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KNOWLEDGE AND ATTITUDE OF POLYCYSTIC OVARIAN SYNDROME (PCOS) AMONG UNIVERSITY STUDENTS AT A HEALTH SCIENCE CAMPUS

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A dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Pharmacy

Johannesburg, 2025

DEDICATION

To my beloved mother, whose love, encouragement, and prayers have fuelled my passion for pursuing a master's degree. I dedicate this work to you. Your trust in me has been the greatest motivation. Thank you for believing in me.

DECLARATION

I, Naasira Ashraf Moosa, declare that this Dissertation is my own, unaided work. It is being submitted for the Master's Degree of Pharmacy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

Naasira Ashraf Moosa

Signature: - 

Date: 31 day of March 2025 in Pretoria

PRESENTATIONS ARISING FROM THIS RESEARCH PROJECT

Throughout the duration of this degree program, the following presentations were delivered based on the research:

•Ashraf Moosa, N., Kathrada, F., Khan, R., Orchard, A., Vally, M., Cheng, A., 5 September 2024.

"Knowledge and Attitude towards Polycystic Ovarian Syndrome (PCOS) among University Students at a Health Science Campus" presented at the Faculty Research Day, Johannesburg, South Africa (Poster).

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First and foremost, I would like to express my deepest gratitude to Allah, the Almighty, for His divine guidance, wisdom, and strength that enabled me to complete this journey.

I wish to express my profound gratitude to my parents (Ashraf and Julie Moosa), husband (Razeen), sisters (Naadira, Khatoon, and Zahra), and amazing children (Nuhaa, Muhammad and Mahdi) for their unwavering commitment to dedicating time to assist me with patience during the entirety of the research process.

This dissertation would not have been possible without the guidance and expertise of my supervisors, Fatima Kathrada, Razeeya Khan, Ané Orchard, Muhammed Vally and Amber Cheng. I am profoundly grateful for their exemplary leadership and significant contributions to my project.

I want to acknowledge my statistician, Dr. Clarence Yah, who guided me with patience and proofread my research methodology chapter and the results section of this project.

As I conclude this chapter of my academic journey, I am reminded of the Prophet Muhammad's (PBUH) words: "Seek knowledge from the cradle to the grave" (Hadith)

May this quote inspire me and others to continue pursuing knowledge and wisdom throughout our lives.

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LIST OF ABBREVIATIONS

AE-PCOS	Androgen Excess and PCOS Society
BCMP	Bachelor of Clinical Medical Practice
BDS	Bachelor of Dental Surgery
BHSc	Bachelor of Health Sciences
BMI	Body Mass Index
BNurs	Bachelor of Nursing
BOHSc	Bachelor of Oral Health Sciences
BPharm	Bachelor of Pharmacy
BSC	Bachelor of Science
CC	Clomiphene Citrate
COCs	Combined Oral Contraceptives
CVDs	Cardiovascular Diseases
DGNM	Diploma of General Nursing and Midwifery
DHT	Dihydrotestosterone
DPH	Diploma in Public Health
FSH	Follicle Stimulating Hormone
GEMP	Graduate Entry Medical Programme
GLP	1 glucagon-like peptide-1
GI	Glycaemic Index (GI)
GNM	General Nursing and Midwifery
GnRH	Gonadotropin-releasing hormone
HA	Hyperandrogenism
HPO	Hypothalamic-pituitary-ovarian
IQR	Interquartile Range
IR	Insulin Resistance
JBI	Joanna Briggs Institute
LH	Luteinizing Hormone
MBBCH	Bachelor of Medicine and Bachelor of Surgery
mFG	Modified Ferriman-Gallwey
NIH	National Institute of Health
NAFLD	Non-alcoholic Fatty Liver Disease
OSF	Open Science Framework

OSCEs	Objective Structured Clinical Examinations
PCC	Population, Context and Concept
PCOD	Polycystic Ovarian Disease
PCOS	Polycystic Ovarian Syndrome
PGDip	Postgraduate Diploma
PhD	Doctor of Philosophy
PI	Participation Information Sheet
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
REDCap	Research Electronic Data Capture
SES	Socioeconomic Status
SHBG	Sex Hormone-binding Globulin
TSH	Thyroid Stimulating Hormone
UK	United Kingdom
USA	United States of America
WITS	University of the Witwatersrand

ABSTRACT

Knowledge and attitude of polycystic ovarian syndrome (PCOS) among university students at a health science campus

Introduction:

Polycystic ovarian syndrome (PCOS) is a common endocrine disorder affecting reproductive, metabolic, and psychological health. It is frequently associated with comorbidities such as obesity, insulin resistance, type 2 diabetes mellitus, and cardiovascular disease. Despite its prevalence, PCOS remains underdiagnosed - partly due to limited awareness. Poor knowledge is linked to delayed diagnosis and suboptimal management. This study aimed to assess the knowledge and attitudes of PCOS among university students.

Methods:

A scoping review and cross-sectional survey were conducted. The scoping review was conducted in accordance with the PRISMA-ScR framework and guided by the methodological recommendations of the JBI. A comprehensive literature search was carried out across three electronic databases—PubMed, Scopus, and MedNar—to identify relevant studies. The survey was carried out among undergraduate and postgraduate students from the Faculty of Health Sciences at the University of the Witwatersrand in Johannesburg. It included 32 knowledge items and 9 attitude-related questions. The tool was selected for its alignment with the study objectives, specifically assessing knowledge related to the pathophysiology, symptoms, complications, and management of PCOS, as well as participants' attitudes toward the disorder.

Results:

A total of 2,415 titles were screened during the scoping review, from which 21 studies met the inclusion criteria. The review revealed varied and often limited knowledge of PCOS among university students. In parallel, the survey included an analysis of a total of 349 complete responses received from participants at the Faculty of Health Sciences, University of the Witwatersrand. Among the participants, 147 of them (46.7%) demonstrated good knowledge of PCOS, while 434 of them (97.99%) reported a positive attitude toward the condition. Knowledge was significantly associated with age, field of study, academic year, prior awareness, and a formal diagnosis of PCOS ($P < 0.001$), whereas attitude was not influenced by any of these factors.

Conclusion:

Despite a health science background, many students lacked sufficient knowledge of PCOS. Addressing this gap through targeted education may support earlier diagnosis and improved outcomes for those affected.

Keywords: Polycystic Ovarian Syndrome (PCOS); Knowledge; Awareness; Attitude; Perception; Student; Undergraduate; Postgraduate; University; College.

CHAPTER 1 - INTRODUCTION

1.1.Overview

Polycystic ovarian syndrome (PCOS) is a common endocrine disorder with reproductive, metabolic (Figure 1.1), and psychological sequelae affecting one in ten women of reproductive age globally (Memon *et al.*, 2020). There is considerable variability in the estimated prevalence of PCOS, largely due to differences in diagnostic criteria and population characteristics (Tehrani *et al*., 2011; Zandi *et al*., 2016; Ybarra *et al*., 2016; Begum *et al*., 2024). Reported prevalence rates range from 2.2% to 26% across various nationalities, ethnicities, and cultural groups (Tehrani *et al*., 2011; Zandi *et al*., 2016; Ybarra *et al*., 2016; Begum *et al*., 2024). For instance, research conducted in the Middle East has estimated the prevalence to lie between 6% and 16% (Ding *et al*., 2017). Despite these figures, studies from countries such as Saudi Arabia and Jordan have identified low levels of awareness among women regarding PCOS (Alsinan and Shaman, 2017; Abu-Taha *et al.*, 2020). In the United States, approximately five million women of reproductive age are diagnosed with PCOS annually (Memon *et al*., 2020). Furthermore, regions including India, the Middle East, and North Africa have reported a noticeable increase in PCOS prevalence in recent years (Upadhye and Shembekar, 2017; Asghari *et al*., 2022).

Polycystic ovarian syndrome (PCOS) is characterised by an imbalance in reproductive hormones and hyperandrogenaemia (Figure 1.1), which interfere with the normal maturation of ovarian follicles (Ndefo *et al*., 2013; Sabitha & Sunanda, 2016). As a result, multiple immature follicles develop but fail to ovulate, leading to irregular menstrual cycles, anovulation, and potential infertility (Ndefo *et al*., 2013; Sabitha & Sunanda, 2016). In addition to reproductive challenges, PCOS is associated with metabolic disturbances, including insulin resistance, obesity, and an increased risk of developing type 2 diabetes, cardiovascular diseases (CVDs), and psychological disorders, including depression and anxiety (Sirmans and Pate, 2013; Patel and Rai, 2018; Pramodh, 2020). The syndrome is regarded as a diagnosis of exclusion, requiring the elimination of other causes of anovulation and/or hyperandrogenism (HA), such as thyroid disorders, congenital adrenal hyperplasia, androgen-secreting tumors, and Cushing's syndrome, before confirming the diagnosis of PCOS (Spritzer *et al*., 2014). The management of individuals at risk for PCOS, as well as those with a confirmed diagnosis, involves comprehensive education on the causes and progression of PCOS, the adoption of

healthy lifestyle practices, and targeted therapeutic interventions to address symptoms of the condition (Witchel *et al*., 2019).

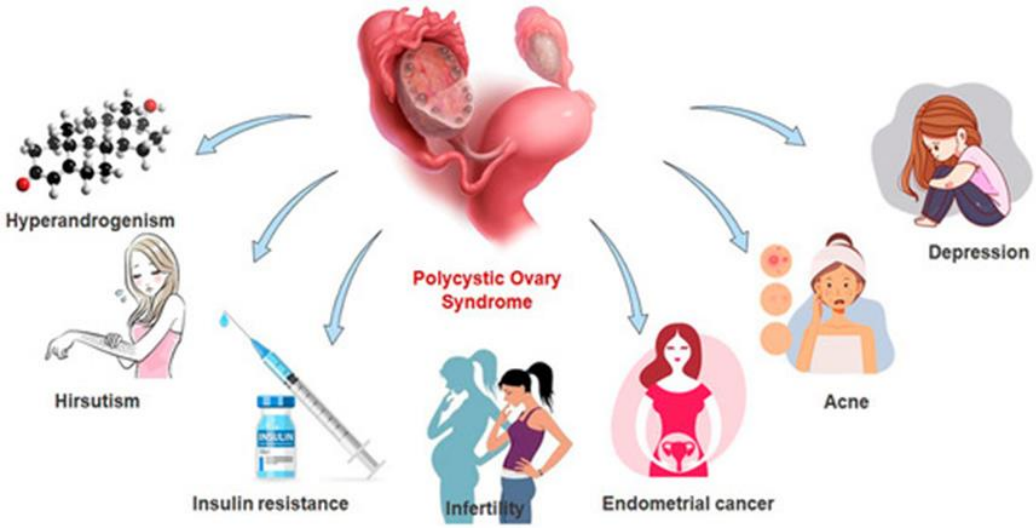


Figure 1.1: Clinical manifestations of PCOS (Yasmin et al., 2022)

1.2.Pathophysiology

Polycystic ovarian syndrome is a multifactorial endocrine disorder involving complex interactions between metabolic, hormonal, and genetic factors (Witchel *et al*., 2019). The pathophysiology of PCOS is primarily driven by dysregulation in insulin signalling, hypothalamic-pituitary-ovarian (HPO) axis dysfunction, and intrinsic ovarian abnormalities (Figure 1.2) (Tsilchorozidou *et al*., 2004; Escobar-Morreale, 2018; Rashid *et al.*, 2022).

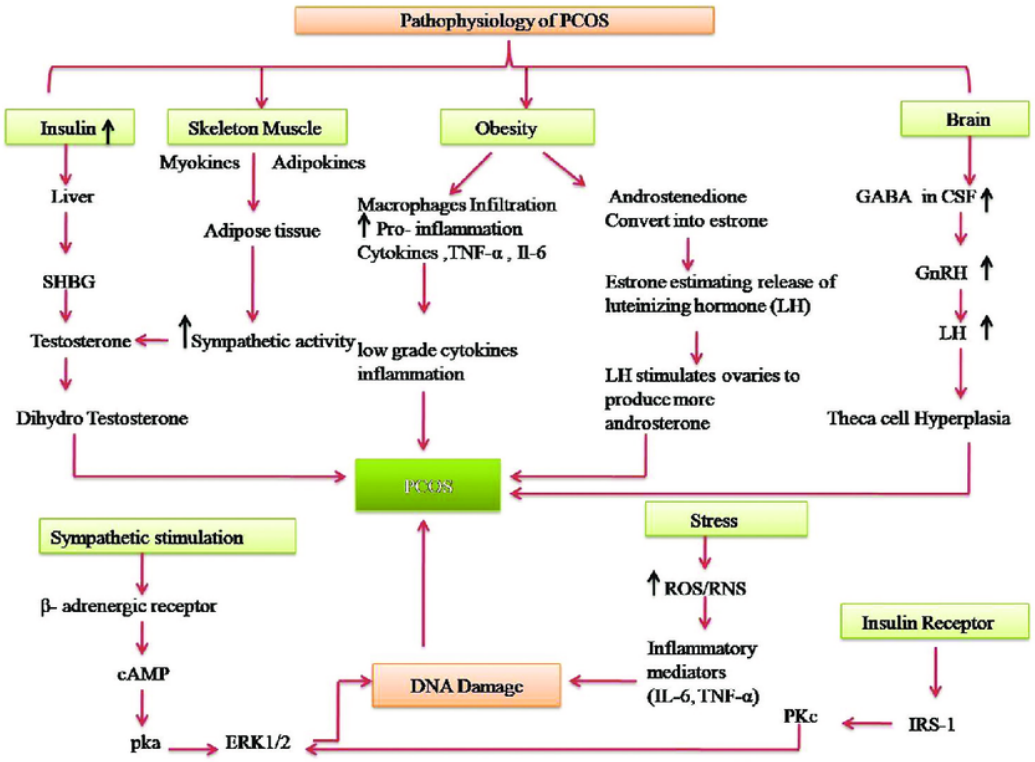


Figure 1.2: A diagrammatic illustration of the pathophysiology of PCOS (Sharma et al., 2023) (Permission granted by corresponding author Dr. Arti Singh) (Appendix A)

The pathophysiology of PCOS is influenced by several interconnected factors, including insulin levels, skeletal muscle function, obesity, and neuroendocrine regulation (Figure 1.2) (Sharma *et al*., 2023). Insulin resistance (IR) and hyperinsulinemia are frequently observed in women with PCOS and play a central role in the condition's progression (Witchel *et al*., 2019). Elevated insulin levels promote alterations in the HPO axis, particularly by increasing luteinizing hormone (LH) secretion (Sharma *et al*., 2023). Increased LH pulse frequency and amplitude, as well as an elevated LH/FSH ratio, are commonly observed in PCOS (Tsilchorozidou *et al.* 2004). These alterations are likely mediated by an increased pulsatile secretion of gonadotropin-releasing hormone (GnRH), which enhances LH release while suppressing FSH secretion (Rashid *et al*., 2022). This hormonal imbalance leads to changes in theca and granulosa cells, resulting in excessive androgen production and reduced estradiol synthesis (Sharma *et al*., 2023). The imbalance inhibits follicle maturation and contributes to the hallmark features of PCOS, such as anovulation and cystic ovarian morphology (Witchel *et al*., 2019).

The compensatory hyperinsulinemia associated with insulin resistance further stimulates excessive ovarian and adrenal androgen secretion while also reducing hepatic production of sex hormone-binding globulin (SHBG) (Witchel *et al*., 2019). As a result, circulating testosterone levels increase, clinically manifesting as hirsutism, acne, and androgenic alopecia (Witchel *et al*., 2019). This excessive androgen secretion is driven by both intrinsic ovarian factors, including altered steroidogenesis, and external factors such as hyperinsulinemia (Witchel *et al*., 2019). In addition to these hormonal abnormalities, there is evidence suggesting that GABA (gamma-aminobutyric acid) signalling plays a role in regulating neuroendocrine changes in PCOS (Witchel *et al*., 2019). Environmental factors such as environmental toxins and obesity play a major role in the occurrence of PCOS (Kumar *et al*., 2022). Common toxins include tobacco, lead, mercury, pesticides, and industrial pollutants can interfere with hormone production, metabolism, and function, resulting in disruptions to hormonal homeostasis and adversely affecting both male and female reproductive health (Diamante-Kandarakis *et al*., 2009).

Unhealthy lifestyles, including poor diet and lack of exercise, contribute to obesity and an exacerbation of PCOS symptoms (Wang and Li, 2023) Moreover, visceral adiposity is prevalent among obese and non-obese women with PCOS worsening metabolic and reproductive outcomes associated with the condition (Glueck and Goldenberg, 2019). Obesity enhances the sensitivity of thecal cells to LH stimulation, increasing functional ovarian hyperandrogenism by promoting higher ovarian androgen production (Glueck and Goldenberg, 2019). It also raises inflammatory adipokines and macrophage invasion, which contribute to greater IR and fat cell formation (Glueck and Goldenberg, 2019). Compensatory IR decreases lipolysis, leading to higher levels of free fatty acids and triglycerides in the blood (Glueck and Goldenberg, 2019). The skeletal muscle activates the sympathetic nervous system, which then triggers the conversion of testosterone to dihydrotestosterone (DHT), playing a role in the development of PCOS (Sharma *et al*., 2023).

Additionally, studies have reported that genetic factors play a significant role in the development of PCOS (Tsilchorozidou *et al*., 2004; Kumar *et al*., 2022). The genes, including CYP11A, CYP21, CYP17, CYP19, androgen receptor gene (AR), and sex hormone-binding globulin (SHBG), play a role not only in hormone production in the ovaries but also in causing reproductive and metabolic complications in women with PCOS (Kumar *et al*., 2022). Twin studies comparing outcomes of monozygotic and dizygotic twins suggest a heritability rate of

approximately 70%, indicating a strong genetic predisposition to the disorder among twins (Vink *et al*., 2006). The hereditary risk of the condition is not fully understood as there are unidentified genetic factors that also contribute to its heritability (Witchel *et al*., 2019).

1.3.Diagnosis of PCOS

Diagnostic criteria for PCOS include the National Institute of Health (NIH) Consensus, which was defined in 1990 (Figure 1.3) (Christ and Cedars, 2023). According to the NIH criteria, a diagnosis requires the presence of HA (clinical/biochemical) and oligo/anovulation (Christ and Cedars, 2023). In 2003, the Rotterdam Consensus added polycystic ovarian morphology on ultrasound as a third criterion (Gilbert *et al*., 2018). The Rotterdam Consensus (2003) is the most used and widely recognised diagnostic criteria for PCOS (Gilbert *et al*., 2018; Pramodh, 2020). In 2006, the Androgen Excess and PCOS Society (AE-PCOS) proposed a more stringent definition, emphasizing hyperandrogenism as a mandatory criterion, in combination with either ovulatory dysfunction or polycystic ovaries. These evolving criteria reflect ongoing efforts to improve diagnostic accuracy and account for the heterogeneity of the syndrome (Teede *et al*., 2018). While such approaches are widely accepted globally, in the South African context, there is currently no nationally adopted diagnostic criterion or PCOS-specific clinical guideline (Sokwala and Dodia, 2023). This reflects a broader regional gap in standardised approaches to PCOS diagnosis and management across many African countries (Sokwala and Dodia, 2023). A delay in diagnosing PCOS can worsen its long-term implications, such as metabolic and reproductive consequences, and psychological impacts, including anxiety, depression, and body image concerns (Dokras *et al*., 2017; Hoeger *et al*., 2020; Sharma *et al*., 2023). Recognising the condition early can facilitate appropriate management and support (Christ and Cedars, 2023).

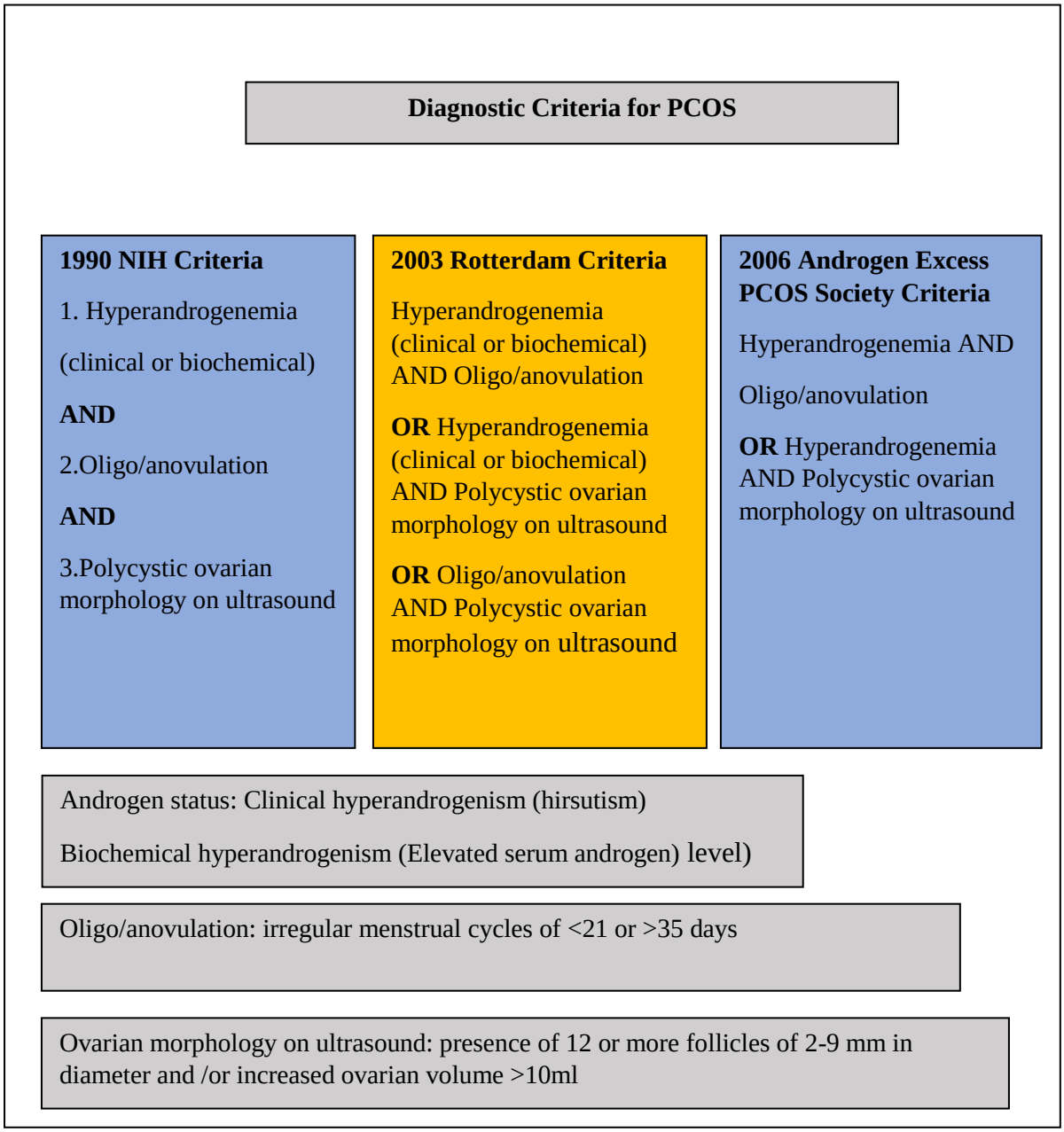


Figure 1.3: Summary of diagnostic criteria for PCOS (adapted from Choudhari et al., 2024)

Using the criteria based on HA, androgenic status can be evaluated through biochemical or clinical methods (Hoeger *et al*., 2020). Biochemical hyperandrogenism can be identified by increased levels of total or free testosterone (Christ and Cedars, 2023). Signs of excess androgen present clinically as acne, alopecia, and hirsutism measured by the modified Ferriman-Gallwey (mFG) score (Spritzer, 2014; Alharbi, 2020; Rashid *et al.*, 2022). The mFG score is a standardised scoring system introduced in 1961 to assess hirsutism (Alharbi, 2020). The score is used to evaluate and track the response to treatment (Goodman *et al*., 2001).

Anovulation presents as irregular menstrual cycles (less than 21-day or more than 35-day cycles), oligomenorrhea (defined as eight or fewer cycles per year), and amenorrhea (a lack of a period for three months or at least six months without a menstrual period typically presented from menarche) (Spritzer, 2014). The transabdominal and transvaginal ultrasound can be used to diagnose polycystic ovaries (Tsilchorozidou *et al*., 2004). Polycystic ovaries are defined as the presence of at least one ovary having 12 or more (2-9 mm) follicles with or without an increase in the volume of one ovary measuring >10 cm^3 (Maharaj and Amod, 2009). However, if irregular periods occur alongside signs of hyperandrogenism (either biochemical or clinical), a pelvic ultrasound is not needed for diagnosis (Hoeger *et al*., 2020). It has also observed that normal menstrual cycles have been reported in 20% of patients with PCOS, and research has asserted that ovarian morphology can appear normal on ultrasound (Tsilchorozidou *et al*., 2004; Dumesic *et al.*, 2015).

1.4. Signs and symptoms

Common symptoms among women with PCOS include hirsutism, alopecia, and acne (**Error! Reference source not found.**4) (Rashid *et al.*, 2022; Christ and Cedars, 2023). Hirsutism has been reported among 70-80% of women with PCOS (Alharbi, 2020). In severe PCOS, very high levels of androgen can present with increased masculinisation, known as hyperthecosis (Teede *et al.*, 2010). Women with PCOS also commonly present with menstrual irregularities, oligo/anovulation, secondary amenorrhea, and subfertility (Barthelmess and Naz, 2014). Ovarian dysfunction is common and has been observed in 40-60% of women with PCOS, and in another report, it has been stated that ovarian dysfunction presents in one-quarter to one-third of women with PCOS (Balen, 2004; Azziz *et al*., 2009). Obesity is another distinguishing feature of PCOS (Gibson-Helm *et al*., 2017). In a study by Hoeger (2007), it was reported that about 50% of women with PCOS are either overweight or obese. In addition, insulin resistance is a cardinal imbalance in most PCOS patients with a higher prevalence in obese patients (Jahangir, 2017). *Acanthosis nigricans* is a marker of insulin resistance where the skin appears as thick, velvety grey/brown patches found symmetrically on the body, commonly on the back and sides of the neck and the axillae (Puri, 2011). Virilization is more indicative of a severe insulin resistance disorder than a characteristic of PCOS (Azziz *et al*., 2009).

Table 1.1: Clinical symptoms and associated features of PCOS (adapted from Ruan et al., 2018)

Menstrual and reproductive dysfunction	• Oligomenorrhea • Amenorrhea • Menorrhagia • Infertility • Subfertility • Adverse pregnancy outcomes such as risk of miscarriage, gestational diabetes
Hyperandrogenic skin symptoms	• Hirsutism • Acne • Seborrhea • Androgenic alopecia • *Acanthosis nigricans* • Skin tags
Metabolic features	• Obesity/difficulty losing weight • Type 2 diabetes mellitus • Insulin Resistance • Dyslipidemia • Hypertension
Mental health and psychological impact	• Depression • Anxiety • Binge eating • Low self-esteem • Poor body image

In young adults, PCOS is characterised by the presence of oligo-anovulation, hyperandrogenism, and polycystic ovarian morphology (Witchel *et al*., 2019). Early detection is vital for managing these symptoms and preventing associated metabolic and cardiovascular risks (Choudhari *et al*., 2024). It has been reported that women with PCOS typically experience a significant decline in quality of life due to the symptoms (Fong *et al*., 2021). Among the most distressing symptoms of PCOS are hirsutism, menstrual irregularities, and infertility (Rashid *et al*., 2022). While PCOS is a common cause of infertility, it does not necessarily impair

fertility in all affected women (Brassard *et al*., 2008; Gilbert *et al*., 2018). Hirsutism often leads to significant psychological distress, societal stigma, and emotional challenges related to female identity (Kitzinger and Willmott, 2002). At the same time, some women are more concerned about irregular menses and infertility depending on socio-cultural and ethnic influences (Rashid *et al.*, 2022). Early detection of symptoms can lead to more targeted interventions and improved long-term health outcomes for women living with PCOS (Barthelmess and Naz, 2014).

1.5. Co-morbidities

Polycystic ovary syndrome is not only a reproductive disorder but also a systematic condition associated with multiple metabolic, cardiovascular, and psychological co-morbidities (Gilbert *et al*., 2018). The metabolic disturbances in PCOS can contribute to the development of type 2 diabetes mellitus, dyslipidaemia, hypertension, atherosclerosis, and coronary artery disease (Patel and Rai, 2018; Pramodh, 2020). Obesity further exacerbates these metabolic abnormalities (Franks, 2018). The tendency to accumulate fat in the abdominal area increases the susceptibility of women with PCOS to cardiometabolic disorders (Daan *et al*, 2014). The condition may increase the risk of non-alcoholic fatty liver disease (NAFLD) due to insulin resistance and hyperandrogenism, which promote hepatic fat accumulation and metabolic dysfunction (Grundy, 2016; Witchel *et al*., 2019). Women with PCOS are at an elevated risk of developing mental health disorders, including depression, bipolar disorder, anxiety, and eating disorders (Sirmans and Pate, 2013). Awareness of the comorbidities associated with PCOS underscores the severity of the condition and highlights the importance of early diagnosis and management (Choudhari *et al*., 2024). This awareness may encourage the adoption of healthier lifestyle choices and improve adherence to treatment protocols, ultimately enhancing overall health outcomes (Rashid *et al.*, 2022).

