

Diagnosis and management of polycystic ovary syndrome: Perspectives of clinicians in Singapore

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ABSTRACT

Introduction: To harmonise the diagnostic processes of polycystic ovary syndrome (PCOS) and enable clinicians to provide better patient care, it is critical to understand the knowledge gaps in PCOS diagnosis. We evaluated how clinicians in endocrinology, family medicine, general practice and gynaecology diagnose PCOS.

Methods: This cross-sectional survey involved 208 clinicians from specific subspecialties across various healthcare settings in Singapore.

Results: A total of 160 responses were included in the final analysis. Among all the diagnostic criteria, the Rotterdam 2003 criteria was most frequently used (66.3%). More than half of the gynaecologists reported having a standardised workplace protocol while the majority from other specialties reported otherwise. A large percentage of respondents (60.5%) were unable to identify the correct PCOS clinical features, which is concerning. Only 8.8% of respondents used clinical and biochemical hyperandrogenism, menstrual disturbances and pelvic ultrasound to diagnose PCOS without performing unnecessary and incorrect investigations. Most clinicians recognised insulin resistance/type 2 diabetes mellitus and fertility problems as complications while only a few recognised psychological complications. Many clinicians (37.3%) sought standardisation of PCOS diagnosis and management guidelines for improvement in PCOS care and 81.9% of respondents would appreciate standardised educational materials.

Conclusion: This is the first study to the best of our knowledge that gives an insight into the diagnostic and management processes of PCOS among various healthcare institutions in Singapore. This study calls for greater harmonisation of diagnostic processes and holistic evidence-based management of patients with PCOS through standardised workplace protocols and patient education resources.

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is a common endocrine disorder estimated to affect 4–21% of women, depending on the diagnostic criteria used.¹ Clinical manifestations of the syndrome are varied, and multiple parameters are needed for its diagnosis.^{2,3} This complicates the diagnosis of PCOS and may cause patient dissatisfaction arising from delayed diagnosis,

conflicting management regimes and differing views on prognosis.^{2,4,5}

The situation is aggravated by a plethora of definitions that professional societies and organisations use to diagnose PCOS.⁶⁻¹¹ The 1990 National Institutes of Health (NIH) criteria require hyperandrogenism, either clinical (Ferriman-Gallwey score ≥ 8) or biochemical hyperandrogenism (elevated total or free testosterone)

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CLINICAL IMPACT

What is New

- 62.2% of gynaecologists reported having a standardised workplace protocol to diagnose polycystic ovary syndrome (PCOS) compared to clinicians from family medicine (31.5%), endocrinology (19.2%) and general practice (11.6%).
- Only 8.8% of respondents used the correct combination of clinical and biochemical hyperandrogenism, menstrual disturbances and pelvic ultrasound to diagnose PCOS.
- 60.5% of respondents were unable to correctly identify PCOS clinical features.

Clinical Implications

- There is a need for greater harmonisation of diagnostic processes and holistic evidence-based management of PCOS.

and chronic oligoanovulation (<6–9 menses per year) to diagnose PCOS.¹² On the other hand, the commonly used Rotterdam 2003 criteria added a new parameter—polycystic ovarian morphology, which is measured by transvaginal ultrasound counting of antral follicles (follicles ≥ 12 in each ovary measuring 2–9mm in diameter) and/or increased ovarian volume ($>10\text{mL}$).¹³ With the advent of highly sensitive 8MHz transvaginal ultrasound probes, the antral follicle count threshold for PCOS diagnosis was revised upwards variably to 19–25 follicles.³ The Androgen Excess and PCOS Society (AE-PCOS) further specified that there must be hyperandrogenism with either oligoanovulation or polycystic ovarian ultrasound morphology.¹⁴ Recently, the revised European Society of Human Reproduction and Embryology (ESHRE) 2018 guideline notably provided detailed radiological guidelines based on route and frequency bandwidths of the ultrasound scans.¹⁵ For transvaginal scans $\geq 8\text{MHz}$, follicle number per ovary should be >20 and/or ovarian volume $\geq 10\text{mL}$, whereas for transabdominal or transvaginal scans $\leq 8\text{MHz}$, ovarian volume should be $\geq 10\text{mL}$.¹⁵

