

# Digital Pharmaceutical Marketing Strategies in Improving PCOS Awareness and Management among Women - A Thematic Review

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**Abstract - Polycystic Ovary Syndrome (PCOS) is a prevalent endocrinological and metabolic disease among women in their reproductive years. This disease carries many reproductive, metabolic, and psychological effects that affect the quality of life negatively. Due to the high prevalence rate of this condition, knowledge regarding PCOS and its management remains limited, especially in developing countries. This article aims to explore methods used to improve the knowledge and management of PCOS using digital media. This is a narrative review with thematic analysis on articles found in scholarly databases like PubMed, ScienceDirect, and SpringerLink and published between 2019 and 2025. Results indicate that although general awareness about PCOS exists, in-depth understanding regarding its causes, complications, and management remains limited. However, challenges such as misinformation, lack of regulation, poor long-term engagement, and digital inequality continue to limit their effectiveness. Overall, digital health strategies show strong potential to improve PCOS awareness and management; but their success depends on integration with structured education, active healthcare professional involvement, and strict ethical regulation to ensure sustainable outcomes.**

**Keywords: Polycystic ovary syndrome, Digital health interventions, Health literacy, mHealth, social media, Pharmacist-led interventions, Patient education, Lifestyle modification, Healthcare communication.**

## I. INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is an endocrine/metabolic condition prevalent among women in their reproductive ages around the globe with its prevalence rate up to 10% (1,2). The clinical characteristics include menstrual cycle disorders, hyperandrogenism, insulin resistance, and polycystic ovary appearance. While most patients with PCOS suffer from reproductive problems, there are also metabolic and psychological complications associated with the syndrome. Patients with PCOS have an increased likelihood of suffering from diseases like type II diabetes, obesity, dyslipidaemia, and cardiovascular problems (1,2). On the other hand, some psychological problems like anxiety and depression are also commonly experienced.

Despite being common, the awareness and understanding of PCOS among women are relatively lower, especially in underdeveloped nations (3–5). While women might have some

basic awareness regarding the symptoms of PCOS, they lack adequate knowledge concerning their causes and the need for proper treatment for PCOS. This results in acquiring information concerning PCOS through unreliable sources, such as social media, leading to poor diagnosis, non-compliance with medications, and improper lifestyle changes (6–8). With the advent of digital health revolution, education and communications within the healthcare industry have changed through several tools that enable people to discuss matters of health. Digital pharmaceutical marketing involves the use of digital platforms such as social media, mobile applications, websites, webinars, online campaigns, and educational tools to improve disease awareness, patient education, healthcare communication, and treatment adherence. In recent years, these digital strategies have played an important role in increasing awareness and supporting the self-management of chronic conditions such as Polycystic Ovary Syndrome (PCOS). For instance,

pharmacists are capable of offering interventions and counselling services to patients, helping them to gain knowledge on PCOS and adherence to medication(9,10). Similarly, digital health marketing in the pharmaceutical industry stresses interventions that seek to enhance the knowledge level of patients concerning PCOS(10). A narrative literature review was conducted using studies published between 2019 and 2025 to evaluate the role of digital pharmaceutical marketing strategies and technology-based interventions in improving PCOS awareness and management. The objectives of this study are to gain insights into the present-day awareness about PCOS among women of reproductive age, the potential role of digital tools and pharmacist-driven programs in increasing awareness and improving self-management skills, the efficacy of awareness campaigns through digital tools, shortcomings of current programs, and ways to improve them based on scientific evidence.

## II. MATERIALS AND METHODOLOGY

### Study Design

The present review employed a thematic analysis approach to organize and interpret findings such as awareness, knowledge, and management of Polycystic Ovary Syndrome (PCOS), with a focus on digital health technologies, pharmaceutical marketing, and pharmacist-led interventions(11,12). The review aims to evaluate the impact of these approaches on awareness, lifestyle modification, and treatment adherence among women with PCOS.