Despite the significant complications that manifest in women with PCOS, several studies indicate that a significant proportion of women possess limited knowledge of the complications of PCOS (Gul *et al*., 2014; Alsinan and Shaman, 2017). Research conducted among adolescent girls revealed that the lack of awareness, coupled with negative perceptions of lifestyle changes, hindered the adolescent's ability to adopt behaviours aimed at improving PCOS-related health outcomes (Mohamed, 2016). Given the significance of knowledge and awareness regarding PCOS among the female population and its correlation with the condition's prognosis, evaluating the level of awareness is a critical component in disease management.

1.6. Risk factors

The risk factors linked to PCOS primarily include hormonal influences, genetic predispositions, a sedentary lifestyle, and environmental factors (Spritzer, 2014; Tsikouras *et al*., 2015; Azziz, 2016; Kulkarni *et al*., 2023). Research indicates that many diagnosed cases of PCOS have a family history of PCOS (Kulkarni *et al*., 2023; Begum *et al*., 2024). Studies report that 35-40% of first-degree female relatives of individuals with PCOS patients are also affected by the condition, suggesting a strong familial and possibly genetic component (Goodarzi and Azziz, 2006; Memon *et al*., 2020; Alharbi, 2020). Research among PCOS also reveals that 29% have maternal or sibling relatives with similar symptoms (All Bassam *et al*., 2018). Environmental factors, such as a sedentary lifestyle, poor diet, and limited exposure to the outdoor environment, contribute to the risk of obesity and PCOS (Jahangir, 2017; Sam, 2017; Kulkarni *et al*., 2023).

Unhealthy lifestyle behaviours, including poor dietary choices and insufficient physical activity, are common among university students, which may contribute to an increased risk of developing PCOS (Douglas *et al*., 2021; Begum *et al*., 2024). Studies report an increased tendency toward disordered eating, high consumption of high-GI foods, and a reliance on fast food among PCOS patients, all of which exacerbate metabolic dysfunctions (Amirjani *et al*., 2019; Ghosh *et al*., 2022). Among university students with PCOS, academic demands often contribute to sedentary lifestyles and unhealthy eating habits, further increasing the risk of obesity and related complications (Begum *et al*., 2024). Awareness programs targeting risk factors may encourage proactive health-seeking behaviour, such as timely medical consultations and lifestyle interventions (Rashid *et al*., 2022). It may also reduce long-term complications, such as type 2 diabetes mellitus and CVD, particularly in high-risk populations like students. Assessment of risk factors is crucial in incorporating lifestyle and dietary modifications for weight reduction at a younger age (Begum *et al*., 2024).

1.7. Management

The management of PCOS is multifaceted, involving lifestyle modifications, pharmacological treatments, and targeted symptom management (Figure 1.44) (Witchel *et al*., 2019). Given that PCOS is a chronic condition with long-term reproductive, metabolic, and psychological implications, early recognition and appropriate intervention are crucial (Witchel *et al*., 2019). However, a lack of awareness and misconceptions about PCOS treatment can lead to delayed diagnosis, poor health-seeking behaviour, and inadequate management (Witchel *et al*., 2019).

This highlights the importance of knowledge among university students, particularly those at risk or in health-related fields who are not only potential patients but also future healthcare providers (Dokras *et al*., 2017). A solid understanding of PCOS within this group can contribute to earlier detection, reduce stigma, and foster evidence-based care practices in future professional roles (Dokras *et al*., 2017). A significant barrier to effective treatment for PCOS is the alarmingly high proportion of individuals who remain undiagnosed until the condition has advanced to a stage that necessitates pharmacological intervention (Pramodh, 2020).

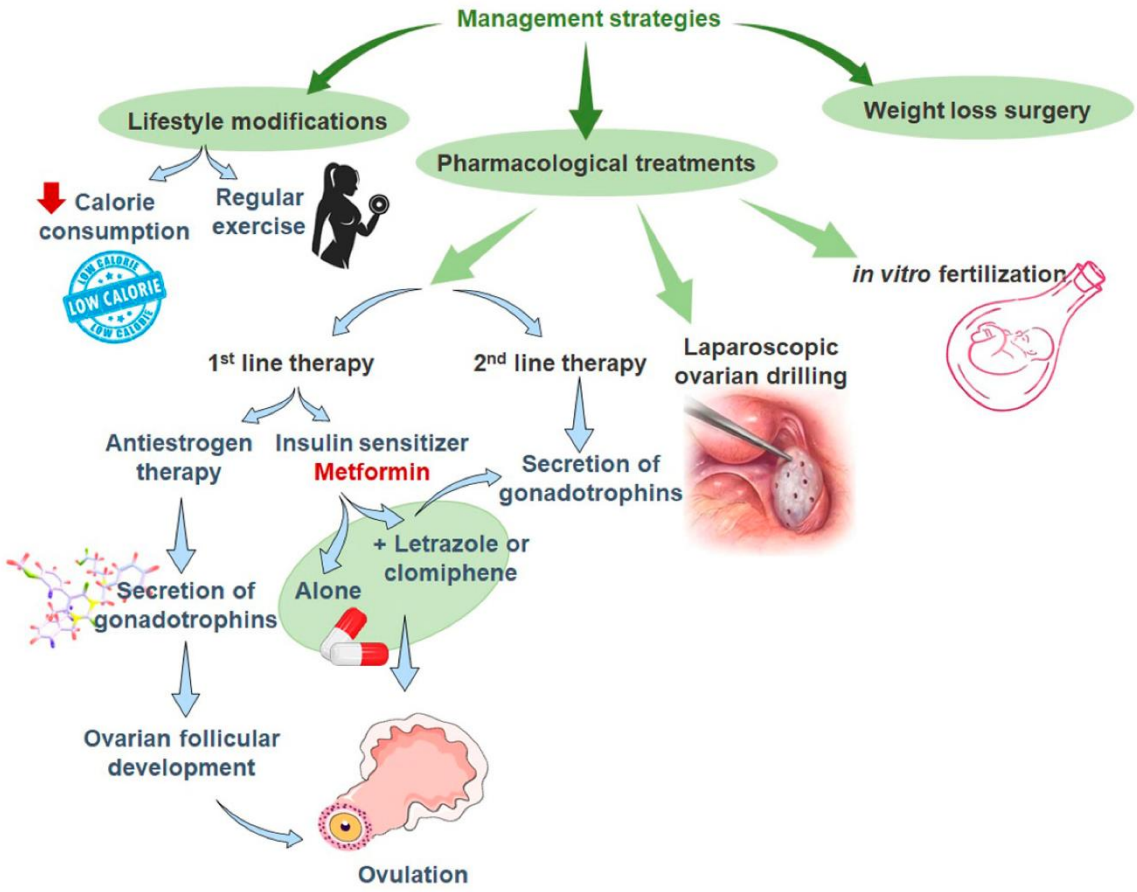


Figure 1.4: Management of PCOS (Yasmin et al., 2022)

1.7.1. Non-Pharmacological Management

Behavioural changes, such as dietary modifications and increased physical activity, are consistently emphasised as first-line strategies for weight management, which is central to improving the symptoms and metabolic complications of PCOS (Haq *et al*., 2017; Szczesnowicz *et al*., 2023; Choudhari *et al*., 2024). Research demonstrates that even modest weight loss (5–10% of total body weight) can regulate menstrual cycles and improve metabolic and hormonal imbalances (Huber-Buchholz *et al*., 1999; Diamanti-Kandarakis *et al*., 2012).

Vigorous aerobic exercise combined with resistance training significantly improves insulin sensitivity and androgen levels (Gu *et al*., 2022). Additionally, dietary changes, such as adopting low glycaemic index (GI) or ketogenic diets, can address metabolic challenges and improve menstrual irregularities (Chen and Pang, 2021; Szczesnowicz *et al*., 2023).

1.7.2. Pharmacological Management

Polycystic ovary syndrome (PCOS) is managed through a symptom-targeted approach, with treatment tailored to the patient's reproductive goals and clinical presentation (Kulkarni *et al*., 2023). Combined oral contraceptives (COCs) are considered the first-line pharmacological treatment for women who are not attempting to conceive (Martin *et al*., 2008). Combined oral contraceptives (COCs) effectively regulate menstrual cycles and reduce androgen levels, thereby alleviating symptoms such as hirsutism and acne (Rashid *et al*., 2022; Kulkarni *et al*., 2023). In cases where additional management of hyperandrogenic symptoms is required, antiandrogens such as spironolactone, 5α-reductase inhibitors (e.g., finasteride), or topical agents like eflornithine may be prescribed (Kulkarni *et al*., 2023). Adjunctive therapies, including topical antibiotics and benzoyl peroxide, are also used to manage acne (Kulkarni et al., 2023). For women desiring pregnancy, ovulation induction is a key focus of treatment (Martin *et al*., 2008). Clomiphene citrate (CC) has traditionally been the first-line agent; however, evidence suggests that letrozole, an aromatase inhibitor, may result in higher live birth rates in women with PCOS attempting to conceive (Franik *et al*., 2018). As COCs inhibit ovulation, they are contraindicated in women actively trying to conceive (Kulkarni *et al*., 2023). Treatment in adolescents and young adults often centres around long-term reproductive planning, symptom control, and psychological well-being (Martin *et al*., 2008).

In addition to these priorities, management strategies also target metabolic health, given the increased risk of insulin resistance and obesity in this population (Szczesnowicz *et al*., 2023). Emerging treatments include insulin sensitisers, such as metformin, and newer agents like glucagon-like peptide-1 (GLP-1) receptor agonists, which have demonstrated effectiveness in managing metabolic dysfunctions and reducing weight (Astrup *et al*., 2010; Szczesnowicz *et al*., 2023). Nutritional supplements and herbal products have emerged as a popular option; however, their safety and efficacy profiles have not been conclusively investigated (Rashid *et al*., 2022). Furthermore, the association between PCOS and mental health conditions like anxiety and depression highlights the need for comprehensive treatment strategies (Teede *et al*., 2010). Overall, pharmacological therapy is often combined with lifestyle modifications to

optimise treatment outcomes and address the multifaceted nature of PCOS (Barthelmess and Naz, 2014).

1.8. Importance of awareness and education

Conducting knowledge and attitude studies on PCOS among university students is crucial for understanding the awareness and perceptions of this prevalent endocrine disorder. These studies are essential to assess the level of knowledge and identify gaps, particularly in educated populations, which can inform targeted educational interventions.

1.9. Significance of student knowledge and attitude towards PCOS

The onset of PCOS symptoms often occurs during the transition from puberty to adulthood, with university years being a critical period for the manifestation of metabolic, reproductive, and psychological issues such as irregular menstrual cycles, hyperandrogenism, and infertility (Witchel *et al*., 2019; Rashid *et al*., 2022; Sharma *et al*., 2023). Early detection and management are crucial during this stage to mitigate long-term health complications and improve quality of life (Witchel *et al*., 2019; Jaber *et al*., 2022). University students, as future professionals, are in a unique position to influence public health outcomes and create a supportive environment for those affected by PCOS (Teede *et al*., 2010). Increasing students' understanding of the condition can help reduce stigma and promote better health practices, leading to improved attitudes towards both diagnosis and treatment (Martin *et al*., 2008; Rizvi *et al*., 2023).

While students generally display a positive attitude toward PCOS, the overall knowledge remains insufficient, underscoring the need for targeted educational interventions (Sabitha and Sunanda, 2016; Gul *et al*., 2017; Haq *et al*., 2017; Jahangir, 2017; Patel and Rai, 2018; Abu-Taha *et al*., 2020; Alharbi, 2020). Misconceptions and gaps in understanding persist, with students reported avoiding discussions about PCOS with healthcare providers due to embarrassment (Rizvi *et al*., 2023). These barriers significantly affect health-seeking behaviour, which is crucial for effective PCOS management. Research has indicated that higher education and occupation are positively correlated with improved knowledge and attitudes, facilitating better diagnosis and management (Jaber *et al*., 2022). Furthermore, final-year medical students were reported to display satisfactory knowledge and attitudes toward PCOS, which are vital for effective diagnosis and management (Adhikari and Battarai, 2017).

Given the limited research on PCOS awareness within the South African context, global initiatives offer valuable insights for promoting awareness among South African students. Studies have highlighted the importance of awareness campaigns in educating the public about the syndrome's symptoms and promoting early diagnosis (Haq *et al*., 2017; Jabeen *et al*., 2022). Such campaigns can significantly improve awareness, bridging knowledge gaps and fostering informed attitudes toward PCOS.

1.10. Problem Statement

Investigations carried out globally regarding the knowledge and attitudes toward PCOS underscore the necessity of augmenting awareness among young women to facilitate early diagnosis and improve patient outcomes. Knowledge and attitude studies conducted among female participants reported that the knowledge of reproductive health terms such as ovary, uterus, and hormones; concepts related to fertility; physiology; and complications of PCOS, were found to be inadequate (Al Souheil and Chahine, 2021; Pramodh, 2020, Goh *et al*., 2022). The investigations underscore the imperative for enhancing comprehensive knowledge regarding PCOS to promote timely intervention. Knowledge of the clinical features, diagnostic criteria, and associated risks of PCOS enables earlier recognition of symptoms such as menstrual irregularities, manifestations of hyperandrogenism, and metabolic abnormalities (Teede *et al*., 2018). Early recognition of PCOS symptoms can facilitate appropriate clinical assessment and management, thereby reducing the risk of long-term complications, including infertility, type 2 diabetes mellitus, cardiovascular disease, and psychological distress (Teede *et al*., 2018).

To date, no study has comprehensively examined the knowledge and attitudes of PCOS among university students in South Africa. The results of this study may emphasise the imperative for the incorporation of awareness programs into the academic curriculum. To effectively execute awareness campaigns and educational interventions within educational institutions, such as universities pertaining to conditions such as PCOS, a comprehensive understanding of the existing knowledge level among students is crucial to discern existing knowledge deficiencies that can guide the development of interventions.

While the survey assessed knowledge and attitudes toward PCOS among South African university students, a scoping review was necessary to explore the breadth of existing global research on this topic. Unlike a traditional literature review, which focuses on narrowly defined

questions and selected studies, a scoping review maps the extent and diversity of available evidence. This approach was appropriate given the variability in study designs, populations, and tools used in PCOS research. It also helped identify knowledge gaps and informed the development of the local survey instrument.

A significant proportion of young women remain unaware that symptoms such as irregular menstrual cycles or weight-related concerns may indicate an underlying endocrine disorder, leading them to postpone seeking medical advice. This highlights the urgency for educational initiatives not only targeting students but also encompassing healthcare professionals who play a pivotal role in the early identification and management of PCOS. Fostering a more comprehensive understanding of the syndrome across various demographics can potentially mitigate the long-term health implications associated with undiagnosed or poorly managed cases of PCOS, thereby improving the overall quality of life for affected individuals.

1.11. Research Question

What is the knowledge and attitude of polycystic ovarian syndrome (PCOS) among university students at a health science campus?

1.12. Aim and objectives

This study aimed to investigate the knowledge and attitude of PCOS among university students at a health science campus, and was supported by a preliminary scoping review of existing evidence to contextualise the findings. The study has 3 main objectives:

1. To conduct a scoping review of the available evidence on the levels of knowledge and attitudes of PCOS among university students.
2. To assess the knowledge and attitudes of PCOS among university students using a questionnaire.
3. To determine the factors affecting the knowledge of PCOS among university students.

1.13. Purpose/Significance of the Study

Despite the escalating incidence of this syndrome, there exists a significant deficiency in extensive research that addresses the full spectrum of PCOS. Conducting knowledge and attitude studies on PCOS among young adults is critical for several reasons. Early detection is crucial due to the condition's association with health complications, including type 2 diabetes and cardiovascular disease. The study may inform individuals at risk of developing PCOS to

pursue a health-conscious lifestyle, potentially averting the emergence of PCOS in later stages of life. A scoping review was conducted to inform the development of the questionnaire and contextualise the results from the primary study. Investigating awareness levels regarding PCOS, alongside identifying knowledge gaps, may stimulate the need for enhancing students' comprehension of PCOS through focused educational programs, awareness initiatives, and support networks within academic institutions regarding conditions such as PCOS, to mitigate potential complications. Analysing attitudes among students brings awareness to misconceptions of PCOS, and such initiatives are anticipated to improve fertility outcomes among individuals diagnosed with PCOS.

1.14. Dissertation structure

The flow of the dissertation is described hereunder:

1. Chapter one includes the introduction to the study.
2. Chapter two addresses objective 1 and includes the scoping review methodology, results, and discussion.
3. Chapter three addresses objectives 2 and 3 and includes the questionnaire methodology and results.
4. Chapter four includes the discussion of the questionnaire.
5. Chapter five includes the conclusion, discusses limitations, and offers recommendations for future research.

CHAPTER 2 - SCOPING REVIEW

2.1. Introduction

This chapter presents the findings related to the first objective, which involved conducting a comprehensive scoping review in lieu of a literature review. The primary aim of the scoping review was to explore existing research on how university students perceive and understand PCOS, examining both the depth of knowledge and the nature of attitudes toward the condition. This involved collating findings from various studies that focused on students' familiarity with PCOS symptoms, diagnostic criteria, treatment options, and the psychological and social aspects associated with the condition. Additionally, the review aimed to highlight any differences in awareness between various student populations, including variations by gender, academic discipline, and year of study. This chapter, therefore, serves as a critical evaluation of the existing literature on PCOS awareness among university students and provides a foundation for further research and interventions aimed at improving knowledge and attitudes toward the condition in this demographic.

A scoping review is a type of evidence synthesis that systematically maps existing knowledge on a topic, identifying key concepts, sources of evidence, theories, and gaps within the literature (Munn *et al*., 2018). Unlike systematic reviews or meta-analyses, which focus on assessing the quality and effectiveness of specific interventions, scoping reviews do not test a hypothesis but rather provide a comprehensive examination of the breadth and depth of research available on a given subject (Tricco *et al*., 2016). The approach was chosen because of the heterogeneous nature of existing studies, which vary in definitions, study populations, and methodologies. Scoping reviews examine the extent of available knowledge, pinpoint areas requiring further investigation, and establish where research has been conducted (Tricco *et al*., 2016). They also support the development of research programs, providing a foundation for future systematic reviews and empirical studies (Tricco *et al*., 2016; Peters *et al*., 2020).

To ensure transparency, methodological rigour, and alignment with established best practices, this scoping review draws upon several key frameworks and tools commonly employed in evidence synthesis. The review is registered with the Open Science Framework (OSF). By registering the scoping review on OSF, the study adheres to best practices in open science**,** enhancing the credibility and accessibility of research findings (Foster and Deardorff, 2017). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for

Scoping Reviews (PRISMA-ScR) offers structured guidance for the transparent and comprehensive reporting of scoping reviews (Tricco *et al*., 2018). This reporting framework aligns with methodological recommendations from the Joanna Briggs Institute (JBI), which underscores the importance of clarity and standardisation in the conduct of scoping reviews (Peters et al., 2020). Additionally, the population, context and concept (PCC) framework is used to formulate the research question and define inclusion criteria, ensuring a focused and systematic review process (Tricco *et al*., 2016). Ultimately, the findings of a scoping review will inform future research directions by identifying gaps in PCOS knowledge and awareness among university students (Tricco *et al*., 2016).

2.2. Methodology

2.2.1. Study design

The scoping review was conducted following the PRISMA-ScR guidelines (Appendix B). It was conducted following the methodology refined by the JBI reporting system framework.

2.2.2. Research Question

What is the level of knowledge and attitudes of PCOS among university students?

2.2.3. Search strategy

The search strategy was developed using the PCC framework. The participants included students enrolled at a university or tertiary institute; the context was any tertiary institute; and the concept was knowledge and attitudes of PCOS. A preliminary search of PubMed, Scopus, and MedNar was conducted, and no current or underway scoping reviews on the topic were identified at the time of the study. MeSH terms that were used included ‘polycystic ovarian* syndrome’ OR ‘polycystic ovarian* disease’ OR ‘stein-leventhal syndrome’ OR ‘sclerocystic ovary disease’, AND knowledge OR attitude OR awareness OR perception OR views AND student OR students OR undergraduate OR postgraduate OR nursing OR science students OR university OR college OR tertiary institute OR higher education institute. The search string was initially designed for PubMed and then translated to Scopus and MedNar.

2.2.4. Study selection

For the first level of screening, two investigators independently screened the title and abstract against the inclusion criteria. Citations were collated and uploaded into EndNote X8 software and duplicates were removed. The two investigators reviewed the full articles independently

and determined the final articles for inclusion, resolving any disagreements through consultation with a third researcher. A supplementary hand search of reference lists was conducted to ensure all relevant articles were included.

2.2.5. Inclusion criteria

This review considered studies that included knowledge and attitudes towards PCOS, among students 18 years or older, enrolled at a university or any tertiary institute. Studies published in English and from 2002-2023 were included. The types of included studies included systematic reviews, cross-sectional observational studies, descriptive studies, and interventional studies. No geographical limitations were applied.

2.2.6. Exclusion criteria

Articles were excluded if not available in English; or if the complete paper was not available. Clinical trials; animal studies; *in vitro* studies; studies that were not restricted to a student population in tertiary institutes; studies limited to women with a diagnosis of PCOS; studies that did not focus on PCOS; and prevalence studies of PCOS were also excluded.

2.2.7. Charting the data

After screening each article, data from included articles were extracted into a self-developed MS Excel sheet. The data extracted included: Author & year of publication, Country in which the study was undertaken, study setting, study population, population size, field of study, outcome measures, main finding(s), knowledge scoring system utilised, sources of information and limitations (Appendix C).

2.3. Results

Database searches yielded a total of 2415 suitable studies. After duplicates were removed, 2115 articles were included. After screening the titles and abstracts, 2066 articles were excluded, and 63 full-text articles were assessed for eligibility against inclusion criteria. Seven articles were included in the final scoping review. An additional 14 articles were identified through a hand search of references. In total, 21 articles met the eligibility criteria for inclusion in this review (Figure 2.1).

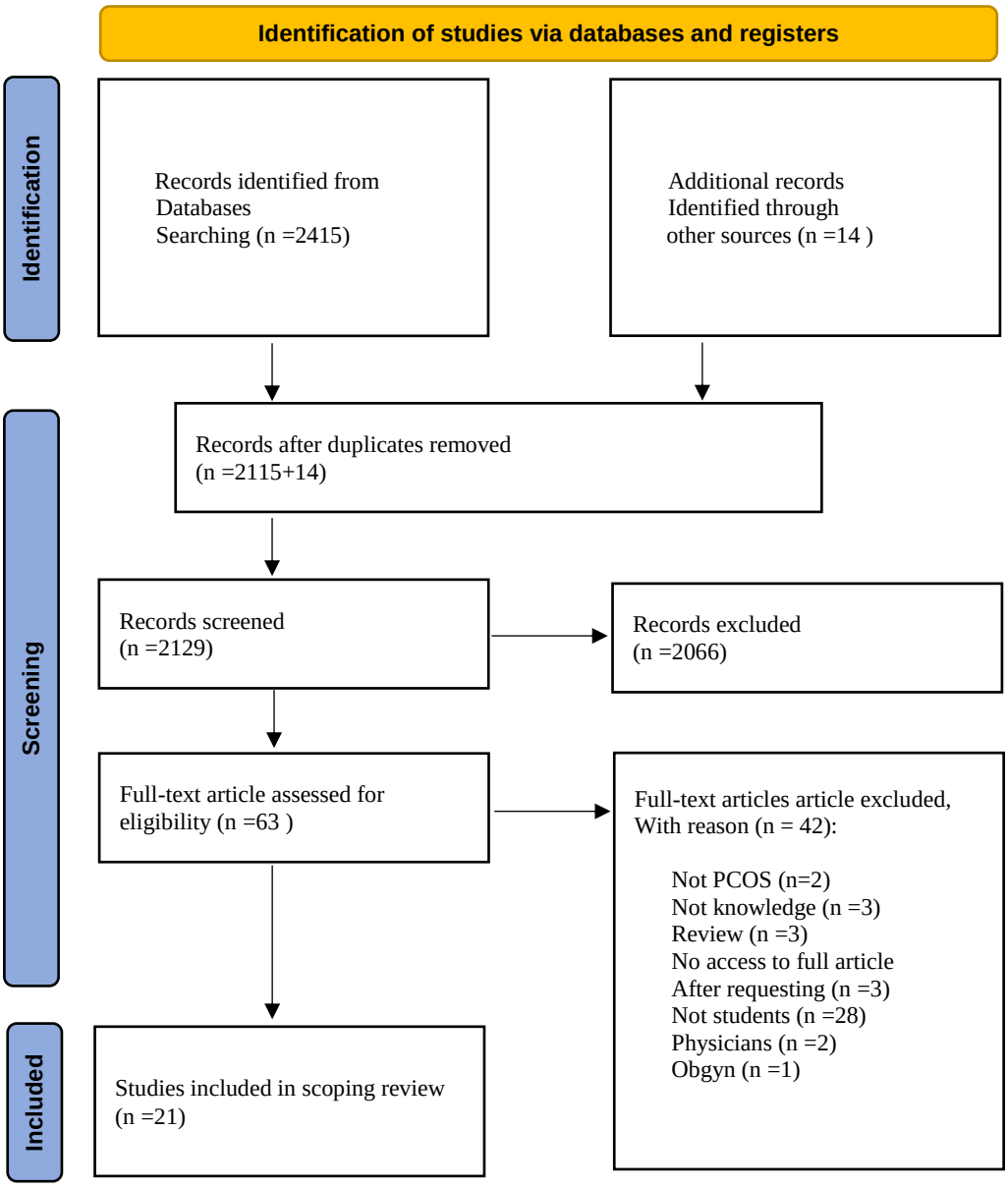


Figure 2.1: PRISMA flow chart of article identification and selection (Page et al., 2021)

2.3.1. Characteristics of included studies

The included studies were published between 2016 and 2023 with the majority of studies being published in 2021 (5) followed by 2017 (4) and 2020 (4). The highest number of included studies originated from India (N=9), followed by Pakistan (N=3), and Malaysia and United States of America with two studies each. Thirteen studies included female students only, whilst 8 studies included both male and female students. The characteristics of the included studies varied in terms of participant groups. Three studies focused exclusively on students in the medical field (Haq *et al*., 2017; Upadhye and Shembekar, 2017; Ghosh *et al*., 2022), while only

one study included students from non-medical fields (Fortuna and Herdiman, 2023). The majority (5) of the studies included only students in the nursing field (Sehar, 2021; Sasikala *et al*. 2021; Devi *et al*. 2017; Sabitha and Sunanda, 2016; Ferrao *et al*., 2022). Two studies included both students in the nursing and midwifery fields (Sehar, 2021; Ferrao *et al*., 2022). Thomas *et al*. (2017) included a combination of students in the medical and nursing field in the study. Of the 21 studies, 13 were categorised as cross-sectional studies, 6 were descriptive in design, and 2 were interventional studies (Figure 2.2).

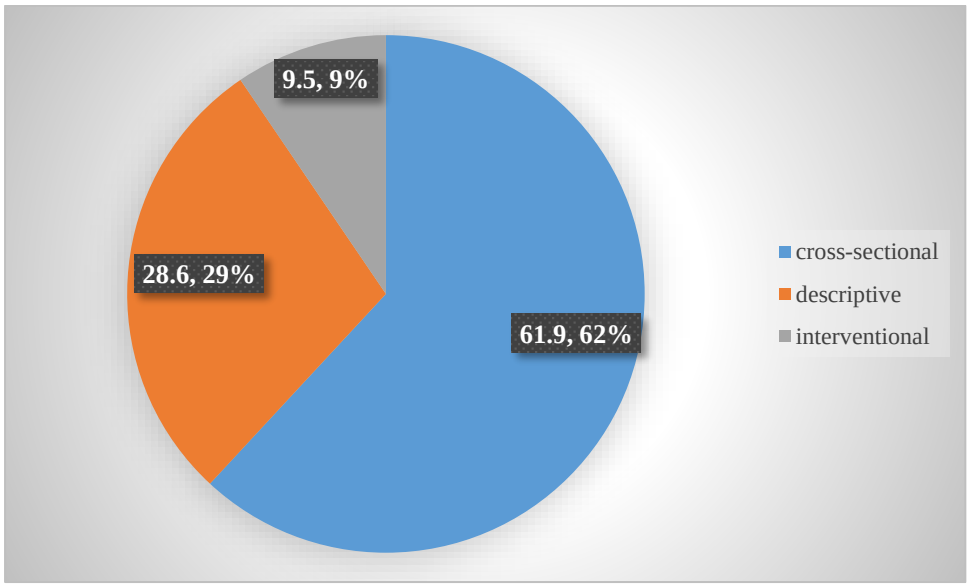


Figure 2.2: Types of included studies

2.3.2. Study findings

From the search results, 16 of the 21 studies were found to focus on either knowledge or awareness of PCOS, and 5 studies explored both knowledge and attitudes toward PCOS. The 21 studies included students attending single as well as multiple tertiary institutions. Study sample sizes ranged from 12 to 1182 participants. Most studies included the knowledge and or attitude of students between the age groups of 18–23 years old. The studies are described in Table 2.1.

