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Knowledge Level on the Association Between Body Mass Index (BMI), Menstrual Cycle and Lifestyle Patterns in Contributing the Development of Polycystic Ovarian Syndrome (PCOS) Among Female University Students

Nurhazirah Zainul Azlan[1,2*], **Siti Zulaika Bustaman**[3], **Redzuan Nul Hakim Abdul Razak**[1,2]

[1]Department of Basic Medical Sciences for Nursing, Kulliyyah of Nursing, International Islamic University Malaysia, Pahang, Malaysia.
[2]IIUM Molecular and Cellular Biology Research Cluster, International Islamic University Malaysia, Pahang, Malaysia.
[3]Kuantan Medical Centre, Pahang, Malaysia.

ABSTRACT

Introduction: Polycystic ovarian syndrome (PCOS) is a heterogeneous endocrine disorder characterized by anovulation, hyperandrogenism, infertility and metabolic dysfunction, that affect ladies in their adolescent period until menopause, specifically at reproductive age. The objective of this study was to determine the knowledge level of PCOS and the association between BMI, menstrual cycle and lifestyle pattern in contributing the development of PCOS and its relationship with sociodemographic characteristics among female students at International Islamic University Malaysia (IIUM), Kuantan, Pahang.

Methods: A quantitative cross-sectional study using convenience sampling method was conducted among 245 female undergraduate students of IIUM Kuantan Campus, from April to May of 2021. Data were collected using Google Forms platform and a quantitative questionnaire which was available in English Language and distributed to all female undergraduate students in the campus. The set of questionnaires were taken from a research paper by Thomas et al. (2018). Data analysis was done by using SPSS version 21.0.

Results: The majority of the participants have above-average knowledge level regarding PCOS and its association with BMI, menstrual cycle and lifestyle pattern (58.0%). The mean score on knowledge on the association between BMI and development of PCOS significantly different in between kulliyyah and year of study, with Kulliyyah of Medicine and students from Year 5 are higher compared to other Kulliyyah and year of study, respectively. For the association between menstrual cycle and development of PCOS, the mean score on knowledge is differed significantly across year of study. The mean score on knowledge on the association between lifestyle pattern and development of PCOS differed significantly across kulliyyah with Kulliyyah of Allied Health Science are higher compared to other kulliyyah.

Conclusion: Female undergraduate students have above-average knowledge regarding PCOS and its association with BMI, menstrual cycle, and lifestyle patterns.

Keywords: Knowledge, Body mass index (BMI), Menstrual cycle, Lifestyle patterns, Polycystic ovarian syndrome (PCOS), Student

***Corresponding author**
Dr. Nurhazirah Zainul Azlan
Department of Basic Medical Sciences for Nursing,
Kulliyyah of Nursing,
International Islamic University Malaysia,
Jalan Sultan Ahmad Shah, Bandar Indera Mahkota,
25200 Kuantan, Pahang, Malaysia.
E-mail: nurhazirah@iium.edu.my

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INTRODUCTION

Presently, women's health has been a concern as many diseases related to this gender have emerged as time passed. With the female's life expectancy in Malaysia being higher compared to males (1), female experience higher rates of morbidity and psychological distress due to their different biological body systems and social roles. Some of the common health issues or problems that women encounter are pregnancy, menopause and gynaecological disorders such as breast cancer, uterine fibroids and endometrial cancer. Polycystic ovarian syndrome (PCOS) is one of those abnormalities that may influence the big population of women. PCOS can be defined as a lifelong disorder that may affect women in their adolescent period until menopause, which is more specifically at the reproductive age of 15 to 49 years old (2). PCOS can also be described as an endocrine disorder with hormonal imbalance in the brain and ovaries, characterised with high level of luteinizing hormone (LH) secreted from the pituitary gland, reduced secretion of follicle stimulating hormone (FSH) and high level of insulin secreted from pancreas which causing the ovaries to secrete additional amount of free testosterone (3).

PCOS is the most prevalent endocrine condition in women during their reproductive age, associated with a variety of cardiometabolic complications, obesity, insulin resistance and hyperandrogenism that play a major role in contributing to symptoms development (4). The effect of this also includes the risk of glucose intolerance, type 2 and gestational diabetes mellitus, coagulation disorders, systemic inflammation, hypertension, atherogenic dyslipidemia and non-alcoholic fatty liver disease (4). About 1 in 10 women of childbearing age may be affected by this syndrome (5). A study reported that the estimated prevalence of PCOS in worldwide community is between 6 to 21% based on the diagnostic criteria used (6). In a study conducted among 242 female medical students of Lahore Medical College, Pakistan, reported that 19.4% of the students has PCOS as they having the symptoms that fit the Rotterdam Consensus Criteria for PCOS (7). Some of the symptoms of PCOS are ovulatory dysfunction such as irregular periods and oligomenorrhea, and hyperandrogenism such as acne, alopecia and hirsutism. In the Rotterdam Consensus Criteria for PCOS, the presence of two of the following three features affirm the presence of this syndrome. These features are oligo or anovulation, clinical or biochemical manifestations of hyperandrogenism and presence of polycystic ovaries on ultrasound (7). In Malaysia, the PCOS prevalence rate among female university staff is 12.6% with hyperandrogenism and polycystic ovaries were observed in all PCOS participants, while anovulation was only present in one participant (8).