### Data Sources

A comprehensive literature search was conducted using several scientific databases and academic publishing platforms to ensure the inclusion of credible and peer-reviewed literature relevant to the study. The major databases and sources used for data collection included ScienceDirect, PubMed and PubMed Central, SpringerLink, Frontiers in

Endocrinology, Journal of Medical Internet Research–Infodemiology, Lippincott Williams & Wilkins (LWW) Journals, Research Journal of Pharmacy and Technology, International Journal of Reproduction, Contraception, Obstetrics & Gynaecology, Midwifery Journal Galenos Publishing, Google Scholar, and other academic websites. These platforms were selected because they provide reliable literature related to biomedical sciences, pharmaceutical marketing, digital health interventions, patient education, lifestyle modification, and treatment adherence associated with Polycystic Ovary Syndrome.

### Search Strategy

Relevant articles were retrieved using a systematic search strategy that combined medical subject terms with digital health-related keywords. The search included terms such as: "Polycystic Ovary Syndrome" OR "PCOS", "PCOS awareness", "PCOS knowledge and perception", "Digital health in PCOS", "mHealth" OR "mobile health applications", "Pharmacist-mediated educational intervention", "Lifestyle modification in PCOS", "Treatment adherence in PCOS", "Digital marketing in healthcare". Boolean operators (AND, OR) were applied to refine and retrieve relevant studies related to awareness, digital interventions, and patient engagement in PCOS management.

## III. STUDY SELECTION CRITERIA

### Inclusion Criteria

Studies were considered for inclusion in the review of literature if they satisfy the following criteria:

- Research articles on Polycystic Ovary Syndrome (PCOS)
- Studies on awareness, knowledge, perception, and education concerning PCOS
- Research articles on digital health interventions, online educational programs, mobile health applications, and digital marketing strategies.

- Studies on pharmacist-mediated educational programs and interventions.
- Research articles on lifestyle modifications, patient engagement, and treatment adherence concerning PCOS.
- Research articles available in the English language.

**Exclusion Criteria**

The following studies were excluded:

- Articles not related to PCOS or Women’s Reproductive Health
- Articles not having full-text content
- Editorials, Commentaries, and Opinion Articles not having any research data
- Duplicate publications in different databases.

**Study Screening and Selection Process**

Initially, all identified articles were screened using their title and abstract to determine their relevance to the objectives of this review. Articles found relevant were further screened using a full-text approach to determine their eligibility in line with set criteria. Duplicate publications were removed during this screening process.

**Data Extraction and Synthesis**

Relevant data were systematically extracted from selected studies, including author details, year of publication, study population, intervention type, awareness strategies, and digital educational methods. The collected information was synthesized descriptively to identify major findings and research trends. Data extraction considered relevant in this study was synthesized descriptively to identify any trends in these studies.

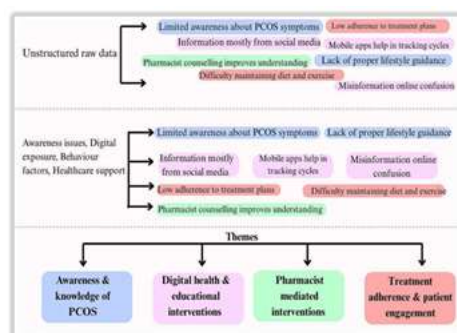
**Data Analysis Approach**

The present review employed a thematic analysis approach to organize and interpret findings from the selected studies. Relevant information was extracted focusing on awareness levels, knowledge gaps, educational interventions, digital platforms, lifestyle practices, and treatment adherence among women with PCOS.

A coding process was used to identify recurring patterns, which were grouped into categories and refined into major themes aligned with the study objectives. Themes were identified based on repeated findings, relevance to PCOS management, and the impact of digital health tools and pharmaceutical marketing on patient behaviour and adherence.

The major themes identified include:

- Awareness and Knowledge of PCOS
- Digital Health and Educational Interventions
- Pharmacist-Mediated Interventions
- Lifestyle Modification and Self-Management
- Treatment Adherence and Patient Engagement



**Figure 1:** Thematic Analysis Process Showing Coding and Theme Development

Together, these themes provide an understanding of how awareness, digital platforms, and healthcare interventions influence the management of Polycystic Ovary Syndrome among women. The findings highlight the role of digital health technologies in improving awareness and treatment adherence. The thematic analysis also identifies existing gaps and challenges in current approaches. It further emphasizes the need for more effective and patient-centered strategies for PCOS management.