It is therefore not surprising that clinicians and patients alike may be confused about the syndrome. This has resulted in patient dissatisfaction after clinic visits due to delayed or inaccurate diagnosis.^{2,4,5} There is a lack of studies about this issue in Southeast Asia. In Singapore, as in many other nations, this is magnified by an absence of a systemic referral system specific to PCOS, with the condition being treated by clinicians

in endocrinology, family medicine, fertility, general practice and gynaecological practices.¹⁶ Knowledge of the diagnostic criteria used, accuracy of application of these criteria, and recognition of potential complications by clinicians across these disciplines are important to reduce patient dissatisfaction and anxiety.¹⁷

To study clinician knowledge on PCOS, we conducted a questionnaire survey to evaluate how clinicians in the fields of endocrinology, family medicine, general practice and gynaecology diagnosed and evaluated PCOS. The primary aim was to document clinician knowledge of PCOS clinical features, and the clinical, biochemical and imaging modalities used to diagnose PCOS. The secondary outcome of the survey was to document clinician knowledge of PCOS complications and its management.

METHODS

The study was approved by the National University of Singapore Institutional Review Board. Participation was anonymous and voluntary.

Study group selection

Clinicians working in endocrinology, family medicine, general practice and gynaecology were invited to participate in the current study. The chosen subspecialties represented the clinician groups most likely to encounter patients with first presentations of PCOS. General practice consisted of clinicians without a Master of Medicine degree in Family Medicine. The recruitment period for the study was from October 2020 to June 2021. The URL link to the questionnaire was disseminated through posters and emails to hospitals, primary care units and societies affiliated with the chosen subspecialties. The surveys were sent to both the government-subsidised public sector clinics and hospitals, and non-subsidised private clinics and hospitals. We had aimed to send the questionnaire to all clinicians treating PCOS in Singapore.

Study design and tools

We used Qualtrics platform, a secure online database, to administer the questionnaire. The questionnaire was adapted from another validated questionnaire previously used to survey clinicians in North America on PCOS knowledge and practice patterns.⁶ It was modified by content experts in the fields of reproductive endocrinology, benign gynaecology and family medicine to contextualise and further find out about clinicians' perspectives and challenges regarding PCOS diagnosis and treatment in Singapore. The questionnaire comprised questions pertaining to several domains: clinician demographics,

diagnostic criteria, clinical features, investigations, non-fertility and fertility management, clinician opinion on patient education and challenges faced in PCOS care. The questionnaire was first piloted in a smaller group of 30 clinicians and further refined before disseminating to our bigger target group.

Statistical methods

Statistical analysis was performed with SPSS Statistics software version 27.0 (IBM Corp, Armonk, US). The main outcomes measured were clinician knowledge of correct PCOS clinical features, and the clinical, biochemical and imaging modalities used to diagnose PCOS. The secondary outcome measures included clinician knowledge of complications and management of PCOS and their perspectives of PCOS care in Singapore. Descriptive statistics were reported as count and percentage responses, and groups were compared using chi-square tests. Binary logistic regression models were performed. Odds ratios and 95% confidence intervals were presented. All variables with $P < 0.1$ in the univariate analyses were added to the models. $P < 0.05$ was considered statistically significant.