Throughout the year, women-related disorders have become apparent in the community over the world. Some of those disorders that has the attention of the people are cysts, breast cancer, cervical cancer, sexually transmitted diseases (STD) and many more. However, PCOS has not come into the interest of the community of the world yet. Even though it has been stressed by many health professionals that PCOS can affect endocrine, reproductive and metabolic system, and it may become a bigger problem as women are aging, the awareness about PCOS is still low. It is reported that only 38.3% of 493 female students of Emirati at Zayed University, Dubai have heard about PCOS (9). Around 59% participants with the age of 18 to 30 years old in India reported of not having awareness about PCOS (10). These data showed that there are still many young women that does not have the knowledge on the disease and its complications. Although the etiology of PCOS remain unclear, the early diagnosis and treatment may reduce the risk of long-term complications such as type 2 diabetes, coagulation disorders and hypertension. Therefore, this study will determine the PCOS knowledge level and the relationship between BMI, menstrual cycle and lifestyle pattern in contributing the development of PCOS and its relationship with sociodemographic characteristic among female university students.

METHODS

A quantitative cross-sectional study was conducted between April to May 2021 and involved 245 female undergraduate students of IIUM Kuantan Campus, Pahang. The Raosoft sample size calculator was used in this study,

with the 5% margin error, 90% confidence interval, 2495 of total population size and 50% response rate. Hence, the required minimum sample size for this study was 245 participants.

The inclusion criteria were female undergraduate full-time students with the age of 19 to 30 years old. The exclusion criteria were female student who are on semester break during the data collection period. The set of questionnaires were taken from a research paper entitled "Contributing Factors and Knowledge of Polycystic Ovarian Syndrome (PCOS) among pre-clinical female students in FMHS, UNIMAS" (11), which has already been pre-tested by the authors before the real survey was conducted. The questionnaires were fully written in English and were distributed among participants by Google Form survey and physically handed.

The questionnaire consists of 4 main sections which include socio-demographic characteristics of respondents such as age, kulliyyah of study, year of study, height, weight and their recent medical check-up; menstrual cycle pattern with the answer of 'YES', 'NO' or 'UNSURE'; lifestyle pattern which divides into two parts, activities during their leisure time with 'YES', 'NO' or 'UNSURE' answer and their daily consumption with the best answer; and knowledge on PCOS with 'YES', 'NO' or 'UNSURE' answer. The knowledge of PCOS was assessed by 16 positive answers and 2 negative answers, which scored '1' for correct answer and '0' for incorrect or unsure answers.

Ethical approvals were obtained from Kulliyyah of Nursing Postgraduates Research Committee (KNPGRC) and IIUM Research Committee (IREC) with approval number of IREC 2021-KON/40 prior to data collection. Each participant was provided with an information sheet about the objectives and confidentiality of this study prior to obtaining the consent to participate in this research. All the participants were assured that the information given to the researcher were protected as confidential and solely for academic purposes. Furthermore, the participants have the right to withdraw from the study at any time.

Data Analysis

Data was analysed using Statistical Package for Social Science (SPSS) version 21.0 with a p-value less than 0.05 and was considered statistically significant. Descriptive statistical tests were used to measure the frequency and percentage. One-way ANOVA was used to assess the differences in the distribution of variables and sociodemographic characteristics, and Bonferroni post-hoc test was used for multiple comparisons.

RESULTS

Table 1 displays the sociodemographic data of the participants. The majority of the participants are 22 years old (24.1%), Year 4 students (29.4%) and from Kulliyyah of Nursing (28.2%). Most of the participants have their last medical checkup 1 to 5 years ago (57.6%) with the purpose of random checkups (86.9%). Around 53.5% of participants went for a screen checkup during their medical checkup such as basic blood analysis, BMI, waist-hip ratio and 36.7% of participants has basic health checkups such as basic medical examination, complete blood analysis urinalysis and ECG. Lastly, 9.8% of participants have another kind of health checkups such as an X-ray and ENT checkup. Most of the participants have normal BMI (18.5 to 24.9) (64.5%), 15.9% participants were underweighted (BMI<18.5), 12.2% participants were overweight (BMI 25 to 29.9) and 7.3% participants were obese (BMI≥30).

Menstrual cycle pattern

A. Pre-menstrual pattern

Table 2 shows a majority of the participants experienced pre-menstrual mood swings such as frustration, anger and irritability (80.8%), experienced food or drink cravings before period (78.4%), experienced breast tenderness or swelling before period (51.4%) and having acne before starting of the menstrual cycle (74.3%). The majority of the students (80.4%) marked their calendars when the menstrual cycle will start.