## IV. RESULTS AND DISCUSSION

### Themes

The findings of this review were organized using a thematic analysis approach to provide a structured understanding of the role of digital pharmaceutical marketing and technology-based interventions in improving PCOS awareness and management(11,13). The themes were developed by analysing patterns and trends across the selected studies. These themes represent key areas such as awareness, patient behaviour, digital interventions, healthcare involvement, lifestyle practices, treatment adherence, and challenges in digital health. Together, they highlight the factors influencing PCOS management and patient outcomes.

### THEME 1: Awareness & Knowledge of PCOS

Awareness and knowledge of Polycystic Ovary Syndrome play a crucial role in ensuring early diagnosis and effective management(14). Based on the reviewed literature, it is evident that most women are able to identify common symptoms such as irregular menstrual cycles, weight changes, and hirsutism(14). A study among 300 adolescent girls reported that 96.3% were unaware of PCOS, with only 3.6% having adequate knowledge. Common findings included irregular menstrual cycles (32%), hirsutism (26.3%), and weight gain (13.2%). Mild hirsutism was observed in 18.1% and moderate to severe in 8.3% of participants. The overall prevalence of PCOS was 12.3%, with 10.3% at high risk and 23.3% at low risk (14). However, their understanding rarely goes beyond these visible signs. There is limited awareness about the underlying causes of PCOS, including hormonal imbalances and insulin resistance, as well as its potential long-term complications such as infertility, metabolic disorders, and cardiovascular risks (3). Although awareness programs and structured educational interventions have shown improvements in knowledge levels, these improvements are often short-term. The previous studies reported that 40.6% of participants were aware of PCOS, while 39.6% had only partial awareness. Irregular menstrual cycles were the most

commonly recognized symptom (76.8%). A significant proportion (46.4%) were unsure about seeking medical treatment, indicating hesitancy and misinformation. While lifestyle changes (32.9%) and medications (29.9%) were known management strategies, awareness of surgical options was low (4.3%). Additionally, 30.4% relied on family and friends as their primary source of information(5). Similarly, digital campaigns have significantly increased the reach of information, but they do not always ensure deeper understanding or long-term retention of knowledge(15).

### Gaps:

- Awareness remains superficial and largely symptom-focused
- Limited understanding of long-term complications
- Poor retention of knowledge over time
- Behavioural outcomes are not consistently assessed

### Implications:

- Combine structured educational interventions with digital campaigns to improve both reach and depth of knowledge.
- Introduce follow-up and reinforcement strategies to enhance long-term understanding
- Design awareness initiatives that emphasize underlying causes and long-term health risks.

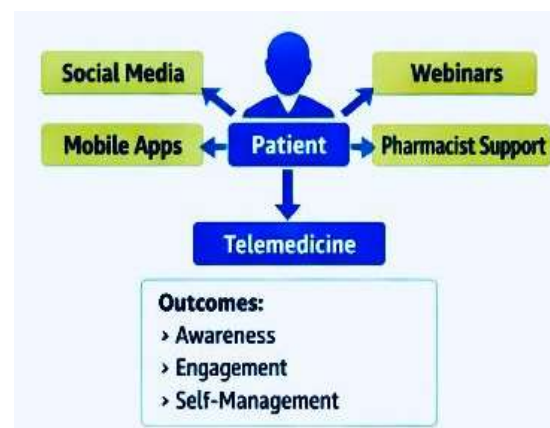


Figure 2: Digital approaches for PCOS awareness and management.

### THEME 2: Patient Perception & Information-Seeking Behaviour

Women are increasingly turning to digital platforms such as social media, blogs, and online forums to seek information about Polycystic Ovary Syndrome(6). These platforms are easily accessible and convenient, making them a preferred source of health-related information. As a result, women's attitudes, beliefs, and overall perceptions about PCOS are often shaped by the content they encounter online. While this shift towards digital self-education reflects greater awareness and proactive behaviour, it also comes with certain challenges(16). Much of the information available online is inconsistent, unverified, or even contradictory, which can lead to confusion and misconceptions regarding the causes, treatment options, and management of the condition(17). In contrast, individuals who seek guidance from healthcare professionals tend to have a more accurate and comprehensive understanding, emphasizing the importance of reliable and evidence-based information(10).