Respondents were asked to identify from a mixed list of correct and incorrect modalities, and peripheral recommendations that they could use to diagnose PCOS. The correct and incorrect modalities were based on a constellation of evidence-based guidelines including the latest ESHRE 2018 guidelines.¹⁵ The correct modalities could be broadly classified into 4 main diagnostic categories: (1) clinical hyperandrogenism; (2) biochemical hyperandrogenism; (3) menstrual disturbances; and (4) polycystic morphology on ultrasound. Acne, male pattern baldness and hirsutism were grouped under clinical hyperandrogenism. Biochemical hyperandrogenism included testosterone levels and free androgen index. Menstrual disturbances included amenorrhoea/oligomenorrhoea. Lastly, ovarian antral follicle count and ovarian volume were grouped under polycystic morphology on ultrasound. Respondents had only needed to select a minimum of 1 modality from each category to be considered to have recognised a category used in PCOS diagnosis. Incorrect modalities included body mass index, fertility problems, prolactin levels, androstenedione levels, estradiol levels and 17-hydroxyprogesterone. Peripheral recommendations included luteinising hormone (LH) to follicle-stimulating hormone (FSH) ratio (LH/FSH),¹⁴ anti-Müllerian hormone^{3,18} and sex hormone binding globulin.¹⁹ These investigations were included as peripheral recommendations as they have not been formally

included in any published guidelines, but have potential utility in diagnosing PCOS.

RESULTS

A total of 208 responses were received. Data from 160 participants who completed at least 78% of the survey, including all essential questions on the diagnostic criteria pertinent to the study were included. As the number of clinicians who received invitations to participate in the questionnaire could not be accurately determined due to the multiple channels of information dissemination used, reach and response rates could not be estimated.

Socio-demographic characteristics of respondents

Table 1 summarises the socio-demographic characteristics of the 160 respondents. Of this number of respondents, nearly two-thirds were aged 50 years and below; more than half (56.9%) were women; a majority worked in the public sector (67.5%); and 28.7% respondents reported not being involved in the care of, and have not seen, any patients with PCOS in the last 12 months. Nearly half of the respondents (45%) were specialists.

Diagnostic criteria and availability of standardised protocol at workplace

Almost all clinicians from gynaecology and endocrinology specialties reported that they followed diagnostic criteria, as compared to those from general practice and family medicine (Table 2). Among the 4 sets of diagnostic criteria, Rotterdam 2003 was the most commonly utilised (66.3%). Significantly more gynaecologists (62.2%) reported having a standardised protocol at their workplace as compared to clinicians from family medicine (31.5%), endocrinology (19.2%) and general practice (11.6%).

Recognition of PCOS clinical features

Factors influencing respondents' ability to correctly identify PCOS clinical features were investigated (Table 3). The binary logistic regression model explained 31.3% of variance in the ability to identify correct clinical features of PCOS and correctly classified 73.8% of cases. Only 39.5% of respondents could identify the correct clinical features, of whom a significant majority were gynaecologists (62.2%).

The respondents' area of work, professional grade, practice of not following any diagnostic criteria nor having a workplace protocol were significant in determining their ability to correctly identify PCOS clinical features. Years involved in the care of patients with PCOS, number of patients with PCOS seen in the

Table 1. Characteristics of clinicians responding to questionnaire

Characteristics	No. (%) N=160
Age, years	
25–30	29 (18.1)
31–40	57 (35.6)
41–50	31 (19.4)
51–60	32 (20.0)
>60	11 (6.9)
Specialty	
General practice	43 (26.9)
Family medicine	54 (33.8)
Gynaecology	37 (23.1)
Endocrinology	26 (16.3)
Location of practice	
Private sector	52 (32.5)
Private clinic	49 (30.6)
Private hospital	3 (1.9)
Public sector	108 (67.5)
Polyclinic	46 (28.8)
Public hospital	62 (38.8)
Years involved in the care of PCOS patients	
No involvement	46 (28.7)
≤5 years	35 (21.9)
6–10 years	31 (19.4)
11–20 years	24 (15.0)
>20 years	24 (15.0)
PCOS patients seen in the last 12 months	
0	46 (28.7)
1–10	59 (36.9)
11–20	19 (11.9)
21–30	8 (5.0)
>30	28 (17.5)
Professional grade	
Residents-in-training	25 (15.6)
Specialists	72 (45.0)
Others	63 (39.4)

PCOS: polycystic ovary syndrome

preceding 12 months, and self-reported clarity about PCOS diagnostic criteria, did not significantly predict the ability to correctly identify PCOS clinical features.

