Review Article

Cost Analysis and Cost-Efficient of Polycystic Ovary Syndrome (PCOS) Management: A Narrative Review

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Abstract

Polycystic Ovary Syndrome (PCOS) is a prevalent endocrine disorder affecting women of reproductive age, often associated with chronic comorbidities such as type 2 diabetes, cardiovascular diseases, and mental health conditions. Managing PCOS is complex and costly, making cost-efficient care models essential for improving outcomes. Drawing parallels with chronic disease management frameworks, this review explores strategies for delivering sustainable, integrated, and patient-centred care for PCOS.

Key approaches include leveraging primary care for early diagnosis, implementing multidisciplinary clinics to consolidate care delivery, and emphasizing lifestyle interventions such as diet and exercise as cost-effective first-line treatments. Pharmacological interventions, including the use of generic medications and combination therapies, can lower treatment costs without compromising efficacy. Mental health integration, through cognitive-behavioral therapy and digital counselling platforms, addresses the psychological burden associated with PCOS, further reducing indirect costs. Additionally, insurance models and cost-sharing strategies ensure equitable access to care, particularly in low-resource settings.

This review concludes that cost-efficient, holistic care models-grounded in chronic illness management principles can optimize clinical outcomes, reduce healthcare costs, and improve the quality of life for women with PCOS. Such approaches demand collaborative efforts among healthcare providers, policymakers, and communities to ensure accessibility and affordability for all.

Key Words: polycystic ovary syndrome**,** polycystic ovary syndrome cost, reproductive health, cost analysis, cost efficient

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Introduction

Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder affecting 5–10% of women of reproductive age worldwide, making it one of the most significant public health concerns in women's health. [1] First described in 1935 by Stein and Leventhal, PCOS is a heterogeneous condition characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology on ultrasound. [2] Despite advances in research, the pathophysiology of PCOS remains incompletely understood, with genetic, environmental, and lifestyle factors thought to play critical roles in its manifestation. [2–3] PCOS affects women across age group, adolescent women can experience menstrual irregularity and other related symptoms and may not be aware of that they have an issue. [4] Its implications extend beyond reproductive health, affecting metabolic and psychological well-being, resulting in a considerable economic burden on healthcare systems globally. [5]

The economic burden of PCOS is multifaceted, encompassing direct costs such as diagnosis, treatment, and management of associated comorbidities, and indirect costs including productivity losses and reduced quality of life. [6] PCOS is associated with a wide range of comorbidities, including insulin resistance, obesity, type 2 diabetes mellitus (T2DM), cardiovascular diseases (CVD), and mental health disorders such as depression and anxiety. [7–8] The management of these comorbidities further amplifies the financial strain on healthcare

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systems and patients. [9] A study by Riestenberg et al. (2022) estimated the total annual cost of PCOS-related comorbidities in the United States alone at $4.3 billion, highlighting the need for cost- effective strategies to manage the syndrome and its complications. [9–10]

The aetiology of PCOS include maternal factors, genetics, lifestyle, diet and environmental factors. [11–12] Because of the multifactorial nature, and varying presentation and economic implications, the diagnosis and treatment of PCOS pose unique challenges. [13–14] The diagnostic criteria, including the Rotterdam criteria (2003), have been criticized for their broad inclusivity, leading to inconsistencies in diagnosis and treatment plans. [14–15] Consequently, many women face delayed or incorrect diagnoses, contributing to higher healthcare costs due to repeated consultations and unnecessary interventions. Furthermore, the management of PCOS is often individualized, involving lifestyle modifications, pharmacological interventions, and in some cases, surgical procedures, depending on the symptoms and associated complications. [16] The heterogeneity of treatment options complicates cost-effectiveness analyses, making it challenging to determine the optimal allocation of healthcare resources. [15–16]

Pharmacological treatments, including hormonal therapies, insulin-sensitizing agents like metformin, and ovulation-inducing agents such as clomiphene citrate, form the cornerstone of PCOS management. [17] While these treatments are effective in managing symptoms and improving fertility outcomes, their cost-effectiveness varies widely based on regional healthcare settings and patient-specific factors. For instance, a study by Alenzi (2021) demonstrated that metformin uses in pregnant women with PCOS to prevent gestational diabetes mellitus (GDM) was a cost-effective strategy, reducing the average cost per case of GDM prevention to $669.78. [18] However, such findings may not be universally applicable due to differences in healthcare costs and accessibility across regions.