**Gaps:**

- Misinterpretation of symptoms and underlying causes
- High dependence on non-verified online sources
- Limited interaction with healthcare professionals
- Confusion arising from conflicting information

**Implications:**

- Improve digital health literacy among women to help them identify reliable information
- Promote the availability and visibility of verified online resources
- Encourage stronger patient–healthcare professional interactions
- Implement monitoring mechanisms to improve the accuracy of online health content

**THEME 3: Digital Health & Educational Interventions**

Digital health technologies, including mobile applications, webinars, and online educational modules, have played a significant role in improving awareness and supporting self-management of Polycystic Ovary Syndrome(18).

Pharmaceutical marketing strategies increasingly utilize social media platforms to disseminate disease-related information, collaborate with health influencers, and improve patient engagement, although concerns regarding bias and misinformation remain. These platforms provide flexible and easily accessible learning opportunities, enabling women to better understand their condition while also allowing features such as symptom tracking and lifestyle monitoring. Compared to passive forms of content, interactive tools tend to be more effective in maintaining user engagement and encouraging active participation, with an average of 1.8 million views “weight” and “diet” were the frequently mentioned topics on Instagram, tiktok(6). Interaction with medical providers was discussed in 30% of the posts(6). However, despite their advantages, a common challenge observed is the decline in user engagement over time. Additionally, many digital tools lack personalization, making it difficult to address individual needs and preferences. Integration with formal healthcare systems is also limited, which reduces their overall effectiveness in long-term disease management(18).

**Gaps:**

- Decline in long-term usage and user engagement
- Limited personalization of digital content
- Insufficient integration with healthcare systems

**Implications:**

- Develop personalized and interactive digital tools tailored to individual needs
- Integrate digital platforms with clinical guidance for improved management
- Implement engagement strategies to sustain long-term usage and adherence

**THEME 4: Role of social media & Digital Content**

Social media plays a significant role in shaping awareness and perceptions of Polycystic Ovary Syndrome among women. Platforms such as Instagram, YouTube, and online communities

have made it easier to access and share information, encouraging self-education and awareness(6). Influencers, peer groups, and digital campaigns contribute to increasing visibility of PCOS-related content and often motivate individuals to learn more about their health. However, despite its wide reach and accessibility, the quality of information shared on social media varies considerably. Misinformation, lack of scientific accuracy, and commercial bias can negatively influence patient understanding and decision-making(8). While social media allows rapid dissemination of information, healthcare-based platforms and professional guidance remain more reliable, though less accessible to many users(19).

**Gaps:**

- Lack of regulation of online health content
- Spread of misinformation
- Commercial bias in pharmaceutical marketing

**Implications:**

- Monitor and regulate online health content to ensure accuracy
- Encourage collaboration between healthcare professionals and digital platforms
- Promote evidence-based and reliable health communication online.



**Figure 3:** Role of social media and digital content in PCOS awareness.

**THEME 5: Pharmacist-Mediated Interventions**

Pharmacists serve as easily accessible healthcare professionals who can play a crucial role in improving awareness and management of PCOS. Through patient counselling, educational sessions, and personalized

guidance, pharmacists help clarify misconceptions and promote adherence to treatment and lifestyle recommendations(9). Interventions such as one-on-one counselling and educational videos have shown positive outcomes in enhancing patient knowledge and self-management practices(10). However, despite their effectiveness, these interventions are often limited in reach and are not widely implemented on a larger scale(20). Additionally, lack of integration with digital tools and insufficient follow-up can reduce their long-term impact(10).

**Gaps:**

- Limited large-scale implementation
- Lack of integration with digital tools
- Insufficient follow-up and monitoring

**Implications:**

- Combine pharmacist-led interventions with digital tools for wider reach
- Strengthen follow-up mechanisms to ensure sustained patient engagement
- Integrate pharmacy services with digital health platforms for better outcomes

**THEME 6: Lifestyle Modification & Self-Management**

Lifestyle modification, including balanced diet, regular physical activity, and behavioural changes, is a key component in the management of PCOS. Evidence suggests that structured lifestyle programs, especially those with proper monitoring and guidance, can significantly improve hormonal balance, reduce symptoms, and enhance overall health outcomes(21–23). However, maintaining these lifestyle changes over the long term remains a major challenge. Many individuals struggle with adherence due to lack of motivation, insufficient support systems, and absence of continuous monitoring. Without proper guidance, lifestyle advice often fails to translate into consistent practice (23).