B. Menstrual cycle pattern

From Table 3, 65.3% participants do not have menstrual cycle shorter than 26 days and 63.3% participants do not have menstrual cycle longer than 31 days. 57.6% participants do not miss periods or have long breaks between periods and 61.2% participants do not experience

Table 1: Sociodemographic data (n=245)

Variables		Frequency (n)	Percentage (%)
Age	≤19 years old	2	0.8
	20 years old	29	11.8
	21 years old	52	21.2
	22 years old	59	24.1
	23 years old	48	19.6
	24 years old	34	13.9
	≥25 years old	21	8.6
Kulliyyah	Kulliyyah of Nursing	69	28.2
	Kulliyyah of Pharmacy	56	22.9
	Kulliyyah of Dentistry	24	9.8
	Kulliyyah of Medicine	36	14.7
	Kulliyyah of Allied Health Science	31	12.7
	Kulliyyah of Science	29	11.8
Year of study	Year 1	40	16.3
	Year 2	48	19.6
	Year 3	65	26.5
	Year 4	72	29.4
	Year 5	20	8.2
Last medical check up	Never	18	7.3
	Less than 1 week ago	4	1.6
	1 week to 1 month ago	13	5.3
	1 month to 6 months ago	29	11.8
	6 months to 1 year ago	40	16.3
	1 years to 5 years ago	141	57.6
Frequency of medical check up	Every 6 months	2	0.8
	Annually	18	7.3
	Every 5 years	7	2.9
	Randomly	213	86.9
	Others	5	2
Type of medical check-up	Screen check-up (basic blood analysis, BMI, waist-hip ratio)	131	53.5
	Basic health check-up (basic medical exam, complete blood analysis, urinalysis, ECG)	90	36.7
	Others	24	9.8
BMI	18.4 and below (underweight)	39	15.9
	18.5 to 24.9 (normal)	158	64.5
	25.0 to 29.9 (overweight)	30	12.2
	30 and above (obese)	18	7.3

Table 2: Menstrual syndrome experienced by female students and their behaviour (n=245)

Pre-menstrual syndrome	Frequency, n (%)		
	Yes	No	Unsure
Experience premenstrual mood swings (frustration, anger, irritability)	198 (80.8)	26 (10.6)	21 (8.6)
Experience food or drink craving before period	192 (78.4)	36 (14.7)	17 (6.9)
Experience breast tenderness or swelling before period	126 (51.4)	87 (35.5)	32 (13.1)
Have acne before menstrual cycle start	182 (74.3)	45 (18.4)	18 (7.3)
Mark calendar when menstrual cycle starts	197 (80.4)	47 (19.2)	1 (0.4)

Table 3: Menstrual cycle pattern of the female students (n=245)

Menstrual pattern	Frequency, n (%)		
	Yes	No	Unsure
Menstrual cycle shorter than 26 days	54 (22)	160 (65.3)	31 (12.7)
Menstrual cycle longer than 31 days	60 (24.5)	155 (63.3)	30 (12.2)
Miss periods or have long breaks between periods	98 (40)	141 (57.6)	6 (2.4)
Experience irregular bleeding or have short breaks between periods	82 (33.5)	150 (61.2)	13 (5.3)
Stress makes menstrual cycle length more irregular	129 (52.7)	61 (24.9)	55 (22.4)
Experience heavy bleeding after 3-4 days	44 (18)	191 (78)	10 (4.1)
Experience light bleeding for the whole period time	43 (17.6)	183 (74.7)	19 (7.8)
Experience strong pelvic cramping with sharp pain or nausea during period	113 (46.1)	166 (47.3)	16 (6.5)
Experience period pain that when soothed by warmth and pressure (e.g., Hug hot water bottle), the pain relieved	159 (64.9)	64 (26.1)	22 (9)
Experience headache during period	86 (35.1)	134 (54.7)	25 (10.2)
Feeling uncomfortable during period	214 (87.3)	25 (10.2)	6 (2.4)
Entire symptoms improve if not under stress	79 (32.2)	54 (22)	112 (45.7)
Entire symptoms improve if just lying down	144 (58.8)	63 (25.7)	38 (15.5)
Feeling exhausted, pale and fatigue after period	94 (38.4)	120 (49)	31 (12.7)
Change pad less than twice within 24 hours	28 (11.4)	211 (86.1)	6 (2.4)
Change pad twice or more than twice within 24 hours	227 (92.7)	15 (6.1)	3 (1.2)

irregular bleeding or have short breaks between periods. However, 52.7% participants agreed that stress makes their menstrual cycle length more irregular. 78.0% participants do not experience heavy bleeding after 3 to 4 days of menstruation and 74.7% participants do not experience light bleeding for the whole period time. 47.3% participants do not experience strong pelvic cramping with sharp pain or nausea during period. Most of the participant experience period pain that when soothed by warmth and pressure such as by hugging hot water bottle (64.9%). 54.7% participants do not experience headache, but 87.3% participants reported feeling uncomfortable during period. 45.7% participants are unsure if their entire symptoms improve if they are not under stress. 58.8% participants agreed that their entire symptoms improve if just lying down and 49.0% participants do not feel exhausted, pale and fatigue after period. 86.1% participants do not change their pad less than twice within 24 hours and 92.7% participants change their pad twice or more than twice within 24 hours.

C. Genetic risk factor

Table 4 showed 46.1% and 44.5% participants were unsure if any of their relatives experience irregular short breaks and if any of their relatives have experience irregular long breaks between periods, respectively. Around 37.1% participants were sure that some of their relatives experience severe period pain.

