diagnosed with PCOS according to the Rotterdam criteria. [9]

The main factor contributing to PCOS is positive family history suggesting that genetic factors influence development of the syndrome. Other factors such as obesity, insulin resistance, Type 2 diabetes, cardiovascular disease, metabolic abnormalities including dyslipidaemia can be long term consequence of woman diagnosed with PCOS.

According to previous studies conducted in various part of

the world, the awareness and knowledge on PCOS is at moderate level. In a study conducted in the Texas Women University (Denton, Dallas, and Houston campuses) concluded that 2.1% of the men 4% of the women stated that they knew everything regarding PCOS. [10] In another study conducted in India concluded that, only 40% of the women among all 400 participants were aware of PCOS; this shows that only minority of the young women in the population are educated regarding the nature of this disease. [11]

The studies done reflect the absolute lack of knowledge and awareness amongst people with regards to PCOS despite its relatively high prevalence and its subsequent medical consequences that may arise. [12] This clearly proves that there is a need to increase awareness among the general population, especially women, to avoid possible cases of fertility problems due to PCOS in the future. [13] Through this study, medical students would have a clearer insight towards PCOS and even more as they cross paths with it during the clinical phase of their course.

In relation to the new international guidelines for the knowledge and awareness of PCOS, it is important to establish baseline practice and identify areas for improvement and translation. [14] Studies that have been carried out on PCOS which emphasizes only on the diagnostic modalities and clinical categorization but studies focussing on awareness of the condition is very scanty which subsequently results in an increase in case load. [15] The studies that had been conducted to analyse the problem of PCOS, states that only one-third of affected females had gained some awareness of the condition and its complications and rest of the study population are unaware of either sequelae or morbidities. [15] We aimed to survey the knowledge of PCOS among medical student and also to identify awareness of PCOS among medical students. Moreover, this study can be used for future research work on PCOS by determining relations between this syndrome and other factors.

2. Methodology

2.1. Study Design, Time, Setting and Population

An analytical cross-sectional study has been conducted between the month of June 2021 to July 2021 in Manipal University College Malaysia (MUCM). Participants of this study are undergraduate medical students of MUCM, which consist of two campuses where Muar campus is located in Johor, Malaysia and Melaka campus located in Melaka, Malaysia. This institution has students who enrolled for MBBS, BDS, FIS course. In MBBS course, there are 10

semesters, where the first and second semesters are conducted in Melaka campus, semester 3, 4 and 5 conducted in India campus and semester 6, 7, 8, 9 and 10 in Muar and Melaka, Malaysia. We have included students from all 10 semesters of MBBS program. This study is conducted to determine "The Prevalence of Polycystic Ovary Syndrome (PCOS) Knowledge and Awareness Among Medical Students", therefore study population of 1300 MBBS students from MUCM is selected.

2.2. Sample Size

According to previous research that had been carried out on university students in Bangladesh, it was recorded that only 8% equivalent to 32 students were very aware about Polycystic Ovary Syndrome. [16] The sample size for this research was calculated using a Microsoft Excel sample size calculator with population size (N) of an approximate total of medical students in MUCM, which is 1300. [17] Our study estimate is 8% with precision error expected at 5%. After calculation, our minimum sample size is 108. The calculation for final sample size with the non-response percentage of 10% was taken into account.

Formula used for final sample size calculation is as follow;

$$n\,final = \frac{n\,calculated}{1 - non\,response\%} = \frac{108}{1 - 0.1}$$

Final sample size is 120.

2.3. Sampling Method

The sampling method used was purposive sampling, a non-probability sampling method where the sample of our study was selected based on the characteristic of the population and objective of the study. Participants of this study are students of Manipal University College Malaysia (MUCM) who are currently studying in semester 6 and 7 of the MBBS program in the Muar campus and students in semester 8, 9 and 10 of the MBBS program in the Melaka campus as well as students currently in semester 1, 2, 3, 4, 5 of the MBBS program in either Melaka Campus or India campus.

The inclusion criteria were the medical students from Manipal University College Malaysia, who are of legal age to provide informed consent and willingly gave consent to participate in the study. After filling up the consent form, questionnaires must be answered to be considered valid for the research. On the other hand, the precluding criteria are those who didn't fill up the consent form, questionnaires that are incomplete and since participation was voluntary, those students who did not give informed consent were excluded including absentees.

2.4. Data Collection

Google forms via online questionnaire were used to collect data and consent was obtained. The questionnaires were taken from the previous studies. [14-16] These set of questions are divided into five sections. The first section consists of demographic information of students including the age, gender, nationality, race, batch and marital status. Only female participants were required to respond to the second part of the questionnaire on whether these female participants themselves, any of their family member or any of their friends have been diagnosed with PCOS.

The third part of the questionnaire consists of seven questions to assess the manifestation relevant to PCOS in terms of yes/no format. Only female participants were required to answer this part as well. The fourth part of the questionnaire consists of six questions to identify students' awareness on PCOS including risk factors, diagnosis and perception about PCOS. The fifth part of the questionnaire is to identify the knowledge of PCOS among the students in terms of yes/no/I don't know format. This fifth part consists of twenty-one questions divided into four sections Both male and female participants are required to answer the fourth and fifth part of this sections.