Table 2.1: Summary characteristics of included studies

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
All Bassam *et al*., 2018	Saudi Arabia	Single tertiary institute	Females (100%)	18-25	Students from: Business & Economics (21%), Medicine (17%), Applied Medical Sciences (11%), Computer Sciences (5%), Pharmacy (3%), Dentistry (0.6%), Other fields (42%)	350	Quantitative, observational Cross-sectional Online survey	Awareness Attitude Practice	Participants asked whether they had heard about PCOS (was scored by the frequency of participants who had heard the term). Attitude and Practice: 1 open-ended question on the beliefs of the community toward PCOS was asked but not scored	71% of female participants had heard about PCOS before Responses to the beliefs and practice questions indicated misconceptions of PCOS, warranting intervention
Alshdaifat *et al*., 2021	Jordan	Two tertiary institutes	Female undergraduates and postgraduates (100%) (Formal diagnosis of PCOS 29.9%) Postgraduates Mean(1.52 (0.69–2.36)) 1st year 187 students; 2nd year 232 students; 3rd year 208 students; 4th year 198 students; 5th	18 - ≥ 24	Students in the medical field	1182	Cross-sectional Online survey	Awareness Sources of information Predictors of high awareness Attitude	Awareness: 22-item awareness score including causes, symptoms, diagnostic workup, treatment; PCOS recognition and beliefs questions used; All the correct answers score 1, total 22. Lowest score 0, highest score 22. Attitude and practices based on the questionnaire	Average score was M=11.59 (SD=4.95) 95.9% recognised PCOS. Healthcare professionals most common source of knowledge Higher academic level and diagnosis associated with better awareness 98% felt spreading awareness was important

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
			year 114 students; 6th year 75 students; Higher education 168 students							
Devi *et al*., 2017	India	Single nursing institute	Female and male undergraduates (percentages not reported) (5 students diagnosed with PCOS- type of diagnosis not reported)	18-23	3rd year Bachelor of Science (BSc) Nursing students	100	Descriptive survey	Knowledge Self-preventative measures taken	Knowledge: structured questionnaire used 32 questions on meaning, definition, causes, risk factor symptoms, diagnosis, treatment, management, and complications. There is one correct answer scoring 1 point per question. Maximum total score of 32. No indication if "heard about PCOS" was asked directly; Attitude and practice assessed through self-preventative and lifestyle behaviour questions	Mean score 14.97out of 32 Minimum knowledge score on the meaning of PCOS and causes and risks Statistically significant difference between sources of knowledge and knowledge of PCOS 100% lacked sufficient PCOS knowledge; unhealthy practices noted among the diagnosed
Douglas *et al*., 2021	America	Single tertiary institute	Female undergraduates and	18-40	Students at a public university (field	12	Descriptive study using a validated	Nutrition knowledge	Nutrition knowledge questionnaire used (60	Mean score

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
			postgraduates (all diagnosed with PCOS--type of diagnosis not reported)		of study not reported)		questionnaire	Diet quality Eating disorder risk	questions). There is one correct answer scoring 1 point per question, for a maximum total score of 60. Familiarity with MyPyramid (23 questions), Nutrient content food (26 questions), Diet-Disease relationships (11 questions). There is one correct answer scoring 1 point per question, for a maximum total score of 60. Attitude and practice: assessed via Eating Disorder Examination-Questionnaire. (28 questions). Scores for responses range from 0–6 (no days to everyday), increased scores corresponding to increasing frequency of negative eating disorder-related thoughts.	29.0 ± 10.9 PCOS students had poor nutrition knowledge (48%); unbalanced diet; high eating disorder risk (41.6%) Familiarity with MyPyramid (52.6% correct). Score was highest for this outcome. Students obese, insulin resistant, consumed unbalanced and limited diet Response showed poor diet and lack of guidance. Urged for university-based dietary education.

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
Ferrao *et al*., 2022	India	Single nursing institute	Female undergraduates (100%)	18-21	General Nursing and Midwifery (GNM) students (1st–3rd year, 85.7%), BSc Nursing students (4th year, 14.3%)	350	Questionnaire -based Cross-sectional study	Knowledge	16 item questionnaire (8 basic knowledge+ 8 treatment/prevention); not based on recognition alone; Knowledge classified into inadequate or adequate; attitude and beliefs included There is one correct answer scoring 1 point per question. Maximum score was 16.	Overall knowledge score: Mean score 8.21 ± 1.3 ; mean percentage score 51.25% 87.4% had inadequate knowledge of PCOS Knowledge of clinical presentation was adequate for menstrual abnormality and infertility. Knowledge was adequate for alopecia, *acanthosis nigricans*, metabolic syndrome, endometrial cancer, risk of diabetes, psychological upset, dyslipidemia, coronary artery disease, hypertension. Association between primary source of information and knowledge
Fortuna and Herdiman, 2023	Indonesia	Seven non-medical tertiary institutes	Female undergraduates (100%)	18-21	Students from: Arts and Design (16%), Engineering (15%),	696	Descriptive Quantitative	Knowledge Attitude	Participants asked whether they had heard of PCOS.	47% had good knowledge; 42% had sufficient knowledge; 11% had no

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
					Communication Sciences (14%), Law (14%), IT (14%), Economics and Business (14%), Psychology (14%)				Knowledge: 20 knowledge questions: ≤ 11 poor knowledge, ≥12 adequate knowledge. Knowledge score categorised as (good/sufficient/less), and attitude score categorised as (good/sufficient); belief questions used.	knowledge. 95% had good attitude 17% suspected of being at risk of PCOS All lived in urban areas, 84% came from middle-class families
Ghosh *et al*., 2022	Bangladesh	Multiple medical tertiary institutes	Female (72.9%) and Male (27.7%) undergraduates	Age range not reported	Medical students (1st to final year)	148	Descriptive and cross-sectional Observational Multi-centric	Awareness	Asked if the participants had heard of PCOS (scored by frequency). Attitude and practice: beliefs towards lifestyle and complications explored/ not scored. 27questions on awareness of PCOS symptoms, possible complications, management, miscellaneous features, and personal questions	Females had better knowledge of symptoms; males had better knowledge of complications. 72.29% were female; knowledge of the role of lifestyle is statistically significant, periodic education is needed.
Haq *et al*., 2017	Pakistan	Three tertiary	Female	18-26	Science	451	Mixed methodology	Awareness measured	Awareness assessed	Awareness increased

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
		institutes	undergraduates (100%) (Formal diagnosis of PCOS- 5.5%)		students		(questionnaire + Intervention)	before and after education, signs and symptoms Prevalence documented .	before and after education (brochure) Attitude and practice not scored; some beliefs noted Prevalence: From 12 signs and symptoms, students having 4-8 symptoms were considered as suspected; students having more than 8 symptoms were considered as diagnosed. Knowledge: 20 knowledge questions: ≤ 11 poor knowledge, ≥12 adequate knowledge Knowledge tested pre- and post-intervention	after intervention. 72.5% unaware of PCOS before intervention; post-intervention awareness increased to 90.2% Majority answered positive to all knowledge questions; except for knowledge on symptomatic treatment and antidiabetic treatment 17.5% suspected of PCOS
Hussin and Kadir, 2020	Malaysia	Seven tertiary institutes	Females (74.4%) Males (25.6%) (whether	Age range not reported	Young students in public and private institutions (field of study	219	Cross-sectional survey	Knowledge Awareness Perception	13 knowledge questions. Calculated by frequency and percentages. 3 components to the questionnaire:	92.2% adequate level of knowledge; 56.6% were unfamiliar with the term “PCOS”

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
			included undergraduate/ postgraduate not reported)		not reported)				Knowledge, awareness and perspective. Knowledge classified as adequate or poor. Participants asked if they had heard of PCOS Attitude and practice: pre/post awareness measured with improvement noted. Reponses highlighted gaps and effect of education materials. 7 Attitude questions: calculated by frequency and percentages 5 Perception questions calculated by frequency and percentages	Most were familiar coming from an educated background Many recognised symptoms of PCOS such as: irregular/absent periods (87.2%); ovarian cysts (87.2%); severe acne (62.1%) Not enough knowledge on treatment of PCOS 84.9% had knowledge of androgen hormones; 56.2% correctly associated PCOS with elevated male hormone Good attitude: attitudes based on symptom presence. The responses suggest a notable proportion of students experienced symptoms Moderate to high perception: perception questions included (believe PCOS can be cured; PCOS is a serious health issue;

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
										healthy diet and exercise important in managing PCOS; knew that PCOS not only affects married women
Jabeen *et al*., 2022	India	Schools and tertiary institutes	Females (100%) High school girls 35.6%; junior college girls 16%; non-medical undergraduates 28.4%; medical undergraduates 20%	13-19 (78.8%) 20-25 (53%)	Students in junior , secondary and tertiary education (medical and non-medical fields)	250	Interventional Prospective pre and post awareness	Prevalence Predisposing factors Awareness Practice	A pre- and post- test questionnaire on awareness, causes, symptoms, complications, and prevention; attitude ad practice was tested assesses after awareness session A post-test questionnaire on satisfaction of knowledge, barriers to awareness, and suggestions for increasing awareness Each of the questions had an answer option of Know-or Don't Know	Prevalence was 6.8% 78.4% unaware before awareness session 21.6% awareness of PCOS. Awareness of symptoms and complications increased significantly after educational intervention Responses revealed barriers like lack of publicity.
Pramodh 2020	Dubai	Single tertiary institute	Female undergraduates (100%) Entry level students (not clearly defined, and the specific	18-25	Undergraduate and graduate students at a Dubai campus (field of study not reported)	493	Cross-sectional survey	Reproductive health knowledge PCOS awareness and awareness of	Students were asked if they were diagnosed with PCOS. Attitude: lifestyle choices assessed.	13% diagnosed with PCOS; 75% had a family history of diabetes. 38% awareness

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
			academic level remains unclear) 3%; 1st-2nd years undergraduates 53%; 3rd-4th years undergraduates 44% (self-reported diagnosis of PCOS-13%)					symptoms	Practice and beliefs discussed, no scoring system for belief responses. RH knowledge: Questions on basic reproductive biology (6) and infertility knowledge (4). Very well/ well, little, and do not know questions for knowledge. True, false, and not sure questions for fertility. Results calculated as percentages Awareness: 1 question on whether they heard of PCOS; Question asked if they experienced four major symptoms of PCOS – absent/excess bleeding during menstruation, excessive hair growth, acne, and patches of thick dark skin.	Low reproductive health knowledge. Students were unclear about important concepts related to fertility. Low physical activity and high indulgence to fast food
Rao *et al.*, 2020	America	Single tertiary institute	Male (12%) and female (98%) undergraduates (including staff) (formal diagnosis of	Over 18 years and above	Students by education level: High school (9.1%), College (17.1%), Associate's degree (15.7%), Bachelor's degree (33.1%),	769	Cross-sectional online survey	Prevalence PCOS Knowledge self-rated ("know some" or "less").	Knowledge was assessed using a 5-point scale ranging from 1 (I know nothing) to 5 (I know everything). Men answered a separate	PCOS prevalence higher than average Majority (66.3% of females and 83% of males) ranked their knowledge as

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
			PCOS-28.5%)		Graduate degree (25%)			Attitude and practice: information sources (eg. healthcare, friends) identified. Beliefs explored separately	similar survey.	3 (know some) Ethnicity influenced awareness and help-seeking. Great disparity for information source-therefore educational material should focus on multiple sources of information. Educational level affected source of information accessed.
Rizvi *et al*., 2023	Pakistan	Two tertiary institutes	Female (100%) undergraduates (self-reported diagnosis of PCOS-18.32%)	18 years and above	Students in medical and non-medical fields	646	Cross-sectional Available as an online survey and paper-based survey	Knowledge Knowledge score compared by course, family history, menstruation patterns. Barriers to consultation highlighted. Attitude Perception	20 questions were adopted from the Colwell *et al.* (2010) study. Response options included Yes, No, or Unsure. Correct answers received a score of 1. A higher score indicated better knowledge. Scores were continuous Attitude: shyness, lack of knowledge identified. Beliefs: stigma, perceptions were recorded about clinical features of PCOS, reason	The average PCOS knowledge score was 11.58 ± 4.99 (overall) Knowledge score higher for students in medical colleges, had menstrual symptoms and a family member affected with PCOS; undergraduates had inadequate knowledge. Medical students had better scores. 68.6% not embarrassed, but 67.3% had not consulted a doctor. Barriers include lack

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
									for undergoing screening, feelings about screening, societal pressures, preference of gynaecologists in terms of gender, barriers towards screening	of knowledge and shyness Positive mindset of the society towards addressing this health issue
Sabitha and Sunanda 2016	India	Single nursing institute	Males and female undergraduates (percentages not reported)	18-25	BSc Nursing students (2nd and 3rd year)	150	Descriptive survey	Knowledge	20-item questionnaire: Knowledge scored Poor (<10), Average (10-15); Good (>15). Calculated as frequency and percentage Attitude and practice not scored	76% had average knowledge; 10.7% had good knowledge; 13.3% had poor knowledge Lifestyle factors affected level of knowledge of PCOS: 92% reported regular menstrual cycles; 82.7% followed mixed diet; 75.3% Christians; 85% 21-25 years Knowledge associated with dietary pattern, junk food consumption, and information sources (P<0.05)
Sasikala *et al*., 2021	India	Single nursing institute	Males and Females (undergraduate /postgraduate	18-22	Students in the field of nursing (year not reported).	88	Cross-sectional Questionnaire	Knowledge Awareness	15 questions: knowledge of risks (6), clinical signs and symptoms (4), and	Educational intervention is needed.

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
			not reported) (percentages not reported)				- based		complications of PCOS (5). Each question included number of students that responded yes or no and the (%) Participants were asked whether they had heard about PCOS, responses were counted. Attitude and practice questions included risk factors, symptoms, and complications; not scored.	89.8% had heard of PCOS. Misconceptions and gaps exist especially regarding complications such as diabetes and endometrial cancer. Majority claimed it to be the most common endocrinological problem
Sehar, 2021	India	Single tertiary institute	Male (18.3%) and female (81.7%) undergraduates and postgraduates	17- <31	Diploma of General Nursing and Midwifery (DGNM) (3rd year), BSc Hons Nursing (4th year)	60	Descriptive Cross-sectional survey	Knowledge	Structured 40 question tool, each question scored 1, maximum score 40, minimum score 1. Attitude and practice not scored or detailed separately. Poor (0-13), Average (14-27), Good (28-40)	60% of nursing students had average knowledge, 38.33% had good knowledge, and 1.66% had poor knowledge. Structured education programme recommended.
Sharwini *et al*., 2019	India	Multiple tertiary institutes	Female (100%) undergraduates (young ladies	18-19 years (adolescents) 20-24 years	Students from different universities	100	Cross-sectional survey	Nutrition awareness	Participants asked about	Low awareness of

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
			and adolescents)	(young ladies)	(field of study not reported)				source of knowledge. Attitude and practice Unawareness of dietary role addressed through advice. . Frequencies and percentages	PCOD (51.4%) Poor (48.6%) awareness of diet. students had minimal awareness of role of diet Misconceptions noted in the response
Subhashree Bangaru *et al*., 2021	India	Single medical tertiary institute	Male (40.62%) female (58.33%) undergraduates	Age range not reported (Mean age 21.9)	Students in the medical field	192	Cross-sectional study with semi-structured tool	Knowledge Awareness	Asked whether participants had heard of PCOS and assessed sources of information. Beliefs and attitudes were not explicitly scored. Associations between gender and socio-economic class with levels of knowledge, categorised as good, fair, and poor	57.8% Good knowledge, 36.9% Fair knowledge, 5.2% poor knowledge More females than males had good knowledge as well as fair knowledge; none of the females demonstrated poor knowledge Majority of students from the upper-middle class demonstrated good knowledge

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
										Awareness level (92.7%) Doctors and peers were common sources. Highlights need for awareness for early diagnosis and lifestyle change
Tahir *et al*., 2020	Pakistan	Single tertiary institute	Female undergraduates (100%) (formal diagnosis of PCOS-11.2%)	19-24	Medical students 94.2%; Dental students 5.8%	278	Cross-sectional survey	Knowledge Level of awareness	Participants asked about PCOS awareness and symptoms. Responses analysed by frequency. Attitude and practice not formally scored-included an open-ended question	74.5% aware Common reported symtoms: acne (55.4%); hirsutism (50.7%); irregular/absent period (37.1%); weight gain (36.3%); alopecia (42.8%); mood swings (63.3%); fatigue (62.6%). Internet (42.2%) and peers (27.3%) were major sources. 11.2% diagnosed with PCOS; 80.6% receiving treatment Need structured awareness campaigns. Behavioural insight:

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
										65.8% said that they would not visit a gynaecologist unless symptoms were severe; 36.6% had a family history of diabetes, hypertension or endocrine disorders; 12.6% reported a family history of PCOS-like symptoms
Thomas *et al*., 2017	Malaysia	Single tertiary institute	Female undergraduates (100%)	Age range not reported	Medical students (N=60; 1st year, and N=62 2nd year) Nursing students (N= 40; 1st year, and N= 39; 2nd year)	210	Cross-sectional Quantitative	Contributing factors Knowledge	Knowledge question score (mean< 0.5= poor knowledge). Attitudes and practices not scored Contributing factors: BMI, menstrual cycle, lifestyle patterns	Medical students (Mean=0.38, SD=0.2) Nursing students (Mean=0.28, SD=0.21) 48.4% of medics have heard of PCOS; 64.6% nurses have never heard of PCOS before Both had ideal BMI, associated with premenstrual syndrome Both had similar lifestyle patterns

Author, Year of publication	Country	Study setting	Population	Populat-ion age range (years)	Field of Study/ degree of population	Population size	Study design	Outcome measures	Knowledge scoring system utilised	Main finding/s
										Both groups lacked sufficient knowledge. Education on PCOS much needed in pre-clinical curricular
Upadhye and Schembekar, 2017	India	Multiple tertiary institutes	Female students (62.5%) and adolescents (37.5%) (formal diagnosis of PCOS-6%)	18-19 (37.5%) 20-24 (62.5%)	Medical students (1st to 3rd years)	200	Cross-sectional Survey using structured questionnaire	Awareness	Awareness scored by frequency of those who heard of PCOS; Attitude and Practice not scored but source of knowledge was documented. Beliefs revealed need for lifestyle education. BMI, type of diet, symptoms, sources of information, type of doctor consulted were documented.	28% unaware of PCOS Knowledge of the disorder and counseling should be included in the curriculum 16.5 % obese, 35.5% Acne, 16% irregular menses, 5% hirsutism, 2% infertility Majority consulted a dermatologist

2.3.3. Knowledge of students toward PCOS

The reviewed studies demonstrated considerable variability in the knowledge and awareness of PCOS of the participants, largely due to differences in question formats and the methods used to assess and calculate knowledge, which hindered direct comparison across studies. In one study, participants were scored based on the ability to identify the causes of PCOS (2 points), symptoms (8 points), treatment (7 points), diagnostic workup (2 points), and associated conditions (3 points) (Alshdaifat *et al*., 2021). Other studies did not use formal scoring but instead categorised knowledge as adequate or poor; or good, average, or poor; based on the frequency of correctly selected survey response options (Sabitha and Sunanda, 2016; Sehar, 2021). Similarly, one study categorised knowledge levels as good, sufficient, or bad, and in another study, knowledge score was considered as poor knowledge (≤ 11) while score ≥ 12 was considered as adequate knowledge respectively (Fortuna and Herdiman (2023); Hussin and Kadir, 2020).

The study by Rao *et al.* (2020) measured the level of knowledge of PCOS using a 5-point scale, ranging from 1 ("I have no knowledge of PCOS") to 5 ("I am fully knowledgeable about PCOS"). Two studies assessed only awareness of PCOS with a question on familiarity with the term PCOS (All Bassam *et al*., 2018; Tahir *et al*, 2020). Most studies had a broad knowledge focus and included questions assessing general knowledge of PCOS, including familiarity with the term, causes, symptoms, treatment, associated conditions, risk factors, diagnosis, management, and prevention (Devi *et al*., 2017; Thomas *et al*., 2017; Pramodh, 2020; Alshdaifat *et al*., 2021; Sasikala *et al*., 2021; Subhashree Bangaru *et al*., 2021; Ferrao *et al*., 2022; Ghosh *et al*., 2022; Jabeen *et al*., 2022). Studies concentrated on detailed aspects, such as nutritional knowledge (Douglas *et al*., 2021), reproductive health and infertility (Pramodh, 2020), awareness of risk factors and long-term complications (Sasikala *et al*., 2021), factors influencing high awareness scores (Alshdaifat *et al*., 2021), and factors affecting source of information used (Rao *et al*., 2020). Interventional studies evaluated knowledge improvement post-education, such as those by Haq *et al*. (2017) and Jabeen *et al*. (2022).

2.3.4. Sources of knowledge

Seventeen studies focused specifically on sources of information, with many reporting doctors as the most common source of information (Figure 2.3).

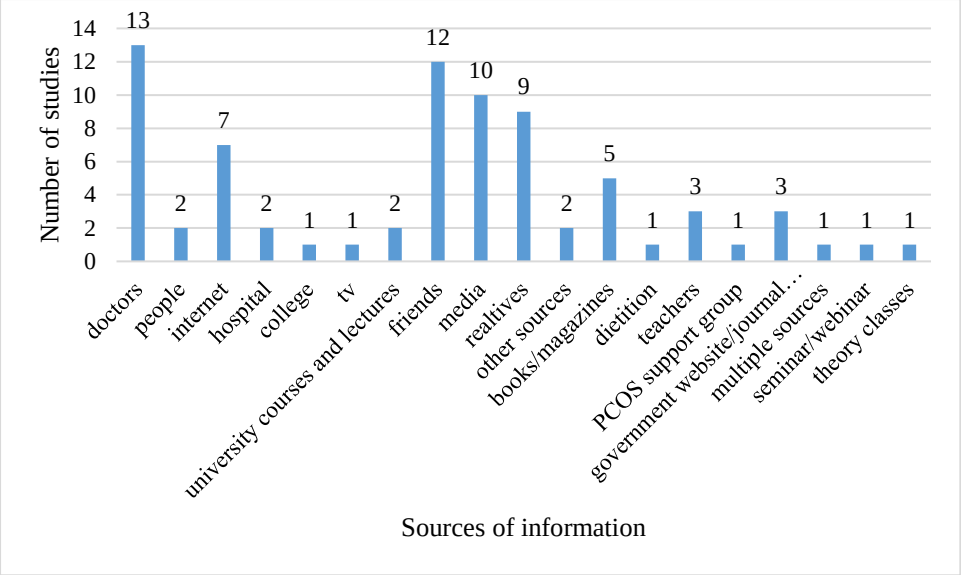


Figure 2.3: Number of studies including each as a source of knowledge

Healthcare professionals emerged as the primary source of information in several studies (Devi *et al*., 2017; Pramodh, 2020; Alshdaifat *et al*., 2021; Ferrao *et al*., 2022; Fortuna and Herdiman, 2023). According to the study by Jabeen *et al*. (2022), teachers (37%) were the most common source of information, followed by doctors (31.5%), as the participants were predominantly adolescents. Alshdaifat *et al*. (2021) reported that most participants (39.34%) relied on physicians, followed by media exposure (35.95%). Similarly, Fortuna *et al*. (2023) found that 59% of participants obtained information from healthcare teams, with media being the second most common source (45%), and family and friends being the least utilised. Pramodh (2020) also observed a preference for healthcare providers (62%), followed by schoolteachers (29.5%), internet resources (21.5%), and media outlets (16%).

Among participants formally diagnosed with PCOS, Rao *et al*. (2020) noted a strong reliance on healthcare professionals (83.7%) by diagnosed participants compared to undiagnosed (31.1%) or uncertain individuals (52.3%). Rao *et al*. (2020) highlighted the influence of ethnicity and education on source preferences. The Rao *et al.* (2020) study found that Caucasian participants were more likely to consult healthcare professionals (50.1%) and family or friends (31.1%), while Hispanic participants, possibly due to stigma and access barriers, relied more on anonymous sources like social media. African American participants used social media the least, and Asian participants reported greater use of print media such as newspapers and magazines. Education level also shaped preferences: those with graduate degrees favoured government websites and journal articles (21.3%), while participants with lower education

levels were less likely to consult professionals (26.90%) or use formal sources (6.0%). These findings underscore the need for culturally and educationally tailored health communication strategies to ensure inclusive access to PCOS information (Rao *et al*., 2020). A study conducted among female Saudi students revealed that nearly 50% of participants identified "other people" as the primary source of information about PCOS (All Bassam *et al*., 2018). The study by Sehar (2021), including male (18.3%) and female (81.7%) students enrolled in BSc Nursing (60%) and DGNM (40%), highlighted a significant reliance on literature, scholarly journals, and digital resources among Indian nursing students as a source relied upon for information.

2.3.5. Factors affecting knowledge of PCOS

A total of five studies conducted among university students indicated that age and level of education significantly affected knowledge assessment scores (Thomas *et al*., 2017; Alshdaifat *et al*., 2021; Sasikala *et al*., 2021; Jabeen *et al*., 2022; Rizvi *et al*., 2023). Individuals possessing a formal diagnosis of PCOS, along with those presenting with various symptoms associated with the condition, were more aware of the condition (Alshdaifat *et al*., 2021). Having irregular menstruation and a family history of PCOS were found to significantly influence the level of knowledge about PCOS (Rizvi *et al*., 2023). Gender identity was identified as a significant factor influencing knowledge of PCOS in multiple studies, including those by Rao *et al*. (2020), Subhashree Bangaru *et al*. (2021), and Ghosh *et al*. (2022). In the study by Subhashree Bangaru *et al*. (2021), a statistically significant association was found between gender and PCOS knowledge among medical students (P = 0.000). While 57.8% of all participants demonstrated good knowledge, a greater proportion of female students (67.26%) had good knowledge compared to male students (44.3%).

Notably, all participants who demonstrated poor knowledge (12.6%) were male, highlighting a clear disparity in awareness levels. These findings suggest that female students were generally more knowledgeable about PCOS than the male counterparts. Rao *et al*. (2020) observed that a higher proportion of male participants ranked knowledge of PCOS as very low compared to female participants. Specifically, 42.6% of men reported knowing "nothing" about PCOS versus 21.7% of women. This suggests a clear gender disparity in PCOS knowledge. Ghosh *et al*. (2022) conducted a study among medical students in West Bengal and found statistically significant gender-based differences in knowledge. Female students showed better knowledge of signs and symptoms of PCOS such as hirsutism and acne. However, a higher

percentage of male students knew that diabetes is a possible complication of PCOS. These gender differences were statistically significant ($P < 0.05$).

2.3.6. Attitude of students toward PCOS

Five studies offered insights into participants' perceptions and beliefs. One of the studies reported that most students (78%) identified PCOS as a major health issue for women in Pakistan (Rizvi *et al*., 2023). Another study reported an overwhelming consensus among female Jordanian students regarding the necessity of spreading awareness about PCOS (Alshdaifat *et al*. (2021). In Saudi Arabia, All Bassam *et al*. (2018) reported prevalent misconceptions about PCOS among female students. Two studies revealed generally positive attitudes toward PCOS reporting that participants expressed openness to learning about the condition and acknowledged the importance of understanding its implications (Hussin and Kadir, 2020; Fortuna and Herdiman, 2023).

2.4. Discussion

Majority of the studies were conducted in South Asia and the Middle East. Comparing the studies revealed differences in knowledge, healthcare-seeking behaviour, treatment approaches, and cultural influences across the geographical area. This highlights the need for tailored interventions. Several studies included in the scoping review reported limited knowledge of PCOS among participants; however, the variability in study designs, assessment tools, and sample populations limits the ability to generalise this finding with certainty. It is evident from these studies that there is an affinity to health care workers, friends and family, and the media for information relating to PCOS, highlighting these as possible targets for dissemination of information. Studies in Jordan and the UAE confirm that while healthcare professionals are a source of information, many knowledge gaps regarding PCOS remain (Alshdaifat *et al*., 2021; Pramodh, 2020). While healthcare professionals were identified as the primary source of PCOS information in several studies, some research highlights the significant role of alternative sources (All Bassam *et al*., 2018; Hussin and Kadir, 2020; Tahir *et al*., 2020). A study in Saudi Arabia found that many women relied on social media and family rather than healthcare professionals or formal education for PCOS-related knowledge (All Bassam *et al*., 2018). Similarly, studies in Malaysia and Pakistan revealed a heavy dependence on informal sources, including peers and the internet, which often contribute to misinformation (Hussin and Kadir, 2020; Tahir *et al*., 2020). This trend, also observed in a study by Rizvi *et al*. (2023) in Pakistan, underscores a key limitation in the current healthcare system. Although doctors are

trusted sources of information, the role of these professionals in providing education on PCOS needs to be enhanced to prevent misinformation.

Structured educational programs in Pakistan and India have improved knowledge levels of PCOS (Haq *et al*., 2021; Jabeen *et al*., 2022). These findings suggest that PCOS education should be integrated into school and university curricula, especially in Middle Eastern countries where discussing reproductive health is often taboo (Rizvi *et al.*, 2023). Amasha and Heeba (2014) had concluded that implementation of an education program was efficient in enhancing the level of knowledge of maternity nurses regarding PCOS. Haq *et al*. (2017) also highlighted the significance of early intervention and the potential for educational programs in university settings to reduce the stigma surrounding PCOS and promote earlier diagnosis. Jabeen *et al* (2022) reported that knowledge of PCOS symptoms and complications showed a significant improvement following the educational intervention. Haq *et al*. (2017) conducted a mixed-methods study across three public universities in Pakistan, incorporating both questionnaire-based assessment and an educational intervention. Only 17.1% of participants were aware of PCOS in the study by Haq *et al*. (2017), improving to 82.9% after an educational intervention (Haq *et al*., 2017). While several studies support the short-term effectiveness of educational interventions in enhancing knowledge about PCOS, a notable gap remains in the literature concerning the long-term impact on health-related behaviours (Kazemi *et al*., 2020). It is unclear whether improved awareness and understanding of PCOS consistently translate into sustained lifestyle changes, better treatment adherence, or continued engagement with healthcare services (Kazemi *et al*., 2020; Aryani *et al*., 2023).