Table 4: Genetic-risk factor (n=245)

Variables	Frequency, n (%)		
	Yes	No	Unsure
Any relatives experience irregular short breaks between periods	56 (22.9)	76 (31)	113 (46.1)
Any relatives experience irregular long breaks between periods	51 (20.8)	85 (34.7)	109 (44.5)
Any relatives experience severe period pain	91 (37.1)	80 (32.7)	74 (30.2)

Lifestyle pattern

Table 5 shows most of the time, participants reported studying (51.4%), sleeping (50.6%), doing housework (46.9%), socializing (43.7%) and social networking (50.2%) as their activities during leisure time. Participants also agreed that they sometimes jogging (76.7%), playing sports (74.3%), doing physical activity (68.6%), dancing (46.9%), walking (49.4%), watching movie (49.4%), shopping (51.4%), eat fast food (74.7%), read book (66.1%) and browse the internet (38.0%) as their activities during leisure time. Majority of the students never went to gym (66.1%) and doing yoga (74.3%). It is also reported that most of the students never smoke (99.2%) and drink alcohol (99.6%). Participants also agreed that they sometimes experience stress (57.1%).

Table 5: Activities done during leisure time (n=245)

Activities done during leisure time	Frequency, n (%)			
	Every time	Most of the time	Sometimes	Never
Going to gym			83 (33.9)	162 (66.1)
Jogging		23 (9.4)	188 (76.7)	34 (13.9)
Playing sports	3 (1.2)	20 (8.2)	182 (74.3)	40 (16.3)
Doing physical activity	10 (4.1)	57 (23.3)	168 (68.6)	10 (4.1)
Dancing	3 (1.2)	23 (9.4)	115 (46.9)	104 (42.4)
Doing yoga	1 (0.4)	7 (2.9)	55 (22.4)	182 (74.3)
Walking	35 (14.3)	79 (32.2)	121 (49.4)	10 (4.1)
Studying	57 (23.3)	126 (51.4)	61 (24.9)	1 (0.4)
Sleeping	88 (35.9)	124 (50.6)	32 (13.1)	1 (0.4)
Watching movie	38 (15.5)	83 (33.9)	121 (49.4)	3 (1.2)
Doing housework	49 (20)	115 (46.9)	80 (32.7)	1 (0.4)
Socializing	49 (20)	107 (43.7)	86 (35.1)	3 (1.2)
Shopping	32 (13.1)	85 (34.7)	126 (51.4)	2 (0.8)
Social networking	63 (25.7)	123 (50.2)	56 (22.9)	3 (1.2)
Eating fast food	13 (5.3)	43 (17.6)	183 (74.7)	6 (2.4)
Reading book	23 (9.4)	51 (20.8)	162 (66.1)	9 (3.7)
Browsing the internet	39 (15.9)	73 (29.8)	93 (38)	40 (16.3)
Smoke			2 (0.8)	243 (99.2)
Drink alcohol			1 (0.4)	244 (99.6)
Stress	21 (8.6)	79 (32.2)	140 (57.1)	5 (2)

Knowledge level on PCOS

Table 6 shows 78.8% participants have heard of PCOS and 61.2% know what PCOS. The participants reported that PCOS is life threatening (44.9%), a tumor (43.3%), due to hormone imbalance (80.0%), an inherited disease (41.2%), can cause difficulty in conceiving (73.9%). Participants also reported that PCOS in female can produce testosterone (71.8%) and affects menstrual cycle (93.1%). Participants agreed that PCOS may occur in overweight female (67.3%) and diabetes patient (50.6%). Participants also agreed that PCOS can be prevented by exercise regularly (54.3%) and aware what one consumes (73.1%). 47.8% participants reported that PCOS is not due to pathogen infection. Most of the participants also unsure regarding treatments for PCOS as such PCOS can be treated by consuming combination of birth control pills that regulate menses (50.2%), by consuming metformin (64.9%) and by removing part of ovary to regulate menses and start normal ovulation (55.1%). 51.0% participants also unsure if ovarian wedge resection can damage the ovary.

Table 6: Knowledge on PCOS (n=245)

Knowledge on PCOS	Frequency, n (%)		
	Yes	No	Unsure
Heard of PCOS (+)	193 (78.8)	43 (17.6)	9 (3.7)
Know what PCOS is (+)	150 (61.2)	52 (21.2)	43 (17.6)
PCOS is life threatening (+)	110 (44.9)	73 (29.8)	62 (25.3)
PCOS is due to pathogen infection (-)	37 (15.1)	117 (47.8)	91 (37.1)
PCOS is a tumor (-)	106 (43.3)	84 (34.3)	55 (22.4)
PCOS is due to hormone imbalance (+)	196 (80.0)	9 (3.70)	40 (16.3)
PCOS is an inherited disease (+)	101 (41.2)	57 (23.3)	87 (35.5)
PCOS cause difficulty in conceiving (+)	181 (73.9)	5 (2)	59 (24.1)
Female can produce testosterone (+)	176 (71.8)	29 (11.8)	40 (16.3)
PCOS affects female's menstrual cycle (+)	228 (93.1)	2 (0.8)	15 (6.1)
Overweight female (BMI>25.0) may have PCOS (+)	165 (67.3)	9 (3.7)	71 (29)
Diabetes patient may have PCOS (+)	124 (50.6)	15 (6.1)	106 (43.3)
PCOS can be prevented by exercise regularly (+)	133 (54.3)	19 (7.8)	93 (38)
PCOS can be prevented by aware about what one consumes (+)	179 (73.1)	12 (4.9)	54 (22)
PCOS can be treated by consuming combination of birth control pills that regulate menses (+)	89 (36.3)	33 (13.5)	123 (50.2)
PCOS can be treated by consuming metformin (+)	32 (13.1)	54 (22)	159 (64.9)
PCOS can be treated by removing part of ovary to regulate menses and start normal ovulation (+)	85 (34.7)	25 (10.2)	135 (55.1)
Ovarian wedge resection can damage ovary (+)	72 (29.4)	48 (19.6)	125 (51)

According to **Table 7**, a total of 42.0% participants has below average score and 58.0% have above average score for PCOS knowledge level.