The purpose of this research is to study the relationship between dependent and independent variables. Independent variables of this research are age, gender, race, nationality, education (Preclinical vs Clinical year), family history of PCOS among female students and symptoms related to PCOS. Dependent variables were knowledge and awareness of PCOS among the students. Data were collected via electronic survey (online questions), language used was English and contains close-ended questions and multiple-choice questions [14-16]

2.5. Data Processing and Data Analysis

Data collected was processed using Microsoft Excel and analysed using Epi Info version 7.2 obtained from the Centre of Disease Control (CDC) official website. Quantitative data (age of participants) the range, mean along with standard deviation were calculated. Qualitative data (gender, race, nationality, education, PCOS among female students, PCOS among family members, PCOS among friends and symptoms of PCOS) the frequency and percentage were calculated accordingly. The level of significance was set at 0.05 (p < 0.05). The statistical tests used to find out the association between the independent variables and dependent variables were shown in Tables 1 and 2 below.

Table 1. Independent, dependent variables and statistical test.

Independent variable	Dependent variable	Statistical test
Age <22 ≥22	Knowledge of PCOS	Unpaired T-test
Gender Female Male	Knowledge of PCOS	Unpaired T-test
Nationality Malaysian Non-Malaysian	Knowledge of PCOS	Unpaired T-test
Race Indian Chinese Malay Others	Knowledge of PCOS	ANOVA
Education Preclinical (Batch 45-48) Clinical (Batch 39-44)	Knowledge of PCOS	Unpaired T-test
Marital status Single Not single (Married or in a relationship)	Knowledge of PCOS	Unpaired T-test

Table 2. Independent, dependent variables and statistical test.

Independent variable	Dependent variable	Statistical test
Age <22 >/=22	Awareness of PCOS (Yes/No)	Chi-square test
Gender Female Male	Awareness of PCOS (Yes/No)	Chi-square test
Nationality Malaysian Non-Malaysian	Awareness of PCOS (Yes/No)	Chi-square test
Race Indian Chinese Malay Others	Awareness of PCOS (Yes/No)	Chi-square test
Education Preclinical (Batch 45-48) Clinical (Batch 39-44)	Awareness of PCOS (Yes/No)	Chi-square test
Marital status Single Not single (Married or in a relationship)	Awareness of PCOS (Yes/No)	Chi-square test

2.6. Ethical Consideration

Approval was obtained prior to the start of this research from the Research Ethics Committee, Faculty of Medicine, Manipal University College Malaysia (MUCM), Malaysia. Participants of this study were obtained by voluntary participations and were all provided with an informed consent form with details relevant to this study. They were able to withdraw from this research without any reason at any time. The participants' information was kept confidential and used solely for the purpose of this research. Anonymity and privacy of all participants were preserved.

3. Results

A total of 140 responses were received. Participants are aged ranging from 18 to 28 years old, therefore mean age of participants are 22 years old. Most of the participants are noted to be female (70.7%) with 99 responses and male (29.3%) with 41 responses. MUCM is a private college with foreign students therefore, it was important for us to observe the relation between nationality on knowledge and awareness of PCOS. Total of 126 participants were Malaysian (90.0%) and only 14 of them were foreign students (10.0%). In terms of race, majority of the participants are Indians (52.9%) and the

second highest participating race being Chinese (27.1%), thirdly others (12.1%) and lastly Malay (7.9%). Education levels are divided into clinical (52.1%) and preclinical (47.9%). Marital status was also taken into account therefore divided into three categories which are; single (75.0%), in a relationship (24.3%) and lastly married (0.7%).

Table 3. Demographic variables.

Variables	Frequency (n)	Percentage (%)
Age		
<22	67	47.9
≥22	73	52.1
Mean (SD)	21.49 (1.65)	
Min-max	18-28	
Gender		
Female	99	70.7
Male	41	29.3
Nationality		
Malaysian	126	90.0
Non-Malaysian	14	10.0
Race		
Indian	74	52.9
Chinese	38	27.1
Malay	11	7.9
Others	17	12.1
Education		
Preclinical	67	47.9
Clinical	73	52.1
Marital status		
Single	105	75.0
Married	1	0.7
In a relationship	34	24.3

Table 4. History of PCOS.

Variables	Frequency (n)	Percentage (%)
Are you diagnosed with Polycystic Ovary Syndrome?		
Yes	14	14.1
No	85	85.9
Are any of your family members diagnosed with Polycystic Ovary Syndrome?		
Yes	12	12.1
No	87	87.9
Are any of your friends diagnosed with Polycystic Ovary Syndrome?		
Yes	31	31.3
No	68	68.7

