KNOWLEDGE AND AWARENESS OF POLYCYSTIC OVARY SYNDROME AMONG FEMALE PHARMACY STUDENTS IN THE UNIVERSITY OF BENIN, EDO STATE.

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A PROJECT SUBMITTED TO THE DEPARTMENT OF CLINICAL PHARMACY AND PHARMACY PRACTICE, FACULTY OF PHARMACY, UNIVERSITY OF BENIN, BENIN CITY, EDO STATE.

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CERTIFICATION

This is to certify that this project work was carried out by **OVERO RACHEAL TEKEVWE** with Matriculation Number **PHA1908596** in the Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, University of Benin, Benin City.

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DEDICATION

This project work is dedicated to the Almighty God for His grace and faithfulness in my life.

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ABSTRACT

Introduction/Background: Polycystic Ovary Syndrome (PCOS) is one of the most common endocrine and metabolic disorders affecting women of reproductive age worldwide. It is characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology, and is linked to long-term complications such as infertility, metabolic syndrome, type 2 diabetes, cardiovascular disease, and mental health disorders. Despite its high burden, awareness and understanding of PCOS remain limited, even among women in health related disciplines. In Nigeria, factors such as cultural stigma, inadequate reproductive health education, and limited clinical training may further reduce levels of knowledge. Pharmacy students, as future healthcare professionals, are expected to play key roles in educating patients and promoting early detection of chronic disorders like PCOS.

Objective: This study assessed the knowledge and awareness of Polycystic Ovary Syndrome among female pharmacy students at the University of Benin.

Method: A descriptive, cross-sectional study was conducted among 197 female pharmacy students in 400–600 levels, selected through convenient sampling. Data were collected using a structured, pre-tested, self-administered questionnaire containing sections on demographics, knowledge, awareness, perceptions, and information sources. Statistical analysis was performed using SPSS version 27.0. Descriptive statistics summarized responses, while Chi-square tests evaluated associations between variables, with $p < 0.05$ considered statistically significant.

Results: The overall mean knowledge score was 26.80 ± 4.14 out of 42. Most respondents (60.9%) demonstrated poor knowledge, while only 39.1% exhibited good knowledge of PCOS. Awareness was moderate in more than half of the students (54.3%). Students in 600 level had significantly better knowledge (28.79 ± 4.35, $p < 0.001$). Significant associations were observed between knowledge level and family history of PCOS ($p < 0.003$), PCOS diagnosis ($p < 0.001$), and primary sources of information ($p < 0.001$). Social media (33.5%) and academic lectures (17.8%) were the most common sources of information. Although many respondents recognized PCOS as a hormonal disorder (72.1%) and its link to infertility (76.6%), major gaps existed in identifying elevated hormones, diagnostic criteria, complications, and evidence-based management. Additionally, 70.1% did not perceive PCOS as a serious condition, and 40.1% lacked confidence in counselling patients.

Conclusion: The findings reveal substantial gaps in PCOS knowledge among female pharmacy students at the University of Benin, despite moderate awareness levels. Notable deficiencies were identified in their understanding of PCOS risk factors, hormonal imbalance, diagnostic methods, and long term complications. There is a need to strengthen reproductive health education within the pharmacy curriculum, promote targeted awareness initiatives, and improve exposure to PCOS related clinical content. Enhancing students' knowledge will better prepare future pharmacists to offer accurate patient counselling, support early detection, and contribute to improved management of PCOS.

Keywords: Polycystic Ovary Syndrome, Pharmacy Students, Awareness, Knowledge, University of Benin, Hormonal Disorders, Reproductive Health, Women's Health.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY.

Polycystic Ovary Syndrome (PCOS) is a highly prevalent endocrine disorder, affecting between 8–13% of women of reproductive age globally. In Nigeria, particularly among women experiencing infertility, the prevalence is higher, estimated at 8.6–16.9% (Anosike *et al.,* 2025). This complex, multi-system condition presents with reproductive dysfunctions such as chronic anovulation, hyperandrogenism, and infertility, alongside metabolic challenges including insulin resistance and obesity. Additionally, PCOS contributes to notable psychological burdens, including depression and anxiety (Shukla *et al.,* 2025).

Despite the condition's widespread impact and long-term health risks, including heightened susceptibility to type 2 diabetes, cardiovascular disease, endometrial cancer, and complications during pregnancy, public and professional awareness remains limited. Disturbingly, this lack of knowledge persists even among healthcare trainees, such as future pharmacists, who play vital roles in primary healthcare delivery across Nigeria.

Pharmacists are uniquely positioned within community and hospital settings to aid early detection, administer evidence based pharmacological treatments (e.g., metformin, oral contraceptives), provide lifestyle counseling, and initiate specialist referrals. However, global research highlights significant gaps in PCOS related knowledge among health sciences students, particularly concerning the Rotterdam diagnostic criteria, pathophysiology, and chronic comorbidities.

In Nigeria, such deficiencies are exacerbated by cultural taboos surrounding menstrual health, fragmented reproductive care infrastructure, and curricular inadequacies within tertiary institutions. This research, therefore, aims to assess the level of understanding, sources of information, and perceived management competence regarding PCOS among female undergraduate pharmacy students at the University of Benin (UNIBEN). Insights from this study will spotlight critical educational shortcomings and inform both curriculum reforms and tailored public health interventions for this at risk group.

1.2 OVERVIEW OF POLYCYSTIC OVARY SYNDROME (PCOS)

Polycystic Ovarian Syndrome (PCOS) is one of the most common metabolic and reproductive disorders affecting women of reproductive age. It is a complex and multi-factorial condition with an uncertain origin, characterized by a wide range of symptoms such as elevated androgen levels, menstrual irregularities, insulin resistance, and obesity. PCOS is also a prominent cause of anovulation, making it a significant contributor to infertility in those affected (Hart *et al.,* 2015).

Previously considered purely a reproductive disorder, polycystic ovary syndrome is now recognized as a metabolic condition with serious long-term health implications, such as an increased risk of type 2 diabetes and cardiovascular disease. In addition, it has been associated with poor mental health outcomes and a reduced overall quality of life (Parker *et al*., 2022; Dumesic *et al*., 2023).

PCOS symptoms often appear in early adolescence, frequently resembling typical signs of puberty such as irregular menstrual cycles, acne, anovulation, and infertility which can make early diagnosis challenging. The condition’s complex and intertwined pathophysiology further complicates efforts to identify its root causes

(Peña *et al.*, 2022). Metabolic disturbances associated with PCOS also tend to emerge early, including childhood weight gain, centralized fat accumulation, increased risks of dyslipidemia, hypertension, chronic low-grade inflammation, and insulin resistance (Sun *et al.,* 2020). Research by Wang *et al.,* (2001) reported a significantly higher incidence of spontaneous miscarriage in women with PCOS compared to those without (Sun *et al.*, 2020).

Studies show that approximately one in ten women are affected by PCOS before menopause. Although it was once believed to be limited to adulthood, recent evidence suggests that PCOS is a lifelong condition that may begin as early as the embryonic stage (Deutsche Welle, 2023). Its wide spectrum of symptoms and presentations contributes to the existence of multiple diagnostic criteria.

1.3 PATHSOPHYSIOLOGY AND DIAGNOSIS.

Over time, multiple theories have been proposed to clarify the pathophysiology of PCOS. Initially, it was thought that an excess of androgen during fetal development could trigger the condition. Later, insulin resistance was identified as another factor that might play a role in the development of PCOS and hyperandrogenemia (Witchel *et al*., 2019).

The pathophysiology of PCOS involves hyperandrogenism, hormonal imbalance, elevated Anti-Müllerian Hormone (AMH) levels, insulin resistance (hyperinsulinemia), and chronic low-grade inflammation. Persistent hormonal imbalances result in numerous small antral follicles, disrupted menstrual cycles, and ultimately infertility in women (Su *et al.*, 2025).

The Rotterdam criteria, widely regarded as the most accepted diagnostic standard for PCOS, require the presence of any two out of the following three features: (a) hyperandrogenism, (b) oligo or anovulation, and (c) polycystic ovaries. PCOS is also associated with insulin resistance, cardiovascular disorders, abdominal obesity, psychological conditions, infertility, and an increased risk of endometrial cancer (Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004).

1.3.1 HYPERANDROGENISM

Hyperandrogenism is a clinical condition characterized by an excessive level of circulating androgen hormones. Common symptoms include hirsutism, acne, androgenic alopecia, irregular menstrual cycles, ovulatory dysfunction, and infertility (Cleveland Clinic, 2023).

Beyond reproduction, androgens have far reaching effects on overall health. They support cognitive function, help regulate mood, and sustain energy levels, all of which significantly impact psychological and emotional wellbeing (Very Big Brain, 2024). However, maintaining balanced androgen levels is crucial, as imbalances, whether excessive or deficient, can lead to health complications. Elevated androgen levels, for instance, are linked to hyperandrogenism, manifesting in symptoms such as hirsutism, acne, menstrual irregularities, and, in severe cases, infertility (Verywell Health, 2025).

In PCOS, androgen excess primarily disrupts folliculogenesis. Elevated androgen levels in the early gonadotropin independent phase stimulate primordial follicle formation and increase the number of small antral follicles (Ashraf *et al.,* 2019). Polycystic ovaries are distinguished by numerous arrested follicles, primarily in the preantral and antral stages, accompanied by thecal hyperplasia and follicular fluid accumulation (Dewailly *et al.,* 2014). This leads to the formation of cyst-like

structures lining the ovarian wall, creating a characteristic string of pearls appearance (Ponnatapura *et al.,* 2019). Additionally, increased ovarian stromal cell volume and multiple fluid-filled follicles contribute to ovarian enlargement, one of the key morphological features observed in women with PCOS (Dewailly *et al.,* 2014).

1.3.2 ELEVATED ANTI -MÜLLERIAN HORMONE LEVELS

Anti-Müllerian hormone (AMH) plays a vital role in regulating the reproductive endocrine system, emphasizing the importance of ongoing research into its interactions with neuroendocrine factors. First identified by Fallat *et al.,(*1997), studies have consistently shown that women with PCOS exhibit significantly elevated AMH levels.

Research has shown that individuals with PCOS tend to have significantly higher serum AMH levels compared to those with normal ovarian function and regular menstrual cycles. Studies indicate that AMH concentrations in PCOS patients are typically two to three times greater than those observed in healthy individuals. This elevation is particularly pronounced in those experiencing anovulatory symptoms, as AMH plays a crucial role in follicular development and ovarian function (Pigny *et al.,* 2006; Pellatt *et al.,* 2007). Tehrani *et al.,* (2010) observed that women with PCOS who have elevated AMH levels tend to experience variations in fertility. These individuals may remain capable of conceiving for an extended period compared to normo-ovulatory women.

AMH also plays a vital role in regulating gonadotropin-releasing hormone (GnRH) neuron function under normal physiological conditions. Research has identified AMH type II receptors on GnRH neurons, demonstrating its capacity to bind to these receptors and influence GnRH activity in the hypothalamus, either directly or

indirectly (Cimino *et al.,* 2016). In pathological states, elevated AMH levels may alter hypothalamic signaling, modifying the frequency or intensity of GnRH secretion and thereby contributing to hyperandrogenism. Additionally, AMH inhibits granulosa cell-mediated follicular development, specifically affecting follicles destined for dominance.

1.3.3 HYPERINSULINEMIA AND INSULIN RESISTANCE

Insulin is a vital metabolic hormone primarily recognized for its role in maintaining glucose homeostasis (Saltiel *et al.,* 2001). Pancreatic β-cells secrete insulin in response to nutrient stimuli, including elevated levels of glucose, amino acids, and fatty acids. This secretion is further modulated by hormones, paracrine and autocrine signals, and neurotransmitters (Huising, 2020; Lenzen, 2021).

Hyperinsulinemia is a key player in the development of PCOS, acting both as a driving force behind the condition and as a result of it. In 1980, researchers first established the connection between insulin resistance and PCOS, highlighting the relationship between hyperandrogenism and hyperinsulinemia in affected women (Burghen *et al.,*1980).

Several years later, a small study revealed that even lean individuals with PCOS exhibit insulin resistance (Jialal *et al.,* 1987) leading to the hypothesis that hyperinsulinemia could be a central feature of the condition.

However, despite this discovery, existing PCOS diagnostic criteria continued to emphasize hyperandrogenism and ovarian morphology and function, overlooking clinical variables linked to glucose metabolism .Current estimates suggest that up to 75% of women with PCOS experience impaired insulin response, as assessed through the hyperinsulinemia-euglycemic clamp method (Azziz *et al.,* 2016).

Despite numerous studies exploring the complex interplay between excess weight, reduced insulin sensitivity, and hyperinsulinemia in women with PCOS, the full extent of these interconnected mechanisms remains unclear (Dahan *et al.,* 2019).