Kazemi *et al*. (2020) observed initial improvements in reproductive health markers following lifestyle interventions; however, these benefits were not consistently maintained over time. After 12 months, certain clinical parameters had regressed to baseline levels, highlighting the challenge of long-term adherence to recommended lifestyle modifications. Aryani *et al.* (2023) similarly emphasised the need for further research to assess the prolonged impact of lifestyle interventions on body mass index (BMI) and other metabolic outcomes in individuals with PCOS. Notably, the exercise programs implemented in the study were effective in reducing waist circumference, suggesting that physical activity plays a crucial role in managing obesity-related symptoms associated with PCOS. Despite these promising results, the long-term sustainability of such interventions remains insufficiently studied (Aryani *et al*., 2023). The current lack of longitudinal data limits an understanding of the enduring value of educational

and lifestyle-based interventions in managing this complex endocrine disorder (Kazemi *et al*. (2020). Addressing this gap is essential for informing the development of more effective, sustained strategies that extend beyond knowledge acquisition to promote meaningful and lasting behavioural change (Aryani *et al*., 2023).

Healthcare-seeking behaviour among women with PCOS varies significantly across regions and is shaped by a complex interplay of cultural, social, and economic factors. In many parts of the Middle East and South Asia, cultural stigma, financial vulnerability, and widespread misconceptions surrounding reproductive health conditions act as major barriers to timely medical consultation (All Bassam *et al*., 2018; Alshdaifat *et al*., 2017). For example, only 44% of surveyed Saudi students indicated that they would seek medical care for PCOS-related symptoms, highlighting a substantial reluctance to engage with healthcare services (All Bassam *et al*., 2018). Similarly, in Pakistan, unmarried women with PCOS often avoid seeking medical help due to societal expectations, misinformation, and fear of social judgement, all of which contribute to heightened anxiety and a desire to maintain a socially acceptable image (Athar and Javed, 2024). This reluctance is frequently rooted in a fear of being judged or shamed, as reproductive and hormonal disorders such as PCOS remain culturally sensitive topics (Athar and Javed, 2024). Symptoms like irregular menstruation, hirsutism, and infertility can cause embarrassment, particularly in conservative communities where femininity is closely tied to traditional reproductive roles (Wickham, 2018; Saleem and Sultana, 2023). The stigma associated with PCOS, often misperceived as a lifestyle disorder, can lead to feelings of isolation and low self-worth (Wickham, 2018). Studies have shown that negative body image—particularly in relation to symptoms such as excessive hair growth—further compounds psychological distress and discourages healthcare engagement (Saleem and Sultana, 2023; Athar and Javed, 2024).

Additionally, fear of infertility and lack of accurate knowledge about the treatability and prevalence of PCOS contribute to delayed diagnosis and treatment (Wickham, 2018). Farajzadegan *et al*. (2023) also highlighted the psychological burden of PCOS, noting that anxiety related to infertility and chronic health complications often prevents women from seeking medical advice, particularly when they anticipate negative outcomes. Despite the severity of symptoms, these sociocultural barriers continue to prevent many women from accessing timely care (Alshdaifat *et al*., 2021). A study conducted across clinics in three cities in Pakistan found that women with PCOS commonly presented with obesity, hirsutism,

elevated blood glucose, irregular menstrual cycles, and acne (Sidra *et al*., 2019). Moreover, participants reported poor quality of life and high rates of depression (Sidra *et al*., 2019). In Jordan, financial barriers were found to lead to delays in seeking treatment, particularly among lower-income groups (Alshdaifat *et al*., 2017). These findings highlight the need for awareness campaigns to normalise conversations about reproductive health to reduce the stigma associated with PCOS and encourage medical consultations (Rizvi *et al*., 2023). Addressing the public health needs of underserved communities is necessary to alleviate the financial burden associated with seeking medical care.

Treatment interventions also vary by region. In the Middle East, participants used medications such as oral contraceptives and metformin for treatment, with minimal focus on lifestyle modifications (Al Bassam *et al*., 2018). Almost half of the students in Dubai were aware that PCOS can be managed with good diet, exercise and medication (Pramodh, 2020). In Pakistan, about 34.7% of PCOS patients were prescribed metformin, while 39.1% received an anti-androgen hormonal therapy, to manage the symptoms of PCOS (Tahir *et al*., 2020). A comprehensive approach that combines lifestyle interventions with pharmacological treatment is essential for achieving optimal and sustainable health outcomes in individuals with PCOS (Teede *et al*., 2018).

Lifestyle practices highlight a critical gap between awareness and actual behaviour (Mohamed, 2016). Several studies have highlighted the gap between PCOS-related knowledge and corresponding lifestyle practices among university students. The study by Douglas *et al*. (2021) found that students diagnosed with PCOS often had poor nutritional habits, despite awareness of the condition. Many consumed high-fat, low-fiber meals, with 27.3% avoiding fruit entirely, and over 75% were classified as obese. Marked disordered eating behaviours and associated thought patterns were evident among 41% of the participants. Douglas *et al*. (2021) noted that many students rely on social media for nutrition advice instead of consulting professionals, leading to misinformation. Another study also reported students' strong preference for sourcing nutrition information online rather than consulting healthcare professionals, which may compromise the quality of guidance received (Lin *et al*., 2018). This disconnect between awareness and action is echoed in other studies. While Sasikala *et al*. (2021) and Rizvi *et al*. (2023) found that nursing students were largely aware of PCOS risk factors—particularly obesity—many still failed to adopt the necessary lifestyle changes.

Similarly, Thomas *et al*. (2017) reported that both medical and nursing students were inclined to sedentary behaviour. The study linked stress, sedentary behaviours, and poor dietary habits to an increased risk of obesity and metabolic complications. The study by Hussin and Kadir (2020) reinforced the idea that knowledge alone does not necessarily lead to behavioural change. The study found that many female participants were unaware of having PCOS, despite presenting with its signs and symptoms (Husin and Kadir, 2020). While some may have had access to information about the condition, there was uncertainty about whether that knowledge warranted action, highlighting a gap between awareness and self-initiated health behaviour (Haq *et al*., 2017). Given that more than 40% of women with PCOS are obese (Sam, 2017), it is evident that knowledge alone may be insufficient for effective prevention and management. Despite improved recognition of PCOS and its risks, unhealthy lifestyle patterns and associated comorbidities, such as type 2 diabetes mellitus, remain prevalent among women with the condition (Sharwini *et al*., 2019). The limited understanding of long-term complications, such as cardiovascular and metabolic disorders, is concerning, as it reduces the perceived urgency to implement essential lifestyle modifications (Sasikala *et al*., 2021). Sharwini *et al*. (2019) identified that 13.5% of female undergraduates were overweight, and 5.4% were obese. Additionally, the study reported that 51.4% of the females did not know that diet assumes an important role in PCOS development (Sharwini *et al*., 2019). Upadhye and Schembekar (2017) also reported that 19.5% of adolescent and young girls were overweight, and 16.5% were obese. Since obesity is a major risk factor, reinforcing that weight management through diet and exercise for managing PCOS symptoms is essential. Rizvi *et al*. (2023) reported that 3.8% of female Pakistani undergraduates were obese. The study concluded that lifestyle modifications were advised for the population, as obesity had been identified as a key factor associated with PCOS (Haq *et al*., 2017).

Similarly, 94% of nursing students in South India were aware of obesity as a risk factor for PCOS, indicating a strong level of understanding of the condition's metabolic implications (Sasikala *et al*., 2021). This elevated level of awareness is particularly relevant when considering how knowledge translates into attitudes and, ultimately, lifestyle practices (Goh *et al*., 2022). Understanding obesity as a contributing factor to PCOS may encourage more proactive health behaviours, such as engaging in regular physical activity, maintaining a balanced diet, and monitoring weight. When students acknowledge the role of lifestyle in PCOS development and management, they are more likely to adopt and advocate for healthier practices, both personally and in future professional roles (Hussin and Kadir, 2020). However,

awareness alone may not guarantee healthy lifestyle choices; positive attitudes toward prevention and management are also essential (Sasikala *et al*., 2021). To bridge this gap, interventions must extend beyond information dissemination. Studies report that education can help improve knowledge and encourage healthier behaviours (Sasikala *et al*., 2021). As suggested by Sharwini *et al*. (2019) and Rizvi *et al*. (2023***)***, successful implementation of lifestyle modifications requires comprehensive education programs that incorporate behavioural change strategies, structured support systems, and practical interventions tailored to the needs of young women.

Cultural attitudes toward PCOS affect diagnosis and treatment. In Middle Eastern societies, reproductive health is a sensitive topic, which often leads to delayed diagnosis and reluctance to seek medical care (Pramodh, 2020). Many women fear infertility, which discourages them from discussing symptoms or seeking treatment (Pramodh, 2020). In Pakistan, the primary issue is a lack of awareness of the urgency to seek medical attention rather than stigma, causing many women to ignore symptoms until they become severe (Haq *et al*., 2017). These cultural differences highlight the need for targeted education campaigns that challenge misconceptions and encourage proactive healthcare-seeking behaviour (Hussin and Kadir, 2020).

Ultimately, knowledge and attitudes strongly impact lifestyle choices and health-seeking behaviour in individuals with PCOS (Goh *et al*., 2022). Misinformation and lack of awareness prevent many from following appropriate diet and exercise recommendations. Educational programs may help address these issues. Awareness campaigns have been effective in improving knowledge and promoting healthier habits (Sasikala *et al*., 2021). Thomas *et al*. (2017) suggested including PCOS education in medical and nursing courses, while Douglas *et al*. (2021) emphasised the need for university-based nutrition counselling and support programs. Digital health platforms should be used to spread accurate information (Bakhali *et al*., 2015). Healthcare professionals should play an active role in patient education, emphasising early diagnosis and holistic treatment (Gibson-Helm *et al*., 2017). Encouraging lifestyle modifications through community programs and making diverse treatment options more accessible can also improve PCOS management (Pramodh, 2020). Future research should explore how socioeconomic status, healthcare access, and cultural beliefs shape PCOS awareness and treatment choices (Aryani *et al*., 2023).

CHAPTER 3 - SURVEY

3.1. Introduction

This chapter presents the methodological framework, and the findings of the study carried out among university students designed to achieve the second objective of the study: Assessing the knowledge and attitudes of health science students toward PCOS, and includes the development and validation of the questionnaire, sampling techniques, and the data collection procedure.

3.2. Methodology

3.2.1. Study design

A descriptive, quantitative cross-sectional study using a structured online questionnaire was undertaken. The questionnaire was adapted from the study by Al Soheil and Chahine (2021), after permission was sought from the authors.

3.2.2. Study site

The study was conducted at the University of the Witwatersrand, Faculty of Health Sciences, in Johannesburg.

3.2.3. Study participants

3.2.3.1.Inclusion criteria

The study included students registered across all degrees within the Faculty of Health Sciences, both undergraduate and postgraduate, engaged in full-time or part-time studies over the age of 18 years. Students from all genders were included.

3.2.3.2.Exclusion criteria

Students registered in any other Faculty besides the Faculty of health sciences, and all staff, were excluded.

3.2.4. Sample size

The sample size was calculated using finite and infinite sample size calculations based on prevalence (Equations 1 and 2).

$$n_0 = \frac{z^2 \text{ X } p\ (1\text{-}p)}{\varepsilon^2}$$

where,

- z = the z score corresponding to the desired confidence level,
- Ɛ = margin of error,
- n_0 = Sample size calculated using the formula for infinite populations,
- p = population proportion

Equation 1: Infinite sample size calculation (Goh *et al*., 2022)

Assuming a knowledge and attitude prevalence of 0.5 (i.e., 50%), confidence interval of 95% corresponding to a z-score of 1.96, and a margin of error (Ɛ) of 0.05 (i.e., 5%) among 6000 students, the sample size was calculated (Equation 1):

$$n_0 = (1.96^2 \text{ X } 0.5\ (1\text{-}0.5))/\ (0.05)^2$$

$$= 384.16$$

To calculate for the finite population, a Modified Cochran's Formula was used (Equation 2):

$$n = n_0 / [1 + \{(n_0 - 1)/Pop\}]$$

where,

- n = adjusted sample size for finite population calculated using the formula for infinite populations,
- n_0= sample size calculated using the formula for infinite populations,
- pop = population

Equation 2: Finite sample size calculation (Thakur, 2022)

$$= 384/1 + \{(384-1)/6000\}$$
$$= 361$$

The minimum sample size required was 361.

3.2.5. Data collection

3.2.5.1.Development of the survey instrument

Written permission to utilise the validated questionnaire was obtained from the corresponding author, Bahia Chahine (Appendix D). The tool was selected as it aligned with the objectives of the study namely assessing knowledge on PCOS, including its pathophysiology, symptoms, complications, and management. Additionally, the questionnaire incorporated questions aimed at understanding participants' perceptions of the disorder, which served as attitude-related questions. To ensure the instrument's relevance to the South African context and the study population, language adjustments were made, and additional questions were included. Based on feedback from supervisors, questions were rephrased where necessary to enhance clarity and understanding for the target population. Two attitude-related questions were added to the original questionnaire to deepen the understanding of participants' perspectives (Alshdaifat *et al*., 2021, Douglas *et al*., 2021).

The questionnaire comprised 50 questions structured into four sections, designed to comprehensively assess participants' awareness, knowledge, and attitudes regarding PCOS. The first section included six questions capturing participant demographic information, such as gender, age, marital status, degree type (undergraduate or postgraduate), degree, and academic year (current degree). The study focused on university students, which influenced the selection of demographic questions. Al Soheil and Chahine (2021) included questions on employment status, physical activity, smoking status, chronic medical conditions, menstrual cycle length, history of infertility, and oral contraceptive use. Since the study aimed to assess knowledge and attitudes toward PCOS within a university setting, demographic questions were tailored to academic factors, such as degree type and field of study, rather than broader lifestyle and reproductive health characteristics. While factors like employment, smoking, and menstrual history could influence PCOS awareness, they were not central to the study's primary objective, which focused on how educational background and academic exposure shape students' understanding of PCOS. Therefore, the decision not to include all demographic questions from the Al Soheil and Chahine (2021) study in the current study was based on the specific research focus and target population.

Similar to the study by Al Soheil and Chahine (2021), which assessed general knowledge, complications, and management of PCOS among Lebanese women, the current study also examined these aspects. By aligning the questionnaire with the scope of the study, the research

maintained a focused and relevant approach, ensuring that the data collected directly contributed to understanding how future healthcare professionals perceive PCOS and how academic training influences awareness and attitudes toward the condition.

Gender was categorised as male or female. Marital status options included married, single, and other. Degree types were classified as undergraduate or postgraduate, with specific undergraduate degrees listed. Academic year was categorised from first year to sixth year. The second section of the questionnaire comprised of three questions focusing on participants' diagnosis and awareness of PCOS, along with sources of information. The response options included “Yes,” “No,” and “I don’t know,” with an additional “Not applicable” option specifically for the diagnosis-related question. The question on sources of information was a multiple-response item, allowing participants to select all applicable options. The third section contained thirty-two close-ended questions evaluating participants' knowledge of the female reproductive system and PCOS across five domains: physiology (five questions), pathophysiology (six questions), symptoms (five questions), complications (eight questions), and management (eight questions). To ensure accurate analysis and account for low response frequencies, adjustments were made. Specifically, response options for "False" or "No" were combined with "I don’t know" for all responses, and for two negative statements, "True" or "Yes" were similarly merged with "I don’t know." These adjustments facilitated the calculation of total knowledge scores. Out of the thirty-two questions, two were negative statements. Negative statements encouraged participants to carefully consider the answers, potentially leading to more thoughtful and accurate responses. The participants that answered correctly scored ‘1’ and incorrect or unsure answers scored ‘0’. The fourth section included nine questions aimed at assessing the attitude of the participants toward PCOS. The attitude of the participants toward PCOS were assessed using a Likert-like scale, with options ranging from “Strongly agree” (five points) to “Strongly disagree” (one point). Completing the questionnaire took approximately 15–20 minutes.

3.2.5.2.Validity and Reliability

Fifteen health science undergraduates and postgraduates were recruited to test the questionnaire (Appendix H) to verify that the layout, structure, and language was clear and appropriate for the participants to assess the validity and reliability of the questionnaire. Additionally, the test exercise provided insight into the average time required for completion of the questionnaire.

The data collected during this test was not included in the final survey results. Based on feedback, minor revisions were made to refine the instrument. Reliability was evaluated using Cronbach's alpha, which yielded a coefficient of 0.9048. This indicates excellent internal consistency, confirming that the questionnaire is a reliable tool for measuring knowledge and attitudes toward PCOS.

3.2.5.3.Mitigation of Bias

Several strategies were employed to minimise potential sources of bias. Participants were assured of the confidentiality and anonymity of their responses, with no personally identifiable information collected. This was intended to reduce social desirability bias and encourage honest and accurate reporting. Additionally, standardised instructions were provided to all participants to ensure consistency in administration.

3.2.5.4. Process of data collection

The survey was conducted via an online questionnaire using the Research Electronic Data Capture (REDCap) tool, hosted by the University of the Witwatersrand, which included a consent form (Appendix E) and a participant information sheet (Appendix F). These documents were provided to ensure participants had a clear understanding of the research objectives, the nature of involvement, and the ethical considerations, such as confidentiality and voluntary participation. To maximise reach and ensure broad participation, the link to the online survey was distributed to the student population through the Deputy Registrar's office. Students were invited to participate in the study via email, with the survey running from 4 July 2023 to 2 April 2024. No reminder emails were sent out during the data collection period. A total of 6,000 students received the questionnaire. After excluding those who did not provide consent and those with incomplete responses, 349 complete responses were retained for the final analysis. Participant responses were collected and securely stored using REDCap (Version 12.5.7). REDCap is a secure, online platform designed to support data collection and management for research projects. These measures safeguarded participant confidentiality and complied with ethical standards for handling sensitive information.

3.2.6. Ethical consideration

Ethical clearance (M221048) to conduct the study was obtained from the Wits Human Research Ethics Committee (Medical) (Appendix G). Permission to conduct the study and to disseminate

the survey among students at the University of the Witwatersrand was granted by the office of the Deputy Registrar. No identifying participant information was collected to maintain confidentiality. Participation in this study was anonymous. Access to the data was limited to the researchers involved in the study, and all information was securely stored on a password protected device and be kept for a period of six years in the absence of publication, or alternatively for two years following the publication date of any resultant article.

3.2.7. Data analysis

The data was analysed using Stata 18 statistical software. To facilitate analysis and address low response frequencies, certain variables were consolidated. For marital status, the "Other" option combined participants who identified as "divorced" with those who selected "prefer not to disclose." Similarly, within undergraduate degree programmes, the "Other" category encompassed less common qualifications outside of the MBBCh and BPharm degrees. For postgraduate degrees, "Other" included programmes such as the Diploma in Public Health (DPH) and the Postgraduate Diploma (PGDip). These classifications were applied to group smaller academic programmes and ensure meaningful comparisons. Additionally, in the question assessing awareness of PCOS, the responses "I don't know" and "No" were merged into a single "No" category due to low individual frequencies and to enhance interpretability.
Each knowledge item was used to derive a variable called knowledge score that is a continuous variable. It was not normally distributed therefore the continuous variables of knowledge score was reported as median and interquartile range (IQR). All the knowledge items were summed up to calculate a total knowledge score. This was determined from the questionnaire selected by Al Soheil and Chahine (2021). A score of one (1) was assigned for each correct answer, with the total possible scores ranging from a minimum of zero to a maximum of thirty-two (32). Knowledge score was categorised as inadequate (0-10), satisfactory (11-21), or good (22-32). The Cronbach's alpha, which yielded a result of 0.9048 indicated that the questionnaire demonstrated excellent reliability in measuring knowledge and attitude.

The students also answered to what extent they agree, are neutral, or disagree with the nine variables related to PCOS to assess attitude of the disorder. This was based on the scoring approach used in the study by Goh *et al*. (2022), which employed a 5-point Likert scale for evaluating practice-related behaviours. Goh *et al.* (2022) included 10 items with possible total scores ranging from 10 to 50, where scores of 10 to 30 were classified as poor practices and 31 to 50 as good practices. Adapting this approach, the study used a 9-item Likert scale to assess

attitudes, resulting in a total possible score ranging from a minimum of nine to a maximum of 45. A cut-off score was established to categorise attitude of participants toward PCOS as either positive or negative based on the 50% score mark. Scores of 23 or more were classified as reflecting a positive attitude, while scores below 23 indicated a negative attitude. This method provided a consistent and structured means of evaluating and interpreting the attitudinal data collected from participants. The Fisher's exact test and chi-square test was used to estimate the relationships between the covariates and the knowledge and attitude of PCOS. A p-value of ≤0.05 was regarded as significant.

3.3.Results

3.3.1. Response rate

The questionnaire was emailed to the entire faculty population of 6,000 students. A total of 349 students responded, yielding a response rate of 6%.

3.3.2. Demographic characteristics of student participants

The study included 349 participants of which 286 were females (81.9%) and 63 were males (18.1%). The age of participants ranged from 18 to 54 years and the median age was 22 [IQR 20-24]. The majority of participants were in the age group 20–21 years old with a significant proportion of them being single (N=302, 86.5%) (Table 3.1).

Table 3.1: Demographic information of student participants

Demographic	Category	Frequency (N)	Percentage (%)
Age	20-21	106	30.4
	22-23	92	26.4
	24-25	38	10.9
Gender	Female	286	81.9
	Male	63	18.1
Marital status	Married	35	10
	Single	302	86.5
	Other	12	3.4

The majority of participants were enrolled in undergraduate programmes (N=251, 71.9%), with the MBBCH (Bachelor of Medicine and Bachelor of Surgery) being the most common, accounting for 37.8% (N=95) of all undergraduates (

Table 3.2). This was followed by BPharm (Bachelor of Pharmacy) at 29.5% (N=74), and BHSc (Bachelor of Health Sciences) at 9.2% (N=23). These three programmes collectively represented over 75% of the undergraduate sample. The distribution of participants by year of study and degree type indicated notable trends across academic levels. Postgraduate participants were more prevalent in the early years of study, particularly in the first and second years, where they constituted the majority. In contrast, undergraduate participants dominated from the third year onwards, accounting for nearly all participants in the fifth year and the sixth year is quite small overall but has a slight postgraduate majority. This pattern highlights a clear shift in participant composition as the years of study progress.

Table 3.2: Distribution of undergraduate and postgraduate degrees by demographics

Demographic	Category	Frequency (N)	Percentage (%)
Degree type (N=349)	Postgraduates	98	28.08
Year of study (N=98)	1st	48	48.99
	2nd	31	31.63
	3rd	10	10.20
	4th	6	6.12
	5th	-	-
	6th	3	3.06
Degree type (N=349)	Undergraduates	251	71.92
Year of study (N=251)	1st	39	15.54
	2nd	34	13.55
	3rd	82	32.66
	4th	58	23.11
	5th	36	14.34
	6th	2	0.80
Degree Programme (N=349)	Undergraduate	251	71.92
Undergraduate degree programme (N=251)	MBBCH	95	37.85
	BPharm	74	29.48
	BHSc	23	9.16
	BNurs	13	5.18
	BCMP	12	4.78
	BDS	10	3.98
	BSc OT	8	3.19
	BSC Physiotherapy	5	2.00
	BOHSc	4	1.59
	Other	7	2.79
Degree Programme (N=349)	Postgraduate	98	28.08
Postgraduate degree programme (N=98)	Masters	56	57.14
	PhD	18	18.37
	Other	24	24.49

3.3.3. Knowledge of student participants toward PCOS

The study reported that less than half of the participants (46.7%) demonstrated good knowledge of PCOS, answering between 22 and 32 questions correctly (Table 3.3). The maximum possible score was 32. The median (median [IQR]) knowledge was score 21 [15-26] indicating that the median knowledge score for at least 50% of participants was in the satisfactory range (11-21). The study sample consisted of a greater number of female participants (81.9%) compared to males (N = 18.1%). Among participants who demonstrated good knowledge of PCOS, the vast majority were female (84.7%), while only 15.3% were male. Additionally, 42.2% of

participants achieved satisfactory knowledge (11–21 correct answers), again with a predominance of female respondents (81.6%). Only 11.2% of participants demonstrated inadequate knowledge (scores between 0 and 10), and even within this lowest category, females accounted for over 70% of responses. This distribution reflects a consistent pattern of female dominance across all knowledge categories, which corresponds with the overall gender composition of the sample. However, the proportion of males in the inadequate knowledge category was notably higher relative to the overall representation, suggesting a potential gender-based gap in the knowledge of PCOS.

Table 3.3: Overall knowledge scores on PCOS, including distribution of knowledge by gender

Knowledge category (score range)	**Interpretation**	**All participants (N=349) Frequency, (%)**	**Male participants N=63 Frequency (%)**	**Female participants N=286 Frequency (%)**
Inadequate (0-10)	Participants who responded to 0-10 questions correctly, indicating inadequate knowledge	39 (11.17)	11 (17.46)	28 (9.79)
Satisfactory (11-21)	Participants who responded to 11-21 questions correctly, indicating satisfactory knowledge	147 (42.12)	27 (42.86)	120 (41.96)
Good (22-32)	Participants who responded to 22-32 questions correctly, indicating good knowledge	163 (46.70)	25 (39.68)	138 (48.25)

When the knowledge scores were analysed within each gender group separately, the following patterns emerged. Of the 286 female participants, 138 (48.25%) demonstrated good knowledge of PCOS. Similarly, among the 63 male participants, only 25 (39.68%) achieved a good knowledge score. While the difference is modest, these findings suggest that female participants were somewhat more knowledgeable about PCOS than the male counterparts. However, it is important to note that this difference was not statistically significant ($P<0.170$), indicating that gender was not a decisive factor in determining knowledge levels within this sample. Similarly, marital status showed no significant association with knowledge of PCOS ($P <0.194$) (Table 3.4).

Table 3.4: Knowledge associations per category of PCOS among student participants

Variables	**Knowledge**							
	Inadequate		**Satisfactory**		**Good**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Gender								**P<0.170**
Female	28	71.8	120	81.6	138	84.7	286	81.9
Male	11	28.2	27	18.4	25	15.3	63	18.1
Age								**P<0.001**
18-19 yrs	7	17.9	25	17	11	6.7	43	12.3
20-21 yrs	12	30.8	58	39.5	36	22.1	106	30.4
22-23 yrs	7	17.9	31	21.1	54	33.1	92	26.4
24-25 yrs	4	10.3	13	8.8	21	12.9	38	10.9
26-27 yrs	0	0	6	4.1	9	5.5	15	4.3
28-29 yrs	2	5.1	1	0.7	9	5.5	12	3.4
>29 yrs	7	17.9	13	8.8	23	14.1	43	12.3
Marital status								**P<0.194**
Married	3	7.7	9	6.1	23	14.1	35	10
Single	34	87.2	133	90.5	135	82.8	302	86.5
Other	2	5.1	5	3.4	5	3.1	12	3.4
Degree type								**P<0.133**
Postgraduate degree	12	30.8	33	22.4	53	32.5	98	28.1
Undergraduate degree	27	69.2	114	77.6	110	67.5	251	71.9
Undergraduate degree programme								**P<0.001**
BCMP	6	22.2	3	2.6	3	2.7	12	4.8
BDS	2	7.4	7	6.1	1	0.9	10	4
BHSc	3	11.1	11	9.6	9	8.2	23	9.2
BNurs	1	3.7	6	5.3	6	5.5	13	5.2
BOHSc	1	3.7	3	2.6	0	0	4	1.6
BPharm	5	18.5	46	40.4	23	20.9	74	29.5
BSc Physiotherapy	2	7.4	0	0	3	2.7	5	2
BSc OT	1	3.7	6	5.3	1	0.9	8	3.2
MBBCH	5	18.5	31	27.2	59	53.6	95	37.8
Other	1	3.7	1	0.9	5	4.5	7	2.8
Total	27	100	114	100	110	100	251	100
Postgraduate degree programme								**P<0.089**
Masters	4	33.3	23	69.7	29	54.7	56	57.1
PhD	5	41.7	5	15.2	8	15.1	18	18.4
Others	3	25	5	15.2	16	30.2	24	24.5
Year of study								**P<0.001**
1st	15	38.5	36	24.5	36	22.1	87	24.9
2nd	8	20.5	23	15.6	34	20.9	65	18.6
3rd	7	17.9	54	36.7	31	19	92	26.4
4^{th} to 6^{th}	9	23	34	23.2	62	38	105	30
Heard of the term PCOS								**P<0.001**
No	21	53.8	9	6.1	3	1.8	33	9.5
Yes	18	46.2	138	93.9	160	98.2	316	90.5

Variables	Knowledge							
	Inadequate		Satisfactory		Good		Total	
	N	%	N	%	N	%	N	%
Diagnosed with PCOS by a health professional								**P<0.001**
I don't know	0	0	4	2.7	6	3.7	10	2.9
No	37	94.9	127	86.4	100	61.3	264	75.6
Not applicable	2	5.1	9	6.1	11	6.7	22	6.3
Yes	0	0	7	4.8	46	28.2	53	15.2

There were significant associations between knowledge of PCOS with age (P<0.001), field of study (undergraduate) (P<0.001), academic year of study (P<0.001), having heard of PCOS (P<0.001), and having been diagnosed with PCOS (P<0.001) (Table 3.4). Further subgroup analysis identified that of the 251 undergraduate participants, 110 (43.8%) demonstrated good knowledge, while 53 (54.1%) of the 98 postgraduate participants achieved the same. Among the 92 participants in third year—including both 10 postgraduates and 82 undergraduates—only 31 (33.7%) were classified as having good knowledge of PCOS, suggesting lower awareness at this level of study. Age also appeared to influence knowledge scores, with 36 (33.96%) of participants aged 20–21 demonstrating good knowledge, and a larger portion in this group (N=58, 54.7%) demonstrating a satisfactory level of understanding.