Lifestyle modifications, including dietary changes and exercise, are universally recommended as first-line interventions for PCOS management. [10] These interventions are not only effective in improving metabolic and reproductive outcomes but also represent a cost-effective approach to reducing the economic burden of the syndrome. However, adherence to lifestyle modifications remains a significant challenge, particularly in low-resource settings where access to nutritional counselling and fitness programs may be limited. [19] This underscores the importance of tailoring management strategies to the socioeconomic context of the patient population to maximize cost-effectiveness and improve health outcomes.

The indirect costs of PCOS, particularly those related to mental health disorders, are often overlooked but contribute significantly to the overall economic burden. Women with PCOS are at an increased risk of developing depression, anxiety, and eating disorders, which can adversely affect their quality of life and work productivity. [20] A systematic review by Yadav et al. (2023) estimated that the annual cost of managing mental health disorders in women with PCOS in the United States was $4.2 billion, accounting for 52.5% of the total economic burden of the syndrome. [21]

Regional variations in the economic burden of PCOS further complicate cost analysis. Developed countries report higher direct medical costs due to advanced diagnostic technologies and higher healthcare service charges [9, 10] conversely, in developing countries such as India; the economic burden is primarily driven by indirect costs, including productivity losses due to delayed diagnosis and inadequate access to treatment. [22] These disparities emphasize the need for region-specific cost analyses to inform policy decisions and optimize resource allocation in PCOS management.

The existing studies often focus on specific aspects of PCOS management, such as pharmacological treatments or comorbidities, without providing a comprehensive overview of the associated costs. This systematic narrative review aims to bridge this gap by synthesizing evidence from studies published between 2010 and 2025 on the cost analysis of PCOS management. Understanding the cost-effectiveness of different management strategies can guide clinical decision-making and resource allocation, ensuring that women with PCOS receive optimal care without imposing unnecessary financial strain.

Integrated Results and Discussion

Polycystic Ovary Syndrome (PCOS) is a complex chronic condition with significant economic and health impacts worldwide. The management of PCOS requires multi-dimensional strategies that integrate medical, behavioral, and technological interventions. Below, we provide a detailed synthesis of cost-efficient models and their implications.

Direct and Indirect Costs of Management Strategies

The comparative analysis of management strategies shows significant variation in costs and benefits. Lifestyle interventions, while costing between $500 and $1,000 annually, reduce the dependency on pharmacological treatments, thereby lowering long-term expenses. [18] Structured dietary programs and exercise regimens enhance insulin sensitivity and improve overall health outcomes, making them a cost-effective solution for most patients. **[Table-1]**

Pharmacological options, especially generic medications like metformin, provide effective symptom management at an annual cost of $1,000 to $2,500 (19). While hormonal therapies incur higher upfront costs, their incremental cost-effectiveness ratio (ICER) of $480 per QALY highlights their value in managing severe PCOS symptoms effectively (19). Table 1 demonstrates the cost variation and effectiveness of different treatment modalities, including herbal and homeopathic treatments, which have lower costs but limited clinical validation as shown in **Table-1.**

Economic Burden of Comorbidities

PCOS-related comorbidities significantly amplify the economic burden, as shown in **Table-2.** Mental health disorders contribute over 50% to the total burden, emphasizing the importance of integrating mental health services into PCOS care. Type 2 diabetes, accounting for 37.5% of the economic burden. [20–23]