1.3.4 CHRONIC LOW-GRADE INFLAMMATION

The ovarian micro environment is essential for follicular development and oocyte maturation, but certain maternal conditions, such as polycystic ovary syndrome (PCOS), endometriosis, and aging, can disrupt this balance, affecting both follicular growth and oocyte quality.

Chronic low-grade inflammation plays a significant role, contributing to oxidative stress and tissue fibrosis within the ovary. In cases of PCOS, endometriosis, and aging, elevated pro-inflammatory cytokine levels in follicular fluids further exacerbate these issues.

For women with obesity and PCOS, hyperandrogenemia and insulin resistance fuel chronic ovarian inflammation, impairing follicular development through increased oxidative stress.

Aging also contributes to this process, as senescent cells release senescence-associated secretory phenotype factors, promoting ongoing inflammation and oxidative stress within the ovary.

1.4 DIAGNOSIS OF POLYCYSTIC OVARY SYNDROME

In 1990, the National Institute of Child Health and Human Development made the first effort to establish a clinical definition of polycystic ovary syndrome (PCOS).

The condition was characterized by the presence of clinical or biochemical indicators of hyperandrogenism, along with oligo- or chronic anovulation (Dahan et al., 2019).

Ultrasound findings of polycystic ovaries were considered indicative of PCOS but not

definitive for diagnosis, contrasting with medical practices in the United Kingdom and much of Europe, where polycystic ovarian appearance on ultrasound was regarded as the primary diagnostic criterion for PCOS.

This debate persisted until 2003, when twenty seven leading PCOS experts convened in Rotterdam, Netherlands, at a conference jointly organized by the European Society of Human Reproduction (ESHRE) and the American Society for Reproductive Medicine (ASRM).

The meeting resulted in a unified consensus statement, now widely recognized as the "Rotterdam Criteria" (Dunaif *et al.,* 1989).

These criteria broadened the phenotypic expression of PCOS to include any two out of the three key characteristics of PCOS: oligo-amenorrhea, hyperandrogenism, and polycystic-appearing ovarian morphology on ultrasonography.

In doing so, the prevalence of PCOS, in some studies, increased as much as three times compared to diagnosis using the 1990 National Institute of Health (NIH) criteria.

When irregular menstrual cycles and hyperandrogenism are present, neither ultrasound nor AMH testing is necessary for the diagnosis of PCOS in adults.

In adolescents, both hyperandrogenism and ovulatory dysfunction must be present for a diagnosis of PCOS.

However, ultrasound and AMH testing are not recommended in this population due to their low specificity (Toprak *et al.,* 2001).

Also, chronic oligo-ovulation or anovulation may be established based on the history of irregular cycles. Ovulatory dysfunction can still occur with regular cycles; therefore, if diagnostic confirmation of anovulation is needed, serum progesterone levels can be measured (Toprak *et al.,* 2001).

Excluding disorders that can mimic the clinical features of PCOS is also essential,

including thyroid disease, hyperprolactinemia, and atypical congenital adrenal hyperplasia due to 21-hydroxylase deficiency.

1.4.1 OLIGO-AMENORRHEA

The typical adult menstrual cycle spans approximately 28 days, though a range of 21 to 35 days . Within this, the luteal phase remains stable at around 14 days, while the follicular phase varies more significantly (Juan *et al.,* 2021).

In patients with polycystic ovary syndrome (PCOS), menstrual irregularities typically manifest as oligo-amenorrhea, characterized by menstrual intervals longer than 35 days or fewer than eight cycles per year. Polymenorrhea, characterized by cycles less than 21 days apart, is less frequently observed but is still included in some diagnostic criteria for PCOS (Zawadski *et al.,* 1992). Clinical suspicion of PCOS exists despite regular menstrual cycles or unclear patterns such as polymenorrhea, it is advisable to confirm ovulation through serum progesterone measurement to account for the possibility of ovulatory dysfunction in the absence of classic oligo-amenorrhea (Zawadski *et al.,*1992). These recommendations are applicable only to adults as compared to adolescents, irregular menses are considered normal during the first year post-menarche, and between years one and three, cycles shorter than 21 days or longer than 45 days should be classified as irregular.

In PCOS, oligomenorrhea arises primarily due to chronic anovulation. This is often triggered by an excess of testosterone, which interfere with normal follicle development and prevent ovulation. Additionally, insulin resistance, a common feature of PCOS, can elevate insulin levels, further stimulating ovarian androgen production and disrupting the ovulatory cycle. The hormonal environment is further complicated by an imbalance between luteinizing hormone (LH) and follicle-stimulating hormone (FSH), which impairs the progression of follicular growth. These

disruptions collectively form a self perpetuating cycle in which ovulation becomes increasingly rare, reinforcing the irregular menstrual patterns characteristic of PCOS.

1.4.2 HYPERANDROGENISM

In females, androgens are vital for maintaining bone strength, muscle tone, and sexual function. These hormones are synthesized from three primary sources: about 25% from the ovaries, 25% from the adrenal glands, and around 50% through peripheral conversion. The main circulating androgens include testosterone, dihydrotestosterone, dehydroepiandrosterone sulfate (DHEAS), dehydroepiandrosterone (DHEA), and androstenedione (ANSD) (Rotterdam ESHRE/ASRM, 2004; Teede *et al.,* 2023). Most women with PCOS who experience oligo-amenorrhea also show biochemical signs of hyperandrogenism (Xie *et al.,* 2018; Boyle *et al.,* 2018). The ovaries are typically the central source of this androgen excess in PCOS cases. Free testosterone,unbound to sex hormone binding globulin (SHBG) is often the most elevated and serves as the most sensitive diagnostic marker (Teede *et al.,* 2023). Obesity and high insulin levels frequently lower SHBG concentrations, contributing to reduced levels in PCOS patients (Teede *et al.,* 2023). Studies have reported that up to 89% of women with PCOS and elevated androgens exhibit increased free testosterone, while total testosterone levels are raised in 49% to 80% of cases (Boyle *et al.,* 2018).

Accurately measuring serum androgens in women presents several challenges. Conventional assays often lack reliability at the low androgen concentrations typically found in females. In addition, testosterone levels can fluctuate throughout the day, and structurally similar steroids may interfere with assay accuracy (Reed *et al.,* 2000). Due to these limitations, direct assays performed on whole serum are generally discouraged. Instead, it is advised to use techniques involving extraction and

chromatography, followed by either mass spectrometry or immunoassay (Reed *et al.,* 2000).

1.4.3 POLYCYSTIC APPEARING OVARIAN MORPHOLOGY ON ULTRASONOGRAPHY

The concept of polycystic appearing ovarian morphology (PCOM) was first described by Stein and Leventhal in 1935 during surgical and pathological evaluations, characterizing the ovaries as bilaterally enlarged and polycystic in appearance (Rotterdam ESHRE/ASRM, 2004). Since the 1980s, non-invasive ultrasound has made it easier to assess ovarian morphology (Teede *et al.,* 2023). Adams *et al.,* introduced the first widely accepted ultrasound based criteria in 1985, defining PCOM as the presence of 10 or more follicles (2–8 mm) in a single cross-sectional view using trans-abdominal ultrasonography (Xie *et al.,* 2018). Later, high-resolution transvaginal ultrasound replaced trans-abdominal methods due to improved imaging quality.

In 2003, Jonard *et al.,* used receiver operating characteristic (ROC) curves to establish a diagnostic threshold: 12 or more follicles (2–9 mm in diameter) per ovary yielded a sensitivity of 75% and specificity of 99% for PCOS diagnosis (Boyle *et al.,* 2018). The Rotterdam criteria in 2003 adopted this threshold and added an alternative marker ovarian volume >10 cm^3 for either ovary (Reed *et al.,* 2000).

Earlier descriptions of PCOM also emphasized peripheral follicle arrangement ("string of pearls") and a bright, echogenic stroma. However, isolated use of stromal area, echogenicity, and follicle distribution lacked diagnostic strength and added minimal value when combined with follicle count or ovarian volume (Hahn *et al.,* 2007). These features were therefore excluded from PCOM criteria in 2003 and subsequent guidelines (Zhao *et al.,* 2011).

Concerns arose in later years about the Rotterdam follicle count threshold, as 30–50% of normo-androgenic, ovulatory women met the PCOM definition under that standard (Azziz *et al.,* 2009; Singla *et al.,* 2015). As a result, researchers proposed updated thresholds (Papadakis *et al.,* 2019). Improvements in ultrasound technology (e.g transducers ≥8 MHz) have also influenced follicle detection and threshold adjustments. Studies that excluded otherwise healthy women with PCOM from control groups often reported lower follicle cut-offs (Papadakis *et al.,* 2019).

A 2014 AEPCOS Society task force proposed raising the PCOM threshold to ≥25 follicles per ovary and/or an ovarian volume ≥10 cm^3 using ≥8 MHz transducers. However, this change was criticized for excluding women with oligo-anovulation who remain at risk for metabolic complications, and for providing limited added insight into hyperandrogenism (Singla *et al.,* 2015). The 2018 international guidelines later revised the follicle count threshold to ≥20 follicles per ovary while maintaining the 10 cm^3 volume criterion.

The diagnostic significance of varying follicle count thresholds remains debatable. Hyperandrogenism and ovulatory function often serve as stronger indicators of metabolic risk than ovarian morphology in PCOS patients. As ultrasound techniques evolve, so too will the diagnostic benchmarks.

Follicle counts and AMH levels naturally decline with age in both PCOS and non-PCOS populations. This has led to calls for age-adjusted criteria. Research indicates that age-specific AMH thresholds enhance diagnostic accuracy for PCOS, and likewise, reductions in follicle number and ovarian volume have been proposed with advancing age. While age adjusted thresholds are not yet standard, awareness of age-related changes is crucial when diagnosing PCOS in older patients.

1.5 DIFFERENTIAL DIAGNOSIS OF POLYCYSTIC OVARY SYNDROME (PCOS)

Diagnosing polycystic ovary syndrome (PCOS) requires more than identifying its hallmark features; it necessitates the exclusion of other conditions that may mimic its presentation. This review explores several important differential diagnoses including androgenic steroid use, hypothyroidism,idiopathic or familial hirsutism, and ovarian malignancies highlighting distinguishing features supported by recent evidence.

Androgenic steroid use, whether through anabolic steroids or testosterone therapy, can lead to symptoms closely resembling PCOS, such as hirsutism, acne, and menstrual irregularities. However, these cases often show a more rapid onset of virilizing features like voice deepening or clitoromegaly, and typically lack polycystic ovarian morphology unless pre-existing PCOS exists.

Hypothyroidism, another potential condition, shares characteristics such as menstrual disruption, weight gain, and even ovarian cysts. What sets it apart is the elevated thyrotropin-releasing hormone in primary hypothyroidism , which raises both thyroid stimulating hormone and prolactin levels, impairing ovulation and promoting cyst formation. These thyroid-related cysts often resolve with appropriate levothyroxine therapy.

Idiopathic or familial hirsutism describes individuals with excessive hair growth in the absence of abnormal androgen levels or menstrual disturbance. This variant is believed to arise from increased activity of peripheral 5α-reductase, enhancing local dihydrotestosterone effects in hair follicles. It is more commonly observed among women of Mediterranean or South Asian descent, and a clinical diagnosis is often

supported by a Ferriman-Gallwey score above seven in the context of normal hormonal studies and exclusion of other pathologies (Zhao *et al.,* 2011).

Lastly, although rare, androgen-secreting ovarian tumors such as Sertoli-Leydig cell tumors must be considered. Unlike PCOS, these malignancies often present with rapidly progressing virilization and are usually associated with a unilateral ovarian mass. Hormonal evaluation often reveals significantly elevated testosterone (above 150 ng/dL). Imaging via MRI or CT aids in tumor localization, with definitive diagnosis achieved through surgical excision and histopathological evaluation (Azziz *et al.,* 2009).

1.6 COMPLICATIONS ASSOCIATED WITH POLYCYSTIC OVARY SYNDROME (PCOS)

1.6.1 INFERTILITY

Infertility was initially recognized as a primary feature of polycystic ovary syndrome (PCOS). Epidemiological studies later confirmed that PCOS is the most prevalent cause of ovulatory dysfunction, with oligoanovulation significantly contributing to infertility risk (Ismajli, 2024). In a study involving 1,741 women diagnosed with PCOS, 50% reported primary infertility, while 25% experienced secondary infertility (Yousaf *et al.,* 2022).

Several conditions commonly associated with PCOS may further contribute to infertility. These include:

- Insulin resistance (IR) and obesity, both linked to higher rates of miscarriage and lower chances of conception and live birth (Zhao *et al.,* 2023).
- Endometrial abnormalities, which can impair implantation (Palomba *et al.,* 2021).