Diagnostic modalities

Table 4 summarises modalities used to diagnose PCOS by respondents. Fifty-five (34.3%) of the 160 respondents chose modalities from all 4 diagnostic categories to diagnose PCOS. However, of these 55 respondents, 33 (60%) respondents chose modalities from the 4 diagnostic categories along with incorrect modalities. There were 35% of the respondents who chose modalities from 3 of the 4 diagnostic categories. Of the 4 diagnostic categories, biochemical hyperandrogenism (50.6%) was the most common category that was not used by respondents for the diagnosis of PCOS. There were 48.1% of clinicians who used peripheral recommendations to aid their diagnosis of PCOS. Of the peripheral recommendations, LH/FSH ratio (43.8%) was the most frequently used. Finally, 71.3% of respondents chose at least 1 incorrect modality to diagnose PCOS, with fertility problems (58.8%) being the most selected incorrect modality.

PCOS complications

Table 5 summarises complications recognised by clinicians. Overall, insulin resistance/type 2 diabetes mellitus (95.6%) and fertility problems (96.8%) were best recognised as complications of PCOS by the clinicians. On the other hand, psychological complications of PCOS such as depression (40.5%) and anxiety (29.7%) were less appreciated. Clinicians from gynaecology and family medicine were more likely to recognise abnormal uterine bleeding and cardiovascular disease complications. Interestingly, the majority of endocrinologists reported non-alcoholic steatohepatitis as a complication. Gynaecologists were most concerned about endometrial cancer compared to other specialties.

Perspectives from clinicians

When clinicians were asked to share how they educated their newly diagnosed patients, only 18.6% of respondents indicated the use of evidence-based guidelines (12.4%) and/or institution pamphlets (6.2%). There were 14.7% of clinicians who reported that they do not counsel their patients. A majority of respondents (81.9%) expressed that provision of standardised educational materials for clinicians will benefit them in caring for patients with PCOS. The respondents were then asked to share the main challenges they faced in caring for patients with PCOS. Interestingly, ensuring

Table 2. Association of diagnostic criteria and availability of standardised protocol with different specialties

	General practice ^a	Family medicine ^b	Gynaecology	Endocrinology	Total N=160	P value
Follows diagnostic criteria, no. (%)						<0.0001
Yes	25 (58.1)	35 (64.8)	36 (97.3)	25 (96.2)	121 (75.6)	
No	18 (41.9)	19 (35.2)	1 (2.7)	1 (3.8)	39 (24.4)	
Diagnostic criteria, no. (%)						<0.0001
NIH 1990	3 (7.0)	1 (1.9)	3 (8.1)	0 (0)	7 (4.4)	
Rotterdam 2003	22 (51.2)	34 (63.0)	31 (83.8)	19 (73.1)	106 (66.3)	
AE-PCOS 2009	0 (0)	0 (0)	1 (2.7)	2 (7.7)	3 (1.9)	
ESHRE 2018	0 (0)	0 (0)	1 (2.7)	4 (15.4)	5 (3.1)	
Has standardised protocol at workplace, no. (%)						<0.0001
Yes	5 (11.6)	17 (31.5)	23 (62.2)	5 (19.2)	50 (31.3)	
No	30 (69.8)	25 (46.3)	12 (32.4)	19 (73.1)	86 (53.8)	
I don't know	8 (18.6)	12 (22.2)	2 (5.4)	2 (7.7)	24 (15.0)	
Follows criteria and workplace protocol	5 (11.6)	15 (27.8)	22 (59.5)	6 (23.1)	48 (30.0)	<0.0001
Either follows criteria or has protocol	22 (51.2)	25 (46.3)	15 (40.5)	19 (73.1)	81 (50.6)	
Neither follows criteria nor has protocol	16 (37.2)	14 (25.9)	0 (0)	1 (3.8)	31 (19.4)	