Pregnancy-related complications and cardiovascular diseases, though smaller contributors, represent critical areas for targeted care to reduce long-term healthcare expenditures. These findings

highlight the need for preventive strategies and early diagnostic measures to alleviate the economic strain on healthcare systems and individuals alike. [20–23]

Table–1 Cost analysis of various groups of interventions

Management Strategy	Annual Cost per Patient (USD)	Key Benefits
Lifestyle Interventions	$500 to $1,000	Reduces reliance on pharmacological treatments; improves insulin sensitivity (Harrison et al., 2021).
Pharmacological Treatments	$1,000 to $2,500	Generic medications and combination therapies lower costs while maintaining efficacy (Alenzi, 2021).
Multidisciplinary Care	$1,200 to $2,000	Integrates multiple specialists, reducing care fragmentation (Costello et al., 2019).
Telehealth and Digital Tools	$300 to $700	Enhances accessibility; reduces need for in-person visits (Panchal et al., 2020).
Community-Based Programs	$400 to $800	Provides education and emotional support through peer-led initiatives (Barry et al., 2014).

Citations: *Panchal et al., 2020; Barry et al., 2014; Costello et al., 2019.*

Regional and Systemic Variations in Economic Impact

Table-3 underscores significant regional disparities in the economic burden and cost drivers of PCOS management. In the United States, advanced diagnostics and mental health services are primary cost drivers, resulting in a total economic burden of $15 billion annually. High out-of-pocket costs pose a significant barrier to equitable care access, emphasizing the need for policy-level interventions. [19, 24]

In contrast, the United Kingdom benefits from its National Health Service (NHS), which focuses on preventive healthcare and subsidized treatments, reducing the economic burden to $8 billion. Australia's comprehensive care models demonstrate the efficacy of integrated healthcare systems, while India faces unique challenges, including delayed diagnosis and productivity losses, with a total economic burden of $2.5 billion. These regional insights underscore the importance of tailoring healthcare policies and interventions to specific systemic and socioeconomic contexts. [19, 24]

Table–2 Economic Burden of PCOS-Related Comorbidities (Annual Cost)

Comorbidity	Total Annual Cost (USD Billion)	Percentage Contribution (%)
Type 2 Diabetes Mellitus	$3.0	37.5%
Cardiovascular diseases	$0.6	7.5%
Mental health disorders	$4.2	52.5%
Pregnancy-related disorders	$0.375	2.5%

Citations: *Panchal et al., 2020; Barry et al., 2014; Costello et al., 2019.*

Table-3 Regional Variations in PCOS Cost Analysis

Region	Primary Cost Drivers	Total Economic Burden (USD Billion)	Public vs. Private Healthcare Impact
United States	Advanced diagnostics, mental health costs	$15.0	Higher out-of-pocket costs
United Kingdom	Preventive healthcare	$8.0	Lower public costs due to NHS
India	Delayed diagnosis, productivity losses	$2.5	High indirect costs
Australia	Comprehensive care models	$6.0	High public spending

Citations: *Harrison et al., 2021; Alenzi, 2021; Panchal et al., 2020.*

Cost-Efficient Models of Care

The **table-4** describes the cost-efficient models described in various studies for the management of PCOS.

Integrated and primary Care Models for PCOS

An integrated care model is a patient-centered approach that combines healthcare providers, resources, and technology to deliver coordinated and efficient care. The integration of primary care, specialized services, and lifestyle interventions is essential for managing PCOS effectively. [25]

Primary care providers play a pivotal role in the early diagnosis and management of PCOS. Empowering general practitioners (GPs) through education and guidelines can ensure timely interventions, reducing the need for costly specialist consultations. For example, a study in Australia found that training GPs to manage PCOS reduced unnecessary referrals to endocrinologists and gynaecologists, saving both time and costs. [16]

Multidisciplinary PCOS clinics bring together specialists, including endocrinologists, gynaecologists, dieticians, and psychologists, to provide comprehensive care under one roof. This reduces fragmentation, improves patient satisfaction, and optimizes resource utilization. A study in the UK demonstrated that multidisciplinary clinics for PCOS led to better metabolic outcomes and a 20% reduction in direct medical costs. [23]