Table 4 shows history of PCOS among female medical students. Total of 99 responses were received. There were only 14 (14.1%) answered yes for diagnosed with PCOS. Only 12 (12.1%) students answered yes for family members diagnosed with PCOS and 31 (31.3%) students yes for friends diagnosed with PCOS.
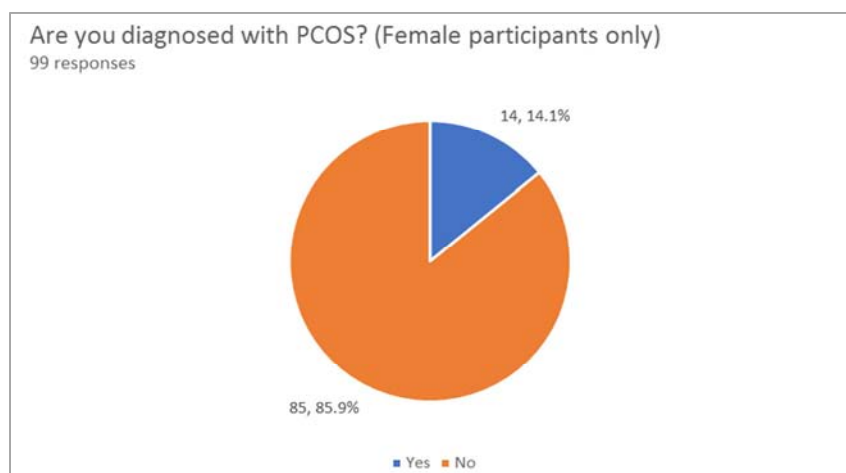

Figure 1. Female participants diagnosed with PCOS.

Table 5. Awareness of PCOS.

Variables	Frequency (n)	Percentage (%)
Have you ever heard about Polycystic Ovary Syndrome?		
Yes	122	87.1
No	18	12.9
What is your level of awareness?		
Not at all	17	12.1
Minimally Aware	34	24.3
Somewhat Aware	72	51.4
Very Aware	17	12.1
What is your perception about Polycystic Ovary Syndrome?		
It's manageable	116	82.9
It's not curable	8	5.7
It's fatal disease	2	1.4
No idea	14	10
What is the risk factor for Polycystic Ovary Syndrome?		
High Cholesterol	5	3.6
Obesity	39	27.9
Type 2 Diabetes Mellitus	17	12.1
Family History	72	51.4
Cardiovascular Disease	2	1.4
High Blood Pressure	5	3.6
Do you have family history of Polycystic Ovary Syndrome?		
Yes	10	7.1
No	130	92.9
How do you think Polycystic Ovary Syndrome diagnosed?		
Androgen Level	54	38.6
Blood Sugar Level	2	1.4
Sonogram	51	36.4
Based on Symptoms	33	23.6
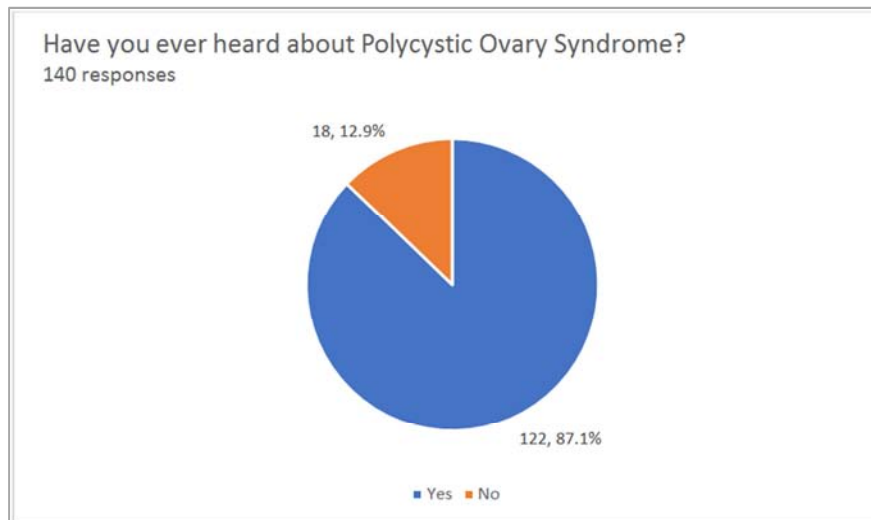
Figure 2. Awareness of participants on PCOS.

The following table consist of the next important part of our study which is about the awareness of Polycystic Ovary Syndrome (PCOS). For the first question which is whether they heard of PCOS or not, 122 (87.1%) has responded yes and 18 (12.9%) has responded no. For the next question on how much they are aware of PCOS, 17 (12.1%) answered very aware, 72 (51.4%) answered somewhat aware, 34 (24.3%) minimally aware and 17 (12.1%) of them not at all. For the question which ask about their perception of PCOS, 116 (82.9%) answered its manageable, 8 (5.7%) answered it's not curable, 2 (1.4) answered it's a fatal disease and 14 (10%) has no idea. For the question which stated what is the risk factor of PCOS, 39 (27.9%) people answered obesity, 5 (3.6%) people answered high cholesterol, 17 (12.1%) person answered type 2 diabetes mellitus, 72 (51.4%) people answered family history, 2 (1.4%) person answered cardiovascular disease and 5 (3.6%) answered high blood pressure. 10 people answered yes and 130 answered no for the question of whether they have family history of PCOS. 54 (38.6%) people thinks androgen level, 2 (1.4%) thinks blood sugar level, 51 (36.4%) thinks sonogram and 33 (23.6%) thinks symptom is the way the to diagnose PCOS.

Table 6. Knowledge of PCOS.