AE-PCOS 2009: Androgen Excess and PCOS Society 2009 criteria; ASRM: American Society for Reproductive Medicine; ESHRE 2018: revised European Society of Human Reproduction and Embryology (ESHRE) 2018 guidelines; NIH 1990: National Institutes of Health 1990 criteria; PCOS: polycystic ovary syndrome; Rotterdam 2003: Rotterdam ESHRE/ASRM-sponsored PCOS consensus workshop group criteria

^a General practice is represented by physicians without a Master of Medicine in Family Medicine degree

^b Family medicine is represented by physicians with a Master of Medicine in Family Medicine degree

patients' compliance to lifestyle modifications (30.3%) and diagnosing PCOS using the correct criteria (24.5%) were the 2 most selected challenges.

DISCUSSION

Clinical features and diagnostic modalities

The diagnosis and management of PCOS is complex, and uncertainties can cause undue stress and anxiety for the patient. Herein, we report findings relevant to PCOS diagnosis and management that showed variations among different healthcare specialties and settings.

We found that a large percentage (60.5%) of respondents (n=98) were unable to identify the correct clinical features of PCOS, which could be a cause for concern. Of these respondents, 80% of them do not follow a diagnostic criterion and/or lack a standardised workplace protocol. This is alarming given that most respondents in similar studies were aware of the clinical features associated with PCOS.⁹ Overall, only 34.3% of respondents recognised the use of all 4 diagnostic categories, including clinical and biochemical hyperandrogenism, menstrual disturbances and polycystic morphology

on ultrasound for the diagnosis of PCOS. Similar to our findings, a study by Chemerinski et al. involving obstetrics and gynaecology residents identified that only 55% of the residents were able to identify at least 1 component of the 3 criteria in the Rotterdam 2003 criteria, and that over 90% of the residents were unable to identify all components of the criteria.²⁰ Clinicians from China were also found to have a low accurate application rate (31.3%) of their chosen diagnostic criteria.⁷ These findings highlight the knowledge gap present in identifying the correct clinical features of PCOS, and discrepancies in the diagnostic criteria used.

Diagnostic criteria and standardised workplace protocol

We found that most clinicians followed the Rotterdam 2003 criteria and others the latest ESHRE 2018 guidelines to diagnose PCOS. This is in line with studies performed in Europe and North America that showed most clinicians still used the Rotterdam criteria.^{6,21} On the other hand, a recent study found that the AE-PCOS criteria was most frequently used to diagnose PCOS in China.⁷

Table 3. Factors influencing ability to correctly identify PCOS clinical features of menstrual disturbances and clinical hyperandrogenism

N=160	Crude OR (95% CI)	Adjusted OR (95% CI)
Specialty		
General practice	Reference	Reference
Family medicine	4.8 (1.0–7.5)	4.8 (1.3–17.6)
Gynaecology	8.4 (3.0–24.1)	10.1 (1.5–67.6)
Endocrinology	5.1 (1.7–15.7)	7.8 (1.5–41.0)
Professional grade		
Residents-in-training	Reference	Reference
Specialists	2.2 (0.8–5.9)	3.2 (0.8–13.6)
Years involved in the care of patients with PCOS		
No involvement	Reference	Reference
≤5 years	2.8 (1.0–7.8)	2.7 (0.4–18.9)
6–10 years	6.6 (2.3–18.7)	3.7 (0.5–25.9)
11–20 years	4.0 (1.3–12.2)	1.3 (0.2–10.3)
>20 years	4.8 (1.6–14.3)	2.0 (0.3–12.4)
Number of patients with PCOS seen in the last 12 months		
0	Reference	Reference
0–10	3.3 (1.3–8.2)	1.2 (0.3–5.6)
11–20	3.5 (1.1–11.3)	0.7 (0.1–3.2)
21–30	7.9 (1.6–40.1)	1.6 (0.3–10.3)
>30	7.3 (2.5–21.5)	Not available
Follows criteria and workplace protocol		
Follows criteria and workplace protocol	Reference	Reference
Either follows criteria or has protocol	0.4 (0.2–0.9)	0.5 (0.2–1.4)
Neither follows criteria nor has protocol	0.1 (0.03–0.4)	0.2 (0.04–0.8)
Clear about PCOS diagnostic criteria		
Yes	2.4 (1.2–4.8)	0.9 (0.3–2.7)
No	Reference	Reference
Perception of PCOS diagnosis		
Correctly diagnosed	Reference	Reference
Under diagnosed	0.3 (0.1–0.8)	0.5 (0.2–1.4)
Over diagnosed	0.6 (0.2–2.0)	0.4 (0.1–1.5)
I don't know	0.2 (0.1–0.7)	0.5 (0.1–2.1)