When comparing the undergraduate academic programmes, 53.6% of participants pursuing a MBBCh degree had good knowledge, compared to 20.9% of participants pursuing a BPharm degree. This suggests that participants pursuing a MBBCh degree were more than twice as likely to have good knowledge of PCOS, pointing to a marked disparity in knowledge levels between the two programmes. In terms of inadequate knowledge, 18.5% of students enrolled in both the MBBCH and BPharm undergraduate programmes fell into this category. Additionally 10.76% of undergraduate participants and 12.24% of postgraduate participants demonstrated inadequate knowledge of PCOS. Among participants aged 20-21 years, 11.32% fell into the inadequate category, while 7.6% of third year participants demonstrated inadequate knowledge of PCOS. These findings suggest that gaps in knowledge persist across levels of study, academic programmes, and age groups.

3.3.4. Awareness of student participants about PCOS

Out of 349 participants, 316 (90.5%) reported having heard of PCOS, while 31 (8.9%) indicated being unfamiliar with the condition (Figure 3.1). Among those who were aware of

PCOS, 160 (50.63%) participants showed a good level of knowledge. Notably, a total of 100 (37.87%) participants not diagnosed with PCOS, had good knowledge of PCOS, while a higher proportion, 46 (86.79%) participants, with a diagnosis of PCOS demonstrated good knowledge. These findings suggesting that a PCOS diagnosis may contribute to increased knowledge acquisition about the condition (Figure 3.1).

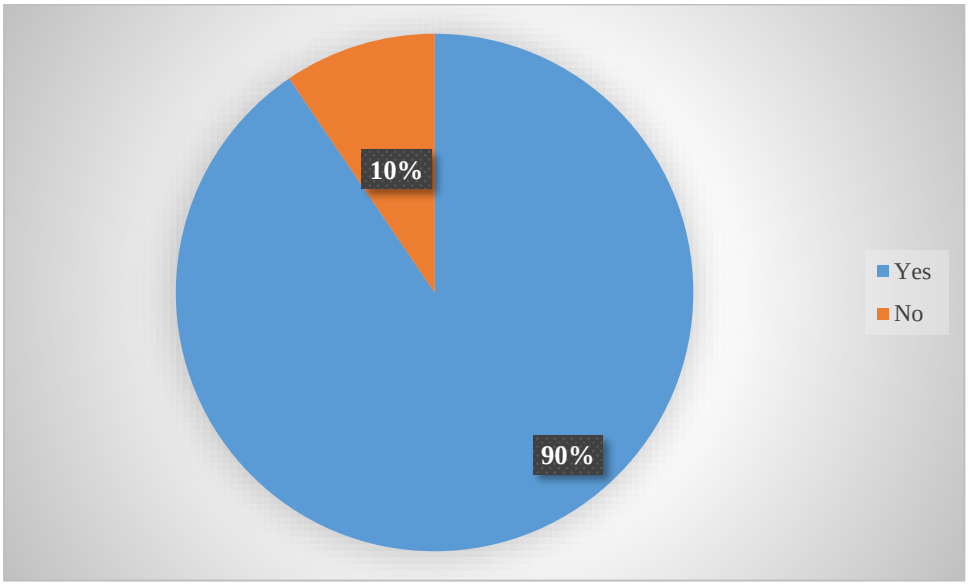


Figure 3.1: Awareness of student participants on PCOS

3.3.5. Knowledge of female reproductive system physiology

Majority of the participants (79.1%) correctly identified that a follicle is a small fluid-filled sac containing a single egg, and 73.4% recognised that a transabdominal ultrasound is a diagnostic tool for PCOS. However, only 31.5% were aware that insulin stimulates the production of testosterone by the ovary. Additionally, 49.6% correctly understood the role of progesterone in regulating the menstrual cycle. Knowledge regarding ovarian morphology was also mixed, with 52.4% of participants recognising that polycystic ovaries contain more visible follicles than non-polycystic ovaries, while 65% correctly identified that polycystic ovaries ovulate less frequently (Table 3.5).

Table 3.5: Student participants' knowledge of PCOS physiology and pathophysiology

Physiology of PCOS	**Yes (N)**	**Respondents (%)**
A follicle is a small fluid filled sac with a single egg inside	276	79.1
Ovulating more frequently improves fertility	196	56.2
After egg release (ovulation), the hormone progesterone is released which will allow the uterine lining to shed in a normal menstrual period	173	49.6
In patients with PCOS, an increase in abdominal fat increases circulating androgen	203	58.2
Insulin stimulates the production of testosterone by the ovary	110	31.5
Polycystic ovaries contain more visible follicles than a non-polycystic ovary	183	52.4
Polycystic ovaries may ovulate less frequently than a non-polycystic ovary	227	65
Male hormone (testosterone) production is increased in women with PCOS	255	73.1
Insulin levels are commonly elevated in women with PCOS	207	59.3
A transabdominal ultrasound is one of the methods used to diagnose PCOS	256	73.4
A specific blood test is available for the diagnosis of PCOS*	256	73.4

*Negatively worded item -A correct response is one that disagrees with the statement.

3.3.6. Knowledge of symptoms on PCOS

Most participants were able to correctly identify the common symptoms of PCOS. The majority (88.8%) recognised irregular menstruation or absence of a menstrual cycle as a symptom. Excessive irregular hair growth (80.2%), weight gain (79.9%), and acne (77.9%) were also widely acknowledged. However, awareness of thinning scalp hair as a symptom was comparatively lower, with only 63% correctly identifying it (Table 3.6).

Table 3.6: Student participants' knowledge of PCOS symptoms

Symptoms of PCOS	**Yes (N)**	**Respondents (%)**
Irregular menstruation/ absence of a menstrual cycle (period)	310	88.8
Excessive hair growth (hirsutism) on the face and body	280	80.2
Weight gain	279	79.9
Thinning scalp hair	220	63
Acne	272	77.9

"Yes" is the correct answer for all these questions

3.3.7. Knowledge of PCOS complications

A large proportion of participants (89.1%) correctly identified infertility as a potential consequence, while 79.1% acknowledged the increased risk of recurrent miscarriages.

Additionally, 72.5% recognised the association between PCOS and depression, and 68.2% were aware of the increased risk of anxiety. Similarly, 64.8% identified metabolic syndrome as a common complication. Awareness of cancer risks was inconsistent; 84.5% incorrectly identified breast cancer as a PCOS complication, whereas only 58.5% correctly recognised the increased risk of endometrial cancer (Table 3.7).

Table 3.7: Student participants' knowledge on PCOS complications

Complications of PCOS	**Yes (N)**	**Respondents (%)**
PCOS increases the risk of recurrent miscarriages	276	79.1
Metabolic syndrome is common in women with PCOS	226	64.8
Patients with PCOS have an increased risk of infertility (inability to conceive)	311	89.1
Patients with PCOS have an increased risk of depression	253	72.5
Patients with PCOS have an increased risk of anxiety	238	68.2
Patients with PCOS have an increased risk of developing breast cancer*	295	84.5
Patients with PCOS have an increased risk of developing endometrial cancer	204	58.5

*Negatively worded item - A correct response is one that disagrees with the statement.

3.3.8. Knowledge of PCOS management

Only 49% recognised insulin-sensitizers like metformin as part of PCOS management, while 68.5% correctly identified COCs as a treatment option. Awareness of the role of insulin reduction was also limited, with only 36.1% understanding that lowering insulin levels may help trigger ovulation, and 48.4% recognising that it may help reduce free testosterone. In of lifestyle interventions, 75.1% correctly identified that exercise, healthy dieting, and weight loss reduce the risk of metabolic syndrome in PCOS patients. However, fewer participants (49.6%) were aware that strength training to increase muscle mass is beneficial in managing PCOS, with effectiveness noted in individuals with obesity-related symptoms (

Table 3.8).

Table 3.8: Student participants' knowledge on PCOS management

Management of PCOS	**Yes (N)**	**Respondents (%)**
Combined oral contraceptives are indicated in the treatment of PCOS.	239	68.5
Insulin-sensitisers such as metformin are indicated in the treatment of PCOS.	171	49
In patients with PCOS, lowering insulin levels may help decrease free testosterone	169	48.4
In patients with PCOS, lowering insulin levels may help trigger ovulation.	126	36.1
Physical exercise improves PCOS symptoms by decreasing insulin levels.	212	60.7
Weight loss improves PCOS symptoms.	220	63
Exercises aimed at increasing muscle mass are encouraged in the management of obese patients with PCOS.	173	49.6
Exercise, healthy dieting, and weight loss decrease the risk of developing metabolic syndrome in patients with PCOS.	262	75.1

"Yes" is the correct answer for all these questions

3.3.9. Attitude of student participants towards PCOS

Responses to the nine attitude-related questions revealed varied views among participants. When asked whether PCOS is a chronic condition with no cure, slightly more participants agreed than disagreed, indicating differing levels of understanding or beliefs about the long-term nature of the condition. Regarding the use of hormone-regulating herbal treatments for PCOS, many participants either agreed or remained neutral, suggesting openness to alternative therapies despite potential uncertainty about the efficacy. A total of 79.4% of participants recognised PCOS as a global health concern, and most agreed that individuals living with the condition require social and emotional support. The participants also demonstrated an understanding of the psychosocial impact of PCOS, with many acknowledging that affected individuals often experience body image dissatisfaction and a sense of diminished femininity. Encouragingly, there was a strong interest in further education about PCOS, with the majority expressing a desire to learn more about the condition. Notably, 88.5% of participants supported the idea that universities serve as appropriate platforms for PCOS awareness campaigns and educational initiatives, underscoring the potential role of institutions in improving understanding and reducing stigma associated with the condition. Consistent with these positive attitudes, the terminology "PCOS" did not appear to cause substantial confusion, as 57.3% of participants disagreed that the name was misleading or difficult to interpret (*Figure 3.2*).

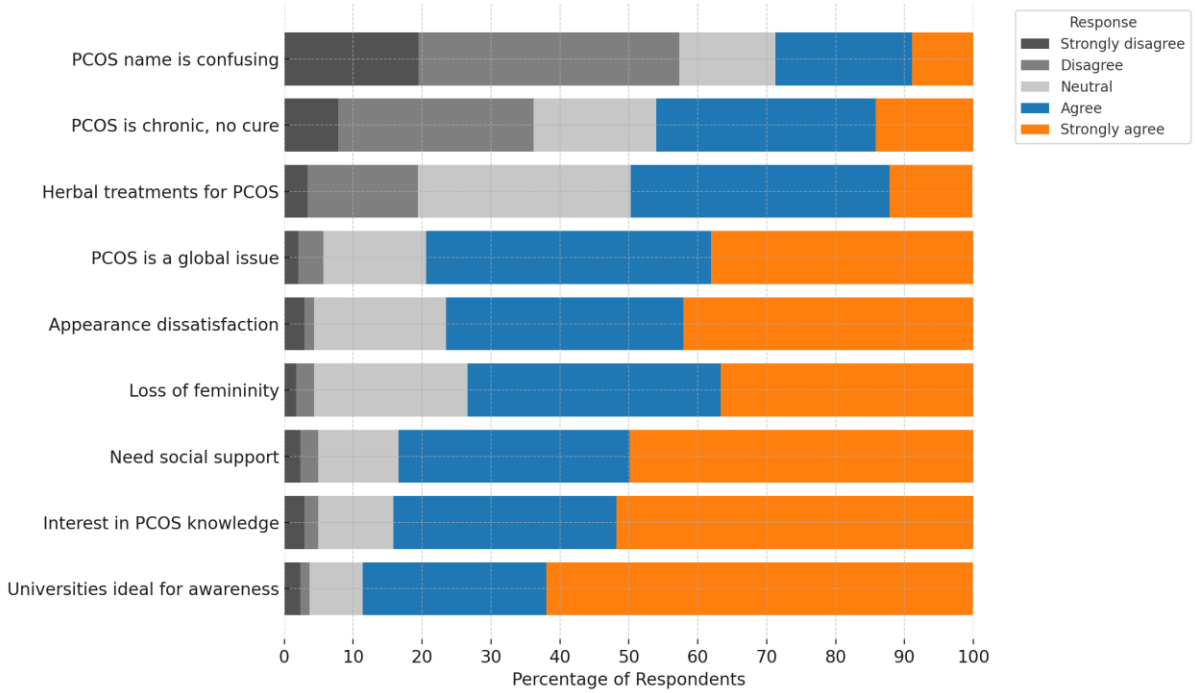


Figure 3.2: Attitude of student participants (N=349) towards PCOS

Statistical analysis revealed no significant association between demographic covariates and attitudes toward PCOS, suggesting that attitudes were generally consistent across different student subgroups, regardless of gender, age, marital status, degree type, or undergraduate degree programme. The study reported that, overall, 97.99% had a positive attitude towards PCOS. The median (median [IQR]) attitude score was 35 [32-37], indicating that the median attitude score for at least 50% of participants was in the positive attitude range (23-45). In terms of gender, 98.3% of females (N=281/286) and 96.8% of males (N=61/63) demonstrated a positive attitude toward PCOS, suggesting minimal gender differences in overall perceptions (Table 3.9). Age also appeared to play a role in positive attitudes. In the 20–21-year age group, 98.1% (N=104/106) expressed a positive attitude towards PCOS, and this group represented the majority (30.4%) of participants with positive attitudes across the sample. Marital status showed a similar trend, with 97.1% (N=34/35) of married participants and 98.3% (N=297/302) of single participants indicating positive attitudes. This suggests that marital status did not have a major influence on perceptions toward PCOS. Academic background and degree type were also examined. Among participants pursuing a MBBCh degree, 96.8% (N=92/95) reported a positive attitude.

Table 3.9: Attitude of student participants towards PCOS at Witwatersrand Health Science Campus, South Africa

Variables	**Attitude**					
	Negative		**Positive**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**
Gender						**P=0.465**
Female	5	71.4	281	82.2	286	81.9
Male	2	28.6	61	17.8	63	18.1
Age						**P=0.893**
18-19 yrs	0	0	43	12.5	43	12.3
20-21 yrs	2	28.6	104	30.4	106	30.4
22-23 yrs	3	42.6	89	26	92	26.4
24-25 yrs	1	14.3	37	10.8	38	10.9
26-27 yrs	0	0	15	4.4	15	4.3
28-29 yrs	0	0	12	3.5	12	3.4
>29 yrs	1	14.3	42	12.3	43	12.3
Marital status						**P=0.383**
Married	1	14.3	34	9.9	35	10
Single	5	71.4	297	86.8	302	86.5
Other	1	14.3	11	3.2	12	3.4
Degree type						**P=0.412**
Postgraduate degree	1	14.3	34	9.9	35	10
Undergraduate degree	6	85.7	254	71.6	254	71.9
Undergraduate degree programme						**P =0.990**
BCMP	0	0	12	4.9	12	4.78
BDS	0	0	10	4.08	10	3.98
BHSc	1	16.7	22	8.9	23	9.2
BNurs	0	0	13	5.3	13	5.2
BOHSc	0	0	4	1.7	4	1.6
BPharm	2	33.3	72	29.4	74	29.5
BSc Physiotherapy	0	0	5	2	5	1.9
BSc_OT	0	0	8	3.27	8	3.2
MBBCH	3	50	92	37.6	95	37.9
Other	0	0	7	2.9	7	2.8

3.3.10. Sources of information

There was a wide variation in the sources from which participants obtained information. Many participants sourced information from social media (N=157, 18%), medical professionals (N=155, 18%), internet sources (N=137, 16%), and subject syllabus lecture material (N=110, 12.6%) (Figure 3.3).

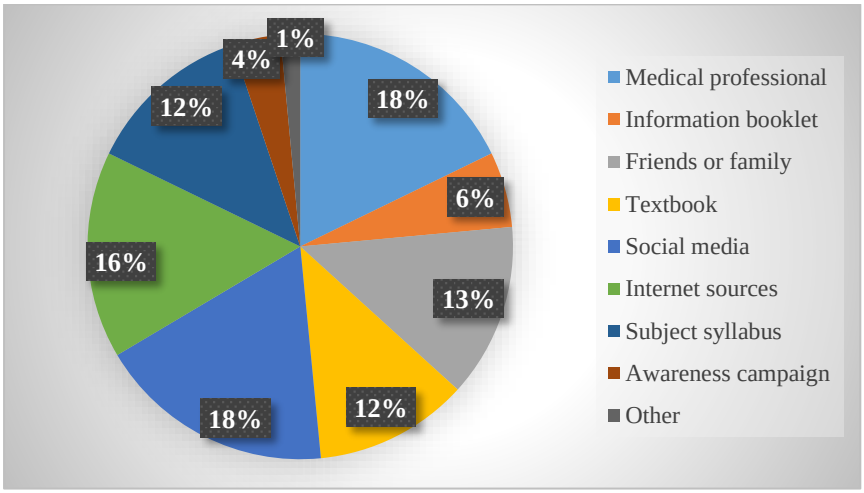


Figure 3.3: Percentage of student participants using different sources of information

The findings suggest that while formal sources such as healthcare professionals (18%) were among the most frequently used, academic content like textbooks (12%) was less commonly cited. In comparison, informal and easily accessible platforms such as social media (18%) and internet sources (16%) and were also widely utilised by participants. Textbooks and awareness campaigns were each reported by 12% and 4% of participants, respectively, while information booklets (6%) and other sources (1%) were less frequently used. These findings indicate that both formal and informal information sources were utilised by student participants. Notably, digital platforms such as internet searches and social media collectively accounted for nearly 30% of responses, indicating widespread use. In contrast, traditional public health tools such as information booklets and awareness campaigns were among the least reported sources.

CHAPTER 4 - DISCUSSION

4.1.Discussion

4.1.1. Introduction

There is a paucity of research on the knowledge and attitudes of PCOS among university students, both globally and in South Africa. Based on the findings of the scoping review (Chapter 2), this is the first study to describe student knowledge and attitudes toward PCOS in South Africa. This chapter presents a comprehensive discussion of the study findings, within the broader context of existing literature. The results are examined in relation to the study objectives, highlighting both expected outcomes and novel insights. Key themes such as gender-based differences, levels of knowledge across different degree programs, impact of limited knowledge and benefits of improved knowledge, and sources of information are explored.

Attention is also given to attitudes of participants toward lifestyle management, as well as the sources, both formal and informal, from which information about PCOS, was sought. Additionally, the discussion addresses areas of uncertainty and common misconceptions identified in the responses, which point to gaps in knowledge of PCOS and potential targets for educational interventions. Finally, the chapter considers the practical implications of these findings for academic curricula, health promotion, and the preparation of future healthcare professionals. Furthermore, this chapter evaluates how participants' knowledge and attitude align—or diverges—from established clinical understanding of PCOS and how this may affect future healthcare delivery. The findings are not only discussed in terms of what they reveal about current participant awareness but also in terms of what they imply for future training, policy development, and public health strategies.

4.1.2. Gender disparities in PCOS knowledge

This study included both male and female university students. Studies have overwhelmingly focused on evaluating the knowledge of PCOS among females, given that PCOS predominantly affects the female reproductive system (Hussin and Kadir, 2020). However, this exclusion of male participants represents a significant limitation, particularly in understanding how awareness and attitudes of males can influence both personal relationships and the management of the condition (D'almeida *et al*., 2024). As observed in this study, research that include both genders typically report higher female participation, perhaps reflecting greater perceived

relevance among women (Sabitha and Sunanada, 2016; Devi *et al*., 2017; Hussin and Kadir, 2020; Rao *et* al., 2020; Sasikala *et al*., 2021; Sehar, 2021; Ghosh *et al*., 2022). Moreover, research consistently shows that males score lower in PCOS knowledge (Hussin and Kadir, 2020; Rao *et al*., 2020; Sasikala *et al*., 2021). In the current study, a consistent pattern of increased knowledge of PCOS across all categories was observed in females. Inadequate knowledge of PCOS was observed in 9.7% of females (28 out of 286) and 17.5% of males (11 out of 63). The study also found that only 39.7% of all males demonstrated good knowledge. This highlights a gender-based knowledge gap, particularly among male participants, which may be addressed through more inclusive and targeted educational strategies in university curricula. This finding is consistent with the results reported by Rao *et al*. (2020), where 83% of male participants rated knowledge of PCOS as "know some" or less, and 42.6% stated that they "know nothing" about the condition. These results indicate that male participants may be less exposed to or engaged with information about PCOS, a condition often perceived as primarily affecting females (Rao *et al*., 2020). Male participants may also have had fewer opportunities for exposure to PCOS-related information through formal education or personal experience (D'almeida *et al*., 2024). This underscores the need for more inclusive educational strategies that target both genders, especially within health science settings where future healthcare professionals are being trained.

Unlike the female counterparts, who may relate directly to the symptoms or know peers with PCOS, males may lack such connections. This suggests that limited knowledge among male students is a common trend across university settings (Devi *et al*., 2017). These findings align with existing literature underscoring the need to enhance male engagement and understanding of PCOS (Muhaidat *et al*., 2023). Knowledge among males can significantly improve the quality of life for both partners by fostering emotional support, enhancing communication, and promoting a collaborative approach to managing the condition (D'almeida *et al*., 2024). Moreover, males often experience emotional distress related to the partner's PCOS, which can affect relationship dynamics (D'Almeida *et al*., 2024). Thus, involving male partners in discussions about female reproductive health is vital (D'almeida *et al*., 2024). Targeting educational initiatives towards both male and female students can promote a shared understanding (Muhaidat *et al*., 2023). By doing so, these programs can help dispel misconceptions and reduce stigma surrounding women's health, ultimately encouraging a more inclusive and supportive environment (D'almeida *et al*., 2024). Thus, broadening the focus to

include both genders not only enriches the understanding of PCOS but also enhances the support networks essential for managing the condition effectively (D'almeida *et al*., 2024).

Understanding PCOS is crucial for male partners, as it impacts both fertility and quality of life for couples in reproductive years (Jindal and Gupta, 1989). PCOS is linked to psychological conditions like anxiety and depression, affecting women's self-esteem and overall well-being (Dokras *et al*., 2017). This condition can also lead to lifestyle disruptions and strained relationships, highlighting the importance of male partners' awareness of these challenges (Alotaibi and Shaman, 2020). Male awareness is vital as emotional responses influence relationship dynamics (D'almeida *et al*., 2024). A study found that a number of males, not from health science backgrounds but rather from the general population, only learned about PCOS post-marriage, yet those with more education or relationship issues actively sought to understand the condition, offering better support to partners (D'almeida *et al*., 2024). Males also expressed an interest in learning more about PCOS, showing a willingness to engage constructively (D'almeida *et al*., 2024). By including male participants, the study may enhance understanding and promote proactive attitudes towards PCOS, fostering a more informed and supportive environment for individuals affected by this condition.

Consistent with findings from other studies, female university students had a better understanding of PCOS. This could likely be due to personal experiences with the condition and increased exposure to reproductive health discussions (Bahkahli *et al*., 2015). Women who experience symptoms of PCOS, such as irregular menstruation, hirsutism, acne, or *acanthosis nigricans*, are more likely to seek medical information, leading to increased knowledge of the syndrome (Bahkahli *et al*., 2015). A study conducted by Alshdaifat *et al*. (2021) among female participants in Jordan found that those experiencing symptoms such as hirsutism and acne demonstrated significantly higher knowledge scores compared to those without these symptoms. This suggests that the visible and often distressing cosmetic effects of PCOS act as a motivator for young women to research the condition and consult healthcare professionals, thereby enhancing awareness and understanding (Rizvi *et al*., 2023; Athar & Javed, 2024). However, while studies indicate that female students generally have higher awareness, knowledge gaps exist in certain areas (Ghosh *et al*., 2022). For example, research among nursing students in India found that while awareness of PCOS risk factors was relatively high among the female nurses, understanding of its complications was limited (Sasikala *et al*., 2021).

The trend of higher knowledge among female participants aligns with existing literature on healthcare-seeking behaviour, which consistently shows that women are more engaged with healthcare services than men (Thompson *et al*., 2016). This general pattern of greater healthcare utilisation, including both preventive and treatment services, may help explain why female university students demonstrated higher levels of PCOS knowledge and more positive attitudes toward the condition. Thompson *et al*. (2016) found that women are more likely than men to consult primary care providers, a behaviour that may naturally lead to increased exposure to reproductive health information, including PCOS. Similarly, studies suggest that females demonstrate higher participation in healthcare services, which may contribute to greater awareness of PCOS compared to male health science students (Quispe-Cañari *et al*., 2021; Mametja *et al*., 2022). Globally, women are more proactive in seeking healthcare, particularly for reproductive health concerns (Elekhnawy *et al*., 2022; Scott *et al*., 2022; Suda *et al*., 2022). This gender disparity in PCOS knowledge raises the question of whether it stems from healthcare-seeking behaviour or the perception of PCOS as a female-specific condition (Rao *et al*., 2020). While clinical vulnerability may be a factor, limited engagement with reproductive health topics among male students likely contributes to knowledge gaps (Kasiri, 2021).

4.1.3. Overall knowledge and attitude toward PCOS

The findings highlighted that less than half of the participants (46.7%) displayed good knowledge of PCOS and 97.99% had a positive attitude towards PCOS. The results are consistent with findings from another study conducted exclusively among male and female medical students and similarly reported good knowledge among 57.8% of students (Subhashree Bangaru *et al*., 2021). In contrast, Fortuna and Herdiman (2023) focused on a different demographic—female non-medical participants—yet the study also revealed comparable awareness levels (47% had good knowledge) paired with generally positive attitudes toward PCOS.

In contrast, research in Malaysia indicated that 47.3% of women from the general population, encompassing individuals with varying educational backgrounds, including primary and secondary school levels, undergraduates, postgraduates, and those with both healthcare and non-healthcare-related degrees, had poor knowledge of PCOS (Goh *et al*., 2022). These findings suggest that limited awareness and understanding of PCOS is not exclusive to medical students (Fortuna and Herdiman, 2023). Limited awareness was also found among students

pursuing a BNurs degree (Devi *et al*., 2017; Ferrao *et al*., 2022). Among male and female nurses, only 10.7% were reported to have good knowledge of PCOS (Sabitha and Sunanada, 2016). In line with these findings, a study by Sehar (2021) reported that among BNurs and Diploma of General Nursing and Midwifery (DGNM) degree students, only 38.33% demonstrated adequate knowledge, further highlighting the widespread gaps in awareness, even within healthcare-related education. The current study reported that from 13 students pursuing a BNurs degree, 6 (46.15%) students had good knowledge of PCOS.

Some studies reported even lower awareness levels. Devi *et al*. (2017) reported that 100% of students in the study had poor knowledge of PCOS, while Ferrao *et al*. (2022) reported 87.4% had inadequate knowledge. However, similar to the findings of the current study, 95% of participants in the Ferrao *et* al. (2022) study had a positive attitude toward PCOS, suggesting that low awareness does not necessarily translate into negative attitudes. Consistently, Alshdaifat *et al*. (2021) highlighted a positive attitude toward PCOS awareness, with 98.9% of participants recognising the importance of spreading awareness. Additionally, PCOS-related nutrition knowledge was found to be poor (48%) among university students with PCOS (Douglas *et al*., 2021), indicating a gap in understanding the role of diet and lifestyle modifications in managing the condition. Understanding the role of lifestyle and dietary modifications is essential in the management of PCOS, given the condition's strong association with IR, metabolic dysfunction, and hormonal imbalances (Witchel *et al*., 2019). Several studies have shown that structured programs providing credible information about PCOS and its management can positively influence behaviour and clinical outcomes (Pirotta *et al*., 2021). Knowledge of dietary strategies—such as adopting low glycemic index foods and high-fiber diets—has been associated with improved insulin sensitivity and hormonal regulation (Gautam *et al*., 2025; Mohamed *et al*., 2025).

Poor knowledge of PCOS can significantly influence health outcomes, leading to poor lifestyle choices, delayed diagnosis, and inadequate management of symptoms (Muhaidat *et al*., 2023). A study among Emirati university students found that poor reproductive health knowledge and PCOS awareness was associated with unhealthy lifestyles, including low physical activity and high consumption of fast-foods (Pramodh, 2020). Similarly, the study among Arabic-speaking female university students indicated that inadequate health literacy and low awareness of PCOS contribute to poor lifestyle choices, such as physical inactivity and unhealthy eating (Maamari

et al., 2023). This may eventually lead to negative health outcomes like obesity and infertility (Maamari *et al*., 2023).

Another study reported that female nursing students demonstrated unhealthy lifestyle patterns and possessed an overall inadequate level of knowledge regarding PCOS, with a statistically significant positive correlation found between lifestyle behaviours and PCOS knowledge (Ali *et al*., 2023). In line with these findings, the current study revealed that although participants performed well on questions related to ovarian function, their knowledge was notably weaker on items addressing metabolic aspects of PCOS. This suggests a limited understanding of the broader endocrinological and lifestyle-related dimensions of the condition, which may similarly influence health behaviours and management strategies. Only 31.5% of students correctly identified that insulin stimulates the production of testosterone by the ovaries, and 58.2% recognised that abdominal fat contributes to elevated androgen levels. These gaps suggest that many students may perceive PCOS as a condition affecting only the ovaries, overlooking its broader metabolic and endocrine dimensions. Since both insulin resistance and central adiposity are critical components of PCOS pathophysiology—and are closely influenced by lifestyle—these misconceptions may hinder the adoption of effective dietary and behavioural strategies for prevention and management (Glueck and Goldenberg, 2019).