Variables	Frequency (n)	Percentage (%)
Clinical features		
Polycystic ovary syndrome causes irregular menstrual cycles.		
Correct answers	129	92.1
Incorrect answers	11	7.9
Polycystic ovary syndrome leads to hirsutism (abnormal hair growth).		
Correct answers	103	73.6
Incorrect answers	37	26.4
Polycystic ovary syndrome causes scalp hair loss		
Correct answers	51	36.4
Incorrect answers	89	63.6
Polycystic ovary syndrome leads to high blood androgen levels.		
Correct answers	97	69.3
Incorrect answers	43	30.7
Polycystic ovary syndrome increases facial acne.		
Correct answers	105	75.0
Incorrect answers	35	25.0
Psychosocial wellbeing		
Polycystic ovary syndrome is a risk factor for developing anxiety.		
Correct answers	80	57.1
Incorrect answers	60	42.9
Polycystic ovary syndrome is a risk factor for developing depression.		
Correct answers	81	57.9
Incorrect answers	59	42.1
Polycystic ovary syndrome can cause body image dissatisfaction		
Correct answers	97	69.3
Incorrect answers	43	30.7
Symptoms of polycystic cystic ovary syndrome can lead to reduced quality of life.		
Correct answers	85	60.7
Incorrect answers	55	39.3
Lifestyle Managements		
Polycystic ovary syndrome causes increase in tendency of weight gain.		
Correct answers	103	73.6
Incorrect answers	37	24.6
Polycystic ovary syndrome leads to difficulty in losing weight		
Correct answers	71	49.3
Incorrect answers	69	50.7
There is improvement of symptoms after weight loss in Polycystic ovary syndrome.		
Correct answers	44	31.4
Incorrect answers	96	68.6
There is improvement of symptoms with a low glycaemic index diet in Polycystic ovary syndrome.		
Correct answers	53	37.9
Incorrect answers	87	62.1
Comorbidities		
Polycystic ovary syndrome causes reduced fertility.		
Correct answers	111	79.3
Incorrect answers	29	20.7
Polycystic ovary syndrome cause insulin resistance.		
Correct answers	68	48.6
Incorrect answers	72	51.4
Polycystic ovary syndrome can lead to increased risk of type 2 diabetes.		
Correct answers	75	53.6
Incorrect answers	65	46.4
Polycystic ovary syndrome can lead to increased risk of gestational diabetes		
Correct answers	61	43.6
Incorrect answers	79	56.4
Polycystic ovary syndrome can lead to increased risk of cardiovascular disease risk factors.		
Correct answers	61	43.6
Incorrect answers	79	56.4
Polycystic ovary syndrome can lead to endometrial cancer.		
Correct answers	63	45.0
Incorrect answers	77	55.0
Polycystic ovary syndrome can lead to fatty liver.		
Correct answers	25	17.9
Incorrect answers	115	82.1
Polycystic ovary syndrome causes sleep apnoea and snoring.		

Variables	Frequency (n)	Percentage (%)
Correct answers	37	26.4
Incorrect answers	103	73.6

Table 6 shows knowledge of (PCOS) in the medical students. There were a total 129 (92.1%) correct answers on PCOS causing irregular menstrual cycles. 73.6% (n=103) answered correctly PCOS will lead to hirsutism while 26.4% (n=37) answered incorrectly regarding that statement. There were total of 36.4%(n=51) correct answers and 63.6%(n=89) of incorrect answers on polycystic ovary syndrome causes scalp hair loss. Majority of students with percentage of 75%(n=105) answered correctly that PCOS increased facial acne. Total of 80 students answered correctly on PCOS as a risk factor for anxiety development while there were 81 correct answers on PCOS as a risk factor for depression. On statement regarding polycystic ovary syndrome can cause body image dissatisfaction, there were total of 69.3%(n=97) correct answers and 30.7%(n=43) incorrect answers. There were total of 85 (60.7%) correct responses and 55 (39.3%) incorrect responses on symptoms of polycystic cystic ovary syndrome can lead to reduced quality of life. Total of 103 students answered correctly on polycystic ovary syndrome causes increase in tendency of weight gain. 71 students responded correctly on polycystic ovary syndrome leads to difficulty in losing weight while 69 students answered incorrectly on that statement. Majority of students with percentage of 68.6%(n=96) answered incorrectly on there is improvement of symptoms after weight loss in Polycystic ovary syndrome while only 31.4%(n=44) answered correctly for that statement. More students answered incorrectly with percentage of 62.1%(n=87) on there is improvement of symptoms with a low glycaemic index diet in PCOS

compared to correct responses with percentage of 37.9%(n=53). The highest percentage of correct answers was 79.3%(n=111) for PCOS causes reduced fertility and the lowest percentage of correct answers was 17.9% (n=25) for PCOS can lead to fatty liver. The correct answers below 50% were,' PCOS leads to difficulty in losing weight 49.3%(n=71), There is improvement of symptoms after weight loss in PCOS 31.4% (n=44), There is improvement of symptoms with a low glycaemic index diet in PCOS was 37.9%(n=53), PCOS causes insulin resistance was 48.6% (n=68), PCOS can lead to endometrial cancer was 45% (n=63), PCOS can lead to fatty liver was 17.9% (n=25) and PCOS causes sleep apnoea and snoring was 26.4% (n=37). The other correct answers were, PCOS causes increase in tendency of weight gain was 73.6% (n=103), PCOS lead to increased type 2 diabetes was 53.6% (n=75), PCOS cause cardiovascular diseases was 53.6% (n=75).

Table 7. Knowledge categories of PCOS.