CI: confidence interval; OR: odds ratio; PCOS: polycystic ovary syndrome

We noted that a higher proportion of clinicians from general practice and family medicine reported that they did not follow any criteria. This could be due to the limited resources to diagnose PCOS in the primary care

facilities, and/or reduced access to teaching sessions on PCOS as compared to the gynaecology specialty. There were 68.8% of respondents who reported that they did not have a standardised protocol in their workplace for the

Table 4. Modalities used to diagnose PCOS by the respondents

Modality	No. (%) N=160
Diagnostic category A: clinical hyperandrogenism	142 (88.9)
Acne	100 (62.5)
Male pattern baldness	49 (30.6)
Hirsutism	141 (88.1)
Diagnostic category B: biochemical hyperandrogenism	79 (49.4)
Testosterone levels	75 (46.9)
Free androgen index	30 (18.8)
Diagnostic category C: menstrual disturbances	149 (93.1)
Diagnostic category D: ultrasound	105 (65.6)
Number of ovarian antral follicles	99 (61.2)
Ovarian volume	47 (29.4)
Peripheral recommendations	
LH/FSH ratio	70 (43.8)
Anti-Müllerian hormone levels	14 (8.8)
Sex hormone binding globulin levels	11 (6.9)
Incorrect modalities	
Fertility problems	27 (16.9)
Body mass index	20 (12.5)
Androstenedione levels	8 (5.0)
17-hydroxyprogesterone	6 (3.8)
Estradiol levels	5 (3.2)
Prolactin levels	3 (1.9)
Respondents who chose modalities from all 4 diagnostic categories	55 (34.4)
Only chose modalities from all 4 diagnostic categories	14 (8.75)
Chose modalities from all 4 diagnostic categories and peripheral recommendations	8 (5.0)
Chose modalities from all 4 diagnostic categories and incorrect modalities	33 (20.6)

LH/FSH: luteinising hormone to follicle-stimulating hormone;
PCOS: polycystic ovary syndrome

management of PCOS. As a lack of standardised protocols may contribute to greater inconsistencies in diagnosing and managing PCOS patients, this could be an area for improvement.^{6,10,11}

Due to its comprehensive evidence-based diagnostic and management approaches, including its recommendation of “PCOS model care”, the ESHRE 2018 PCOS guidelines could be recommended as the standardised criteria for

diagnosing PCOS in Singapore. The “PCOS model of care” entails a sustainable approach to multidisciplinary and holistic management of PCOS patients. Similarly, a standardised protocol can be implemented for diagnosis and holistic management of PCOS patients in Singapore, providing a clear evidence-based, multidisciplinary management framework involving clinicians from gynaecology, endocrinology, family medicine, psychiatry and dietetics. This would eliminate some of the challenges faced by clinicians in PCOS care such as inconsistencies in diagnostic and management processes, the need for further PCOS education for clinicians, and clearer referral pathways. Put together, these interventions may help to improve patient satisfaction through a systematic and holistic care provision that targets physical and psychosocial aspects of PCOS.