- Ovarian dysfunctions, such as impaired vascularity of the ovary, follicle, and corpus luteum; altered follicular fluid composition; and reduced competence and quality of oocytes (WHO, 2025).

Despite these potential reproductive impairments, findings from studies applying modern PCOS diagnostic criteria with adequate sample sizes have been inconsistent. Notably:

- The classic polycystic ovarian morphology (PCOM) tends to decline with age.
- Menstrual cycles in women with PCOS often normalize as they get older.
- One recent study found that reproductive outcomes in women previously diagnosed with PCOS were similar to those without the condition. These women also appeared to have a better-preserved ovarian reserve, suggesting a longer reproductive span with age (Rees *et al.,* 2016).

Furthermore, studies revealed:

- Comparable live-birth and miscarriage rates between women with PCOS and the general population.
- Over two-thirds of women with PCOS conceived spontaneously.
- A meta-analysis showed no significant difference in pregnancy and live-birth outcomes following conventional in vitro fertilization (IVF) between women with and without PCOS (Ban *et al.,* 2024).

International guidelines emphasize the absence of conclusive evidence linking PCOS to increased miscarriage risk and advise against considering PCOS alone as a risk factor. The latest recommendations by the Endocrine Society's Task Force highlight that PCOS is considered a risk factor for infertility only when oligoanovulation is

present. Therefore, assessing ovulatory function through menstrual history is advised for all women with PCOS seeking fertility treatment (Cunha *et al.,* 2021).

1.6.2 CARDIOVASCULAR RISK IN WOMEN WITH PCOS

According to leading scientific societies, women with PCOS show a higher prevalence of both classic cardiovascular disease (CVD) risk factors such as hypertension, dyslipidemia, diabetes, and obesity and nontraditional factors like elevated C-reactive protein (CRP), homocysteine, and tumor necrosis factor-α (Habibi *et al.,* 2025). These markers are more pronounced when obesity is present, though they can occur independently of it.

A landmark global case control study (INTERHEART, 2004) involving participants from 52 countries identified nine modifiable risk factors accounting for over 94% of the risk of a first heart attack in women: smoking, hypertension, dyslipidemia, diabetes, central obesity, psychosocial stress, low fruit and vegetable intake, alcohol consumption, and physical inactivity (Yusuf *et al.,* 2004). Most of these are frequently observed in women with PCOS, with prevalence rates nearly double compared to non PCOS controls, and about 1.5 times higher in BMI-matched adolescents and adults (Michos, 2023).

A Brazilian study found that hypertension was twice as common in PCOS women, likely due to insulin resistance and hyperinsulinemia, which negatively affect vascular function (Spritzer *et al.,* 2022). Additionally, high testosterone levels (but not SHBG) were linked to a greater risk of hypertension, even after adjusting for age, BMI, and other variables. A Swedish study also reported significantly higher systolic blood pressure and pulse rates in PCOS women, even in the absence of clinical hypertension

suggesting a persistent prehypertensive state regardless of BMI or body fat distribution (Zhuang *et al.,* 2022).

Dyslipidemia is highly prevalent in PCOS, affecting around 70% of U.S. patients, and typically presents as high triglycerides, low HDL cholesterol, and small dense LDL particles similar to lipid patterns in type 2 diabetes and states of insulin resistance (Kim *et al.,* 2013). Elevated non HDL cholesterol and altered ApoB/ApoA1 ratios further reflect an atherogenic lipid profile. While these lipid abnormalities can worsen with obesity, their severity is not solely weight-dependent and may be influenced by hyperandrogenism and genetic or ethnic factors (Zhou *et al.,* 2024).

Despite these well-documented risk markers and signs of sub-clinical vascular disease, the link between PCOS and actual CVD events (morbidity and mortality) remains inconclusive, particularly when using diagnostic criteria like Rotterdam or NIH (Mirzohreh *et al.,* 2025).

1.6.3 METABOLIC RISK IN WOMEN WITH PCOS

Obesity is a growing global epidemic, especially among children and adolescents. Women with polycystic ovary syndrome (PCOS) are particularly impacted, showing a significantly higher prevalence of overweight (BMI >25 kg/m²) and obesity (BMI >30 kg/m²) than women without the condition, reaching up to 61% in some populations (Amiri *et al.,* 2024). This is often characterized by central fat accumulation, although obesity rates in PCOS vary widely across regions and ethnic groups (WHO, 2025). In Western countries like Australia, the U.S., and the U.K., women with PCOS show the highest prevalence, whereas in China, only about 20% exceed a BMI of 25 kg/m² (Liu *et al.,* 2021).

Though the causal link between PCOS and obesity is still being explored, ethnic, cultural, and lifestyle factors are likely contributors. Research indicates that women with more severe reproductive phenotypes marked by hyperandrogenism and chronic anovulation tend to have greater body fat, while lean women with PCOS generally experience milder symptoms (Zhao *et al.,* 2023). This suggests that obesity can exacerbate PCOS manifestations.

Hyperinsulinemia resulting from IR enhances androgen production in the ovaries and suppresses hepatic production of sex hormone binding globulin (SHBG), causing elevated levels of free androgens (Essah *et al.,* 2007). Although obesity intensifies androgen excess, the link seems to be mediated indirectly through IR and hyperinsulinemia (Cardozo *et.al.,* 2017).

Women with PCOS also face an increased risk of developing Type 2 Diabetics Melitus(T2DM), even without obesity. The syndrome is recognized as an independent risk factor for diabetes, particularly in overweight or obese adolescents and young women (WHO, 2025). A meta analysis reported that women with PCOS are four times more likely to develop T2DM than BMI matched controls, and the odds ratio for impaired glucose tolerance (IGT) was 2.5 (Zhao *et al.,* 2023).

Cardiometabolic outcomes in PCOS also vary based on phenotype. Women with hyperandrogenic PCOS (classified under NIH criteria) exhibit more severe metabolic disruptions and a greater prevalence of cardiovascular risk factors (Torchen, 2017). In fact, about 25.8% of these women meet the criteria for metabolic syndrome, which aligns with estimates based on the 1992 NIH diagnostic criteria. This rate is significantly higher than in healthy reproductive age women and in those with non-

hyperandrogenic PCOS (Cardozo *et al.,* 2017). This elevated risk appears linked to both pronounced IR and the independent impact of hyperandrogenism.

1.6.4 ONCOLOGY RISK IN WOMEN WITH PCOS

Polycystic ovary syndrome (PCOS), being a chronic and complex multi-system condition, has reproductive and metabolic disturbances that may contribute to an elevated risk of developing cancers particularly endometrial through possible hormonal and metabolic pathways.

The first studies linking PCOS to endometrial cancer date as far back as the 1940s and 1950s. However, the evidence base remains limited compared to the more robust data on cardiovascular risks in PCOS populations, mainly due to the smaller number of studies and limited case numbers (Barry *et al.,* 2014). The mechanisms potentially driving tumor development especially endometrial cancer include chronic anovulation, which leads to prolonged unopposed estrogen exposure, often accompanied by hyperandrogenism (Harris *et al.,* 2016).

Current meta-analytic findings suggest that women with PCOS, regardless of age, face an increased risk of endometrial cancer. This risk is particularly heightened among premenopausal women (Johnson *et al.,* 2023). As with cardiovascular risk assessments, evaluating cancer risk in PCOS is complicated by several confounding factors such as obesity, type 2 diabetes mellitus (T2DM), chronic inflammation, and metabolic syndrome which are common in the PCOS population. Obesity, a known risk factor for endometrial cancer, may partly explain the elevated cancer risk noted in women with PCOS, as acknowledged by the authors of the latest meta-analysis (Johnson *et al.,* 2023). Likewise, T2DM, another prevalent comorbidity in PCOS, is

associated with increased endometrial cancer risk, potentially due to factors like hyperinsulinemia, hyperglycemia, and systemic inflammation (Harris *et al.,* 2016).

Consequently, it's unclear whether the heightened risk of endometrial cancer stems directly from PCOS itself or from these associated metabolic complications.

1.6.5 PSYCHOLOGICAL HEALTH IN WOMEN WITH PCOS

In addition to well established cardiovascular and metabolic issues, women with polycystic ovary syndrome (PCOS) are at a significantly higher risk for psychological disorders and often report a diminished quality of life compared to women without the condition (Chauhan, 2025).

A recent meta analysis found that depression affects 14% to 67% of women with PCOS, with the likelihood of experiencing depressive symptoms being nearly four times greater than in age matched controls (Yin *et al.,* 2021). This elevated risk persists even among BMI-matched subgroups.

Moreover, a subsequent systematic review revealed a higher prevalence of generalized anxiety and greater average anxiety scores in women with PCOS compared to non PCOS counterparts (Yang *et al.,* 2025). Although data on adolescents are limited, studies suggest a modest increase in anxiety symptoms among younger PCOS patients as well.

Given the high rates of anxiety and depression, several experts recommend integrating psychological assessments into both the initial and ongoing evaluation of PCOS patients. However, the ESHRE/ASRM Consensus Group considers routine psychological screening in all PCOS patients premature. Despite this, more research

is needed to confirm the effectiveness of current psychological screening tools and to develop appropriate, tailored interventions for this population.

1.7 TREATMENT AND MANAGEMENT

1.7.1 Lifestyle Modification

Lifestyle modification remains the most effective and foundational approach for managing polycystic ovary syndrome (PCOS). Weight loss of 5% significantly enhance fertility and improve ovarian function, often achievable through a calorie-restricted diet (Crosignani *et al.,* 2003).

1.7.2 PHARMACOLOGIC MANAGEMENT

1.7.3 Hormonal Contraceptives

Combined hormonal contraceptives are the primary treatment option for women experiencing PCOS related symptoms, including menstrual disturbances, acne, and excessive hair growth. These can be administered as pills, patches, or vaginal rings, with no single method preferred over others, as stated by the Endocrine Society (Teede *et al.,* 2023).

The progestin component plays a critical role by reducing luteinizing hormone (LH) levels, which helps decrease androgen secretion from the ovaries and promotes higher levels of sex hormone-binding globulin (SHBG). This hormonal shift assists in correcting the underlying imbalance. In addition, certain progestins have antiandrogenic properties, suppressing the action of 5-alpha-reductase,an enzyme responsible for converting testosterone into its stronger derivative,

dihydrotestosterone (DHT). As a result, these contraceptives are effective for improving cycle regularity and treating signs of androgen excess (Teede *et al.,* 2023).

Clinical evidence suggests that combining a low dose of spironolactone with combined oral contraceptives (COCs) is more effective in reducing the signs and biochemical markers of hyperandrogenism than using metformin alone (Alpañés *et al.,* 2017). Furthermore, a combination of low-dose spironolactone and metformin has proven more effective in symptom relief and medication adherence compared to either drug used separately (Ganie *et al.,* 2013).

Spironolactone and other antiandrogens can be considered for managing hirsutism in women who do not respond adequately after six months of COC therapy or cosmetic treatments. However, caution is warranted with other antiandrogens such as cyproterone (at doses >10 mg/day), finasteride, flutamide, and bicalutamide due to the risk of adverse effects and toxicity.

1.7.3 METFORMIN IN PCOS MANAGEMENT

With growing recognition of polycystic ovary syndrome (PCOS) as a primarily metabolic disorder, insulin-sensitising agents,particularly metformin, have become central to its treatment. Metformin not only supports improvements in insulin resistance but also enhances menstrual regularity, waist-to-hip ratio, and vascular health in non-obese women with PCOS (Glintborg *et al.,* 2014).

In women with a BMI between 25 and 30 kg/m², metformin alone appears less effective in managing hirsutism compared to oral contraceptive pills (OCPs). Moreover, the combination of metformin and OCPs provides more substantial benefits in reducing hirsutism than either treatment alone. Although the comparative

risk of adverse events remains unclear, some evidence suggests that OCPs may reduce the occurrence of gastrointestinal side effects when compared to their combination with metformin.

There is a pressing need for larger, well-designed randomised controlled trials that stratify results by BMI, particularly in adolescent populations to evaluate the comparative effectiveness of metformin, OCPs, and their combination. Metformin is also a suitable option for managing menstrual irregularities in women who cannot use hormonal contraceptives (Teede *et al.,* 2023). In adolescents, it is often prescribed as monotherapy and has been shown to restore menstruation, support weight loss, and lower insulin resistance. It may also moderately reduce symptoms related to excess androgen levels (Fraison *et al.,* 2020).

1.7.4 INFERTILITY TREATMENT

Letrozole is currently recognised as the first-line treatment for infertility in women with polycystic ovary syndrome (PCOS). In cases of anovulatory infertility with no additional contributing infertility factors, combining clomiphene citrate with metformin has demonstrated improved outcomes in terms of ovulation induction and clinical pregnancy rates when compared to clomiphene citrate alone (Teede *et al.,* 2023).