Variable	Frequency (%)
Knowledge	
Good (≥80%)	24 (17.1%)
Poor (<80%)	116 (82.9%)
Mean (SD)	54.4 (24.5)

Table 7 shows that knowledge of PCOS is divided into good (≥80%) and poor (<80%). Participants with good level of knowledge amounts to 24 equivalents to 17.1%. Participants with poor level of knowledge amounts to 116 equivalents to 82.9%. Mean knowledge is noted at 54.4 with standard deviation of 24.5.
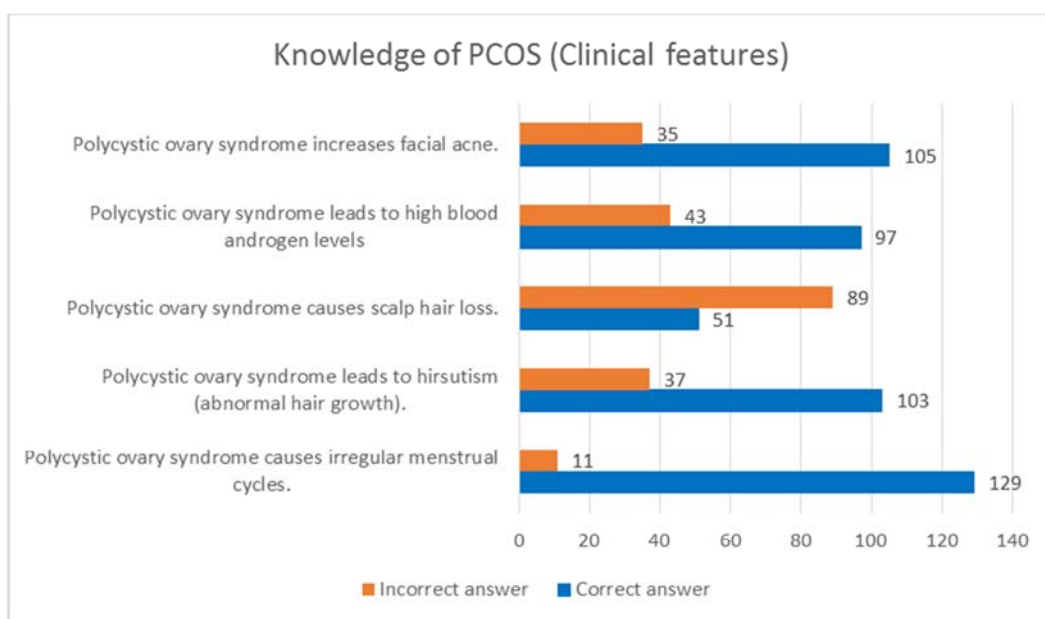

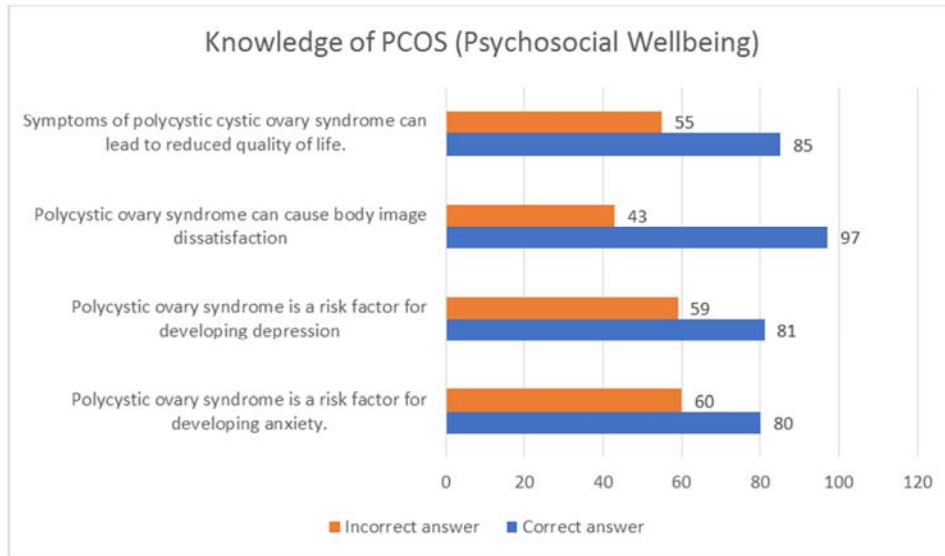**Figure 3.** Knowledge of PCOS (Clinical features) among participants.