Perspectives from clinicians

Notably, 31.3% of respondents did not offer any counselling and only 16% used evidence-based guidelines and institution pamphlets for counselling. Easier access to educational resources regarding PCOS and its complications would promote greater understanding of the condition, which will in turn increase patient compliance to lifestyle modifications and other treatment plans.² This would be highly desirable given that non-compliance to lifestyle modifications was highlighted to be one of the main challenges for clinicians. Most clinicians believed that standardised educational brochures could be created and shared with patients. Studies overseas reflected similar findings in that most clinicians from North America, Europe and other regions from gynaecology and reproductive endocrinology believed that they could be best supported in caring for women with PCOS through curation of broadly available education materials.²¹ We could consider sharing e-resources with our patients, such as the “Ask PCOS” phone application created by Monash University²² that contains infographics and interactive videos by PCOS experts.

Residency committees could consider to include more training hours and clinical exposure to PCOS in endocrine, family medicine and gynaecology residency programmes. Clinicians may also be updated about PCOS guidelines through various modes such as workshops, webinars and flexible learning opportunities involving existing online PCOS courses for healthcare professionals via renowned and accredited platforms.^{21,22} Creating consolidated and standardised resources for all clinicians and patients across Singapore may further harmonise workflow and protocols.

Table 5. Table of complications recognised by clinicians across specialties

N=160	General practice No. (%) ^a n=43	Family medicine No. (%) ^a n=54	Gynaecology No. (%) ^a n=37	Endocrine No. (%) ^a n=26	Total No. (% of total responses)	P value
Fertility problems	42 (97.7)	52 (96.3)	35 (94.6)	24 (92.3)	153 (96.8)	0.725
Insulin resistance/type 2 diabetes mellitus	38 (88.4)	53 (98.1)	35 (94.6)	25 (96.2)	151 (95.6)	0.072
Abnormal uterine bleeding	19 (44.2)	38 (70.4)	37 (100.0)	11 (42.3)	105 (66.5)	<0.001
Cardiovascular disease	15 (34.9)	33 (61.1)	23 (62.2)	10 (38.5)	81 (51.3)	0.046
Endometrial cancer	9 (20.9)	21 (38.9)	32 (86.5)	17 (65.4)	79 (50.0)	<0.001
Depression	14 (32.6)	25 (46.3)	13 (35.1)	12 (46.2)	64 (40.5)	0.455
NASH	10 (23.3)	22 (40.7)	8 (21.6)	17 (65.4)	57 (36.1)	0.002
Anxiety	8 (18.6)	19 (35.2)	10 (27.0)	10 (38.5)	47 (29.7)	0.279

NASH: non-alcoholic steatohepatitis

^a(%) in columns represent percentage of doctors in the subspecialty choosing the complication

Strengths and limitations

The sample is not representative of the whole population of family medicine, gynaecology and endocrine specialists. Selection bias might be present as clinicians who were more involved in PCOS work might be more inclined to participate in this study. Regardless of the limitations, this is the first study to the best of our knowledge that gives an insight into the diagnostic and management processes of PCOS in Singapore among various healthcare institutions. Further studies could recruit a larger and more diverse population of clinicians with a stratified sampling approach to obtain a more representative opinion. Investigating the patient's satisfaction level with regards to PCOS diagnosis and management would also provide a new perspective and can be used to supplement the findings from this study. This would help to create targeted interventions to improve the diagnostic and management processes of PCOS in Singapore.

CONCLUSION

The current study evaluated the diagnostic processes adopted by clinicians from different specialties and healthcare settings in Singapore. It is anticipated that similar conundrums are faced by patients in Singapore as the patients worldwide. This study calls for greater harmonisation of diagnostic processes and holistic evidence-based management of PCOS patients, through standardised workplace protocols and patient education resources.

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