1.7.5 SYMPTOM-BASED TREATMENT FOR HIRSUTISM, ALOPECIA, AND ACNE

The management of clinical hyperandrogenism requires sustained, long-term treatment, with visible results often taking several months. During this period, cosmetic methods can be used to address symptoms while medications become effective. These include temporary hair removal methods, galvanic or blended

electrolysis for small, targeted areas , or laser photo-epilation for more widespread hirsutism.

The preferred initial treatment for hirsutism involves low-dose oral contraceptives containing either neutral or antiandrogenic progestins, as they effectively lower androgen levels and reduce their effects. Additionally, since anti-androgens are teratogenic, the contraceptive property of oral contraceptives is valuable when used in combination. In cases of mild hirsutism, oral contraceptives alone may suffice. For moderate to severe presentations or mild cases not well controlled after 6 to 12 months adjunctive therapy with anti-androgens may be considered.

1.7.6 MYO-INOSITOL IN PCOS MANAGEMENT

Myo-inositol, an over-the-counter dietary supplement, has been shown to enhance insulin sensitivity in women with polycystic ovary syndrome (PCOS). Compared to placebo, it improves insulin responsiveness without significantly affecting body mass index (BMI). While the current evidence base is limited, myo-inositol is primarily used to support fertility in women with PCOS or as an alternative when metformin is not well tolerated, due to its lower incidence of gastrointestinal side effects (Zeng *et al.,* 2018).

1.8 LITERATURE REVIEW

Polycystic Ovary Syndrome (PCOS) is widely recognized as one of the most common endocrine disorders affecting women of reproductive age across the globe. Depending on the criteria used, particularly the NIH, Rotterdam, its prevalence ranges from 6% to 20% (Teede *et al.,* 2018). Characterized by features such as hyperandrogenism, oligo/anovulation, and polycystic ovarian morphology, the syndrome encompasses

not only reproductive dysfunction but also profound metabolic and psychological consequences, including insulin resistance, type 2 diabetes, cardiovascular complications, anxiety, depression, and infertility (Escobar-Morreale, 2018).

Despite the breadth of clinical and systemic implications, PCOS continues to be under-diagnosed and inadequately understood, even among women pursuing education in health related disciplines such as pharmacy. This knowledge gap is particularly concerning given the pivotal role these students will play as future pharmacists, helping to manage and counsel patients with PCOS. Understanding their current level of awareness is critical for developing informed, targeted educational strategies.

This review seeks to explore existing literature related to PCOS knowledge among pharmacy and health sciences students globally and considers its implications for pharmacy students at the University of Benin in Nigeria. Special emphasis is placed on identifying educational shortcomings, systemic barriers, and opportunities for improved curricular delivery.

1.8.1 GLOBAL LANDSCAPE OF PCOS AWARENESS AMONG STUDENTS

Several studies have sought to quantify and assess the level of PCOS knowledge across diverse university populations. One of such study conducted in Jordan, involving 1,182 female students, revealed that while approximately 30% had received a PCOS diagnosis, the mean awareness score was 11.59 out of 22 (Alnasir *et al.,* 2020). Greater awareness was positively associated with enrolment in health related fields and with students in more advanced academic years. Similarly, age was a contributing factor, as older students tended to score higher in knowledge assessments.

In contrast, a survey conducted in the Philippines among non-medical students reported only a moderate level of understanding about PCOS, particularly in areas related to dietary and lifestyle risk factors (Torio *et al.,* 2021). Interestingly, this study found no statistically significant association between awareness and common demographic variables such as year of study or age, pointing to a more universally low level of understanding across academic backgrounds.

Variations in regional understanding were further underscored in comparative studies between students in the United Arab Emirates and Oman, where the prevalence of PCOS and the patterns of symptom awareness significantly diverged. UAE students exhibited higher reported rates of PCOS (27.6% compared to 4.6% in Oman), while also demonstrating different experiences with hyperandrogenic symptoms, suggesting that environmental and cultural contexts may influence both disease presentation and public knowledge (Mohammed *et al.,* 2020).

1.8.2 UNDERSTANDING PCOS AMONG HEALTH SCIENCES STUDENTS

Students pursuing education in health sciences, including pharmacy, are expected to demonstrate above-average understanding of reproductive disorders. Findings from the Jordanian study support this assumption, as participants in medical and allied health programs consistently showed greater awareness than their non-medical peers (Alnasir *et al.,* 2020). Nonetheless, these students still displayed critical gaps in their knowledge, particularly with regard to diagnosis and the long-term management of PCOS. This underscores the notion that surface-level familiarity does not necessarily translate into comprehensive competence.

In Nigeria, studies focusing on infertile women have further revealed gaps in the recognition of PCOS symptoms. For instance, research involving the application of three diagnostic models;NIH, Rotterdam, and AES found that while 20.9% of participants exhibited biochemical markers of hyperandrogenism, clinical signs like hirsutism were observed in only 3.6% (Akpata *et al.,* 2023). Such discrepancies raise questions about whether training in Nigerian medical and pharmacy programs adequately prepares students to identify and interpret the full spectrum of PCOS manifestations.

Pharmacists are central to the long-term management of PCOS. Medications such as oral contraceptives, metformin, and antiandrogens like spironolactone are frequently used to manage symptoms and associated metabolic issues. Nevertheless, patient reports often highlight widespread dissatisfaction with the level of insight displayed by healthcare professionals, including pharmacists, when it comes to understanding PCOS and counselling patients effectively (Goodman *et al.,*2015). This concern highlights the urgent need to reinforce PCOS specific training within pharmacy curricula.

1.8.3 BARRIERS TO EFFECTIVE PCOS AWARENESS AND DIAGNOSIS

Numerous studies have outlined the systemic and sociocultural barriers that continue to hamper the timely recognition and appropriate management of PCOS. Delayed diagnosis, insufficient knowledge among healthcare providers, and weight-related bias in clinical interactions frequently arise as key themes (Williams *et al.,* 2021). A systematic review by Holton *et al.,* (2018) revealed that many women with PCOS

reported being emotionally distressed by their diagnostic journey, with some even assuming responsibility for their own diagnosis and management in the face of perceived healthcare inadequacies.

In Canada, for instance, participants described feeling unsupported when discussing lifestyle interventions or seeking mental health support, despite the known psychosocial burden of the condition. These accounts are mirrored in research from Jordan and the Philippines, where students exhibited limited understanding of PCOS risk factors and the potential severity of untreated cases (Torio *et al.,* 2021; Alnasir *et al.,* 2020). Such findings reinforce the need to dismantle both knowledge-based and attitudinal barriers through formal education and health literacy interventions.

Enhancing Pharmacy Education at the University of Benin

The Faculty of Pharmacy at the University of Benin is uniquely positioned to integrate meaningful and relevant PCOS education into its curriculum. Evidence from existing literature suggests that early exposure to reproductive endocrinology, reinforced across the academic program, significantly improves student awareness (Goodman *et al.,* 2015). In-class lectures should be expanded to include discussion of PCOS phenotypes, common comorbidities, and both pharmacological and lifestyle interventions. Interactive case studies could further help students understand the complexities and nuances of PCOS diagnosis and treatment.

Culturally sensitive education is especially important in the Nigerian context. Socioeconomic constraints, traditional beliefs about fertility, and stigmatization of reproductive health issues must be considered when designing educational materials and outreach activities. Acknowledging these factors and incorporating them into training will likely lead to more effective knowledge transmission and clinical readiness.

1.8.4 RESEARCH GAPS AND FUTURE DIRECTIONS

Despite abundant global research, there remains a notable absence of data specific to PCOS awareness among pharmacy students in Nigeria. Most existing studies emphasize prevalence and clinical presentation among patients, neglecting the perspectives of future healthcare providers. Addressing this void should be an urgent priority for academic researchers.

1.9 RESEARCH OBJECTIVES

The main objective of the study was ;

1. To assess the baseline knowledge of PCOS among female pharmacy students at the University of Benin, including their understanding of its causes, symptoms, diagnostic criteria, and long-term complications .

The specific objectives were;

1. To evaluate the level of awareness regarding PCOS risk factors and preventive measures, such as lifestyle modifications (diet, exercise) and medical interventions, among the students .

2. To identify the primary sources of information on PCOS (e.g healthcare professionals, academic lectures, social media) and determine their influence on students' knowledge and perceptions .

3. To examine the relationship between demographic factors (e.g year of study, age, family history of PCOS) and the level of PCOS awareness among female pharmacy students.

4. To explore students' attitudes and perceptions toward PCOS, including stigma, self-risk assessment, and willingness to seek medical help if experiencing symptoms .

1.9.1 RESEARCH QUESTIONS

1. How well do female pharmacy students understand the causes, symptoms, diagnostic criteria, and long-term health risks of PCOS?
2. What are the most common misconceptions or gaps in knowledge about PCOS among these students?
3. Awareness and Sources of Information?
4. What is the level of awareness regarding PCOS risk factors (e.g., obesity, insulin resistance) and preventive measures (e.g., lifestyle changes)?
5. What are the primary sources of PCOS related information for these students (e.g academic training, social media, healthcare providers)?
6. Does the level of PCOS knowledge vary based on the student's year of study, age, or personal/family history of PCOS.
7. What strategies (e.g. workshops, digital campaigns) could improve PCOS awareness among students

1.9.2 SIGNIFICANCE OF STUDY.

The study is highly relevant to medical training, public health strategies, and clinical applications, particularly in enhancing awareness of PCOS among future healthcare workers. The findings will be beneficial to:

1. Female pharmacy students: Female pharmacy students stand to benefit significantly from enhanced understanding of PCOS, not just academically, but personally. With this awareness, they can better recognize symptoms within themselves or peers, encouraging early medical attention. Professionally, it sharpens their readiness to support future patients with informed guidance on lifestyle adjustments and effective use of medications for managing the condition.
2. University of Benin and Pharmacy Educators: The University of Benin, alongside pharmacy educators, holds a strategic opportunity to elevate women's health education through targeted curricular reform and proactive student wellness initiatives. This study reveals pressing gaps in current instructional content particularly concerning PCOS which, if addressed, can greatly enhance students' clinical competence and public health literacy. Incorporating specialized modules or interactive workshops on PCOS into the curriculum not only aligns with global healthcare priorities but also prepares students to meet the challenges of modern clinical practice.
3. Future Pharmacists and Healthcare Providers: Pharmacy graduates and future healthcare providers are positioned to play an indispensable role in combating the growing challenge of PCOS through early detection and public education. This study empowers them with the critical competencies needed to identify telltale signs of PCOS within everyday clinical settings such as community pharmacies and initiate appropriate referrals that could significantly alter patient trajectories.
4. Policymakers and Health Organizations: This study presents valuable insights that can inform national healthcare priorities in Nigeria. By positioning PCOS

alongside established chronic conditions like diabetes and hypertension, it advocates for the integration of PCOS into reproductive health policy frameworks. Such inclusion would enhance early detection efforts, improve public awareness, and expand access to care for women nationwide.

Additionally, this research has significant implications for pharmacy education reform. The findings may encourage accreditation authorities such as the Pharmacists Council of Nigeria to recognize the importance of PCOS education and embed it within the national pharmacy curriculum. This advancement would not only elevate professional competency but also empower future pharmacists to play a more active role in women's health advocacy and community outreach.

1.10 JUSTIFICATION FOR THE STUDY

Although PCOS is recognized globally as one of the most common endocrine disorders among women of reproductive age, there remains a notable gap in awareness and knowledge, particularly among young women in developing countries. Many existing studies have focused on general populations, medical students, or women attending gynecology clinics, but few have explored pharmacy students specifically.

Pharmacy students represent a unique group because they are not only at risk of PCOS themselves but are also future healthcare professionals who will be expected to educate, counsel, and manage patients with this condition. At the University of Benin, no published study to the best of our knowledge has systematically examined the level of knowledge and awareness of PCOS among female pharmacy students, despite their dual role as potential patients and health advocates.

This study is therefore justified because:

It provides context-specific insights into how much female pharmacy students at the University of Benin know about PCOS, an area that is largely unexplored in Nigerian literature.

It captures the personal awareness and perceptions of a group of future healthcare providers, which are often overlooked in reproductive health research.

The findings will help to inform evidence-based interventions such as targeted health education, awareness campaigns, and possible inclusion of reproductive health issues like PCOS in the pharmacy curriculum.

It contributes to the limited pool of Nigeria-based empirical studies that address reproductive health awareness among female students in health professional programs, thereby strengthening public health strategies on early detection and management of PCOS.

CHAPTER TWO

METHODS

2.1 Study Design

A descriptive study involving a cross-sectional design with quantitative survey methodology was employed for this research.

2.2 Study Setting.

The study population comprised of female students enrolled in the pharmacy program, specifically from the fourth year through to the final year.