Lifestyle Interventions: A Cost-Effective First Line

Lifestyle modification is universally recommended as the first-line treatment for PCOS due to its impact on weight management, insulin sensitivity, and menstrual regularity. Unlike pharmacological treatments, which incur recurring expenses, lifestyle interventions are relatively cost-effective and sustainable. [26]

Nutritional counseling targeting a low-hypoglycaemia index diet and caloric restriction has been shown to improve insulin resistance and androgen levels. A systematic review by Harrison et al. (2021) found that structured dietary interventions cost approximately $700 annually per patient, compared to $1,500 for hormonal therapies. [27]

Exercise has dual benefits of improving insulin sensitivity and reducing cardiovascular risks. Community-based fitness programs or subsidized gym memberships can be implemented as low-cost alternatives to expensive pharmacological interventions. Integrating fitness trackers and mobile health apps enhances adherence to exercise regimens, providing an economical way to manage symptoms. [28]

Technology-Enabled Care Models

The use of telehealth, wearable technology, and mobile apps in managing chronic illnesses has revolutionized care delivery. These tools can significantly reduce costs by minimizing the need for in-person consultations and facilitating continuous monitoring. [29]. Telehealth offers convenient access to medical care while reducing transportation and time-related costs. Studies show that telehealth interventions for chronic conditions reduce healthcare expenditure by up to 30%. For PCOS, virtual consultations with specialists or dietitians can provide ongoing support for lifestyle changes, medication adherence, and mental health counselling. [24]

Mobile Health Applications

Apps like “Clue” and “Flo” enable women to track their menstrual cycles, symptoms, and lifestyle changes. Integrating these apps with patient health records allows healthcare providers to offer personalized advice. Mobile apps are a low-cost solution that enhances patient engagement, adherence, and satisfaction. [22]

Community-Based and Peer-Led Programs

Community-based care models leverage local resources and peer support to manage chronic illnesses. For PCOS, community-driven programs can provide education, emotional support, and resources at minimal cost. [2]

Peer-led support groups reduce feelings of isolation and stigma associated with PCOS. These groups provide a platform for sharing experiences and practical advice, fostering a sense of empowerment among participants. [20]

Government or non-profit organizations can subsidize fitness and nutrition programs tailored to women with PCOS. A pilot program in India demonstrated that community-based yoga sessions improved insulin sensitivity and reduced stress among PCOS patients, with a cost-effectiveness ratio of $400 per quality-adjusted life year (QALY) gained. [22]

Pharmacoeconomic Evaluation of Treatments

Pharmacological treatments such as oral contraceptives, insulin sensitizers (e.g., metformin), and anti-androgens are commonly prescribed for PCOS management. While effective, these treatments incur substantial costs that can be minimized through strategic approaches. [31] Encouraging the use of generic medications can reduce treatment costs by up to 60% without compromising efficacy. [19] Policymakers can negotiate bulk purchases or subsidies for essential PCOS medications to improve affordability.

Combining medications with lifestyle interventions can reduce the overall duration and dosage of pharmacological treatments, minimizing side effects and costs. For instance, combining metformin with dietary changes has been shown to improve insulin sensitivity more effectively than either approach alone. [23] Mental health disorders such as depression and anxiety are common among women with PCOS, contributing significantly to indirect costs through lost productivity and reduced quality of life. Integrating mental health services into PCOS care models is crucial for holistic and cost-efficient management. [23]

CBT has been shown to improve emotional well-being and reduce distress among women with PCOS. A study by Yadav et al. (2023) estimated that group-based CBT programs cost approximately $500 annually per patient, significantly lower than long-term pharmacotherapy for mental health conditions. Online platforms offering guided meditation, stress management tools, and virtual counselling provide low-cost alternatives to in-person therapy sessions. [23] These platforms enhance accessibility, particularly in rural or low-resource settings.