Table 7: Knowledge level on PCOS (n=245)

PCOS Knowledge Level	Total score	Frequency (n)	Percentage (%)
Below average	**0-9**	103	42
Above average	**10-18**	142	58

Association between sociodemographic characteristic and knowledge on the relationship between BMI and development of PCOS

Table 8 shows that there is no difference in mean score on knowledge on the association between BMI and development of PCOS among female students from different age group, F (6, 244) =2.045, p=0.061. However, mean score on knowledge on the association between BMI and development of PCOS significantly different in between kulliyyah, F (5, 244) =6.093, p=0.000 and year of study, F(4, 244)=5.117, p=0.001. It is demonstrated that mean score on knowledge on the association between BMI and development of PCOS among female students from Kulliyyah of Medicine are significantly higher compared to other Kulliyyah ($p<0.05$). The mean score among female students from Year 5 and Year 1 along with Year 5 and Year 2 are significantly different where the mean score on knowledge on the association between BMI and development of PCOS among Year 5 female students are higher compared to those from other years.

Table 8: Mean score on knowledge on the association between BMI and development of PCOS among female students from different sociodemographic (n=245)

Variables	n	Mean (SD)	F-statistics (df)[n]	*p*-value
Age				
≤19 years old	2	1.00 (0.00)	2.045 (6, 244)	0.061
20 years old	29	0.52 (0.51)		
21 years old	52	0.60 (0.50)		
22 years old	59	0.68 (0.47)		
23 years old	48	0.67 (0.48)		
24 years old	34	0.76 (0.43)		
≥25 years old	21	0.90 (0.30)		
Kulliyyah				
Kulliyyah of Nursing	69	0.57 (0.50)[a]	6.093 (5, 244)	**0.000***
Kulliyyah of Pharmacy	56	0.63 (0.49)[a]		
Kulliyyah of Dentistry	24	0.63 (0.50)[a]		
Kulliyyah of Medicine	36	1.00 (0.00)		
Kulliyyah of Allied Health Sciences	31	0.81 (0.40)		
Kulliyyah of Science	29	0.52 (0.51)[a]		
Year of study				
Year 1	29	0.50 (0.51)[b]	5.117 (4, 244)	**0.001***
Year 2	40	0.56 (0.50)[b]		
Year 3	48	0.74 (0.44)		
Year 4	65	0.69 (0.46)		
Year 5	72	1.00 (0.00)		

Note: One-Way ANOVA test

*Means of score on knowledge on the association between BMI and development of PCOS among female students between different sociodemographic characteristics were significantly different, p<0.05

[a]Bonferroni post hoc test indicates that the means score on knowledge on the association between BMI and development of PCOS among female students as compared to Kulliyyah of Medicine are significantly different

[b]Bonferroni post hoc test indicates that the means score on knowledge on the association between BMI and development of PCOS among female students as compared to Year 5 are significantly different

Association between sociodemographic characteristic and knowledge on the association between menstrual cycle and development of PCOS

Table 9 shows that there is no difference in mean score on knowledge on the association between menstrual cycle and development of PCOS among female students from different age group, F (6, 244) =0.922, p=0.480 and kulliyyah, F (5, 244) =1.767, p=0.120. However, mean score on knowledge on the association between menstrual cycle and development of PCOS differed significantly across year of study, F (4, 244) =2.599, p=0.037.

Table 9: Mean score on knowledge on the association between menstrual cycle and development of PCOS among female students from different sociodemographic characteristics (n=245)

Variables	n	Mean (SD)	F-statistics (df)[n]	*p*-value
Age				
≤19 years old	2	1.00 (0.00)	0.922	0.480
20 years old	29	0.86 (0.35)	(6, 244)	
21 years old	52	0.90 (0.30)		
22 years old	59	0.93 (0.25)		
23 years old	48	0.94 (0.25)		
24 years old	34	1.00 (0.00)		
≥25 years old	21	0.95 (0.22)		
Kulliyyah				
Kulliyyah of Nursing	69	0.91 (0.28)	1.767	0.120
Kulliyyah of Pharmacy	56	0.93 (0.26)	(5, 244)	
Kulliyyah of Dentistry	24	0.96 (0.20)		
Kulliyyah of Medicine	36	1.00 (0.00)		
Kulliyyah of Allied Health Science	31	0.97 (0.18)		
Kulliyyah of Science	29	0.83 (0.38)		
Year of study				
Year 1	29	0.85 (0.36)	2.599	**0.037***
Year 2	40	0.88 (0.33)	(4, 244)	
Year 3	48	0.97 (0.17)		
Year 4	65	0.96 (0.20)		
Year 5	72	1.00 (0.00)		