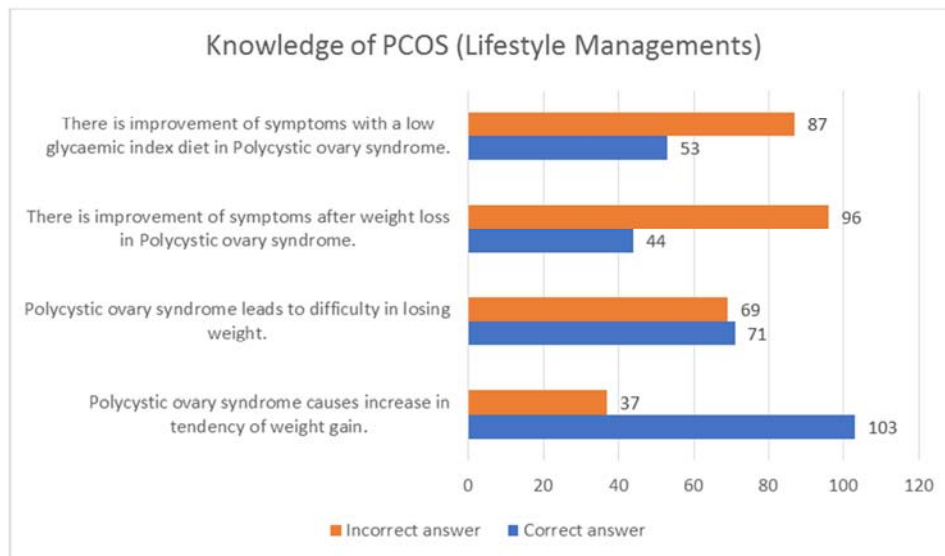**Figure 4.** Knowledge of PCOS (Psychosocial wellbeing) among participants.

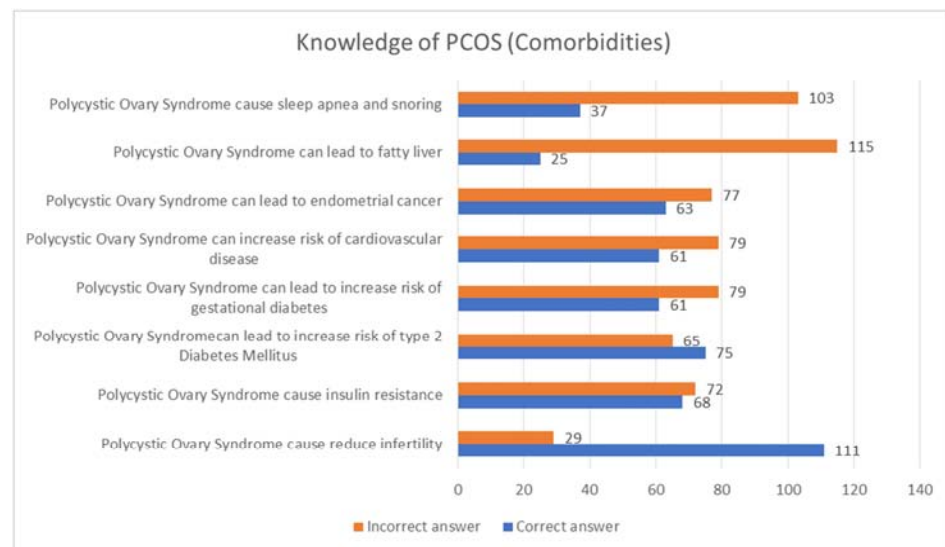**Figure 5.** Knowledge of PCOS (Lifestyle management) among participants.

Figure 6. Knowledge of PCOS (Comorbidities) among participants.

Table 8. Association of demographic characteristics with awareness of PCOS using Chi square.

Independent variables	Awareness of PCOS		OR (95% CI)	Chi square value	P value
	Yes, n (%)	No, n (%)			
Age					
≥22	72 (98.63)	1 (1.37)	24.48 (3.156-189.939)	17.965	<0.001
<22	50 (74.63)	17 (25.37)	Reference		
Gender					
Female	90 (90.10)	9 (9.09)	2.813 (1.026-7.708)	4.280	0.039
Male	32 (78.05)	9 (21.95)	Reference		
Education					
Clinical	73 (100.00)	0 (0)	-	22.506	<0.001
Preclinical	49 (73.13)	18 (26.87)	Reference		
Nationality					
Non-Malaysian	14 (100.00)	0 (0)	-	2.295	0.130
Malaysian	108 (85.71)	18 (14.29)	Reference		
Race					
Indian	62 (83.78)	12 (16.22)	Reference		
Chinese	33 (86.84)	5 (13.16)	1.277 (0.415-3.937)	0.182	0.670
Malay	10 (90.91)	1 (9.09)	1.936 (0.226-16.559)	0.375	0.540
Others	17 (100.00)	0 (0)	-	3.176	0.075
Marital status					
Single	92 (87.62)	13 (12.38)	1.180 (0.388-3.581)	0.085	0.771
Not single	30 (85.71)	5 (14.29)	Reference		

Table 8 records the association between socio-demographic characteristics and awareness of PCOS. It is seen that students above 22 years old are 24.48 times more likely to have awareness of PCOS compare to students below 22 years (95% CI for OR 3.1551-189.93 P-value 0.00002). Next it is seen that female are 2.813 more likely to have awareness of PCOS compare to male (95% CI for OR 1.026-7.708, P value is 0.039). Everyone in clinical batches who responded to our questionnaire aware of PCOS compare to preclinical batch (P value<0.001). All the international students who responded to our questionnaire are aware of PCOS compare to Malaysian students (P value 0.130). For ethnicity, participants of Chinese ethnicity and Malay ethnicity were 1.277 (95 CI OR for 0.415-3.937 P value 0.670) and 1.936 (95 CI OR for 0.226-16.559 P value 0.540) more likely to have awareness of PCOS compare to Chinese whereas all from others who responded to our questionnaire are fully aware of PCOS (P value 0.075). Single people are 1.180 more likely to have awareness of PCOS compare to not single person (95 Cl% 0.388-3.581, P value is 0.771).