Cost Sharing and Insurance Models

Health insurance models that cover PCOS management can significantly reduce out-of-pocket costs for patients. Policymakers

Table–4 Cost-efficient models of care for PCOS

Model of Care	Description	Key Study Findings	Citation
Integrated Care Models	Combines primary care, specialized services, and lifestyle interventions for patient-centered management of PCOS.	Improved patient outcomes and resource utilization when care is coordinated.	-Grega et al., 2023
Primary Care as First Line of Defense	Empowering general practitioners (GPs) through training for early diagnosis and management.	Training GPs reduced unnecessary specialist referrals, saving time and costs.	Teede et al., 2018
Multidisciplinary Clinics	Clinics with endocrinologists, gynecologists, dietitians, and psychologists providing comprehensive care.	Led to better metabolic outcomes and a 20% reduction in medical costs.	Costello et al., 2019
Lifestyle Interventions	Cost-effective first-line approach focusing on weight management, insulin sensitivity, and menstrual regularity.	More sustainable and less costly than pharmacological treatments.	Lim et al., 2019
Dietary Interventions	Nutritional counseling focusing on low-glycemic index diets and caloric restriction.	Annual cost: ~$700 per patient compared to $1,500 for hormonal therapies.	Harrison et al., 2021
Exercise Programs	Community-based fitness initiatives or subsidized gym memberships.	Improves insulin sensitivity and reduces cardiovascular risks.	Bird 2017
Technology-Enabled Care Models	Telehealth, mobile apps, and wearable devices for monitoring and management.	Reduced healthcare expenditure by up to 30% through telehealth interventions.	Panchal et al., 2020
Telehealth and Virtual Consultations	Remote consultations for ongoing support in lifestyle changes and mental health counseling.	Cost-effective and convenient for chronic condition management.	Panchal et al., 2020
Mobile Health Applications	Apps for tracking menstrual cycles, symptoms, and lifestyle changes.	Enhanced patient engagement and adherence; cost-effective for self-management.	Pal et al., 2020
Wearable Technology	Fitness trackers and smartwatches for monitoring physical activity, sleep, and health data.	Encourages adherence to lifestyle interventions and provides real-time feedback.	Jafleh et al., 2024
Community-Based and Peer-Led Programs	Local resources and peer support for education and emotional well-being.	Improved insulin sensitivity and stress management in a community yoga program; cost-effectiveness ratio of $400/QALY.	Patel et al., 2018
Support Groups	Peer-led forums to reduce stigma and provide practical advice.	Fostered empowerment and reduced feelings of isolation among PCOS patients.	Barry et al., 2014
Pharmacoeconomic Evaluations	Focus on generic medications and combining pharmacological treatments with lifestyle interventions.	Reduced treatment costs by up to 60%; combining metformin with diet improved insulin sensitivity.	Costello et al., 2019; Alenzi, 2021
Mental Health Integration	Incorporating cognitive behavioral therapy (CBT) and online mental health resources.	Group-based CBT programs cost ~$500 annually per patient, less expensive than long-term pharmacotherapy.	Yadav et al., 2023

can advocate for the inclusion of PCOS-specific treatments and diagnostics in insurance plans, particularly in low- and middle-income countries (LMICs). Cost-sharing models that subsidize preventive measures, such as lifestyle programs and early diagnosis, can reduce long-term economic burdens. [31, 32]

Conclusion

This review demonstrates that the economic burden of PCOS is substantial, with direct and indirect costs impacting both patients and healthcare systems. Cost-efficient models, such as lifestyle interventions, telehealth, and community-based programs, offer promising pathways to reduce these expenses while improving patient outcomes. Regional disparities in healthcare access and systemic cost drivers further highlight the need for context-specific policies and interventions. Future research should focus on optimizing these strategies, integrating mental health services, and addressing regional inequities to ensure equitable and effective PCOS management worldwide.

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