Note: One-Way ANOVA test *Means of score on knowledge on the association between menstrual cycle and development of PCOS among female students between different sociodemographic characteristics were significantly different, $p<0.05$

Association between sociodemographic characteristic and knowledge on the association between lifestyle pattern and development of PCOS

Table 10 shows that there is no difference in mean score on knowledge on the association between lifestyle pattern and development of PCOS among female students from different age group, $F(6, 244)=1.542$, $p=0.165$ and year of study, $F(4, 244)=0.893$, $p=0.469$. However, mean score on knowledge on the association between lifestyle pattern and development of PCOS differed significantly across kulliyyah, $F(5, 244) =3.977$, $p=0.002$. The mean score on knowledge on the association between lifestyle pattern and development of PCOS among female students from Kulliyyah of Allied Health Science are higher compared to those from other kulliyyah and the means score on knowledge between Kulliyyah of Allied Health Science and Kulliyyah of Science; and Kulliyyah of Allied Health Science and Kulliyyah of Nursing are significantly different.

Table 10: Mean score on knowledge on the association between lifestyle pattern and development of PCOS among female students from different sociodemographic characteristics (n=245)

Variables	n	Mean (SD)	F-statistics (df)[n]	*p*-value
Age				
≤19 years old	2	0.50 (0.71)	1.542	0.165
20 years old	29	0.52 (0.51)	(6, 244)	
21 years old	52	0.50 (0.51)		

22 years old	59	0.56 (0.50)		
23 years old	48	0.42 (0.50)		
24 years old	34	0.65 (0.49)		
≥25 years old	21	0.76 (0.44)		
Kulliyyah				
Kulliyyah of Nursing	69	0.42 (0.50)[a]	3.977	**0.002***
Kulliyyah of Pharmacy	56	0.57 (0.50)	(5, 244)	
Kulliyyah of Dentistry	24	0.58 (0.50)		
Kulliyyah of Medicine	36	0.58 (0.50)		
Kulliyyah of Allied Health Science	31	0.84 (0.37)		
Kulliyyah of Science	29	0.38 (0.49)[a]		
Year of study				
Year 1	29	0.50 (0.51)	0.893	0.469
Year 2	40	0.48 (0.51)	(4, 244)	
Year 3	48	0.58 (0.50)		
Year 4	65	0.53 (0.50)		
Year 5	72	0.70 (0.47)		

Note: One-Way ANOVA test

*Means of score on knowledge on the association between lifestyle pattern and development of PCOS among female students between different sociodemographic characteristics were significantly different, $p<0.05$

[a]Bonferroni post hoc test indicates that the means score on knowledge on the association between lifestyle pattern and development of PCOS among female students as compared to Kulliyyah of Allied Health Science are significantly different

DISCUSSION

An individual recommended to have their medical checkup once every 3 years if they are younger than 50 years old and healthy, while it is recommended for those with age over 50 years old to do an annual medical checkup (12). The medical checkup is very important to detect any risk of disease and therefore, early detection and necessary treatment can be taken. World Health Organization also recommends annual screening for people over the age of 65, as well as those with diseases such as obesity that place them at a higher risk of hypertension (13). In this study, out of 245 participants, 141 (57.6%) have their last medical checkup 1 to 5 years ago and 86.9% of the participants randomly have their medical checkup. This may be because most of the students do not have medical issues, and some reported to have their last medical checkup during the mandatory routine medical checkup before entering university. 53.5% of the participants reported having screening checkup such as basic blood analysis, BMI and waist-hip ratio during their medical checkup. BMI can be categorized to several groups; underweight is below 18.5 kg/m2, normal weight is between 18.5 to 24.9 kg/m2, overweight, also known as pre-obesity, is between 25.0 to 29.9 kg/m2 and obesity is 30.0 kg/m2 and above (14). In this study, most of the participants (64.5%) have a normal BMI. Also, 15.9% participants were underweight, 12.2% participants were overweight and 7.3% participants were obese. Obesity in women can be a great risk factor for PCOS development and PCOS can also cause women at a greater risk of getting obese (15).

In this study, a high number of female students experiencing premenstrual syndromes such as frustration, anger and irritability (80.8%), food or drink craving before period (78.4%), breast tenderness or swelling before period (51.4%) and having acne before starting of menstrual cycle (74.3%). Previous study also reported high percentage of female students in Iran's university experience mood variability, fatigue, lethargy and change in appetite whether overeating or anorexia before their menstrual cycle start (16). Premenstrual syndrome may cause by low level of progesterone and PCOS has been associated with low level of progesterone which may be caused by hyperinsulinemia (17). 80.4% participants will mark their calendar as when their menstrual cycle will start, and this is a good behavior as it

alerts the students and prepare them for their menstrual cycle. In addition, this also will help them to stay vigilant on any changes in their menstrual cycle. A previous study reported that some of the reasons of why women track their menstrual cycle either by digital calendar, paper calendar or premenstrual bodily symptoms are because they want to know the condition and reaction of their body to different menstrual phases (18).