Table 9. Association between demographic variables and knowledge of PCOS.

Independent variables	Knowledge Mean (SD)	Mean Difference (95% CI)	P value
Age			
<22	9.42 (5.31)	-3.86 (-5.46, -2.25)	<0.001
≥22	13.27 (4.25)		
Gender			
Female	12.34 (4.95)	3.12 (1.30, 4.95)	0.001
Male	9.22 (5.00)		
Nationality			
Malaysian	11.25 (5.27)	-1.83 (-4.69, 1.04)	0.209
Non-Malaysian	13.07 (3.58)		
Race			
Indian	11.81 (5.02)		0.103
Chinese	9.76 (5.38)		
Malay	12.27 (6.12)		
Others	12.94 (3.82)		
Education			
Preclinical	9.28 (5.20)	4.11 (2.53, 5.70)	<0.001
Clinical	13.40 (4.26)		
Marital status			
Single	11.44 (5.30)	-0.04 (-2.03, 1.96)	0.970
Not single	11.40 (4.74)		

Table 9 shows the association between independent variables such as; age, gender, nationality, race, education and marital status and the knowledge on Polycystic Ovary Syndrome (PCOS) score. Participants age below 22 recorded a mean score of 9.42 (SD=5.31) comparing to participants age 22 and above with a recorded a mean score of 13.27 (SD=4.25). The mean difference is -3.86 with 95% CI range from -5.46 to -2.25. The p-value is less than 0.001 therefore indicating a

significance association between age and knowledge on PCOS. Female participants have a mean score of 12.34 (SD=4.95) and male participants have a mean score of 9.22 (SD=5.00). The mean difference is 3.12 with 95% CI range from 1.30 to 4.95. The p-value is 0.001 therefore indicating that there is a significant association between gender and knowledge on PCOS. Malaysian participants have a mean score of 11.25 (SD=5.27) and non-Malaysian participants have a mean score of 13.07 (SD=3.58). The mean difference is -1.83 with 95% CI range from -4.69 to 1.04. The p-value is 0.209 indicating that there is no significant association between nationality and knowledge on PCOS. Indian participants have a mean score of 11.81 (SD=5.02), Chinese ethnicity participants recorded a mean score of 9.76 (SD=5.38), Malay ethnicity participants have a mean score of 12.27 (SD=6.12) and other races such as Sinhalese have a mean score of 12.94 (SD=3.82). The p-value is 0.103 indicating that there is no significant association between race and knowledge on PCOS. Participants in preclinical phase of education have a mean score of 9.28 (SD=5.20) and participants in clinical phase have a mean score of 13.40 (SD=4.26). The mean difference is 4.11 with 95% CI range from 2.53 to 5.70. The p-value is 0.00 indicating that there is significant association between education and knowledge on PCOS. Single participants have a mean score of 11.44 (SD=5.30) and participants who are not single have a mean score of 11.40 (SD=4.74). The mean difference is -0.04 with 95% CI range from -2.03 to 1.96. The p-value is noted at 0.970 indicating that there is no significant association between marital status and knowledge on PCOS.

4. Discussion & Conclusion

Our research was done to study the knowledge of PCOS among medical students in Manipal University College Malaysia (MUCM). This research was also intended to identify the awareness of PCOS among the medical students. According to our study, we found out that the overall knowledge of PCOS in medical students is positive in most of the categories. Based on the cross-sectional study done on women from India, results showed that the current level of knowledge on PCOS is still low compared to past decades. [15]

From our research, most of the students are not diagnosed with PCOS. This result is consistent with the study done in CMH Lahore Medical College & Institute of Dentistry, Lahore, Pakistan among female students, where only some of students are diagnosed with PCOS but majority of students who has been diagnosed has taken treatment. [20] In the cross-sectional study done among staff and students in Texas Woman's University campuses in Denton, Dallas, and Houston, a smaller number of the respondent has a formal

diagnosis of PCOS. [10] In another cross-sectional study done among female adolescent students in RAKMHSU stated that a smaller number of students are diagnosed with PCOS. [26] Majority of participants does not have any family member diagnosed with PCOS and most of participants said they do not have any friends diagnosed with PCOS. Another quantitative observational cross-sectional study done among volunteer students in Qassim University which reported that only one-third of students has mother/sister diagnosed with PCOS. [25]

As for the awareness of Polycystic Ovary Syndrome (PCOS) among MUCM, according to our study, majority of the students have heard about PCOS and only some have never heard about it. Awareness is dire for early intervention such as behaviour modification, this is to minimize the immediate and chronic consequences of PCOS. [19] In a cross-sectional study conducted among female students of CMH Lahore Medical College & Institute of Dentistry, Lahore, Pakistan shows that, most of the students heard about PCOS. [20] In another cross-sectional study done among female science students of different public universities in Quetta, Pakistan, every participant has heard of the term "PCOS". [21] In addition to that, in a single-arm, pre-post (quasi-experimental) design which was carried out at Zagazig University among students of Faculties of Technology and Development & Science, it was reported that most of them does not know the term "PCOS". [22] A Hospital Based Experimental Study was done among Women of Known Population which stated that the level of awareness of PCOS has improvement after intervention is given. [24] Next, two-third of people have a high level of awareness of PCOS whereas one-third of people have a low level of awareness. Finally, in a survey conducted among nursing students and female staff at Shaikh Zayed Medical and Dental College, which shows that most of them are having average levels of awareness. [23]