Regarding the attitude of students towards PCOS, the study found that all undergraduate participants expressed a positive attitude, which is particularly significant in the context of health education and awareness among university students. Additionally, with regards to gender, it was reported that nearly all participants—98.6% of females and 96.8% of males—demonstrated a positive attitude toward PCOS, suggesting that gender does not play a major role in shaping perceptions about the condition. These findings are aligned with previous studies such as Fortuna and Herdiman (2023) and Alshadaifat *et al*. (2021), which also reported good attitude. Similarly, marital status appeared to have minimal influence, as both single (98.67%) and married students (97.1%) reported positive attitudes—suggesting that attitudes are shaped more by academic and social environments than by personal life experiences (Qourrichi, 2023). While no statistically significant associations were found between demographic covariates and attitudes, descriptive statistics showed consistently high levels of support, empathy, and interest in the condition across the participant population.

Studies have shown that individuals with higher reproductive health knowledge are more likely to seek medical advice for irregular menstrual cycles, weight fluctuations, and other early signs of PCOS, reducing the risk of undiagnosed cases and long-term complications (Alshdaifat *et al*., 2021; Chavhan and Gupta, 2024). Furthermore, better knowledge fosters preventive behaviours, such as maintaining a healthy lifestyle and adhering to recommended medical interventions, which are essential for managing PCOS effectively (Pramodh, 2020; Maamari *et al*., 2023). Universities provide an ideal setting for structured PCOS education through curriculum integration, peer-led initiatives, and health promotion programs (Dashti *et al*., 2022). Support for university-based PCOS education reflects a shift toward a more open and accepting attitude toward reproductive health discussions (Douglas *et al*., 2021).

The study by Douglas *et al*. (2021) directly supports the implementation of comprehensive lifestyle and nutrition education programs within university settings for students with PCOS. It emphasizes that nutrition knowledge was low, and that university students would benefit from structured health education initiatives to improve dietary behaviours and overall disease management. It also highlights delays in diagnosis and the need for increased health education and engagement at the university level, aligning with the idea of promoting PCOS education through academic institutions (Douglas *et al*., 2021). When students advocate for PCOS awareness within the academic environment, it encourages institutions to implement targeted educational interventions (Rizvi *et al*., 2023).

A systematic review identified that both women with PCOS and healthcare providers require better resources and education to address the complexities of the condition (Gibson-Helm *et al*., 2017). Research suggests that greater exposure to structured PCOS education can reduce stigma, misinformation, and misconceptions, particularly surrounding issues like hirsutism, infertility, and insulin resistance (Teede *et al.*, 2010). This fosters greater empathy and support, encouraging open conversations about PCOS and promoting a culture of reproductive health awareness within university communities (Abu-Taha *et al*., 2021). Encouragingly, the study found strong interest among student participants in learning more about PCOS, with 88.5% of participants supporting university-based awareness campaigns and educational initiatives.

This highlights the critical role of universities as platforms for promoting reproductive health literacy, as emphasized by Ferrao *et al*. (2022). The Ferrao *et al*. (2022) study reported that students view universities as ideal settings for disseminating health information, a sentiment

mirrored in the findings of the current study. Interest in further education is an important consideration in knowledge and attitude studies, as it may reflect participants' recognition of their own informational gaps. In the context of PCOS, where awareness is often limited and misconceptions are widespread, a desire for further learning suggests that students may be aware of their insufficient understanding and are motivated to improve it (Husin and Kadir, 2020; Fortuna and Herdiman, 2023). Research further indicates that proactive learning behaviours lead to greater knowledge retention and improved health literacy, particularly in reproductive health topics (Jabeen *et al*., 2021). Previous studies have indicated that many young women, including those studying health sciences, lack comprehensive knowledge of PCOS, particularly regarding its long-term complications and management strategies (Sasikala *et al*., 2021). As such, assessing students' interest in further education not only highlights existing gaps but also provides insight into the potential receptiveness of the target population to structured educational interventions.

Participants in the current study perceived PCOS as a serious health concern. This perception appears to motivate students to engage in preventive measures such as healthy eating, regular exercise, and weight management, which are essential in reducing the risk of long-term complications like type 2 diabetes and cardiovascular disease (Pramodh, 2020). Furthermore, it promotes timely medical consultations, enabling students to seek professional guidance and adhere to evidence-based treatments, rather than relying on unverified home remedies or misinformation (Lau *et al*., 2022). Approximately three-quarters of all participants from the current study acknowledged the psychosocial impacts associated with PCOS, such as dissatisfaction with physical appearance and diminished sense of femininity, echoing findings by Rizvi *et al*. (2023) who noted that university students often recognise the emotional distress associated with the disorder.

A universally positive attitude across diverse groups in this study suggests that students may be open to learning more about the condition, empathy toward those affected, and a potential willingness to engage in supportive behaviours—whether as future health professionals, peers, or partners (Alshdaifat *et al*., 2021). This is a promising indicator for public health, as attitudes are known to influence both learning outcomes and behavioural intentions. Positive attitudes may also reflect growing awareness and reduced stigma surrounding women's health issues among younger, more socially conscious generations (Alshdaifat *et al*., 2021). In a university setting, especially within health-related programs, such attitudes can foster a more supportive

environment for individuals living with PCOS and promote more informed future healthcare professionals (Alshdaifat *et al*., 2021). Similarly, a study conducted by Fortuna and Herdiman (2023) among non-medical students in Indonesia reported that despite 47% of the students demonstrating good knowledge, 95% had good attitude. Hussin and Kadir (2020) also reported positive attitude among the participants in that study.

The consistency of the finding across diverse settings suggests a broader trend: even when knowledge is limited, students tend to hold constructive attitudes. This underscores the value of targeted educational programs that can build on this positive foundation to improve knowledge and encourage proactive behaviour. Additionally, the lack of significant associations between covariates and attitudes indicates that attitude change does not depend on personal background, which further supports the feasibility of implementing targeted PCOS intervention programs at health science campuses. Given the interest and openness observed, universities should consider formal inclusion of PCOS-related content earlier in curricula, supplemented with interactive sessions, guest talks, support group collaborations, and awareness days (Rizvi *et al*., 2023). These efforts can reinforce existing empathy with accurate, evidence-based knowledge, ultimately preparing students to provide better care and support in future roles as healthcare providers (Fortuna and Herdiman, 2023).

4.1.4. Impact of limited knowledge and the benefits of improved knowledge on PCOS

The findings of the current study highlight notable limitations in PCOS knowledge among students across different academic programmes. Among students pursuing a Bachelor of Pharmacy (BPharm) degree, only 31% demonstrated good knowledge of PCOS, while just 39% of those enrolled in the Bachelor of Health Sciences (BHSc) programme reached the same level. These results indicate that, despite being in health-related fields, a significant proportion of students possess limited understanding of PCOS, suggesting gaps in education or exposure that warrant attention in curriculum development. Limited knowledge of PCOS can contribute to delayed diagnosis and suboptimal management (Muhaidat *et al*., 2023). Many women expressed dissatisfaction with the diagnostic process, often attributing it to a lack of awareness and expertise among healthcare professionals (Lau *et al*., 2022). Similarly, a study conducted among female university students in Kuwait found that while some participants were aware of PCOS, knowledge did not always translate into timely diagnosis or effective management, resulting in prolonged symptoms and an increased risk of long-term complications (Alkhezi *et al*., 2024). Since PCOS has a significant impact on mental well-being and academic

performance, research conducted among university students diagnosed with PCOS revealed that the students experienced higher levels of perceived stress, and greater academic pressure compared to peers without the condition (Almhmoud *et al*., 2024). These findings indicate that insufficient knowledge about PCOS and its management may contribute to heightened mental health challenges, which can negatively affect academic success and overall quality of life (Almhmoud *et al*., 2024). Cultural and regional factors can also influence the impact of PCOS knowledge on health outcomes (Kaushansky *et al*., 2017). A study among female university students in the Middle East found that cultural attitudes and lack of awareness about PCOS contributed to delayed diagnosis and inadequate management (Pramodh, 2020; Alkhezi *et al.*, 2024).

Poor knowledge also has long-term consequences significantly affecting healthcare seeking behaviour (Maamari *et al.*, 2023). A study conducted among female nursing students reported that 73.2% of participants did not perceive symptoms of PCOS as warranting medical attention (Ali *et al*., 2022). Greater access to information via social media has the potential to improve awareness and encourage earlier healthcare-seeking behaviours (Mousiolis *et al*., 2012). However, dependence on unverified sources may contribute to misinformation, potentially exacerbating confusion and mismanagement of the condition (Ali *et al*., 2022).

Better knowledge of PCOS often leads to proactive healthcare-seeking behaviour (Ferrao *et al*., 2022). Better-informed individuals are more likely to engage in routine health check-ups, discuss concerns with healthcare professionals, and advocate for appropriate diagnostic testing (Muhaidat *et al*., 2023). Moreover, students that recognise PCOS as a health concern tend to have more positive attitudes toward PCOS, viewing it as a manageable condition rather than a stigmatising disorder, which encourages early intervention and adherence to treatment (Rizvi *et al*., 2023).

4.1.5. Student preferences for sources of knowledge on PCOS

The findings of this study reveal that university participants relied on various sources for acquiring knowledge about PCOS. Social media and medical professionals were each cited by 18% of students, followed closely by the internet (16%) and subject syllabus material (12%). The differences in usage between these sources were relatively small, indicating that no single source overwhelmingly dominated as the primary avenue of information. Awareness campaigns (3.67%) and unspecified "other" sources (1.49%) were minimally cited.

This multi-source approach reflects a broad engagement with both formal and informal channels of information. Similarly, studies from the scoping review, such as Alshdaifat *et al*. (2021), also identified healthcare professionals as the most common source of PCOS information among university students, while lectures—although highly effective—were underutilised outside the academic curriculum. Devi *et al.* (2022) found that knowledge levels were significantly associated with the sources of information accessed by students, reinforcing the impact of where and how students learn about PCOS. This pattern may reflect participants' reliance on digital tools for quick access to information, though it also raises concerns about the credibility and accuracy of the content being consumed (Haq *et al*., 2021).This highlights the need for structured, accurate, and accessible PCOS education—especially in health science curricula—to ensure students receive reliable information that supports early diagnosis and appropriate management. Interestingly, the study by Sehar (2020) reported that a significant proportion of nursing students relied on books and journals as a source of PCOS knowledge. The inclusion of textbooks and academic literature is noteworthy, as it suggests a reliance on more structured, potentially evidence-based information.

Several studies, including those by Douglas *et al*. (2021), Husin and Kadir (2020) and Tahir *et al*. (2020) have highlighted the reliance on social media platforms as a source of information about PCOS. Alotaibi and Shaman (2020) observed that digital fluency and a preference for rapid, accessible information contribute to students' reliance on social media for health education. Students' reliance on the internet for health information presents both benefits and challenges. While many access reliable content from academic databases, official health organisation websites, and university-affiliated portals, others turn to unverified forums and blogs that promote anecdotal or sensationalised information (Lau *et al*., 2022). This can lead to self-diagnosis, increased anxiety, and hesitation to seek standard medical care (Pramodh, 2020). As such, digital literacy and critical appraisal skills are essential for navigating online health content effectively. Social media platforms like Instagram, TikTok, and YouTube have contributed to increased awareness of PCOS by featuring discussions on symptoms, diet, and lifestyle changes (Bakhali *et al*., 2015). However, the unregulated nature of these platforms remains a major concern. Inconsistent information quality exposes users to unverified treatments, extreme diets, and misleading claims about fertility or hormonal therapy (Mallappa Saroja & Chandrashekar, 2010; Pramodh, 2020). Overreliance on social media influencers—many of whom lack medical qualifications—can delay proper diagnosis and treatment, potentially worsening outcomes (Alshdaifat *et al*., 2021). Nevertheless, students continue to

value structured academic resources, such as textbooks and curriculum-based materials, for their reliability (Alshdaifat *et al*., 2021; Sehar, 2021). This preference highlights the importance of integrating PCOS education into university programs to provide accurate, evidence-based knowledge and reduce the influence of misinformation found online.

Healthcare professionals, including gynaecologists and endocrinologists, remain the most reliable sources of PCOS knowledge, offering evidence-based insights and tailored treatment plans (Jena *et al*., 2018). Students who consult health professionals are more likely to adhere to medical advice, undergo timely screenings, and adopt effective management strategies (Jabeen *et al*., 2021; Abu-Taha *et al*., 2020). However, barriers such as limited healthcare accessibility, financial constraints, and discomfort in discussing reproductive health may prevent some students from seeking regular professional consultations (Jabeen *et al.*, 2022). Additionally, studies also highlight significant dissatisfaction among women with the healthcare services they receive (Gibson-Helm *et al*., 2017). At most 35.2% reported satisfaction with the diagnostic experience, and only 15.6% were satisfied with the information provided at the time of diagnosis (Gibson-Helm *et al*., 2017). More than half of the women indicated they received no information about long-term complications or emotional support. Inadequate information on fertility is another recurring concern (Pramodh, 2020). These findings underscore a broader issue within healthcare: the need for improved patient education and more holistic care approaches (Gibson-Helm *et al*., 2017).

The problem is further compounded by the fact that many patients rely heavily on healthcare professionals as the primary—and sometimes only—source of information (Pramodh, 2020, Rao *et al*., 2020). When healthcare providers fail to deliver comprehensive, clear, and empathetic guidance, it can leave patients underinformed and ill-equipped to manage the condition, ultimately affecting long-term health outcomes (Muhaidat *et al*., 2023). Among Australian women with PCOS, 57% expressed dissatisfaction with fertility-related information provided at diagnosis (Ching *et al*., 2007; Gibson-Helm *et al*., 2017). Similar findings have been reported in the United Kingdom (UK), where women described insufficient advice and support on fertility issues (Tomlinson *et al*., 2013; Kitzinger and Willmott, 2002). This lack of communication undermines patient trust in healthcare professionals and diminishes the perception of being empowered to manage the condition (Gibson-Helm *et al*., 2017).

Given these findings, there is a clear need to enhance participants health literacy—particularly the ability to distinguish between credible and non-credible sources of information. Health science curricula should include components that foster critical thinking, evidence-based reasoning, and communication skills to empower students to engage in informed peer discussions and make responsible health decisions (Maamari *et al*., 2023). Universities should also strengthen formal education on PCOS and reproductive health to offset the risks associated with informal digital learning (Ferrao *et al*., 2022).

4.1.6. Assessment of PCOS knowledge among health science students and the broader impact of poor knowledge

This study reported that participants scored above 60% on all questions regarding PCOS symptoms. The students scored the highest on knowledge of irregular menstruation being a symptom of PCOS. This is perhaps because women are more likely to experience or notice changes in menstrual cycles, making them more aware of irregular periods as a hallmark symptom of PCOS (D'almeida *et al*., 2024). Male and female medical students from Bangladesh were also reported to have good knowledge of symptoms of PCOS (Ghosh *et al*., 2022). Devi *et al*. (2017) also reported that the participants had good knowledge of symptoms. The results are promising since failure to recognise the relationship between irregular menses and the possibility of PCOS can lead to missed opportunities for early intervention, lifestyle changes, and treatment options, including hormonal management and metabolic support (Muhaidat *et al*., 2023). Additionally, among most medical and dental students from Pakistan the study reported that they would consider the same reason as a key factor in deciding to undergo screening in the future (Rizvi *et al*., 2022).

In contrast to these findings, a study among adolescent and young girls from South India demonstrated that most of the participants were unaware of symptoms of PCOS (Jabeen *et al*., 2022). This could have been attributed to the fact that majority of the participants in the study by Jabeen *et al*. (2022) were high school girls (35.6%). Low awareness of PCOS symptoms can result in delayed diagnosis, worsening both physical and mental health challenges (Teede *et al*., 2010; Ali *et al*., 2022). Knowledge about alopecia as a symptom of PCOS was low among participants in the current study, unlike the study by Al Soheil and Chahine (2021) that reported it to be one of the most recognised symptoms among Lebanese women. This limited knowledge can result in an incomplete understanding of the syndrome, potentially delaying diagnosis or misinterpreting symptoms (Ferrao *et al*. 2022). Additionally, this narrow

understanding can affect attitude towards the condition—possibly underestimating its seriousness or its psychological and emotional impact on individuals experiencing symptoms that affect physical appearance, such as hair loss (Rashid *et al*., 2022). According to Ali *et al*., (2021), low awareness of the less visible or less discussed symptoms of PCOS contributes to the persistence of stigma and poor empathy toward those affected.

The study found that only one-third of students were aware that insulin stimulates testosterone production in the ovary, a result consistent with findings from a study among Lebanese women (Al Soheil & Chahine, 2021). Understanding this mechanism is crucial, as it highlights the role of insulin resistance in PCOS (Sharma *et al*., 2023). Individuals who grasp this concept are more likely to recognise the importance of lifestyle interventions, such as diet and exercise, in managing symptoms and improving health outcomes (Choudhari *et al*., 2024). The knowledge of the participants on the complications of PCOS demonstrated how they perceived the severity of PCOS. In another study, it was reported that female Emirate students correctly identified infertility and recurrent miscarriages as major complications of PCOS, highlighting an understanding of its reproductive consequences (Pramodh, 2020). Awareness of the psychological impact among the current study participants, including depression and anxiety, was also significant, suggesting that students recognise the broader effects of PCOS beyond reproductive health. However, fewer participants recognised metabolic syndrome and endometrial cancer risk. Additionally, a notable misconception emerged, with 58.5% of participants incorrectly associating PCOS with breast cancer. A knowledge and awareness study among nursing students from South India reported a low level of knowledge of the risk of hypertension and diabetes (Sasikala *et al*., 2021). This misinformation suggests a need for targeted education to clarify the long-term health risks associated with PCOS, particularly its metabolic and oncological implications.

Limited awareness of PCOS complications among health science students can lead to delayed diagnosis, inadequate management, and a lack of emphasis on preventative care (Choudhari *et al*., 2025). As future healthcare professionals, health science students with inadequate knowledge of PCOS complications may struggle to effectively counsel patients on long-term risks such as infertility, metabolic disorders, and cardiovascular complications, potentially leading to poorer patient outcomes (Gibson-Helm *et al*., 2017). Al Soheil and Chahine (2021) demonstrated good awareness of management of PCOS among Lebanese women similar to the current study. University students represent a transitional phase where individuals are often not

actively considering pregnancy (Pramodh, 2020). As such, this demographic presents a unique opportunity to analyse awareness and knowledge of COCs in the management of PCOS (All Bassam *et al*., 2017).

Combined oral contraceptives are widely used not only for contraceptive purposes but also for mitigating PCOS symptoms, such as regulating menstrual cycles and reducing androgen levels (Hoeger, e*t al*., 2020). Almost 70% of the participants in the study correctly recognised COCs as a treatment option, demonstrating a reasonable understanding of pharmacological management (Hoeger, e*t al*., 2020). The finding is crucial, as it highlights a growing recognition among young adults of COCs beyond the contraceptive utility, reflecting broader health education efforts that emphasise comprehensive reproductive health (Naidu *et al*., 2024). Additionally, many participants in the current study responded with neutral or uncertain views on the use of hormone-regulating herbal treatments, indicating a lack of clarity about the difference between evidence-based treatments and alternative therapies. This highlights the need for more comprehensive, evidence-based education within university curricula to address misconceptions and improve understanding (Hussin and Kadir, 2020).

Knowledge of lifestyle interventions was also encouraging, with three-quarters of participants correctly identifying the role of exercise, healthy eating, and weight loss in reducing the risk of metabolic syndrome in PCOS patients. This reflects a growing awareness of the importance of non-pharmacological strategies in managing the condition. In contrast to these findings, nursing students in India demonstrated minimum awareness on management of PCOS (Devi *et al*., 2017). Awareness of management options is essential as it influences attitudes toward both treatment and prevention (Pramodh, 2020). Participants with insufficient knowledge may adopt ineffective or even harmful self-management strategies, such as using unverified herbal treatments or attempting extreme dietary restrictions without medical supervision (Jabeen *et al*., 2022). The consequences of inadequate management are particularly concerning given the association of PCOS with long-term metabolic, reproductive, and psychological complications, including insulin resistance, type 2 diabetes, infertility, and depression (Alshdaifat *et al*., 2019).

The findings from the knowledge questions indicated that participants had a well-rounded understanding of PCOS. Comprehensive knowledge of all aspects of the condition is crucial for effective management and for ensuring a successful treatment plan (Colwell *et al*., 2010; Teede *et al.*, 2010). The level of understanding may be attributed to multiple factors, such as

greater exposure to reproductive health topics, personal experiences with symptoms, or knowledge gained through healthcare encounters (Ghosh *et al*., 2022). The findings of Garad and Teede (2020) indirectly support this connection, as the study—though not focused specifically on university participants —highlights global delays in PCOS diagnosis due to limited awareness among both patients and healthcare professionals.

The study stresses the need for improved education and training within clinical settings to address this gap, which aligns with the findings from the study by Pramodh (2020) that academic and clinical exposure within university curricula may contribute to participants acknowledgment of PCOS (Pramodh, 2020). Further reinforcing this idea, the study by Pramodh (2020) reported that the survey itself was successful in increasing PCOS awareness among students. These findings highlight the impact of structured educational tools—even outside formal lectures—on participants understanding of PCOS. When embedded within a health sciences curriculum, such exposure is likely even more effective, as students continuously engage with clinical content and reproductive health issues. Knowledge of PCOS among students has been shown to be influenced by primary sources of information (Devi *et al*., 2017; Ferrao *et al.*, 2022).

Two studies noted that poor knowledge was associated with limited or informal sources, concluding that planned teaching programmes may be necessary to enhance comprehensive understanding of the condition. This suggests that when participants are provided with accurate, structured information on PCOS and its management, early identification becomes more likely (Pramodh, 2020). Devi *et al*. (2017) further emphasized that nursing curricula should be updated to ensure that, once in clinical practice, nurses can help raise awareness among other women, reinforcing the long-term impact of academic training (Devi *et al*., 2017). Despite these insights, there is a noticeable gap in literature explicitly examining how nursing or broader health science curricula address PCOS in a formal, integrated manner (Devi *et al*., 2017). Most existing research instead focuses on evaluating the effectiveness of structured teaching interventions (Haq *et al*., 2021). For example, Malavad and Mirjahan (2024) assessed the impact of a structured teaching programme and found it to be highly effective, with post-test knowledge scores increasing by 34.5% compared to pre-test scores. This significant improvement underscores the potential of targeted educational strategies to increase awareness and understanding of PCOS. In the context of health sciences, enhancing formal education

around PCOS not only benefits students' academic development but also equips them to promote early intervention and patient education in future healthcare roles (Ferrao *et al*., 2022).

4.1.7. Factors contributing to variations in PCOS knowledge among students

In the current study, 37.8% of participants without a diagnosis of PCOS demonstrated good knowledge suggesting that informational exposure—whether through coursework, social media, peer discussions, or general interest—can positively influence understanding (Thomson *et al*., 2016). This also implies that knowledge of PCOS is not necessarily limited to those with the condition, highlighting the effectiveness of broader educational outreach (Maamari *et al*., 2023). Moreover, it suggests a foundation upon which targeted interventions can be built, especially within university environments. Increasing knowledge among those without a diagnosis is crucial for early recognition of symptoms, timely medical consultation, and support for peers who may be affected but undiagnosed (Maamari *et al*., 2023). The study also reported that 46 (86.7%) out of 53 students diagnosed with PCOS had good knowledge of the condition. A statistically significant association was identified between having a PCOS diagnosis and higher knowledge levels. This finding is consistent with the study by Alshdaifat *et al*. (2021), which similarly reported that individuals with a confirmed diagnosis were more likely to possess greater knowledge about PCOS. The studies suggests that personal experience with PCOS may drive greater awareness and understanding (Choudhari *et al*., 2024).

In contrast, the study by Douglas *et al*. (2021) reported that a diagnosis alone is not sufficient to ensure a comprehensive understanding of PCOS (Douglas *et al*., 2021). While it might seem intuitive that being diagnosed with PCOS would lead to greater knowledge about the condition, several studies have found that a personal diagnosis does not necessarily result in better understanding or awareness. Douglas *et al*., (2021), reported that all 12 participants had been diagnosed with PCOS, and reported that nutrition knowledge was limited. A factor influencing knowledge of PCOS is access to reliable healthcare guidance. The study by Douglas *et al*. (2021) demonstrated that women with PCOS primarily relied on the internet for nutrition advice, which may impact the accuracy and depth of knowledge on PCOS. This reliance on informal sources is likely influenced by limited professional support, as only three participants in that study were under the care of a physician for PCOS or menstrual disturbances (Douglas *et al*., 2021). The study by Pramodh (2020) reported that 13% of female Emirati students self-reported being diagnosed with PCOS, yet only 3.5% were receiving medication for the

condition. These findings indicate that even diagnosed individuals may lack adequate understanding, reinforcing the need for structured educational interventions.

PCOS diagnosis has a broader impact extending beyond knowledge and influences mental health, self-perception, and healthcare-seeking behaviour (Sirmans and Pate, 2013). One of the major challenges associated with PCOS is the delay in diagnosis, which has been identified as a key predictor of heightened anxiety and depression (Deeks *et al*., 2011). Women who remain undiagnosed often struggle to understand symptoms, such as hirsutism, acne, and irregular menstruation, leading to increased psychological distress (Sirmans and Pate, 2013). Kitzinger and Willmott (2002) reported that many undiagnosed women described themselves as feeling "abnormal" or "freakish," highlighting the emotional toll of unexplained symptoms. This lack of clarity not only contributes to low self-esteem and body image concerns but may also discourage individuals from seeking medical help, further prolonging the diagnostic process (Rizvi *et al*., 2023). Receiving a diagnosis may also provide a sense of validation, helping individuals understand the symptoms and access appropriate treatment (Choudhari *et al*., 2024). Early diagnosis enables timely intervention, including lifestyle modifications, medical therapy, and psychological support, all of which can significantly mitigate the emotional and physical burden of PCOS (Rao *et al*., 2020). In the Alshdaifat *et al*. (2021) study, 98.9% of participants emphasised the importance of raising awareness about PCOS to improve understanding and early detection. Furthermore, a diagnosis encourages informed healthcare-seeking behaviour, as women with greater awareness of PCOS are more likely to engage in preventive measures, regular screenings, and appropriate symptom management (Rao *et al*., 2020).

The study found that 90.5% of participants had heard of PCOS. Awareness of the condition was also found to be a statistically significant factor influencing knowledge levels. A total of 98.2% of those who were familiar with PCOS demonstrated good knowledge. Exposure of participants to information about PCOS, whether through formal education, social media, or personal experiences, plays a significant role in shaping students' knowledge and attitudes toward the condition (Rao *et al*., 2020). Hearing about PCOS can bridge awareness gaps, correct misconceptions, and encourage proactive healthcare behaviours (Alshdaifat *et al*., 2021). Increased exposure to reliable information fosters better recognition of symptoms, improved understanding of complications, and a more positive attitude toward PCOS management (Alshdaifat *et al*., 2021). Without this awareness, many individuals may dismiss symptoms as normal variations rather than potential indicators of an underlying condition,

leading to delayed diagnosis and worsened health outcomes (Jabeen *et al*., 2021). Familiarity with PCOS is also associated with more informed and empathetic attitudes toward those affected (Maamari *et al*., 2024). Participants who have encountered discussions about PCOS are less likely to perceive it as a rare or unfamiliar disorder, reducing stigma and fostering open conversations about reproductive health (Alshdaifat *et al*., 2021). Increased awareness can also normalise healthcare-seeking behaviour, encouraging individuals to seek medical guidance without fear of judgment (Alshdaifat *et al*., 2021). This also highlights the need for broader educational initiatives to ensure that even those without a diagnosis are well-informed about PCOS.

Hearing about PCOS increases the likelihood of participants understanding its risk factors and long-term health implications, such as metabolic syndrome, diabetes, and infertility (Alshdaifat *et al*., 2021). Knowledge promotes proactive lifestyle modifications, including exercise, healthy eating, and weight management, which are essential in reducing the severity of PCOS symptoms (Douglas *et al*. 2021). Additionally, students familiar with PCOS are more likely to be aware of evidence-based treatments, such as combined oral contraceptives and insulin-sensitizing medications, rather than relying on misconceptions or unverified remedies (Lau *et al*., 2022). Participants who are aware of PCOS are more likely to seek medical advice if they experience symptoms, reducing the risk of undiagnosed cases and long-term complications (Pramodh, 2020). In contrast, those unaware of PCOS may ignore symptoms, dismissing them as minor concerns, leading to delayed medical intervention and an increased burden of disease (Jabeen *et al*., 2021).

Socioeconomic factors also play a significant role in shaping knowledge and awareness of PCOS. Research suggests that lower socioeconomic status (SES) is associated with reduced understanding of the condition, emphasising the need for targeted educational interventions (Subhashree Bangaru *et al*., 2021). A study by Subhashree Bangaru *et al*. (2021) found that participants from lower economic backgrounds had less knowledge about PCOS compared to those from higher socioeconomic backgrounds. Limited access to healthcare resources and educational materials further contributes to this knowledge gap (Neugebauer, 2024). For instance, Haq *et al*. (2017) reported that 72.5% of female participants were unaware of PCOS before receiving educational interventions. The need for educational interventions to improve awareness of PCOS among young women was emphasized in the study, particularly in university settings. Furthermore, the study noted that most female students do not seek

gynaecological consultation unless symptoms are severe or perceived as life-threatening (Haq *et al*., 2017). This reluctance to engage with healthcare services may further contribute to low levels of awareness and delayed diagnosis, reinforcing the importance of accessible and proactive health education programmes targeting reproductive health (Haq *et al*., 2021).