A menstrual cycle is enumerated from the first day of menses until the day before the next cycle starts and the normal interval is 28 days. Over 8 out of 10 women who have normal ovulation experience menstrual bleeding in duration of 3 to 6 days but can extend up to 12 days with the heaviest bleeding on the second day (19). In this study, majority of the students having menstrual cycle that shorter than 26 days (65.3%), no longer than 31 days (63.3%), not missing or having long breaks between periods (57.6%), irregular bleeding or having short breaks between periods (61.2%), heavy bleeding after 3 to 4 days (78.0%) and light bleeding for the whole period time (74.3%), thus, demonstrating that majority of the students having normal menstrual cycle. In another study, science students from different public universities in Pakistan reported having normal menstrual cycle as they do not experience prolonged period more than 7 days and partial absence of periods before 28 days of cycle (20).

Good menstrual symptoms can be defined as a good response to treatment for period pain or not having menstrual symptoms at all during menses. Some of the traditional or non-pharmacological intervention that used to relieve period pain are rest, heat, herbal medicine, herbal teas and exercise (21). This study demonstrated good menstrual symptoms by the students as period pain are soothed by warmth and pressure, includes hugging hot water bottle (64.9%), entire symptoms improved when lying down (58.8%), do not experience headache during period (54.7%) and do not feeling exhausted, pale and fatigue after period (49.0%). In a study done in several nursing schools in Egypt, 80% students reported that their dysmenorrhea pain decreased after taking hot bath (22). Around 74.1% of high school female students in Turkey also reported not having headache that associated with menstrual pain (23). This current study also reported some negative menstrual symptoms such as menstrual cycle length became more irregular due to stress (52.7%) and feeling uncomfortable during period (87.3%). An association between high psychosocial stress levels and irregular menstrual cycles among undergraduate medical students in Pondicherry, India have been reported (24). Stress can cause ovulation to completely stop that resulted to anovulatory cycle in which no eggs will be produce by the ovary (25).

Women should change their pads or tampons at least every 4 to 8 hours, which is more than 3 times per day (26). Changing pad frequently should be done for one's comfort and to prevent infection and bad odour regardless the amount of stain (27). The students in this study can be reported as having good menstrual hygiene as they change their pad twice or more than twice within 24 hours (92.7%) and do not change their pad less than twice within 24 hours (82.1%). Another study done among female nursing students in Egypt also reported that more than 60% of their participants changed their sanitary pads three or more times each day (22). Menstrual hygiene is crucial as lack of hygiene care may increase one's susceptibility to urinary tract infections, perineum and other related infections which consequently can affect women's health (28).

Females with family history of dysmenorrhea is more likely to experience dysmenorrhea compared to those who not (29). Moreover, menstrual cycle irregularities are increasingly being recognized as chromosomal and genetic origins (30). It is demonstrated in this study that the students are unsure regarding any genetic risk factors of irregular menstrual cycle among their relatives, as seen 46.1% and 44.5% students are unsure if any of their relatives experience irregular short and long breaks between periods, respectively. This reveal that the menstrual pattern among family and relatives never been discussed by them. However, 37.1% students reported that some of their relatives experience severe period pain. In Iranian women, more than half of the participants agreed that they have family history of period pain either from their mom or sister or both (31).

A healthy lifestyle pattern which can be determined by healthy eating pattern, obesity prevention, regular physical exercise and not smoking, which can reduce the risk for cardiovascular disease or any other diseases (32, 33). The lifestyle adjustments such as changes in dietary, physical exercise and weight reduction are the effective first line treatments for PCOS (33). Based on the findings in this study, most of the students never went to gym (66.1%) and practice yoga (74.3%). The students also reported only sometimes jogging (76.7%), playing sports (74.3%), doing physical activity (68.6%), dancing (46.9%) and walking (49.4%). Moreover, the student spends most of their time sleeping (50.6%), socializing (43.7%) and social networking (50.2%). The students also reported as sometimes watching movie (49.4%), eat fast food (74.7%), read book (66.1%) and browse the internet (38.0%). This reveal that the students practice sedentary lifestyle which might be due to that IIUM Kuantan campus is a medical and science-based campus where most of the students spend less time on being active as they spend most their time to study, clinical posting, revision and relaxing during free time. This is also demonstrated that they spend most of the time studying (51.4%). In addition, considering these activities are only done sometimes, it may be as one of the steps to reduce stress after studying or examination. However, there are students reported that they spend more time on doing housework (46.9%) which is a good activity to burn calories as this activity need a lot of energy. In a study conducted among 40 women between the age of 18 to 34 years old with diagnosed of PCOS reported that 67% improvement on the women's menstrual cycle after lifestyle changes were done, including 30 minutes-walk, some body weight resistance exercise and daily total calorie intake reduction (34). The risk of PCOS in women also can be reduced by exercise and physical activity that help in reducing BMI (35).

Majority of the students also reported not smoking (99.2%) and drinking alcohol (99.6%). However, there are reported of 2 students smoking (0.8%) and 1 student (0.4%) drinking alcohol (0.4%). One of the reasons why Malaysian university students smoke is due to stress (36) as seen in this study, 57.1% students reported as having stress sometimes. Previous study reported that a tobacco-using person were more prone to binge drinking than non-tobacco-using person (37). A study done among French college students reported that majority of the participants also having high level of perceived stress (86.3%) and psychological distress (79.3%) that linked to low self-esteem, selection of fields and freedom of schedule organization (38).