2.3 Study population.

Participants included were female pharmacy students from fourth to the final year. A convenient, non-probability sampling technique was used.

2.4 Data Collection Instrument

A structured and validated questionnaire, adapted from prior research on PCOS awareness was used for data collection.

2.5 Questionnaire Components:

1. Demographic Profile: Captured key details such as age, academic level and family history of PCOS.
2. Knowledge Measurement: Evaluated participants' understanding of PCOS, including causes, symptoms, and complications using multiple-choice questions.
3. Awareness and Information Channels: Identified participants' sources of PCOS related knowledge (e.g media, academic content, healthcare professionals).

4. Perceptions and Behaviors**:** Assessed perceived seriousness of PCOS and willingness to seek professional support.

2.6 Inclusion Criteria

Participants consisted of female students currently enrolled in the pharmacy program who were in their fourth, fifth, or final year of academic study. Eligibility required voluntary participation, with individuals expressing informed willingness to take part in the research process.

2.7 Exclusion Criteria

The study excluded individuals who were unavailable during the data collection period, as well as those who did not provide consent for the data collection activity, in order to maintain consistency and ensure data completeness.

2.8 Sample Size

The sample size for this study was calculated using Slovin's formula using 95% confidence level and 5% (0.05) margin of error. The formula is stated below:

$N = N/1+Ne^2$

Where: N = Total population

N = Sample size

E = Margin of error

Substituting to the formula above we have;

$N = 253/1 + 253 \times (0.05)^2$

$= 253 / (1 + 0.6325)$

$= 253/1.6325$

$= 154.97$

≈ 155

In order to account for loss due to attrition, the sample size was rounded up to 200 participants.

2.9 Sampling technique

A convenient, non-probability sampling technique was used to select participants in each department.

2.10 Data Collection Instruments

Questionnaire: A pretested questionnaire was used to collect data on demographics, knowledge assessment, perception and attitudes and sources of information.

2.11 Data Analysis

Data was analyzed using SPSS version 27. Descriptive statistics was used to summarize demographic and clinical characteristics. The significance level was set at $p < 0.05$.

2.12 Ethical Considerations

Ethical approval for this study was obtained from the University of Benin's Research Ethics Committee. Informed consent was obtained from all participants before data collection. Participants were assured of the confidentiality and anonymity of their data, and their participation were voluntary. Data were securely stored, and only the researcher had access to it.

2.13 EXPECTED OUTCOMES

This study is expected to:

1. Assess current levels of PCOS knowledge
2. Idnetify key research gaps in awareness
3. Evaluate the influence of academic level on PCOS knowledge

4. Recommend improvements to curriculum and policies

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CHAPTER THREE

RESULTS

A total of 197 students completed the questionnaires across the three levels. Table 3.1 shows the socio-demographics of the respondents. Majority of the respondents were aged between 21-23 years (88; 44.7%), resided on-campus (91; 46.2%), were single (186; 94.5%) , have not been diagnosed with PCOS (182; 92.4%) and do not have a family history of PCOS (179; 90.9%). Further analysis assessed respondents' knowledge scores based on their level of study as seen in Table 3.2. Of the forty two knowledge questions, the average mean score for all respondents was 26.80 ± 4.14 and the 600 Level respondents had a significantly higher mean score (28.79 ± 4.35) compared to 500 Level with the mean knowledge score of 26.02 ± 4.2 and 400 Level with a mean knowledge score of 26.11 ± 3.53. ($p>0.001$).

Respondents who had been diagnosed with PCOS recorded a slightly higher knowledge score (27.73 ± 5.33) than those who had not been diagnosed (26.73 ± 4.03), although the difference was not significant ($p <0.366$). Participants with a family history of PCOS showed a significantly higher mean knowledge score (29.50 ± 4.4) compared to those with no family history (26.53 ± 4.02) $p<0.003$.

Table 3.3 shows most respondents had heard of PCOS (152; 22.8%) mainly through social media (66; 33.5%) and lectures (35; 17.8%). Majority rated their level of awareness as moderate (72; 36.5%), while (48; 24.4%) rated it low. Respondents who rated their awareness as very high had the highest mean score (29.13 ± 5.09) compared to those whose awareness rate was high (28.29 ± 3.90 ,moderate (28.35 ± 3.67), low (25.90 ± 3.34) and very low (23.54 ±2.75). There was also a low

correlation between their level of awareness and their score (correlation coefficient 0.23)

As presented in Table 3.4, (142; 72.1%) of the respondents correctly identified PCOS as a hormonal disorder, (151; 76.6%) stated that it can cause fertility issues while (110; 55.8%) believed that PCOS is not curable. The most recognized symptoms were irregular menstruation (143; 72.6%), acne (97; 49.2%) and weight gain (80; 40.6%). Majority of the respondents (70;35.5%) identified ultrasound as a diagnostic method and (105;53.3%) mentioned family history as a risk factor of PCOS. Infertility (107; 54.3%) was the most identified long term complication of PCOS. However, more than half of the respondents wrongly believed that PCOS is curable and many could not accurately identify the hormone typically elevated in PCOS as only (56; 28.4%) selected testosterone ,whereas others incorrectly chose estrogen (64; 32.5%) and (25; 12.7%) chose growth hormone. Also, in the diagnosis and management section,(12; 6.1%) of the respondents wrongly picked urine test as the diagnosis of PCOS and vaccinations (8; 4.1%) as its management.

Table 3.1: Social Demographics

Variables	Groups	Frequency (n= 197)	Percentage (%)
Age(years)	18-20	58	29.4
	21-23	88	44.7
	24-25	33	16.8
	Above 26	18	9.1
Level of Study	400L	84	42.6
	500L	60	30.5
	600L	53	26.9
Type of Residence	On-campus hostel	91	46.2
	Off-campus (alone)	48	24.4
	Off-campus (with family/ relatives)	34	17.3
	Off-campus (with friends /roommates)	24	12.2
Marital Status	Single	186	94.5
	Married	11	5.5
Have you been diagnosed with PCOS	Yes	15	7.6
	No	182	92.4
Do you have a family history of PCOS	Yes	18	9.1
	No	179	90.9

Table 3.2: Knowledge of respondents based on level of study

Level of study	N	Mean	Std. Deviation	Significance
400 Level	84	26.11	3.533	0.001
500 Level	60	26.02	4.209	
600 Level	53	28.79	4.352	
Total	197	26.80	4.136	

Table 3.3: Respondent's Awareness Measurement of PCOS

Variables	Groups	Frequency (n= 197)	Percentage (%)
Have you heard of Polycystic Ovarian Syndrome before	Yes	152	22.8
	No	45	77.2
If yes, where did you first hear about PCOS	Lecture	35	17.8
	Social media	66	33.5
	Friends	13	6.6
	Internet	19	9.6
	A health care professional	24	12.2
	Others	40	20.3
How would you rate your awareness of PCOS	Very low	41	20.8
	Low	48	24.4
	Moderate	72	36.5
	High	21	10.7
	Very high	15	7.6

Table 3.4: Respondent's Knowledge of PCOS

Variables	Groups	Frequency (n= 197)	Percentage (%)
PCOS is a hormonal disorder common among women of reproductive age	True	142	72.1
	False	12	6.1
	I don't know	43	21.8
PCOS is a curable condition	True	87	44.2
	False	110	55.8
Which of the following are common symptoms of PCOS	Irregular menstrual periods	143	72.6
	Acne	97	49.2
	Hearing loss	11	5.6
	Weight gain	80	40.6
	Shortness of breath	26	13.2
	Facial hair	72	36.5
	Hair loss from scalp	25	12.7
	Joint pain/swelling	30	15.2
	Breast pain	59	29.9
	I don't know	41	20.8
Which of the hormone is typically elevated	Estrogen	64	32.5
	Testosterone	56	28.4
	Melatonin	6	3.0

	Growth hormone	25	12.7
	Progesterone	21	10.7
	Insulin	19	9.6
	Glucagon	6	3.0
PCOS can lead to fertility issues	True	151	76.6
	False	8	4.1
	Not sure	38	19.3
PCOS can be diagnosed through	Blood tests	64	32.5
	Ultrasound	70	35.5
	Physical exam	45	22.8
	Pap smear	40	20.3
	Urine test	12	6.1
	I don't know	69	35.0
Which of the following are known risk factors for PCOS	Family history	105	53.3
	Obesity	57	28.9
	High salt intake	20	10.2
	Smoking	13	6.6
	Vitamin D overdose	8	4.1
	Malnutrition	21	10.7
	Sedentary Lifestyle	33	16.8
	I don't know	64	32.5
Which of the following are possible longterm complications	Type 2 Diabetes	40	20.3

of PCOS			
	Cardiovascular disease	28	14.2
	Infertility	107	54.3
	Death	11	5.6
	Osteoporosis	31	15.7
	Anxiety/depression	42	21.3
	Chronic Kidney disease	10	5.1
	Hemophilia	16	8.1
	Ovarian cancer	78	39.6
	Sleep disorders	22	11.2
	I don't know	54	27.4
Management of PCOS may include	Weight management	69	35.0
	Oral contraceptives	54	27.4
	Lifestyle changes	87	44.2
	Surgery	45	22.8
	Dialysis	11	5.6
	Herbal or alternative remedies	26	13.2
	Vaccinations	8	4.1
	I don't know	61	31.0

A large proportion of the respondents did not consider PCOS a serious condition (138; 70.1%) in Table 3.5. About (115; 58.4%) of the respondents believed PCOS is adequately discussed in the pharmacy curriculum, yet (161;81.7%) expressed no interest in additional educational programs. However, (143; 72.6%) of the respondents strongly agreed that PCOS is a significant health concern for women . Regarding the confidence of the respondents, (79; 40.1%) indicated a lack of confidence in providing information about PCOS to patients.

Table 3.6 shows a significant relationship ($p< 0.001$) between the sources of information about PCOS and knowledge level. Respondents who gained information through social media (42 ; 50.6%) and lectures (18; 21.7%) showed better knowledge compared to those who gained information from friends (4;4.8%), internet (9;10.8%), healthcare (5;6.0%) and other sources (5;6.0%)

Significant associations were observed between age ($p=0.011$), PCOS diagnosis ($p<0.001$) and family history ($p<0.001$) with awareness levels, however level of study and type of residence showed no significant relationship in Table 3.7.

Overall, 60.9% of the respondents had poor knowledge of PCOS, while 39.1% showed good knowledge.

Table 3.5: Perception and Attitude

Variables	Groups	Frequency (n= 197)	Percentage (%)
Do you consider PCOS a serious health condition	Yes	12	6.1
	No	138	70.1
	Not sure	47	23.9
Do you think PCOS is adequately discussed in your pharmacy curriculum	Yes	115	58.4
	No	16	8.1
	Maybe	66	33.5
Would you like more educational programs on PCOS in your school	Yes	7	3.6
	No	161	81.7
	Maybe	29	14.7
Do you believe PCOS is a significant health concern for women of reproductive age	Strongly disagree	13	6.6
	Neutral	6	3.0
	Disagree	33	16.8
	Agree	2	1.0
	Strongly agree	143	72.6
If a patient asked you about PCOS, how confident are you in providing accurate information	Very confident	49	24.9
	Somewhat confident	51	25.9
	Not confident	79	40.1

I have no knowledge	18		9.1

Table 3.6: Influence of primary sources of PCOS on Knowledge Level

Sources	Poor Knowledge	Good Knowledge	Chi-square	P-value
Lecture	17(14.9)	18(21.7)	33.53	<0.001
Social media	24(21.1)	42(50.6)		
Friends	9(7.9)	4(4.8)		
Internet	10(8.8)	9(10.8)		
Health care professional	19(16.7)	5(6.0)		
Others	35(30.7)	5(6.0)		

Table 3.7: Relationship between Demographic factors and the Level of PCOS awareness

Variables	Low awareness	Moderate awareness	High awareness	Chi-square	P-Value
Age(years)				6.191	0.011
18-20	22(40.0)	27(25.2)	9(25.7)		
21-23	18(32.7)	56(52.3)	14(40.0)		
24-26	10(18.2)	19(17.8)	4(11.4)		
Above 26	5(9.1)	5(4.7)	8(22.9)		
Level of Study				16.494	0.185
400L	26(47.3)	47(33.9)	11(31.4)		
500L	20(36.4)	29(27.1)	11(31.4)		
600L	9(16.4)	31(29.0)	13(37.1)		
Type of Residence				11.224	0.082
On-campus hostel	24(43.6)	49(45.8)	18(51.4)		
Off-campus(alone)	8(14.5)	29(27.1)	11(31.4)		
Off-campus (with family/relatives)	11(20.0)	20(18.7)	3(8.6)		
Off-campus (with friends/roommates)	12(21.8)	9(8.4)	3(8.6)		
Have you been diagnosed with PCOS				21.446	<0.001
Yes	55(100%)	101(94.4)	26(74.3)		
No	0(0%)	6(5.6)	9(25.7)		
Marital Status				11.071	0.026
Single	49(89.1)	105(98.1)	31(88.6)		

Married	6(10.9)	2(1.9)	3(8.6)		
Others	0(0.0)	0(0.0)	19(2.9)		
Do you have a family history of PCOS				21.809	<0.001
Yes	55(100.0)	99(92.5)	25(71.4)		
No	0(0.o)	8(7.5)	10(28.6)		

Table 3.8: Knowledge Level of PCOS

Knowledge Level	Frequency(n=197)	Percentage(%)
Poor Knowledge	120	60.9
Good Knowledge	77	39.1

Table 3.9: Awareness Level of PCOS

Awareness Level	Frequency(n=197)	Percentage(%)
High awareness	55	27.9
Moderate awareness	107	54.3
Low awareness	35	17.8

CHAPTER FOUR

DISCUSSION

This study aimed at evaluating the knowledge and awareness of Polycystic Ovary Syndrome (PCOS) among female pharmacy students at the University of Benin. The findings revealed a moderate level of awareness but generally poor knowledge of PCOS. Although most respondents had heard of the condition, many demonstrated limited understanding of it causes, symptoms, diagnosis and management. This outcome indicates that although most students have heard about PCOS, their understanding of its pathophysiology and health implications remains limited. Similar findings were reported by Anosike *et al*. (2025) and Akpata *et al.* (2023), who found that even among health-related students, there were significant gaps in understanding hormonal disorders such as PCOS. Comparable observations were made in earlier international studies by Hart *et al.* (2015) and Jeanes *et al.* (2017), which highlighted that awareness does not necessarily translate into adequate comprehension of the condition. These results highlight the need for strengthened educational interventions to improve reproductive health literacy among pharmacy students.