Cultural factors also influence awareness and understanding of PCOS. Hispanic women were the least likely to seek healthcare resources (36%) or discuss PCOS symptoms with family and friends (17.6%), indicating cultural barriers to accessing medical information (Rao *et al*., 2020). These findings suggest that cultural norms, language barriers, and perceptions around reproductive health may influence information-seeking behaviour and contribute to disparities in PCOS awareness among different ethnic populations (Rao *et al*., 2020). Similarly, in the Emirati context, reproductive health remains a culturally sensitive issue, with limited open discussion about menstrual irregularities and related conditions like PCOS (Pramodh, 2020). In the South African context there is limited published research examining cultural attitudes toward reproductive health and PCOS awareness (Dyer *et al*., 2002).

This lack of cultural visibility and limited awareness may hinder individuals' understanding of the seriousness of PCOS and reduce the likelihood of timely management and care (Sokwala & Dodia, 2024). Another critical challenge is the absence of region-specific clinical guidelines in South Africa for the diagnosis and management of PCOS. While international guidelines such as those developed by Teede *et al.* (2018) provide a framework for managing PCOS, they may not fully account for cultural, economic, and systemic differences present in African healthcare settings. This lack of localised guidelines can hinder healthcare providers' ability to deliver contextually appropriate care and contributes to a fragmented approach to PCOS diagnosis and management (Dyer *et al*., 2002).

In many African contexts, including South Africa, reproductive health remains a sensitive and often stigmatised topic, particularly among young women (Dyer *et al*., 2002). In addition to stigma, there is a low uptake of healthcare services for chronic conditions like PCOS in many parts of Africa (Dyer *et al*., 2002). This is compounded by limited reproductive health education, especially in under-resourced communities, and limited access to specialised healthcare (Dyer *et al*., 2002). This further limit exposure to accurate medical information and timely diagnosis of reproductive conditions such as PCOS (Dyer *et al*., 2002). Although the current study focuses on health science students, who are likely to have greater access to

information, these cultural and systemic factors may still influence the willingness to discuss or engage with reproductive health topics, including PCOS.

Additionally, socio-demographic factors, including physical activity levels and marital practices, can influence both the experience and understanding of PCOS (Sirmans and Pate, 2013; D'almeida *et al*., 2024). The current study found no significant association between marital status and knowledge of PCOS, aligning with findings from Alessa *et al*. (2017), Al Soheil and Chahine (2021), and Aripin *et al*. (2022). Abu-Taha *et al*., (2020), reported a positive correlation that married women had better PCOS knowledge than the unmarried counterparts, particularly among those with higher educational levels. While socioeconomic disparities remain a key factor, research suggests that awareness can be significantly improved through targeted educational programs, demonstrating that knowledge gaps can be addressed regardless of economic background (Rizvi *et al*., 2023).

A significant factor influencing knowledge of PCOS among health science students was the year of study and age of the participant. The current study, along with previous research by Alshdaifat *et al*. (2021) and Sasikala *et al*. (2021), found that awareness and understanding of PCOS tend to improve as participants progress through academic programs. The current study demonstrated that the majority of participants aged 20 and 21 years (54.7%) demonstrated a satisfactory level of knowledge about PCOS. Similarly, 58.7% of third-year participants also fell within the satisfactory knowledge category. Overall, among undergraduate participants, 45.4% were found to have a satisfactory level of knowledge, indicating a consistent trend across age and academic year groups. This trend may be attributed to greater exposure to reproductive health topics within the curriculum**,** increased clinical training, and peer discussions around women's health issues (Rizvi *et al*., 2023) . For example, Alshdaifat *et al*. (2021) reported that senior participants showed significantly higher knowledge scores compared to first- and second-year participants.

Similarly, Subhashree Bangaru *et al*. (2021) observed that final-year medical participants were more capable of identifying symptoms and complications of PCOS than the junior counterparts. In the context of the current study, the majority of participants (26.4%) were in the third year of study, which may explain why certain aspects of PCOS—such as symptom recognition—were well understood. This suggests that from the third year onward, participants are more likely to engage with relevant curriculum content, attend health awareness campaigns, and

participate in clinical placements where reproductive conditions like PCOS are discussed. As Abu-Taha *et al*. (2021) noted, advancement in academic level increases exposure to health-related educational material and discussions, which likely contributes to a deeper understanding of reproductive health conditions such as PCOS.

This finding is consistent with research conducted on PCOS knowledge in Jordan, where participants with higher educational levels demonstrated better knowledge of PCOS (Abu-Taha *et al*., 2020). Similarly, higher education levels have been linked to greater knowledge of PCOS symptoms, complications, and management strategies (Kaundal *et al*., 2023). It is reasonable to assert that as students advance through university, they gain greater exposure to educational opportunities, including awareness campaigns, lectures, and health-related discussions, which enhances the understanding of PCOS (Alshdaifat *et al*., 2021). Other studies also demonstrated that age significantly influences knowledge and awareness of PCOS, with younger participants reporting lower levels of understanding compared to older individuals (Sharwini *et al*., 2019). Studies have indicated that PCOS awareness tends to increase with age and the number of years spent in university, suggesting that both academic exposure and personal maturity play a role in shaping students' understanding of the condition.

A study conducted in the year 2022 among undergraduate participants (both medical and non-medical) reported a 92% awareness rate, while pre-university participants had only 2.5%, highlighting that academic progression, rather than just health science education, influences knowledge levels (Jabeen *et al*., 2022). Ferrao *et al*., (2022) reported that among adolescents aged 18-20, 84.7% had inadequate knowledge of PCOS, indicating a substantial gap in awareness at this early stage. This suggests that as participants advance in education, they are more likely to gain exposure to awareness campaigns, health-related courses, and peer discussions that enhance understanding of PCOS (Abu-Taha *et al*., 2021). Furthermore, despite improvements in knowledge with age, gaps in understanding persist, even among older participants. For instance, while a significant proportion of participants correctly identified infertility and psychological effects as complications of PCOS, fewer recognised metabolic syndrome and cancer risks, suggesting that certain aspects of PCOS remain underrepresented in public awareness (Lau *et al*., 2022). Additionally, misinformation about herbal remedies and alternative treatments continues to circulate, highlighting the need for structured PCOS education across all academic levels (Pramodh, 2020). This suggests that merely incorporating

PCOS into the academic program is insufficient without engaging, well-structured, and outcome-driven teaching methods (Pramodh, 2020).

Supporting this trend, Alshdaifat *et al*. (2021) found that participants in the later years of the academic programs demonstrated significantly higher levels of PCOS knowledge compared to peers in the earlier years. This improvement could be attributed to exposure to reproductive health content in the curriculum, as well as increased interactions with healthcare settings and possibly with individuals affected by PCOS (Rizvi *et al*., 2023). The studies suggested that this trend reflects the cumulative effect of medical education, where more advanced students are not only taught reproductive pathologies in greater depth but also begin to apply this knowledge in clinical contexts (Subhashree Bangaru *et al*., 2021). Additionally, a study by Upadhye *et al*. (2017) supported this finding, and reported that participants in higher academic years were more confident in discussing menstrual and endocrine disorders, including PCOS, due to increased educational engagement and clinical training. These results suggest that as students' progress through the academic journey, particularly in health sciences, understanding of PCOS becomes more comprehensive, likely due to enhanced curriculum content, exposure to patient cases, and growing personal interest in health-related issues (Rizvi *et al*., 2023).

Studies focusing on PCOS knowledge and attitudes among university participants have primarily targeted undergraduate populations. This contrasts with the current study that included both undergraduate and postgraduate participants across various academic years providing a more comprehensive understanding of the academic community's awareness and attitudes toward PCOS. Including participants from multiple academic years enabled the study to identify a positive correlation between academic level and knowledge scores, indicating that students at more advanced academic levels possessed greater knowledge of PCOS. A similar study conducted by Alshdaifat *et al*. (2021) included both undergraduate and postgraduate participants, though only 14.2% of the participants were postgraduates. In comparison, the current study included a slightly higher proportion of postgraduates (28.1%), offering a broader perspective across academic levels. Both studies reported that a higher proportion of postgraduates demonstrated good knowledge. A total of 43.8% of undergraduates and 54.1% of postgraduates had good knowledge of PCOS. However, as undergraduates made up the majority of those with good knowledge overall, this highlights the importance of considering both proportional performance and absolute representation when interpreting knowledge trends across degree types. This broader approach allows for the identification of knowledge gaps and

misconceptions that may exist at different educational levels, informing the development of targeted educational programs.

The type of degree program also played a role in knowledge variation. The study sample included participants pursuing any health science degree at a selected tertiary institution. A total of 59 (62%) out of 95 participants pursuing a MBBCh degree demonstrated good knowledge, compared to only 23 (31%) out of 74 participants pursuing a BPharm degree. This indicates that participants pursuing a MBBCh degree were more than twice as likely to have a good understanding of PCOS, highlighting a clear difference in knowledge levels between the two groups. Additionally, 39% participants pursuing a BNurs degree and 62% of participants pursuing a MBBCH degree had good knowledge of PCOS. This aligns with previous research where medical students demonstrated higher PCOS awareness than nursing students (Thomas *et al*., 2017).

The studies by Alshdaifat *et al*. (2021) and Goh *et al*. (2022) also support the finding that academic background influences PCOS knowledge levels. The findings from the study by Alshdaifat *et al*. (2021) reported that students in the fifth and sixth years of study had the highest awareness scores, which is supported by several interrelated factors. Firstly, this trend can be attributed to the fact that students pursuing medical (MBBCh) degrees typically complete six-year programs, which provide longer and more comprehensive academic exposure compared to other health science degrees. Moreover, the inclusion of PCOS in the curricula of these specific programs reinforces the idea that formal academic training plays a pivotal role in shaping knowledge (Rizvi *et al*., 2023). Alshdaifat *et al*. (2021) also reported that the students are not only exposed to health-related content through coursework but also via awareness campaigns, off-campus lectures, and peer discussions. These varied learning opportunities enhance both theoretical understanding and practical awareness (Alshdaifat *et al*., 2021). Supporting this, Goh *et al*. (2022) reported that participants with a healthcare-related educational background demonstrated significantly better knowledge of PCOS than those from non-healthcare disciplines. This further emphasises the role of academic context and duration of study in equipping students with the necessary knowledge to understand and engage with complex health conditions like PCOS (Alshdaifat *et al*., 2021).

A higher level of PCOS knowledge among students in medical and health-related disciplines also influences the attitude toward treatment and prevention (Alshdaifat *et al*., 2021). Students

with greater awareness are more likely to recognise the importance of early diagnosis, lifestyle modifications, and medical interventions, leading to more proactive healthcare-seeking behaviour (Douglas *et al*., 2021). Additionally, improved understanding promotes empathy and support for individuals with PCOS, particularly among future healthcare professionals who will be responsible for diagnosing and managing the condition in clinical settings (Alshdaifat *et al*., 2021).

4.1.8. Educational strategies to improve PCOS Awareness

In the current study, 12% of participants reported using subject syllabus material as a source of PCOS knowledge, suggesting that the condition is, to some extent, included within the academic curriculum. There is evidence to suggest that knowledge improves as students progress academically (Alshdaifat *et al*., 2021; Sasikla *et al*., 2021*;* Goh *et al*., 2022). This increase in knowledge indicates that students at higher academic levels are more likely to have a better understanding of PCOS symptoms, possibly due to increased exposure to relevant curriculum content, clinical discussions, or reproductive health modules. Therefore, it is plausible that the topic is introduced or more extensively covered from the third year onward, which may explain the improvement in knowledge observed in later years (Alshdaifat *et al*., 2021). However, it is uncertain whether PCOS is explicitly included in the curricula across all health science programs. While this is encouraging, it also implies that PCOS may not yet be comprehensively covered, especially considering the complexity and prevalence of the disorder. Devi *et al*. (2017) reported that PCOS was included in the third-year syllabus, which supports the idea that formal instruction on the condition becomes more prominent at this stage of training. Despite this potential inclusion, simply having PCOS as part of the curriculum does not guarantee adequate understanding. For example, Devi *et al.* (2017) found that 100% of nursing students had inadequate knowledge of PCOS, even though the condition was formally included.

For universities to serve as appropriate platforms for delivering health education interventions would not only reinforce existing knowledge but also ensure that participants —particularly future healthcare professionals—are equipped with accurate, clinically relevant information (Gibson –Helm, 2017). Enhancing curriculum content to include PCOS in greater depth, through lectures, case studies, and interdisciplinary teaching, could help bridge existing knowledge gaps and foster greater confidence in the identification and management of the condition (Rizvi *et al*., 2023). As university students represent a key demographic for early

intervention and future health advocacy, targeted educational strategies within academic institutions could have a far-reaching impact on PCOS awareness, early diagnosis, and holistic care (Alessa *et al*., 2017). Incorporating PCOS awareness into university health science curricula is essential, as universities serve as ideal platforms for disseminating health information (Ferrao *et al*., 2022). The study by Ghosh *et al*., (2022) among university students, reported that several strategic interventions may be implemented to enhance awareness, address misconceptions, and promote proactive healthcare-seeking behaviour (Ghosh *et al*., 2022). Structured educational initiatives have been shown to enhance knowledge and encourage healthier lifestyle choices among students (Haq *et al*., 2021). Research highlights the impact of educational interventions on PCOS awareness, with a study conducted among undergraduate students in Tanahun revealing that after an educational program, all participants demonstrated a significant improvement in knowledge of PCOS (Shrestha and Darshandhari, 2024).

Similarly, an educational initiative targeting adolescent girls effectively increased the knowledge of PCOS diagnosis, causes, risk factors, complications, and management (Mohamed, 2016). Studies have also shown that medical and health science students who receive formal education on PCOS demonstrate higher knowledge scores and improved attitudes toward the condition, reinforcing the importance of structured academic training (Alshdaifat *et al*., 2021). These findings underscore the vital role of structured programs in bridging knowledge gaps and fostering informed health behaviours. Establishing PCOS awareness programs through workshops and guest lectures by medical professionals can provide students with in-depth knowledge about symptoms, diagnosis, and treatment options (Devi *et al.*, 2017). Additionally, student-led awareness campaigns utilizing social media, posters, and health centre resources can effectively reach a wider audience and foster a supportive campus environment (Lau *et al*., 2022; Rizvi *et al*., 2023). Research indicates that social media-driven awareness campaigns can increase PCOS knowledge by 30% among young adults, demonstrating the effectiveness of digital outreach strategies (Malhotra *et al*., 2023).

As a condition with metabolic, reproductive, and psychological implications, PCOS is relevant to health science students (Jabeen *et al*., 2021). Strategies such as integrating reproductive health education into university curricula is important, as it equips students with essential knowledge about PCOS, its causes, and management strategies (Rizvi *et al*., 2023). Reviewing

the health science curriculum to include PCOS education may prepare future healthcare professionals to diagnose and manage the condition effectively, leading to improved patient outcomes (Jabeen *et al*., 2022). Establishing PCOS support groups on campus can also offer emotional support, reduce stigma, and promote a sense of community among those affected (Ismayilova and Yaya, 2022). Peer education has also been identified as a high-impact method of improving health knowledge among university students (Ismayilova and Yaya, 2022). Training student ambassadors to lead workshops and discussions on PCOS can foster engagement and relatability, making reproductive health topics more accessible and approachable (Ismayilova and Yaya, 2022). Peer-led interventions have proven to be highly effective in reproductive health education, as students are more likely to engage with non-judgmental, peer-based discussions than formal lectures alone (Alshdaifat *et al*., 2021).

Additional suggested strategies include designating a PCOS awareness month on campus as can be an effective way to promote understanding and empathy through events, campaigns, and educational activities (Rizvi *et al*., 2023). Implementing wellness initiatives, such as fitness programs and healthy eating campaigns, can help mitigate the effects of PCOS by encouraging healthier lifestyles among students and faculty (Pramodh, 2020). Providing access to educational resources on PCOS, including workshops and counselling services, can support individuals in managing the condition through nutrition, lifestyle modifications, and mental health care (Pramodh, 2020). Additionally, offering fertility-related education and access to specialists can assist those affected by PCOS who are trying to conceive (Gibson-Helm *et al*., 2017). Addressing the mental health aspects of PCOS through therapy and counselling services is also crucial in helping participants and faculty cope with the emotional and psychological challenges associated with the condition (Sirmans and Pate, 2013). By integrating these initiatives, universities can foster a more informed, supportive, and health-conscious campus community (Ferrao *et al*., 2022). By incorporating these strategies, universities can play a crucial role in raising awareness about PCOS, supporting students, and preparing future healthcare professionals to address the condition effectively.

The Jabeen *et al*., (2022) study, among adolescent and young girls in South India, identified key reasons that contribute to the lack of knowledge among younger students: lack of information, absence of advertisements, social stigma, and misinformation. The adolescent and young girls in the study suggested various strategies to improve awareness, including surveys (28%), awareness programs (22%), campaigns (4.4%), advertisements (3.6%), and seminars

(2%). Additionally, research by Alshdaifat *et al*., (2021) attributed the inaccurate knowledge of PCOS risk factors to the lack of discussions on reproductive health in both school curricula and family settings. The absence of structured education on PCOS and the limited accessibility of reproductive health resources further contribute to the knowledge disparity between adolescents and older students (Neugebauer, 2024). These findings underscore the importance of incorporating PCOS education into school health programs and public awareness initiatives to bridge the knowledge gap at an earlier stage in academic development (Haq *et al*., 2017). Social media, educational initiatives, and direct interactions with affected individuals also contribute to improved knowledge among female students (Bahkahli *et al*., 2015).

CHAPTER 5 - LIMITATIONS, FUTURE RECOMMENDATIONS AND CONCLUSION

5.1.Introduction

The final chapter addresses the limitations of the study, proposes recommendations for future research, and the conclusion. The chapter outlines several key recommendations for future research.

5.2.Limitations

The study had several limitations that warrant consideration. The participants' disclosure to being diagnosed with PCOS was based entirely on participants' responses and were not substantiated. Additionally, the current study was conducted online, which may have increased the risk of misinterpretation of certain questions. Participation in the research was voluntary, which may have skewed the results towards students who were more confident or knowledgeable about PCOS. A key limitation of the study is the focus on students from a single faculty, which restricts the generalisability of the findings to the broader university population. The exclusion of students from other health science-related disciplines—such as emergency medical care, podiatry, dietetics, audiology, speech-language pathology, biokinetics, and diagnostic and therapeutic radiography—limits the scope of perspectives captured. Future research should aim to include participants from a wider range of academic disciplines and institutions to allow for meaningful comparisons and to generate findings that are more representative of the diverse student population across South Africa.

5.3.Future Recommendations

A cross-sectional study captures a moment in time but does not assess how knowledge and attitudes evolve. To address this, future research should incorporate longitudinal studies to monitor the progression of PCOS awareness and attitudes among health science students throughout the academic journey. By assessing students from the first to final years, researchers can identify persistent knowledge gaps despite formal education and evaluate the effectiveness of existing curricula in improving PCOS awareness. Additionally, studies should examine whether increased knowledge leads to better clinical decision-making among future healthcare professionals. This could include Objective Structured Clinical Examinations (OSCEs) to assess students' ability to diagnose and counsel patients, surveys of practicing graduates to determine if education adequately prepared them to manage PCOS, and comparative studies

between institutions with and without structured PCOS education to identify the most effective teaching approaches. Long-term studies can also assess knowledge retention after graduation and its application in professional practice.

Intervention-based research can help identify the most effective educational strategies for enhancing PCOS awareness. Future studies should evaluate structured PCOS education modules within health science courses by comparing pre- and post-intervention knowledge levels. Additionally, interactive workshops and simulation-based learning with real patient case studies can enhance diagnostic and management skills. The integration of digital learning tools, such as mobile applications and online courses, can further engage students and reinforce learning. Furthermore, community-based outreach programs, where students educate the public about PCOS, can both strengthen their understanding and contribute to broader awareness efforts.

An important area for further exploration involves understanding the level of PCOS awareness among students in non-healthcare faculties. Existing research highlights notable disparities in PCOS awareness among students from non-healthcare faculties and health science students (Karkar *et al*., 2019; Fortuna and Herdiman, 2023; Yie, 2023). Students from science-related disciplines tend to perform better than those from arts or mathematics faculties, suggesting disparities linked to curricular exposure (Nelson *et al*., 2017). Although some non-medical students may gain exposure to PCOS-related content through media, peer discussions, or health campaigns during the academic journey, overall awareness remains insufficient (Alshdaifat *et al*., 2021).

Given the disparities, universities have a critical role in extending PCOS education beyond health faculties. Universities should promote inclusive and easily accessible educational opportunities across disciplines (Douglas *et al*., 2021; Ferrao *et al*., 2022). This includes offering student support groups for individuals diagnosed with PCOS, and by improving access to PCOS-specific counselling and health services, students are enabled to manage symptoms more effectively (Thomas *et al*., 2017; Alfadeel *et al*., 2022). Establishing support groups for students diagnosed with PCOS can foster a sense of community and provide a platform for sharing experiences and coping strategies (Alfadeel *et al*., 2022). Broader initiatives such as awareness campaigns, peer-led educational programs, and accessible digital resources are essential in ensuring that students from non-healthcare faculties are equally informed about the

symptoms, risks, and long-term implications of PCOS (Robinson and Larson, 2023). The interventions would not only raise awareness but also promote early intervention and support across the wider student population (Alshdaifat *et al*., 2021).

Studies suggest that increasing male awareness can improve relationship dynamics, reduce stigma, and foster a more supportive environment for individuals with PCOS (D'almeida *et al.*, 2024). Consequently, future interventions should include strategies to engage male students in reproductive health discussions to ensure a holistic and inclusive approach to PCOS education. Strengthening health literacy through digital education programs, university workshops, and peer-led initiatives can enhance students' ability to critically evaluate online health information and make informed decisions (Alshdaifat *et al*., 2021; Lau *et al*., 2022).

Beyond the academic setting, further research is needed to assess community awareness and understanding of PCOS, particularly given the limited studies conducted in South Africa. Understanding the broader public perception of PCOS can inform targeted awareness campaigns and policy initiatives. Additionally, qualitative research can provide valuable insights into the underlying factors contributing to delayed health-seeking behaviour and attitudes toward PCOS. Exploring cultural, societal, and psychological barriers that prevent timely diagnosis and treatment will be essential in shaping interventions that effectively address these challenges. By incorporating these research approaches, future studies can ensure that both healthcare professionals and the public are better informed, ultimately leading to earlier diagnosis, improved management, and better health outcomes for individuals with PCOS.

5.4.Conclusion

This study set out to examine the knowledge and attitudes toward PCOS among health science students at a South African university. It aimed to evaluate student knowledge of PCOS pathophysiology, symptoms, complications, and management strategies, while also exploring attitudes towards the condition.

The findings revealed that while most participants had heard of PCOS, fewer than half demonstrated good knowledge. Many demonstrated only satisfactory knowledge, and a small subset displayed inadequate knowledge. Openness to unverified remedies, such as herbal treatments, further underscored the need for structured, evidence-informed PCOS education

within health sciences curricula. As the study focused solely on students from a health sciences faculty, the results reflect the perspectives of individuals with some degree of academic exposure to reproductive health. It is therefore plausible that students from other faculties—who may not receive such curricular exposure—could exhibit even lower levels of knowledge or different attitudes toward PCOS, highlighting the broader need for cross-disciplinary awareness initiatives.

Knowledge disparities were observed across academic levels and disciplines, with students pursuing MBBCh degrees out performing students pursuing BPharm degrees and other counterparts. However, no significant associations were found between knowledge levels and gender, marital status, or degree type—suggesting that academic exposure, rather than demographic characteristics, is the primary driver of knowledge acquisition. Importantly, a greater proportion of students in advanced academic years and those with a personal diagnosis of PCOS demonstrated good knowledge compared to those in lower academic years and participants without a diagnosis, reinforcing the influence of both formal education and lived experience on PCOS awareness.

Despite these gaps, student attitudes toward PCOS were overwhelmingly positive. Participants recognised PCOS as a significant global health issue, acknowledged its psychosocial burden, and expressed empathy, openness, and a strong willingness to learn. They also supported the integration of PCOS education into university curricula and called for broader awareness efforts, reflecting a readiness to engage meaningfully with reproductive health topics—provided the appropriate educational support is in place.

The accompanying scoping review contextualised these findings within the global literature, highlighting similar knowledge gaps worldwide—particularly around long-term complications, lifestyle management, and psychosocial impacts. The review also confirmed that educational exposure, gender, and personal diagnosis are influential factors in shaping knowledge, and that while short-term knowledge gains from interventions are well documented, there remains limited evidence of sustained behavioural change.

The implications of limited PCOS knowledge among future healthcare professionals are significant. Inadequate understanding can lead to delayed diagnoses, progression of complications, and poor psychosocial outcomes for those affected. Moreover, knowledge

deficits may perpetuate stigma, misinformation, and healthcare inequalities—especially in communities where reproductive health is still considered taboo. Addressing these gaps is both an academic and public health imperative.

This research makes a foundational contribution to the understanding of PCOS knowledge and attitudes among South African health science students. As the first study of its kind on a local campus, it offers valuable insights into student perspectives and learning needs. The findings not only highlight key areas for curriculum development but also provide a strong basis for targeted interventions that can enhance future healthcare professionals' capacity to recognise, manage, and support individuals living with PCOS.

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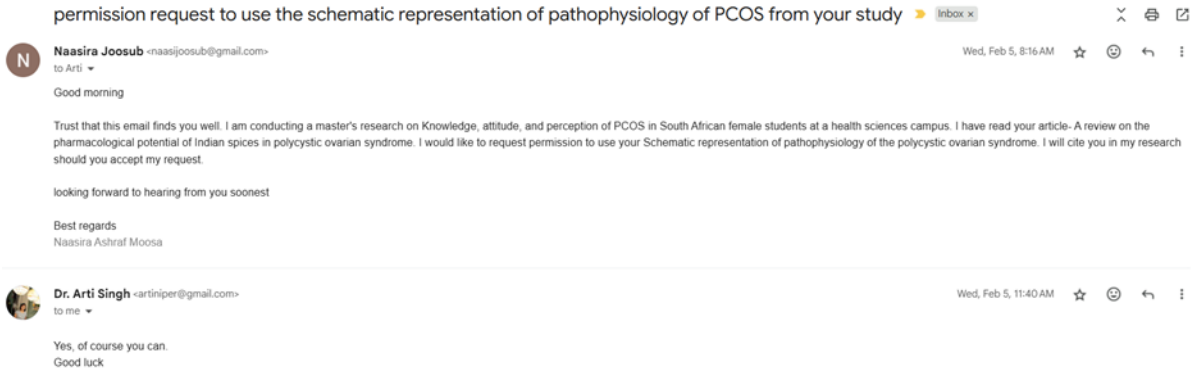
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APPENDICES

Appendix A: Journal(s) permission



permission request to use the schematic representation of pathophysiology of PCOS from your study Inbox ×

Naasira Joosub <naasijoosub@gmail.com> Wed, Feb 5, 8:16 AM
to Arti

Good morning

Trust that this email finds you well. I am conducting a master's research on Knowledge, attitude, and perception of PCOS in South African female students at a health sciences campus. I have read your article- A review on the pharmacological potential of Indian spices in polycystic ovarian syndrome. I would like to request permission to use your Schematic representation of pathophysiology of the polycystic ovarian syndrome. I will cite you in my research should you accept my request.

looking forward to hearing from you soonest

Best regards
Naasira Ashraf Moosa

Dr. Arti Singh <artiniper@gmail.com> Wed, Feb 5, 11:40 AM
to me

Yes, of course you can.
Good luck

APPENDIX B: Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist.