In context to knowledge of PCOS among medical students, knowledge is divided into four main categories. For the first category which is clinical features, majority of students have clear idea about Polycystic Ovary Syndrome causing irregular menstrual cycles and increasing facial acne. For psychosocial wellbeing category, more than one third students have idea on PCOS causing body image dissatisfaction. For lifestyle management category, more students know Polycystic ovary syndrome causes increase in tendency of weight gain. With regards to comorbidities category, majority of students are aware of Polycystic ovary syndrome causes reduced fertility. However, most of the students are unaware of PCOS causing sleep apnoea, snoring and fatty liver. It should be noted that our study results are slightly different as compared to the cross-sectional study conducted by Anandraj Vaithy. K, which shows majority of women have unclear idea about polycystic

diseases of ovary have mostly acquired the awareness from health education awareness schedules and friends of sociodemographic. [15] Majority of them are aware of the complications associated with PCOS. [15]

The association between demographic characteristics with awareness of PCOS, age, gender and education level have positive significant association. When comparing the age groups, students with age 22 and above are more aware about PCOS compared to age group below 22. By comparing both genders, females are more aware of PCOS than males. Regarding the education level, all the clinical students are fully aware about PCOS compared to preclinical students. Nationality, race and marital status do not show any significant association with awareness of PCOS. On survey approach by Sunanda B pn 150 B. Sc. nursing students, that there is significant association between knowledge on PCOS and demographic variables. [18]

Based on the assessment on the association between the demographic variables of the participants and knowledge of PCOS, several significant associations were found. Firstly, among participants of different age group, where participants aged 22 and above showed a better level of knowledge as compared to the participants aged below 22 years old. Secondly, among both female and male participants, female participants were found to have better knowledge of PCOS as compared to male participants. Lastly, participants in clinical phase of education were found to have better knowledge on PCOS as compared to participants in preclinical phase of education. In a study conducted in south east coastal population of India, it is observed that education level plays a vital role in the awareness and knowledge of PCOS as shown in the present study which is due to various health education programmes and attitudes towards women's health. [15] The present results in a study conducted among women in Saudi Arabia revealed that the level of awareness regarding PCOS was very much related to educational levels, and it significantly increased among participants with higher education level. [27]

For the association between demographic characteristics with awareness of PCOS, nationality, race and marital status do not show any prominent effect on participants awareness of PCOS likewise for the association between demographic variables and knowledge, nationality, race and marital status do not show any significant influence among the medical students. On cross-sectional study conducted by Anandraj Vaithy. K, sociodemographic characteristics of patients plays a prominent role in obtaining knowledge regarding PCOS. [15]

There are few limitations present in our study. Firstly, we conducted this research in 5 weeks' time only which is considered short duration to do a research study. Our research study design is cross-sectional which will allow us to observe the respondents at one point of time only. Therefore, we won't be able to find out or follow up if there are any changes in their awareness and knowledge at different period of time. We collected the exposure and outcome at same time, we were not able to establish the temporal relationship between them. Additionally, this research was done only in one private medical university so it cannot be generalized to other settings. It was difficult to obtain the responses from all the students in MUCM because the questionnaire was no distributed physically. Other than that, we did not include what are the factor that cause increase or decrease awareness and knowledge of PCOS. There were very less responses from final year students which might affect the results because there might be having different level of awareness and knowledge of PCOS.

As it was evident in our study that although majority of the participants have high level of awareness on PCOS, they lack knowledge on PCOS. We studied the different aspects of knowledge on PCOS including clinical features, psychosocial wellbeing, lifestyle managements and also comorbidities. This study revealed that age, gender and education level are crucial factors affecting the level of knowledge among participants in Manipal University College Malaysia (MUCM). The present study conducted aimed to assess the awareness and knowledge of participants in PCOS and at the same time, improve understanding on this syndrome among our participants. Future research may enhance more knowledge about this topic in several directions. Firstly, more studies should be conducted on this topic to gain more awareness among people in the community. Secondly, researchers can target other groups of participants, to be able to reach out to people of different age groups, background and literacy. Currently, the research on awareness and knowledge of PCOS or any similar studies are limited especially in medical colleges in Malaysia. We suggest that similar studies should be done not only in medical colleges but also in all other colleges or universities with health and science related faculties. Therefore, with all these efforts proposed, we hope that it will help to extend the level of awareness and knowledge among people on Polycystic Ovary Syndrome.

Acknowledgements

Community Medicine, MUCM) and Dr. Sujata Khobragrade (Department of Community Medicine, MUCM) throughout the study. Our mentor, Professor Dr. Htoo Htoo Kyaw Soe has helped us throughout the whole study, in every part of the study with encouragement and continuous support to make sure our research work was progressing well. In addition, we want to thank every participant who participated in our research and the Research Ethics Committee of Manipal University College Malaysia (MUCM) for approving our research. We want to express sincere gratitude and appreciation towards Ms Tilka Fannana and Professor Terhi Piltonen for giving us permission for the use of the questionnaire and the reference of their thesis study.

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