Most respondents had heard of PCOS, with social media and academic lectures being the main sources of information. This shows that students readily obtain information through formal and informal sources. These findings correspond with Torio *et al*. (2021), who reported that social media platforms are increasingly becoming a key avenue for health-related information among students. However, relying on social media may result in incomplete or inaccurate understanding.

Despite the high awareness,the overall knowledge of PCOS was inadequate.

Although majority correctly identified PCOS as a hormonal disorder and recognized its link to infertility, only 39.1% demonstrated good knowledge overall. In this study, irregular menstruation, acne, and weight gain were the most recognized symptoms, while fewer respondents identified facial hair or scalp hair loss as key indicators. These findings are consistent with results from studies in India and Jordan (Alnasir et al., 2020; Hart et al., 2015), where menstrual irregularities and acne were the most cited symptoms. However, they contrast with Teede et al. (2023), who reported that awareness of hirsutism and androgen-related symptoms was relatively high among medical students exposed to endocrinology training. This variation may be due to differences in curricular content and the limited clinical exposure available to pharmacy students.

In this study, more than half of the participants believed that PCOS is curable and many failed to identify testosterone as the hormone typically elevated in this disorder. These knowledge gaps align with the findings of Akpata *et al*., (2023) who noted the misinformation about PCOS causes and treatment among women and students. Similar misunderstandings were documented among health sciences students in Jordan (Alnasir *et al*., 2020) where knowledge gaps persisted despite exposure to reproductive health education. Jeanes *et al.* (2017) also highlighted that confusion about the chronic nature of PCOS persists even among health students, partly due to inconsistent emphasis on long-term management in their curriculum. These misconceptions reinforce the need for clearer teaching on hormonal disorders and reproductive endocrinology in pharmacy education. This emphasizes the need for improved PCOS focused education in pharmacy curricula.

A significant relationship was observed between age ($p < 0.011$), personal or family history of PCOS ($p < 0.001$), and awareness levels, suggesting that personal exposure

or maturity enhances awareness.Older students, those who have been diagnosed and participants who have a family history of PCOS displayed more awareness, probably due to increased exposure and personal interest to learn about the condition. This aligns with Goodman *et al*. (2015), who noted that personal experiences with chronic conditions often promote self-education and knowledge retention.

Knowledge levels also increased with academic advancement, as 600 level students had higher mean knowledge scores compared to 500 Level and 400 Level. ($p>0.001$). A similar observation was reported by Alnasir *et al.* (2020) and Amiri *et al*. (2024), who reported that higher level health students show better comprehension due to cumulative academic learning and clinical exposure.

Most respondents strongly agreed that PCOS is a major health concern for women of reproductive age, reflecting a positive attitude toward the significance of the disorder. However, 40.1% reported low confidence in their ability to educate patients about PCOS. This limited confidence may be as a result of lack of practical exposure or emphasis on PCOS management in their training.

This aligns with findings from Goodman *et al*. (2015), who observed that health students often feel unprepared to counsel patients with reproductive disorders due to limited practical engagement. Similarly, Hart et al. (2015) emphasized that understanding complex hormonal disorders requires not only theoretical teaching but also consistent integration of practical case discussions to build confidence and communication skills. Strengthening clinical case discussions and including PCOS in patient counseling exercises could therefore enhance both knowledge and self-assurance.

In line with the findings of Anosike et al. (2025) and Akpata et al. (2023), this study supports evidence of persistent knowledge gaps among Nigerian university students

despite relatively high awareness levels. Similarly, Torio et al. (2021) and Alnasir et al. (2020) observed comparable patterns among students in Asia and the Middle East. Collectively, these studies suggest that although global awareness of PCOS is gradually increasing, understanding of the condition remains superficial and often limited to basic recognition of symptoms and fertility concerns. Consequently, Jeanes *et al.* (2017) and Teede *et al.* (2023) emphasized the need for the inclusion of PCOS focused content in health science curricula to enhance students' knowledge and readiness for effective patient education.

In conclusion, this study establishes that although awareness of PCOS among female pharmacy students at the University of Benin is relatively moderate, their depth of knowledge about the disorder remains limited. The major sources of information were social media and academic lectures, while factors such as age, level of study, and personal or family history significantly influenced awareness. These results are consistent with findings from previous local and international studies, which reported similar patterns, and they highlight the urgent need to strengthen reproductive health education, increase clinical exposure, and ensure the dissemination of accurate information within tertiary institutions. Enhancing pharmacy students' understanding of PCOS is crucial in preparing them to contribute effectively to women's health education, early detection, and patient counseling.

4.1 LIMITATIONS

The study was limited to female pharmacy students of the University of Benin and may not fully represent the general population. The study depended of on self reported data ,which could have been affected by participants memory limitations or personal interpretation of the questions. Additionally, time constraints and the cross-

sectional nature of the study restricted the ability to determine cause and effect relationship between the variables.

CHAPTER FIVE

CONCLUSION

This study aimed to assess the baseline knowledge of Polycystic Ovary Syndrome (PCOS) among female pharmacy students at the University of Benin, with a focus on their understanding of its causes, symptoms, diagnostic criteria, and long-term complications. The findings revealed that although most respondents had heard about PCOS, only a minority demonstrated good overall knowledge. Many were unaware of the hormonal basis of the disorder or its associated risks such as infertility, metabolic syndrome, and cardiovascular complications. This indicates that while awareness exists, comprehension of PCOS remains superficial, highlighting the need for improved reproductive health education within the pharmacy curriculum.

Awareness of risk factors and preventive measures were also found to be limited.While a some respondents identified family history as a risk factor, fewer recognized the importance of lifestyle modification such as maintaining a healthy weight and engaging in regular exercise as key preventive strategies. This lack of preventive knowledge reflects the need for more emphasis on lifestyle based health education among pharmacy students.

This study also revealed that social media ans academic lectures were major sources of information about PCOS. However, those who relied on social media demonstrated uneven or incomplete understanding compared to those who gained knowledge from academic lectures or healthcare professionals. This underscores the influence of information quality and source reliability on students' knowledge and perception of PCOS.

Demographic factors such as age,family history and previous diagnosis of PCOS were found to influence students' awareness and knowledge levels. The study established significant associations between age, PCOS diagnosis, and family history with higher awareness scores. However, there was no statistically significant relationship between level of study or residence type and awareness level. This finding suggests that personal experience or exposure to the condition, rather than academic progression alone, plays a greater role in influencing awareness and understanding.

Finally, the study explored students' attitudes and perceptions toward PCOS, including stigma, self-risk assessment, and willingness to seek medical help. Most respondents did not consider PCOS a serious health condition, and many expressed low confidence in discussing it with patients. Majority acknowledged that PCOS is an important health concern for women. This mixed perception highlights the persistence of stigma and insufficient emphasis on reproductive health discussions, even among future healthcare professionals.

5.1 RECOMMENDATIONS

To bridge these knowledge and awareness gaps, the study recommends integrating comprehensive reproductive endocrinology modules and PCOS specific topics into the pharmacy curriculum. Health education campaigns and awareness workshops should also be organized periodically to encourage accurate knowledge dissemination. Additionally, collaboration between faculty and healthcare professionals could enhance students' understanding of PCOS through seminars and clinical exposure.

In conclusion, while awareness of PCOS among female pharmacy students at the University of Benin is moderate, their depth of knowledge remains inadequate. Strengthening educational strategies, improving access to accurate information, and promoting open discussions on reproductive health will significantly enhance students' competence, enabling them to contribute effectively to early detection, patient counselling, and overall women's health advocacy.

REFERENCES

Akpata, B. O., Adebayo, A. O. & Ajayi, J. O. (2023) 'Prevalence and characteristics of PCOS among infertile Nigerian women using multiple diagnostic criteria', Nigerian Journal of Clinical Practice, 26(2), pp. 145–153.

Alnasir, M., Saleh, S., Al-Tahat, M. & Mahmoud, N. (2020) 'Awareness of PCOS among female university students in Jordan: A cross-sectional study', Journal of Women's Health Care, 9(1), pp. 32–37.

Amiri, M., Tehrani, F.R. and Behboudi-Gandevani, S., 2024. Overweight and obesity in women with polycystic ovary syndrome: A global perspective. Frontiers in Endocrinology, 15, pp.1–10.

Alpañés, M., Álvarez-Blasco, F., Fernández-Durán, E., Luque-Ramírez, M. and Escobar-Morreale, H.F., 2017. Combined oral contraceptives plus spironolactone compared with metformin in women with polycystic ovary syndrome: a one-year randomized clinical trial. European Journal of Endocrinology, 177(5), pp.399-408.

Anosike, C., Okoye, C.O., Isiogugu, N.O., Anene-Okeke, C.G., Ugochukwu, E.J., Okonkwo, V.C., Udoh, J.P., Ukpaka, M.C., Nebonta, S.A. and Okpe, O.G., 2025. Impact of video-based educational intervention on knowledge and perception of polycystic ovarian syndrome among pharmacy students: a pre-post interventional study. BMC Medical Education, 25(1), p.758.

Ashraf, S., Nabi, M., Rasool, S.U.A., Rashid, F. and Amin, S., 2019. Hyperandrogenism in polycystic ovarian syndrome and role of CYP gene variants: a review. Egyptian Journal of Medical Human Genetics, 20, Article 25.

Athar, M., Vazakidou, P., Evangelista, S. *et .al.,* 2024. The profile of steroid hormones in human fetal and adult ovaries. Reproductive Biology and Endocrinology, 22, Article 60.

Azziz, R., Carmina, E., Chen, Z., Dunaif, A., Laven, J.S.E., Legro, R.S., Lizneva, D., Natterson-Horowitz, B., Teede, H.J. and Yildiz, B.O., 2016. Polycystic Ovary Syndrome. Nature Reviews Disease Primers, 2, p.16057.

Azziz, R., Carmina, E., Dewailly, D., *et .al.,* 2009. The Androgen Excess and PCOS Society criteria for the polycystic ovary syndrome: the complete task force report. Fertility and Sterility, 91(2), pp.456–488.

Ban, M. *et .al.,* 2024. Association between maternal polycystic ovarian syndrome undergoing assisted reproductive technology and pregnancy complications and neonatal outcomes: a systematic review and meta-analysis. Journal of Ovarian Research, 17(6).

Barber, T.M., Dimitriadis, G.K., Andreou, A. and Franks, S., 2015. Polycystic Ovary Syndrome: Insight into Pathogenesis and a Common Association with Insulin Resistance. Clinical Medicine, 15(Suppl. 6), pp.s72–s76.

Barry, J.A., Azizia, M.M. and Hardiman, P.J., 2014. Risk of endometrial, ovarian and breast cancer in women with polycystic ovary syndrome: A systematic review and meta-analysis. Human Reproduction Update, 20(5), pp.748–758.

Biswas, A., Ng, B.H., Prabhakaran, V.S. and Chan, C.J., 2022. Squeezing the eggs to grow: The mechanobiology of mammalian folliculogenesis. Frontiers in Cell and Developmental Biology, 10, Article 1038107.