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	1,2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	17
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	17
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	17
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	18

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	17
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	17,18
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	18
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	18,19
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	20,21,22
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	19
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	19

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	20,21,22
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	21,22
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	22,22
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	46-57
Limitations	20	Discuss the limitations of the scoping review process.	58
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	59.
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	N/A

APPENDIX C – Scoping review extraction results

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
All Bassam *et al*., 2018	Saudi Arabia	Single tertiary institute	Females (100%)	18-25	Applied medical sciences 11% Business & Economics 21% Medicine 17% Computer Sciences 5% Dentistry 0.6% Pharmacy 3% Other 42%	Awareness Attitude Practice	71% of female participants had heard about PCOS before Responses to the beliefs and practice questions indicated misconceptions of PCOS, warranting intervention	Participants asked whether they had heard about PCOS (was scored by the frequency of participants who had heard the term). Attitude and Practice: 1 open-ended question on the beliefs of the community toward PCOS was asked and not scored	People (49%), Internet (21%), Hospital (20%), College (11%), TV (1%)	Not reported
Alshdaifat *et al*., 2021	Jordan	Two tertiary institutes	Female undergraduates and postgraduates Postgraduates Mean(1.52 (0.69–2.36)) 1st year 187 students; 2nd year 232 students; 3rd year 208 students; 4th year 198 students; 5th year 114 students; 6th year 75;	18 - ≥ 24	Various medical disciplines	Awareness Sources of information Predictors of high awareness Attitude	Average score was M=11.59 (SD=4.95) 95.9% recognised PCOS. Healthcare professionals most common source of knowledge Higher academic level and diagnosis associated with better awareness	Awareness: 22-item awareness score including causes, symptoms, diagnostic workup, treatment; PCOS recognition and beliefs questions used; All the correct answers score 1, total 22. Lowest score 0, highest score 22. Attitude and practices based on the questionnaire	Doctors (39%), university courses and lectures (24%), friends (23.9%), media (35.9%), relatives (32%), other sources (22%).	Convenience sampling technique and a newly developed questionnaire and scoring system. Score validation and nationwide longitudinal studies are required

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
			Higher education 168 students				98% felt spreading awareness was important			
Devi *et al*., 2017	India	Single nursing institute	Female and male undergraduates (5 diagnosed with PCOS)	18-23	3rd year BSc Nursing students	Knowledge Self-preventative measures taken	Mean score 14.97out of 32 Minimum knowledge score on the meaning of PCOS and causes and risks Statistically significant difference between sources of knowledge and knowledge of PCOS 100% lacked sufficient PCOS knowledge; unhealthy practices noted among the diagnosed	Knowledge: structured questionnaire used 32 questions on meaning, definition, causes, risk factor symptoms, diagnosis, treatment, management, and complications. There is one correct answer scoring 1 point per question. Maximum total score of 32. No indication if "heard about PCOS" was asked directly; Attitude and practice assessed through self-preventative and lifestyle behaviour	Healthcare providers (66%), mass media (14%), friends (7%), family members (2%).	Small sample size-family history of PCOS failed to show its association with the level of knowledge of PCOS. Findings from the study cannot be generalised

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
								questions		
Douglas *et al*., 2021	America	Single tertiary institute	Females (100% diagnosed with PCOS)	18-40	University students	Nutrition knowledge Diet quality Eating disorder risk	Mean score 29.0 ± 10.9 PCOS students had poor nutrition knowledge (48%); unbalanced diet; high eating disorder risk (41.6%) Familiarity with MyPyramid (52.6% correct). Score was highest for this outcome. Students obese, insulin resistant, consumed unbalanced and limited diet	Nutrition knowledge questionnaire used (60 questions). There is one correct answer scoring 1 point per question, for a maximum total score of 60. Familiarity with MyPyramid (23 questions), Nutrient content food (26 questions), Diet-Disease relationships (11 questions). There is one correct answer scoring 1 point per question, for a	Internet (75%), doctors (41.7%), friends/family (41.7%), books (25%), dietitians (16.7%)	Small, diverse sample size. Students subjected to selection bias since were recruited from a university student health center. Lack of a control group for comparison. Since ultrasound equipment was not available, evidence of PCOS was not used for diagnosis. Presence of an eating disorder was not confirmed

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
							Response showed poor diet and lack of guidance. Urged for university-based dietary education.	maximum total score of 60. Attitude and practice: assessed via Eating Disorder Examination-Questionnaire. (28 questions). Scores for responses range from 0–6 (no days to everyday), increased scores corresponding to increasing frequency of negative eating disorder-related thoughts.		
Ferrao *et al*., 2022	India	Single nursing institute	Females	18-21	1st to 3rd year General Nursing and Midwifery (GNM) (26%) 4th year BSc Nursing (15%)	Knowledge	Overall knowledge score: Mean score 8.21 ± 1.3 ; mean percentage score 51.25% 87.4% had inadequate knowledge of	16 item questionnaire (8 basic knowledge+ 8 treatment/prevention); not based on recognition alone; Knowledge classified into inadequate or adequate; attitude	Primary information (56%), relatives (19.4%), mass media (16%)	Delimited to a selected nursing college; data was collected using a self-report technique. The result cannot be generalised to a wider extent since awareness is

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
							PCOS Knowledge of clinical presentation was adequate for menstrual abnormality and infertility. Knowledge was adequate for alopecia, *acanthosis nigricans*, metabolic syndrome, endometrial cancer, risk of diabetes, psychological upset, dyslipidemia, coronary artery disease, hypertension. Association between primary source of information and knowledge	and beliefs included There is one correct answer scoring 1 point per question. Maximum score was 16.		assessed in only 1 setting
Fortuna and Herdiman, 2023	Indonesia	Seven non-medical tertiary institutes	Females (100%)	18-21	Faculty of Arts and Design 16%; Faculty of Engineering 15%; Faculty of	Knowledge Attitude	47% had good knowledge; 42% had sufficient knowledge; 11% had no knowledge.	Participants asked whether they had heard of PCOS. Knowledge: 20 knowledge	Majority have heard of PCOS diseases through the health team (18%), mass	Only educated females, therefore results cannot be generalized to the whole country

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
					Communication Sciences 14%; Faculty of Law 14%; Faculty of Information Technology 14%; Faculty of Economics and Business 14%; Faculty of Psychology 14%		95% had good attitude 17% suspected of being at risk of PCOS All lived in urban areas, 84% came from middle-class families	questions: ≤ 11 poor knowledge, ≥12 adequate knowledge. Knowledge score categorised as (good/sufficient/less), and attitude score categorised as (good/sufficient); belief questions used.	media (45%), family (15%), friends (22%).	
Ghosh *et al*., 2022	Bangladesh	Multiple medical tertiary institutes	Females (72.9%) Males (27.7%)	MBBS (medical students)	1st to final year medical students	Awareness	Females had better knowledge of symptoms; males had better knowledge of complications. 72.29% were female; knowledge of the role of lifestyle is statistically significant, periodic education is needed.	Asked if the participants had heard of PCOS (scored by frequency). Attitude and practice: beliefs towards lifestyle and complications explored/ not scored. 27questions on awareness of PCOS symptoms, possible complications, management, miscellaneous features, and	Not reported	Only educated students, the results cannot be generalized

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
								personal questions		
Haq *et al*., 2017	Pakistan	Three tertiary institutes	Females 5.5% diagnosed with PCOS	18-26	Science students (100%)	Awareness measured before and after education, signs and symptoms Prevalence documented .	Awareness increased after intervention. 72.5% unaware of PCOS before intervention; post-intervention awareness increased to 90.2% Majority answered positive to all knowledge questions; except for knowledge on symptomatic treatment and antidiabetic treatment 17.5% suspected of PCOS	Awareness assessed before and after education (brochure) Attitude and practice not scored; some beliefs noted Prevalence: From 12 signs and symptoms, students having 4-8 symptoms were considered as suspected; students having more than 8 symptoms were considered as diagnosed. Knowledge: 20 knowledge questions: ≤ 11 poor knowledge, ≥12 adequate	Not reported	Only in one city in Pakistan and only educated females due to the unavailability of sources, the results cannot be generalized to the whole country. Due to a lack of facilities, the diagnosis was made based on signs and symptoms

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
								knowledge Knowledge tested pre- and post-intervention		
Hussin and Kadir, 2020	Malaysia	Seven tertiary institutes	Males (25.6%) and Females (74.4%) 3.5% diagnosed with PCOS	Higher education students	Young students of higher education	Knowledge Awareness Perception	92.2% adequate level of knowledge; 56.6% were unfamiliar with the term "PCOS" Most were familiar coming from an educated background Many recognised symptoms of PCOS such as: irregular/absent periods (87.2%); ovarian cysts (87.2%); severe acne (62.1%) Not enough knowledge on treatment of	13 knowledge questions. Calculated by frequency and percentages. 3 components to the questionnaire: Knowledge, awareness and perspective. Knowledge classified as adequate or poor. Participants asked if they had heard of PCOS Attitude and practice: pre/post awareness measured with	Social media internet (42.2%)	The result from this study might not be able to represent the whole population as not all institutes have participated in this survey

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
							PCOS 84.9% had knowledge of androgen hormones; 56.2% correctly associated PCOS with elevated male hormone Good attitude: attitudes based on symptom presence. The responses suggest a notable proportion of students experienced symptoms Moderate to high perception: perception questions included (believe PCOS can be cured; PCOS is a serious health issue; healthy diet and exercise important in managing PCOS; knew that PCOS not only affects married women	improvement noted. Reponses highlighted gaps and effect of education materials. 7 Attitude questions: calculated by frequency and percentages 5 Perception questions calculated by frequency and percentages		

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
Jabeen *et al*., 2022	India	Schools and tertiary institutes	Females	13-19 (adolescents) (78.8%) 20-25 (young girls) (53%)	35.6% were high school girls, 16% were junior college girls, 28.4% were non-medical undergraduates, and 20% were medical undergraduates	Prevalence Predisposing factors Awareness Practice	Prevalence was 6.8% 78.4% unaware before awareness session 21.6% awareness of PCOS. Awareness of symptoms and complications increased significantly after educational intervention Responses revealed barriers like lack of publicity.	A pre- and post-test questionnaire on awareness, causes, symptoms, complications, and prevention; attitude ad practice was tested assesses after awareness session A post-test questionnaire on satisfaction of knowledge, barriers to awareness, and suggestions for increasing awareness Each of the questions had an answer option of Know-or Don't Know	Teachers (37%), doctors (31.5%), internet (11.1%), other sources (12.9%), friends (7.5%).	The PCOS prevalence rates observed do not necessarily reflect the real prevalence. Diagnosis of PCOS among the participants was not performed based on definitive diagnostic criteria. Inclusion of limited subpopulations and subgroups from a defined geographical area contribute to bias in the results

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
Pramodh 2020	Dubai	Single tertiary institute	Females (undergraduates) (100%) 13% diagnosed with PCOS	18-25	Entry level students 3%. 1st-2nd years Undergraduate: 53%. 3rd-4th years Undergraduate: 44%	Reproductive health knowledge PCOS awareness and awareness of symptoms	13% diagnosed with PCOS; 75% had a family history of diabetes. 38% awareness Low reproductive health knowledge. Students were unclear about important concepts related to fertility. Low physical activity and high indulgence to fast food	Students were asked if they were diagnosed with PCOS. Attitude: lifestyle choices assessed. Practice and beliefs discussed, no scoring system for belief responses. RH knowledge: Questions on basic reproductive biology (6) and infertility knowledge (4). Very well/ well, little, and do not know questions for knowledge. True, false, and not sure questions for fertility. Results calculated as percentages Awareness: 1 question on whether they heard of PCOS; Question asked if they experienced four major symptoms of PCOS –	Health professional (62%)	No clinical evidence to support survey results- Ultrasound scan, hormonal evaluation, or FG scoring for hirsutism not possible within the scope of this study. Approximate weight and height measurements were given by selecting a range; BMI calculations could not be performed. Small sample size

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
								absent/excess bleeding during menstruation, excessive hair growth, acne, and patches of thick dark skin.		
Rao *et al*., 2020	America	Single tertiary institute	Males (12%) and female (98%) undergraduates (including staff) 28.5% diagnosed	Over 18 years and above	High school 9.1 %; Some college 17.1 %; Associates degree 15.7%; Bachelor's degree 33.1%; Graduate degree 25%	Prevalence PCOS Knowledge self-rated ("know some" or "less"). Attitude and practice: information sources (eg. healthcare, friends) identified. Beliefs explored separately	PCOS prevalence higher than average Majority (66.3% of females and 83% of males) ranked their knowledge as 3 (know some) Ethnicity influenced awareness and help-seeking. Great disparity for information source-therefore educational material should	Knowledge was assessed using a 5-point scale ranging from 1 (I know nothing) to 5 (I know everything). Men answered a separate similar survey.	Health professional (83.7%)	The prevalence of PCOS based on self-reported medical diagnosis. The prevalence was high but could be due to increased likelihood of PCOS females responding to the questionnaire. Only limited conclusions can be drawn from the results of sources of information since the scope of this survey was exploratory

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
							focus on multiple sources of information. Educational level affected source of information accessed.			
Rizvi *et al*., 2023	Pakistan	Two tertiary institutes	Females (100%) (undergraduates) 18.32% diagnosed	18 years and above	Undergraduate (medical and non-medical students)	Knowledge Knowledge score compared by course, family history, menstruation patterns. Barriers to consultation highlighted. Attitude Perception	The average PCOS knowledge score was 11.58 ± 4.99 (overall) Knowledge score higher for students in medical colleges, had menstrual symptoms and a family member affected with PCOS; undergraduates had inadequate knowledge. Medical students had better scores.	20 questions were adopted from the Colwell *et al*. (2010) study. Response options included Yes, No, or Unsure. Correct answers received a score of 1. A higher score indicated better knowledge. Scores were continuous Attitude: shyness, lack of knowledge	Multiple sources (29.8%), doctor or family/relatives (55 8.5%)	Results cannot be generalised. PCOS diagnosis of the females was based solely on the response given by them; some may not be aware or have been undiagnosed bringing in a degree of variability

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
							68.6% not embarrassed, but 67.3% had not consulted a doctor. Barriers include lack of knowledge and shyness Positive mindset of the society towards addressing this health issue	identified. Beliefs: stigma, perceptions were recorded about clinical features of PCOS, reason for undergoing screening, feelings about screening, societal pressures, preference of gynaecologists in terms of gender, barriers towards screening		
Sabitha and Sunanda 2016	India	Single nursing institute	Males and Females	18-25	2nd and 3rd year BSc nursing	Knowledge	76% had average knowledge; 10.7% had good knowledge; 13.3% had poor knowledge Lifestyle factors affected level of knowledge of PCOS: 92% reported regular menstrual cycles; 82.7% followed mixed diet; 75.3% Christians; 85% 21-25 years Knowledge associated with dietary pattern,	20-item questionnaire: Knowledge scored Poor (<10), Average (10-15); Good (>15). Calculated as frequency and percentage Attitude and practice not scored	Parents (30.6%), teachers (28%), health personnel (20.6%), friends (9.6%), mass media (8.6%)	Small sample size and the study delimited to a selected nursing college

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
							junk food consumption, and information sources (P<0.05)			
Sasikala *et al*., 2021	India	Single nursing institute	Males and Females	18-22	Nursing students (year not specified).	Knowledge Awareness	Educational intervention is needed. 89.8% had heard of PCOS. Misconceptions and gaps exist especially regarding complications such as diabetes and endometrial cancer. Majority claimed it to be the most common endocrinological problem	15 questions: knowledge of risks (6), clinical signs and symptoms (4), and complications of PCOS (5). Each question included number of students that responded yes or no and the (%) Participants were asked whether they had heard about PCOS, responses were counted. Attitude and practice questions included risk factors, symptoms, and complications; not scored.	Not reported	Small sample size, findings from the study cannot generalised

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
Sehar, 2021	India	Single tertiary institute	Males (18.3%) and Females (81.7%)	17- <31	DGNM 3rd year, BSc Hons Nursing 4th year	Knowledge	60% of nursing students had average knowledge, 38.33% had good knowledge, and 1.66% had poor knowledge. Structured education programme recommended.	Structured 40 question tool, each question scored 1, maximum score 40, minimum score 1. Attitude and practice not scored or detailed separately. Poor (0-13), Average (14-27), Good (28-40)	Books, journals, internet (55%), theory classes (28%), medical personnel (8.3%), family friends (5%), seminar/ webinar (3.4%)	Small sample size, findings from the study cannot generalised
Sharwini *et al*., 2019	India	Multiple tertiary institutes	Female undergraduates (young ladies and adolescents) (100%)	adolescents (18-19 years) young ladies (20-24 years)	University students	Nutrition awareness	Low awareness of PCOD (51.4%) Poor (48.6%) awareness of diet. students had minimal awareness of role of diet Misconceptions noted in the response	Participants asked about source of knowledge. Attitude and practice Unawareness of dietary role addressed through advice. . Frequencies and percentages	Doctors (19.5%), friends and family (23%), media (18.4%), Internet (23%), books (16%).	Small sample size, findings from the study cannot generalised

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
Subhashree Bangaru *et al*., 2021	India	Single medical tertiary institute	Males (40.62%) and Females (58.33%)	Mean age 21.9	Medical students	Knowledge Awareness	57.8% Good knowledge, 36.9% Fair knowledge, 5.2% poor knowledge More females than males had good knowledge as well as fair knowledge; none of the females demonstrated poor knowledge Majority of students from the upper-middle class demonstrated good knowledge Awareness level (92.7%) Doctors and peers were common sources. Highlights need for awareness for early diagnosis	Asked whether participants had heard of PCOS and assessed sources of information. Beliefs and attitudes were not explicitly scored. Associations between gender and socio-economic class with levels of knowledge, categorised as good, fair, and poor	Doctors (20.83%), someone with PCOS (20.83%), magazines or books (16.14%), internet (16.14%), friends (10.93%), teachers (8.33%), mass media (3.12%)	The result from this study might not be able to represent the whole population

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
							and lifestyle change			
Tahir *et al*., 2020	Pakistan	Single tertiary institute	Females (100%) (11.2% diagnosed)	19-24	Medical students 94.2%; Dental students 5.8%	Knowledge Level of awareness	74.5% aware Common reported symtoms: acne (55.4%); hirsutism (50.7%); irregular/absent period (37.1%); weight gain (36.3%); alopecia (42.8%); mood swings (63.3%); fatigue (62.6%). Internet (42.2%) and peers (27.3%) were major sources. 11.2% diagnosed with PCOS; 80.6% receiving treatment Need structured awareness campaigns.	Participants asked about PCOS awareness and symptoms. Responses analysed by frequency. Attitude and practice not formally scored-included an open-ended question	Internet and social media (42.2%), family members, friends, or colleagues (27.3%), hospital (12.3%), books, class lectures and universities (4%)	The study did not use a standardized and pre-tested knowledge scale to document the knowledge score of participants. The study only included female medical and dental students

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
							Behavioural insight: 65.8% said that they would not visit a gynaecologist unless symptoms were severe; 36.6% had a family history of diabetes, hypertension or endocrine disorders; 12.6% reported a family history of PCOS-like symptoms			
Thomas *et al*., 2017	Malaysia	Single tertiary institute	Females	Not specified	Medical student (n=60; 1st years, and 62 2nd years) Nursing (n= 40 1st years, and 39 2nd years)	Contributing factors Knowledge	Medical students (Mean=0.38, SD=0.2) Nursing students (Mean=0.28, SD=0.21) 48.4% of medics have heard of PCOS; 64.6% nurses have never heard of PCOS before Both had ideal BMI, associated with premenstrual syndrome	Knowledge question score (mean< 0.5= poor knowledge). Attitudes and practices not scored	Not reported	Include female students of only two faculties, with narrow age range. Not giving a holistic view of the menstrual cycle pattern and its relation to PCOS

Author, Year of publication	Country	Study setting	Population	Population age range (years)	Field of study/degree of population	Outcome measures	Main finding/s	Knowledge scoring system utilised	Sources of information	Limitations
							Both had similar lifestyle patterns Both groups lacked sufficient knowledge. Education on PCOS much needed in pre-clinical curricular			
Upadhye and Schembekar, 2017	India	Multiple tertiary institutes	Female students (62.5%) and adolescents (37.5%) 6% diagnosed with PCOS	Young girls (20-24) Adolescents (18-19)	Medical students (1^{st}, 2^{nd}, 3^{rd} years) 18-19 years 37.5%; 20-14 years 62.5%	Awareness	28% unaware of PCOS Knowledge of the disorder and counseling should be included in the curriculum 16.5 % obese, 35.5% Acne, 16% irregular menses, 5% hirsutism, 2% infertility Majority consulted a dermatologist	Awareness scored by frequency of those who heard of PCOS; Attitude and Practice not scored but source of knowledge was documented. Beliefs revealed need for lifestyle education. BMI, type of diet, symptoms, sources of information, type of doctor consulted were documented.	Teachers (33%), friends (19%), doctor (11.5%), newspapers (3.5%), internet (5%)	Study only included female medical students

APPENDIX D - Permission to use validated questionnaire by Al Souheil and Chahine (2021)

To whom it may concern 20 July 2022

Letter granting permission to utilise survey tool

This serves as a confirmation of my permission granted to Naasira Ashraf Moosa (0201695G), Masters candidate at the University of the Witwatersrand to make use of the survey instrument validated by the study - Al Souheil, F. and Chahine, B., 2021. Knowledge of Polycystic Ovarian Syndrome, Its Complications, and Management among Lebanese Women: A Cross-Sectional Survey. *Journal of Health and Allied Sciences NU*. - for research purposes.

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APPENDIX E - Participant Informed Consent Form

Research Project entitled: Knowledge and attitude of polycystic ovarian syndrome among university students at a health science campus.

I hereby confirm that I have accurately read and understood the information sheet provided by the researcher, and I understand that the following will be done:

1. I will participate in the study towards the research project.
2. I will remain anonymous.
3. I will be required to answer a questionnaire about my knowledge and attitude of PCOS.
4. I will give my honest opinion when answering the questions in the questionnaire.
5. I confirm that I have given consent freely and willingly and that I may withdraw at any time during the study.

- I hereby agree that I understand the requirements of this project and am willing to participate and provide feedback for research purposes.

  Date: _____

APPENDIX F - Study information document

Dear Participant

I, Naasira Ashraf Moosa, currently registered for a Master's Degree in Pharmacy, am doing a research study on the knowledge of polycystic ovarian syndrome (PCOS) among university students. As such, I would like to invite university students registered for a degree in any year of study in the Health Sciences Faculty to participate in this study to help us gather information we require.

Participating in the study involves completing an online questionnaire which consists of close-ended questions which should take 15-20 mins to complete. By answering the following questionnaire, you will contribute to the study aimed at measuring knowledge gaps regarding PCOS.

There are no risks in participating in this study. Your participation in this survey is completely voluntary, and you are free to withdraw from this study at any time prior to submission of the data without giving a reason and without having any consequences. All your responses will remain anonymous. Consent is required before participating in this study.

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg. A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

Confidentiality will be maintained in this study. You will remain anonymous as no personal information will be collected.

Contact details of researcher/s:

Researcher: Naasira Ashraf Moosa
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E-mail: 0201695g@students.wits.ac.za.

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Supervisor: Fatima Kathrada
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Supervisor: Amber Cheng
Tel: 0117172552
E-mail: amber.cheng@wits.ac.za

Contact details of HREC administrator and chair – for reporting complaints/problems.

If you have any concerns over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Date: September 2022

APPENDIX G – Ethical Clearance

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research and Innovation)

TO: Ms N Ashraf Moosa
School of Therapeutic Sciences
Department of Pharmacy and Pharmacology
Medical School
University

E-mail: 0201695G@students.wits.ac.za

CC: Supervisor: Ms F Kathrada, et al
<Fatima.Kathrada@wits.ac.za>
and <HREC-Medical Research Office@wits.ac.za>

FROM: Mr Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252

E-mail: Iain.Burns@wits.ac.za

DATE: 2023/02/20

REF: R14/49

PROTOCOL NO: **M221048** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)

PROJECT TITLE: *Knowledge and attitude of polycystic ovarian syndrome (PCOS) amongst university students at a health science campus*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R49 Ms N Ashraf Moosa

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M221048

NAME: (Principal Investigator)	Ms N Ashraf Moosa
DEPARTMENT:	School of Therapeutic Sciences Department of Pharmacy and Pharmacology Medical School University
PROJECT TITLE:	*Knowledge and attitude of polycystic ovarian syndrome (PCOS) amongst university students at a health science campus*
DATE CONSIDERED:	2022/10/28
DECISION:	Approved unconditionally
CONDITIONS:	
NOTE:	If contact information regarding student study participants is required, please contact the Registrar's office - <Nicoleen.Potgieter@wits.ac.za>
SUPERVISOR:	Ms F Kathrada, et al
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2023/02/20

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **October** and therefore reports and re-certification will be due in the month of **October** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator

16/05/2023
Date

APPENDIX H - Questionnaire

Questionnaire: Knowledge and attitude of polycystic ovarian syndrome at a health science campus.

<u>Before answering the questionnaire, we would like to inform you about a few points</u>:

- The following information that you provide will be used for research purposes only.

Section I: Demographic characteristics

1. Gender:
   - female
   - male

2. What is your age in 2023? (give a whole number)

3. Please indicate your marital status:
   - Single
   - Married
   - Other

4. Which type of degree are you currently registered for?
   - Undergraduate degree
   - Postgraduate degree

5. What degree are you registered for? (if selected undergraduate degree)
    - BCMP-Clinical Medical Practice
    - BDS-Dental Science
    - BHSc
    - BNurs- Nursing
    - BOHSc- Oral Health Sciences
    - BPharm-Pharmacy
    - BSC (Physiotherapy)- Physiotherapy
    - BSC (OT)
    - MBBCH-Medicine and Surgery

5. What degree are you registered for? (if selected postgraduate degree)
    - Masters
    - PhD
    - Other

6. What is your academic year of study in the degree you are currently registered for?
    - 1st
    - 2nd
    - 3rd
    - 4th
    - 5th
    - 6th

Section II: Female medical and reproductive information

7. Have you been diagnosed with PCOS by a health professional?
    - Yes
    - No
    - I don't know
    - Not applicable

8. Have you heard of the term polycystic ovary syndrome (PCOS)?
    - Yes
    - No
    - I don't know

9. What source or sources did you use to come to know about PCOS? **
    - Medical professional (doctor, pharmacist, nurse, physiotherapist)
    - Information booklet available at consulting rooms, clinic or pharmacy
    - Friends or family
    - Textbooks
    - Social media
    - Internet sources
    - Subject syllabus lecture material
    - Awareness campaign
    - Other

** Multiple response question

Section III: Basic knowledge regarding the physiology of female reproductive system of participants

(True, False, Don't know)

10. A follicle is a small fluid filled sac with a single egg inside.

11. Ovulating more frequently improves fertility.

12. After egg release (ovulation), the hormone progesterone is released which will allow the uterine lining to shed in a normal menstrual period.

13. In patients with PCOS, an increase in abdominal fat increases circulating androgen.

14. Insulin stimulates the production of testosterone by the ovary.

Participants' knowledge of pathophysiology, diagnosis & presentation of PCOS

(True, False, Don't know)

15. Polycystic ovaries contain more visible follicles than a non-polycystic ovary.

16. Polycystic ovaries may ovulate less frequently than a non-polycystic ovary.

17. Male hormone (testosterone) production is increased in women with PCOS.

18. Insulin levels are commonly elevated in women with PCOS.

19. A transabdominal ultrasound is one of the methods used to diagnose PCOS.

20. A specific blood test is available for the diagnosis of PCOS.

Knowledge of signs and symptoms of PCOS (Yes, No, I don't know)

21. Irregular menstruation or the absence of a menstrual cycle (period) is a symptom of PCOS.

22. Excessive hair growth (hirsutism) on the face and body is a symptom of PCOS.

23. Weight gain is a symptom of PCOS.

24. Thinning scalp hair is a symptom of PCOS.

25. Acne is a symptom of PCOS.

Knowledge of the complications with PCOS (Yes, No, I don't know)

26. PCOS increases the risk for diabetes (type 2).

27. PCOS increases the risk of recurrent miscarriages.

28. Metabolic syndrome is common in women with PCOS.

29. Patients with PCOS have an increased risk of infertility (inability to conceive).

30. Patients with PCOS have an increased risk of depression.

31. Patients with PCOS have an increased risk of anxiety.

32. Patients with PCOS have an increased risk of developing breast cancer.

33. Patients with PCOS have an increased risk of developing endometrial cancer.

Knowledge of PCOS management (True, False, Don't know)

34. Combined oral contraceptives are indicated in the treatment of PCOS.

35. Insulin-sensitizers' such as metformin are indicated in the treatment of PCOS.

36. In patients with PCOS, lowering insulin levels may help decrease free testosterone.

37. In patients with PCOS, lowering insulin levels may help trigger ovulation.

38. Physical exercise improves PCOS symptoms by decreasing insulin levels.

39. Weight loss improves PCOS symptoms.

40. Exercises aimed at increasing muscle mass are encouraged in the management of obese patients with PCOS.

41. Exercise, healthy dieting, and weight loss decrease the risk of developing metabolic syndrome in patients with PCOS.

Section IV: Study participants attitude regarding PCOS

(5. Strongly agree, 4. Agree, 3. Neutral, 2. Disagree, 1. Strongly disagree)

42. The name PCOS is confusing as PCOS gives no clue about the disease.

43. PCOS is a chronic condition with no cure.

44. Hormone-regulating herbal treatments may be used to treat PCOS.

45. PCOS is a big health issue globally.

46. Individuals with PCOS commonly experience dissatisfaction with their appearance.

47. Individuals with PCOS commonly experience feelings of loss of femininity.

48. Patients with PCOS require social support.

49. I am interested in learning more about PCOS.

50. Universities are ideal environments for awareness campaigns and educational intervention about PCOS.

APPENDIX I - Turnitin Report



Knowledge and attitude of polycystic ovarian syndrome (PCOS) among university students at a health science campus

ORIGINALITY REPORT

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.researchgate.net Internet Source	1%
2	Innocent Musonda, Erastus Mwanaumo, Adetayo Onososen, Retsepile Kalaoane. "Development and Investment in Infrastructure in Developing Countries: A 10-Year Reflection", CRC Press, 2024 Publication	<1%
3	www.thieme-connect.com Internet Source	<1%
4	pmc.ncbi.nlm.nih.gov Internet Source	<1%
5	Mohammed Alotaibi, Amani Ali Shaman. "Enhancing polycystic ovarian syndrome awareness using private social network", mHealth, 2020 Publication	<1%
6	www.frontiersin.org Internet Source	<1%
7	Crystal Clark Douglas, Rachel Jones, Rachel Green, Kristina Brown, Greschen Yount, Robert Williams. "University Students with PCOS Demonstrate Limited Nutrition Knowledge", American Journal of Health Education, 2021 Publication	<1%