This study manifested a good knowledge regarding PCOS as 58% students having above average score, and this can be further seen as most of the students have heard and know what PCOS is (78.8% and 62.2%, respectively), female can produce testosterone (71.8%), PCOS is life threatening (44.9%), PCOS is not due to pathogen infection (47.8%) but due to hormone imbalance (80.0%), PCOS is an inherited disease (41.2%) that cause difficulty in conceiving (73.9%) and affects female's menstrual cycle (93.1%), overweight female and diabetes patient may have PCOS (67.3% and 50.6%, respectively), and PCOS can be prevented by exercise regularly (54.3%) and diet (73.1%). Another study also reported a good knowledge on PCOS among young students (47.8%) from random courses that are non-clinical in several higher educational institutions in Perak, Malaysia (39). However, a high percentage of students in this study mistakenly understand that PCOS is a tumor (43.3%), which demonstrated that there is still misunderstanding on the causes of PCOS.

Treatment for PCOS should be individualized based on their signs and symptoms as PCOS is a complex syndrome that affects many organ systems and has substantial metabolic and reproductive consequences. Changes in lifestyle, weight loss and reduction of calorie intake is the first line treatment for overweight PCOS women (40). In addition, hormonal contraceptives can be used to treat hyperandrogenism and regulate menses while metformin are only suggested as a treatment for PCOS women with Type 2 Diabetes Mellitus (41). About 22 women with PCOS condition having decrease in testosterone level after undergoing laparoscopic ovarian wedge resection and consequently are able to get pregnant (42). Unfortunately, majority of the students in this study do not have a good knowledge on the treatments of PCOS as they are unsure of the treatments, such as combination of birth control pills that regulate

menses (50.2%), metformin (64.9%) and removal part of ovary to regulate menses and start normal ovulation (55.1%). Majority of the students also unsure if ovarian wedge resection can damage the ovary (51.0%). In a previous study, 33.71% of female non-clinical undergraduate students in Bangladesh reported that medication can treated PCOS and 19.71% students think that surgery can help PCOS patients to totally get rid of the condition (43). Contrary to the study done among female science students from different universities in Pakistan that majority of them reported that hormonal therapy, anti-diabetic medications such as metformin and surgery may be used to treat PCOS (20). This result showed that the knowledge regarding on PCOS can be attributed by the background study of the student.

The findings from this study revealed that kulliyyah and year of study are significantly associated to knowledge on the relationship between BMI and development of PCOS. In terms of kulliyyah, the mean score among student by Kulliyyah of Medicine are higher compared to those from other kulliyyah. Then, the mean score among Year 5 female students is higher compared to other years which may be due to that Year 5 students are consists of medical and dentistry students. This supported by previous finding that reported higher knowledge among medical students as the source of information is through their teacher (11, 44). Despite that, another study reported that 42.2% of the female medical students know about PCOS through internet and social media and only 4% aware about PCOS from class lectures and book readings (45). Problem based learning (PBL) that is used as learning methods by the medical students provide better understanding and improve clinical thinking among students. As students learn throughout years, their knowledge is believed to increase too (46). However, age does not influence the level of knowledge regarding relationship between BMI and development of PCOS.

Based on this study, there was no significant association between age and kulliyyah of study with the knowledge on the association between menstrual cycle and development of PCOS, which also reported by previous study conducted in universities at Pakistan (20). Despite that, there was a significant association between year of study and knowledge on the association between menstrual cycle and development of PCOS where Year 5 has higher mean score due to Year 5 student are consists of medical and dentistry students. One of the sources of information for medical and dentistry students is during their clinical postings and rotations (45). There was also a significant association between kulliyyah of study with the knowledge on the association between lifestyle pattern and development of PCOS. The mean score among

Kulliyyah of Allied Health Science are higher compared to those from other kulliyyah, which attributed by their syllabus and practicum study that are more exposed on physical activities and eating behaviour, making them more alert on the healthy lifestyle pattern. This kulliyyah offer programs on biomedical sciences, dietetics and physiotherapy in which physiotherapy course educate their students with skills on assessing, managing, and prevent any issues linked to the body, movement and function (47), in addition to advice suitable exercise according to the patient's condition (48). However, there was no significant association between age and year of study with knowledge on the association between lifestyle pattern and development of PCOS in this study.

CONCLUSION

The finding of this study suggest that most participants have a good understanding related to PCOS but lacking knowledge regarding the treatments. Some of the limitations that has been observed is the study is being done in one campus only, which is the health sciences campus. Thus, the findings cannot be generalized to all female undergraduate students in Malaysia. More exposure towards this syndrome should be provided formally by including it in high school syllabus, along with the treatment in order to ensure that the students will know how to tackle this condition better. It is also recommended that more study regarding knowledge and awareness towards PCOS should be done in order to know our community's level of knowledge towards this syndrome as there is no sufficient study in Malaysia. This should be done to promote the betterment in health and awareness regarding this syndrome can be implemented. Therefore,

the symptoms of PCOS can be detected earlier in individual and prevention steps can be taken to manage its development.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare with regard to this work.

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