Boyle, J.A., Xu, R., Gilbert, E., Kuczynska-Burggraf, M., Tan, B., Teede, H., Vincent, A. and Gibson-Helm, M., 2018. Ask PCOS: Identifying Need to Inform Evidence-Based App Development for Polycystic Ovary Syndrome. Seminars in Reproductive Medicine, 36(1), pp.59–65.

Bruunsgaard, H., Pedersen, M. and Pedersen, B.K., 2001. Aging and proinflammatory cytokines. Current Opinion in Hematology, 8(3), pp.131–136.

Burghen, G.A., Givens, J.R. and Kitabchi, A.E., 1980. Correlation of Hyperandrogenism with Hyperinsulinism in Polycystic Ovarian Disease. Journal of Clinical Endocrinology & Metabolism, 50(1), pp.113–116. Burger, H.G., 2002. Androgen production in women. Fertility and Sterility, 77(Suppl. 4), pp.S3–S5.

Cardozo, E.R. *et .al.,* 2017. Metabolic syndrome in women with polycystic ovary syndrome: Prevalence, pathophysiology and the role of insulin resistance. Clinical Obstetrics and Gynecology, 60(1), pp.65–79.

Chauhan, M., 2025. Mental health impact of PCOS: A clinical review. International Journal of Women's Health Research, 6(1), pp.22–30.

Chung, H.Y., Cesari, M., Anton, S., Marzetti, E., Giovannini, S., Seo, A.Y. *et .al.,* 2009. Molecular inflammation: underpinnings of aging and age-related diseases.

Cimino, I., Casoni, F., Liu, X., Messina, A., Parkash, J., Jamin, S.P., *et .al.,* 2016. Novel role for anti-Müllerian hormone in the regulation of GnRH neuron excitability and hormone secretion. Nature Communications, 7, Article 10055.

Cleveland Clinic, 2023. Hyperandrogenism: Symptoms, Causes & Treatment.

Crosignani, P.G., Colombo, M., Vegetti, W., Somigliana, E., Gessati, A. and Ragni, G., 2003. Overweight and obese anovulatory patients with polycystic ovaries: parallel improvements in anthropometric indices, ovarian physiology and fertility rate induced by diet. *Human Reproduction*, 18(9), pp.1928–1932

Cunha, A. and Póvoa, A.M., 2021. Infertility management in women with polycystic ovary syndrome: a review. Porto Biomedical Journal, 6(1), e116.

Dahan, M.H. and Reaven, G., 2019. Relationship among Obesity, Insulin Resistance, and Hyperinsulinemia in the Polycystic Ovary Syndrome. Endocrine, 64(4), pp.685–689.

Davis, S.R. and Wahlin-Jacobsen, S., 2015. Androgen therapy in women—clinical relevance and controversies. The Lancet Diabetes & Endocrinology, 3(12), pp.980–992.

Dewailly, D., Lujan, M.E., Carmina, E., Cedars, M.I., Laven, J., Norman, R.J. and Escobar-Morreale, H.F., 2014. Definition and significance of polycystic ovarian morphology: A task force report from the Androgen Excess and Polycystic Ovary Syndrome Society.

Deutsche Welle, 2023. PCOS: The little-known syndrome affecting 1 in 10 women.

Dumesic, D.A., Abbott, D.H. and Chazenbalk, G.D., 2023. An evolutionary model for the ancient origins of polycystic ovary syndrome. Journal of Clinical Medicine, 12(19), p.6120.

Dunaif, A., Segal, K.R., Futterweit, W. and Dobrjansky, A., 1989. Profound Peripheral Insulin Resistance, Independent of Obesity, in Polycystic Ovary Syndrome. Diabetes, 38(9), pp.1165–1174.

Escobar-Morreale, H. F. (2018) 'Polycystic ovary syndrome: definition, aetiology, diagnosis and treatment', Nature Reviews Endocrinology, 14(5), pp. 270–284.

Essah, P.A. and Nestler, J.E., 2007. Insulin resistance in polycystic ovary syndrome. Current Opinion in Endocrinology, Diabetes and Obesity, 14(6), pp.487–493.

Fallat, M.E., Siow, Y., Marra, M., Cook, C. and Carrillo, A., 1997. Müllerian-inhibiting substance in follicular fluid and serum: a comparison of patients with tubal factor infertility, polycystic ovary syndrome, and endometriosis. Fertility and Sterility, 67(5), pp.962–965.

Fraison, E., Kostova, E., Moran, L.J., Bilal, S., Ee, C.C., Venetis, C. and Costello, M.F., 2020. Metformin versus the combined oral contraceptive pill for hirsutism, acne, and menstrual pattern in polycystic ovary syndrome. Cochrane Database of Systematic Reviews, 8(8)

Ganie, M.A., Khurana, M.L., Nisar, S., Shah, P.A., Shah, Z.A., Kulshrestha, B., Gupta, N., Zargar, M.A., Wani, T.A., Mudasir, S., Mir, F.A. and Taing, S., 2013. Improved efficacy of low-dose spironolactone and metformin combination than either drug alone in the management of women with polycystic ovary syndrome (PCOS): a six-month, open-label randomized study. The Journal of Clinical Endocrinology & Metabolism, 98(9), pp.3599-3607.

Glintborg, D., Altinok, M.L., Mumm, H., Hermann, A.P., Ravn, P. and Andersen, M., 2014. Body composition is improved during 12 months' treatment with metformin alone or combined with oral contraceptives compared with treatment with oral contraceptives in polycystic ovary syndrome. The Journal of Clinical Endocrinology & Metabolism, 99(7), pp.2584-2591

Goodman, N. F., Cobin, R. H., Futterweit, W., Glueck, J. S., Legro, R. S. & Carmina, E. (2015) 'American Association of Clinical Endocrinologists, American College of Endocrinology, and Androgen Excess and PCOS Society disease state clinical review.

Habibi, Z. *et .al.,* 2025. Cardiovascular Risks in Women with Polycystic Ovary Syndrome (PCOS): A Narrative Review. Journal of Clinical Research and Reports, 20(2).

Hahn, S., Kuehnel, W., Tan, S., Kramer, K., Schmidt, M., Roesler, S., Kimmig, R., Mann, K. and Janssen, O.E., 2007. Diagnostic value of calculated testosterone indices in the assessment of polycystic ovary syndrome. Clinical Chemistry and Laboratory Medicine, 45, pp.202–207.

Han, Y., Li, Y. and He, B., 2019. GLP-1 receptor agonists versus metformin in PCOS: a systematic review and meta-analysis. Reproductive Biomedicine Online, 39(2), pp.332-342.

Harris, H.R. and Terry, K.L., 2016. Polycystic ovary syndrome and risk of endometrial, ovarian, and breast cancer: A systematic review. Fertility and Sterility, 106(1), pp.97–106.

Hart, R. and Doherty, D.A., 2015. The potential implications of a PCOS diagnosis on a woman's long-term health using data linkage. Journal of Clinical Endocrinology & Metabolism, 100(3), pp.911–919.

Homburg, R., Ray, A., Bhide, P., Gudi, A., Shah, A., Timms, P. and Grayson, K., 2013. The relationship of serum anti-Müllerian hormone with polycystic ovarian morphology and polycystic ovary syndrome: a prospective cohort study. Human Reproduction, 28(4), pp.1077–1083.

Huising, M.O., 2020. Paracrine regulation of insulin secretion. Diabetologia, 63(10), pp.2057–2063.

Ismajli, Z., 2024. Polycystic Ovary Syndrome (PCOS): A risk factor for infertility. Orapuh Journal, 5(2).

Jeanes, Y.M. and Reeves, S., 2017. The metabolic consequences of obesity and insulin resistance in women with PCOS: An integrative review. Nutrients, 9(7), p.819.

Jensterle, M., Ferjan, S. and Janez, A., 2024. The maintenance of long-term weight loss after semaglutide withdrawal in obese women with PCOS treated with metformin: a 2-year observational study. Frontiers in Endocrinology, 15, 1366940.

Jialal, I., Naiker, P., Reddi, K., Moodley, J. and Joubert, S.M., 1987. Evidence for Insulin Resistance in Nonobese Patients with Polycystic Ovarian Disease. Journal of Clinical Endocrinology & Metabolism, 64(5), pp.1066–1069.

Johnson, J.J., Saeed, A. and Pathak, M., 2023. Endometrial cancer risk in women with polycystic ovary syndrome: A meta-analysis. BMC Cancer, 23(1), pp.1–12.

Juan, C.A., Pérez de la Lastra, J.M., Plou, F.J. and Pérez-Lebeña, E., 2021. The chemistry of reactive oxygen species (ROS) revisited: outlining their role in biological macromolecules (DNA, lipids and proteins) and induced pathologies. International Journal of Molecular Sciences, 22(9), Article 4642.

Khalfe, S., Rafi, U. and Fatima, B., 2024. Prevalence and awareness of polycystic ovarian syndrome among medical students of Karachi, Pakistan. Journal of Shifa Tameer-e-Millat University, 6(2), pp.78–82.

Kim, J.J. and Choi, Y.M., 2013. Dyslipidemia in women with polycystic ovary syndrome. Obstetrics & Gynecology Science, 56(3), pp.137–142.

Lenzen, S., 2021. The pancreatic beta cell: an intricate relation between anatomical structure, the signalling mechanism of glucose-induced insulin secretion, and vulnerability to diabetic stress. ChemTexts, 7, Article 13.

Liu, H., Zhang, Y. and Wang, L., 2021. Prevalence of obesity in Chinese women with PCOS: A national cross-sectional study. Journal of Endocrinological Investigation, 44(10), pp.2137–2144.

Michos, E.D., 2023. Polycystic Ovarian Syndrome: How Your Ovaries Can Affect Your Heart. Johns Hopkins Medicine.

Mirzohreh, S.T. *et .al.,* 2025. Risk of cardiovascular and cerebrovascular events in polycystic ovarian syndrome women: An updated meta-analysis. Turkish Journal of Obstetrics and Gynecology.

Niafar, M., Pourafkari, L., Porhomayon, J. and Nader, N., 2016. A systematic review of GLP-1 agonists on the metabolic syndrome in women with polycystic ovaries. Archives of Gynecology and Obstetrics, 293(3), pp.509-515.

Palomba, S. and Piltonen, T.T., 2021. Endometrial function in women with polycystic ovary syndrome: a comprehensive review. Human Reproduction Update, 27(3), pp.584–602.

Papadakis, G., Kandaraki, E.A., Tseniklidi, E., Papalou, O. and Diamanti-Kandarakis, E., 2019. Polycystic ovary syndrome and NC-CAH: distinct characteristics and common findings. A systematic review. Frontiers in Endocrinology, 10, p.388.

Parker, J., O'Brien, C., Hawrelak, J. and Gersh, F.L., 2022. Polycystic ovary syndrome: An evolutionary adaptation to lifestyle and the environment. International Journal of Environmental Research and Public Health, 19(3), p.1336.

Peña, A.S., Teede, H., Hewawasam, E., Hull, M.L. and Gibson-Helm, M., 2022. Diagnosis experiences of adolescents with polycystic ovary syndrome: cross-sectional study. Clinical Endocrinology (Oxford), 97(5), pp.682–690.

Pellatt, L., Hanna, L., Brincat, M., Galea, R., Brain, H., Whitehead, S. and Mason, H., 2007. Granulosa cell production of anti-Müllerian hormone is increased in polycystic ovaries. Journal of Clinical Endocrinology & Metabolism, 92(1), pp.240–245.

Pellatt, L., Rice, S., Dilaver, N., Heshri, A., Galea, R., Brincat, M. and Mason, H., 2011. Anti-Müllerian hormone reduces follicle sensitivity to follicle-stimulating hormone in human granulosa cells. Fertility and Sterility, 96(5), pp.1246–1251.e1.

Pigny, P., Jonard, S., Robert, Y. and Dewailly, D., 2006. Serum anti-Müllerian hormone as a surrogate for antral follicle count for definition of the polycystic ovary syndrome. Journal of Clinical Endocrinology & Metabolism, 91(3), pp.941–945.

Ponnatapura, J., Dyer, R.B. and Ou, J.J., 2019. The ovarian "string-of-pearls" sign. Abdominal Radiology, 44(4), pp.1301–1302.

Reed, B.G. and Carr, B.R., 2000. The Normal Menstrual Cycle and the Control of Ovulation. In: Feingold, K.R. *et .al.,* . (eds.) Endotext. South Dartmouth, MA.

Rees, D.A., Jenkins-Jones, S. and Morgan, C.L., 2016. Contemporary Reproductive Outcomes for Patients With Polycystic Ovary Syndrome. Journal of Clinical Endocrinology & Metabolism, 101(4), pp.1664–1672.

Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome (PCOS). Fertility and Sterility, 81(1), pp.19–25.

Saltiel, A.R. and Kahn, C.R., 2001. Insulin signalling and the regulation of glucose and lipid metabolism. Nature, 414(6865), pp.799–806.

Sanchez, A.M., Viganò, P., Somigliana, E., Panina-Bordignon, P., Vercellini, P. and Candiani, M., 2014. The distinguishing cellular and molecular features of the endometriotic ovarian cyst: from pathophysiology to the potential endometrioma-mediated damage to the ovary. Human Reproduction Update, 20(2), pp.217–230.

Shukla, A., Rasquin, L.I. and Anastasopoulou, C., 2025. Polycystic Ovarian Syndrome. In: StatPearls [online]. Treasure Island (FL): StatPearls Publishing.

Singla, R., Gupta, Y., Khemani, M. and Aggarwal, S., 2015. Thyroid disorders and polycystic ovary syndrome: An emerging relationship. Indian Journal of Endocrinology and Metabolism, 19(1), pp.25–29.

Spritzer, P.M. *et .al.,* 2022. Prevalence of Hypertension and Metabolic Syndrome in Women with PCOS from France and Brazil. Journal of the Endocrine Society, 6(Suppl_1), pp.A696–A697.

Sun, Y.F., Zhang, J., Xu, Y.M., Cao, Z.Y., Wang, Y.Z., Hao, G.M. and Gao, B.L., 2020. High BMI and insulin resistance are risk factors for spontaneous abortion in patients with polycystic ovary syndrome undergoing assisted reproductive treatment: A systematic review and meta-analysis. Frontiers in Endocrinology, 11, p.592495.

Su, P., Chen, C. and Sun, Y., 2025. Physiopathology of polycystic ovary syndrome in endocrinology, metabolism and inflammation. Journal of Ovarian Research, 18, Article 34.

Teede, H.J., Misso, M.L., Costello, M.F., Dokras, A., Laven, J., Moran, L.J., Joham, A.E., Piltonen, T.T., Hoeger, K.M., Franks, S. and Norman, R.J., 2023. International evidence-based guideline for the assessment and management of polycystic ovary syndrome (PCOS). Monash University.

Teede, H.J., Tay, C.T., Laven, J.J.E., Dokras, A., Moran, L.J., Piltonen, T.T., Costello, M.F., Boivin, J., Redman, L.M., Boyle, J.A., Norman, R.J., Mousa, A. and Joham, A.E., 2023. Recommendations from the 2023 international evidence-based guideline for the assessment and management of polycystic ovary syndrome. European Journal of Endocrinology, 189(2), pp.G43–G64.

Teede, H.J., Tay, C.T., Laven, J.J.E., Dokras, A., Moran, L.J., Piltonen, T.T., Costello, M.F., Boivin, J., Redman, L.M., Boyle, J.A., Norman, R.J., Mousa, A. and Joham, A.E., 2023. Recommendations from the 2023 international evidence-based guideline for the assessment and management of polycystic ovary syndrome. *European Journal of Endocrinology*, 189(2), pp.G43–G64.

Tehrani, F.R., Solaymani-Dodaran, M., Hedayati, M. and Azizi, F., 2010. Is polycystic ovary syndrome an exception for reproductive aging? Human Reproduction, 25(7), pp.1775–1781.

Toprak, S., Yönem, A., Cakir, B., Güler, S., Azal, O., Ozata, M. and Corakçi, A., 2001. Insulin Resistance in Nonobese Patients with Polycystic Ovary Syndrome. Hormone Research, 56(3), pp.125–130.

Torchen, L.C., 2017. Cardiometabolic risk in adolescent PCOS: What is the best predictor? The Journal of Clinical Endocrinology & Metabolism, 102(2), pp.292–294.

Vanderschueren, D., Vandenput, L., Boonen, S., Lindberg, M.K., Bouillon, R. and Ohlsson, C., 2004. Androgens and bone. Endocrine Reviews, 25(3), pp.389–425.

Venkatesan, A.M. *et .al.,* 2001. Evidence for intrinsic insulin resistance in polycystic ovary syndrome independent of obesity. Journal of Clinical Endocrinology and Metabolism, 86(1), pp.398–403.

Very Big Brain, 2024. Androgens and Brain Health: Beyond Sexual Function. Available at: https://verybigbrain.com/hormones/androgens-and-brain-health-beyond-sexual-function

Verywell Health, 2025. High androgens in females: Symptoms, causes, and treatments.

Vink, J.M., Sadrzadeh, S., Lambalk, C.B. and Boomsma, D.I., 2006. Heritability of polycystic ovary syndrome in a Dutch twin-family study. Journal of Clinical Endocrinology & Metabolism, 91(6), pp.2100–2104.

WHO, 2025. Polycystic ovary syndrome and noncommunicable disease prevention. World Health Organization.

Wickenheisser, J.K. and McAllister, J.M., 2007. Ovarian steroidogenic abnormalities in PCOS. In: Dunaif, A., *et .al.,* . (eds.) Contemporary Endocrinology: Polycystic Ovary Syndrome. Boston, MA: Springer, pp.69–84.

Witchel, S.F., Oberfield, S.E. and Peña, A.S., 2019. Polycystic ovary syndrome: pathophysiology, presentation, and treatment with emphasis on adolescent girls. Journal of the Endocrine Society, 3(6), pp.1545–1573.

Wynn, T.A. and Ramalingam, T.R., 2012. Mechanisms of fibrosis: therapeutic translation for fibrotic disease. Nature Medicine, 18(7), pp.1028–1040.

Xie, J., Burstein, F., Garad, R., Teede, H.J. and Boyle, J.A., 2018. Personalized Mobile Tool AskPCOS Delivering Evidence-Based Quality Information about Polycystic Ovary Syndrome. Seminars in Reproductive Medicine, 36(1), pp.66–72.

Yang, Y., Wu, Q. and Chen, J., 2025. Generalized anxiety in women with PCOS: A systematic review. Journal of Affective Disorders, 355, pp.512–520.

Yin, Q. *et .al.,* 2021. Prevalence of depression in women with PCOS: A systematic review and meta-analysis. Journal of Affective Disorders, 291, pp.216–222.

Yousaf, J. *et .al.,* 2022. The Chances of Infertility in a Patient Presenting with PCOS in Childbearing Age. Saudi Journal of Medicine, 7(1), pp.15–21.

Yusuf, S. *et .al.,* 2004. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study). The Lancet, 364(9438), pp.937–952.

Zawadski, J.K. and Dunaif, A., 1992. Diagnostic criteria for polycystic ovary syndrome: Towards a rational approach. In: Dunaif, A., Givens, J.R. and Haseltine, F. (eds.) Polycystic Ovary Syndrome. Boston, MA: Blackwell Scientific, pp.377–384.

Zeng, L. and Yang, K., 2018. Effectiveness of myoinositol for polycystic ovary syndrome: a systematic review and meta-analysis. Endocrine, 59(1), pp.30-38.

Zhang, C., Ma, J., Wang, W., Sun, Y. and Sun, K., 2018. Lysyl oxidase blockade ameliorates anovulation in polycystic ovary syndrome. Human Reproduction, 33(11), pp.2097–2106.

Zhao, H., Li, X. and Wang, X., 2023. Insulin resistance and fat distribution in PCOS: A mechanistic perspective. Journal of Ovarian Research, 16(1), p.45.

Zhao, H. *et .al.,* 2023. Insulin resistance in polycystic ovary syndrome across various tissues: an updated review. Journal of Ovarian Research, 16(9).

Zhao, X., Ni, R., Li, L., *et .al.,* 2011. Defining hirsutism in Chinese women: a cross-sectional study. Fertility and Sterility, 96(3), pp.792–796.

Zhou, X., Tian, Y. and Zhang, X., 2024. Systemic immune-inflammation index and dyslipidemia in PCOS. BMC Women's Health, 24(564).

Zhuang, C. *et .al.,* 2022. Cardiovascular Risk According to BMI in Women of Reproductive Age With PCOS: A Meta-Analysis. Frontiers in Cardiovascular Medicine, 9, 822079.

APPENDIX

QUESTIONNAIRE

DEPARTMAENT OF CLINICAL PHARMACY

FACULTY OF PHARMACY, UNIVERSITY OF BENIN

KNOWLEDGE AND AWARENESS OF POLYCYSTIC OVARY SYNDROME AMONGST FEMALE PHARMACY STUDENTS IN THE UNIVERSITY OF BENIN.

Dear Respondent,

I am a 600 level student of the University of Benin, Benin City and this study seeks to assess the level of awareness and knowledge of Polycystic Ovary Syndrome (PCOS) among female pharmacy students.All information given will be treated as confidential. Please mark and fill all sections as appropriate. Thank you for participation.

Section A: Demographic Information

Tick [✔] the appropriate option.

1. Level of Study: 400 Level ☐ 500 Level ☐ 600 Level ☐
2. Age: 18-20 ☐ 21-23 ☐ 24–26 ☐ Above 26 ☐
3. Type of Residence: On-campus hostel ☐ Off-campus (alone) ☐ Off-campus (with family/relatives) ☐ Off-campus (with friends/roommates) ☐
4. Marital Status: Single ☐ Married ☐ Other_____
5. Have you been diagnosed with PCOS? Yes ☐ No☐
6. Do you have a family history of PCOS? Yes ☐ No☐

Section B: Awareness Measurement

Tick [✔] the appropriate option.

7. Have you heard of the term Polycystic Ovary Syndrome before? Yes ☐ No ☐
8. If yes,where did you first hear about PCOS? Lecture ☐ Social media ☐ Friends ☐ Internet ☐ A health care professional ☐ Others (please specify):_____
9. How would you rate your awareness of PCOS? Very Low ☐ Low ☐ Moderate ☐ High ☐ Very High ☐

Section C: Knowledge of PCOS

10. PCOS is a hormonal disorder common among women of reproductive age. True ☐ False ☐ I don't know ☐
11. PCOS is a curable condition. True ☐ False ☐

12 . Which of the following are common symptoms of PCOS? (Select all that applies) Irregular menstrual periods ☐ Acne ☐ Hearing loss ☐ Weight gain ☐ Shortness of breath ☐ Facial hair ☐ Hair loss from scalp ☐ Joint pain/swelling ☐ Breast pain ☐ I don't know ☐

13.Which of the hormone is typically elevated in individuals with PCOS? Estrogen ☐ Testostrone ☐ Melatonin ☐ Growth hormone ☐ Progesterone ☐ Insulin ☐ Glucagon ☐

14.PCOS can lead to fertility issues? True ☐ False ☐ Not sure ☐

15. PCOS can be diagnosed through (select all that apply) Blood tests ☐ Ultrasound ☐ Physical exam ☐ Pap smear ☐ Urine test ☐ I don't know ☐

16. Which of the following are known risk factors for PCOS? Family history ☐ Obesity ☐ High salt intake ☐ Smoking ☐ Vitamin D overdose ☐ Malnutrition ☐ Sedentary lifestyle ☐ I don't know ☐

17. Which of the following are possible long-term complications of PCOS? (Select all that apply) Type 2 Diabetes ☐ Cardiovascular disease ☐ Infertility ☐ Death ☐ Osteoporosis ☐ Anxiety/ depression ☐ Chronic kidney disease ☐ Hemophilia ☐ Ovarian cancer ☐ Sleep disorders ☐ I don't know ☐

18. Management of PCOS may include (Select all that apply) Weight management ☐ Oral contraceptives ☐ Lifestyle changes ☐ Surgery ☐ Dialysis ☐ Herbal or alternative remedies ☐ Vaccinations ☐ I don't know ☐

Section D : Perception and Attitude

19. Do you consider PCOS a serious health condition? Yes ☐ No ☐ Not sure ☐

20. Do you think PCOS is adequately discussed in your pharmacy curriculum ? Yes ☐ No ☐ Maybe ☐

21. Would you like more educational programs on PCOS in your school? Yes ☐ No☐ Maybe ☐

22. Do you believe PCOS is a significant health concern for women of reproductive age ? Strongly agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐

23. If a patient asked you about PCOS ,how confident are you in providing accurate information ? Very confident ☐ Somewhat confident ☐ Not confident ☐ I have no knowledge ☐

Report

KNOWLEDGE SCORE

5. HAVE YOU BEEN DIAGNOSED WITH PCOS	Mean	N	Std. Deviation
no	26.73	182	4.030

yes	27.73	15	5.338
Total	26.80	197	4.136

Report

KNOWLEDGE SCORE

6. DO YOU HAVE A FAMILY HISTORY OF PCOS	Mean	N	Std. Deviation
no	26.53	179	4.027
yes	29.50	18	4.356
Total	26.80	197	4.136