**Gaps:**

- Poor long-term adherence
- Limited behavioural support systems
- Lack of continuous monitoring

**Implications:**

- Integrate digital tracking tools for diet and physical activity
- Provide behavioural support and motivation strategies
- Encourage structured and monitored lifestyle programs for sustainability

### **THEME 7: Treatment Adherence & Patient Engagement**

Adherence to treatment regimens, including medication and lifestyle recommendations, is essential for effective management of PCOS. Patient awareness, education, and engagement play a significant role in improving compliance(21). Digital tools such as reminders, mobile applications, and educational platforms have been shown to enhance adherence by keeping patients informed and motivated(6). However, despite initial improvements, engagement often decreases over time, and long-term adherence remains a concern(24). The absence of continuous monitoring and reinforcement further contributes to reduced compliance(7).

#### **Gaps:**

- Poor long-term adherence
- Lack of monitoring systems

#### **Implications:**

- Adopt patient-centered approaches with continuous engagement
- Use digital reminders, feedback systems, and follow-ups to maintain adherence.
- Strengthen long-term monitoring and support mechanisms.

### **THEME 8: Accessibility, Inclusivity & Digital Divide**

Digital health interventions have improved access to information and resources related to PCOS; however, access is not equally distributed among all populations(8). Factors such as geographic location, socioeconomic status, and digital literacy significantly influence the ability to benefit from these technologies. Urban populations and individuals with better access to technology tend to benefit more, while rural

and underserved communities face challenges due to limited resources and awareness(25). This digital divide creates inequalities in healthcare access and outcomes(18).

#### **Gaps:**

- Digital inequality and limited inclusivity
- Unequal distribution of digital resources

#### **Implications:**

- Develop inclusive digital health strategies targeting underserved populations
- Promote digital literacy and awareness programs
- Ensure availability of low-cost and accessible digital health tools.

### **THEME 9: Challenges, Barriers & Ethical Issues**

Despite the advantages of digital pharmaceutical marketing and health interventions, several challenges and ethical concerns remain(17,26). Issues such as misinformation, lack of regulation, commercialization, and data privacy risks can affect the reliability and trustworthiness of digital health platforms(17). The absence of clear guidelines for digital health communication further complicates the situation, potentially exposing patients to misleading or biased information(8). These challenges not only impact patient trust but also limit the overall effectiveness of digital health strategies.

#### **Gaps:**

- Lack of regulatory frameworks
- Ethical concerns in digital health marketing
- Data privacy and security issues

#### **Implications:**

- Establish clear ethical guidelines and regulatory policies
- Ensure data privacy and security in digital platforms
- Monitor and control misinformation and commercial bias

Overall, the results show that the use of digital health and pharmaceutical marketing

campaigns has considerably raised awareness and patient participation in PCOS treatment(27). Nonetheless, there remain several barriers including disinformation, low adherence, insufficient personalization of digital resources, and digital divide that may impede their success(28). The results suggest that the adoption of integrated, research-based, and patient-oriented digital approaches backed up by healthcare experts and proper regulation is essential for sustainable progress in PCOS treatment(29).

## V. CHALLENGES AND LIMITATIONS

Digital pharmaceutical marketing and digital health interventions have significantly improved awareness and management of Polycystic Ovary Syndrome among women by increasing access to health information, educational resources, and patient engagement platforms. However, several challenges continue to affect their effectiveness and long-term sustainability. Since health-related information directly influences patient behaviour and treatment decisions, digital communication in healthcare requires accurate, ethical, and evidence-based dissemination of information(7,17).

### **Challenges in Digital Health Communication:**

One of the major challenges associated with digital health platforms is the rapid spread of misinformation and non-verified health content through social media, blogs, and online communities(8). Information shared on digital platforms may lack scientific accuracy, leading to confusion, misconceptions, and inappropriate self-management practices among patients. Additionally, maintaining consistent and evidence-based communication across multiple digital platforms such as mobile applications, websites, webinars, and social media remains difficult due to frequent content updates and limited regulatory monitoring.(17)

### **Ethical and Regulatory Concerns:**

Ethical concerns also play an important role in digital pharmaceutical marketing. Issues such as

commercial bias, misleading promotional content, lack of transparency in sponsored health information, and inadequate regulation of online healthcare communication may negatively affect patient trust and healthcare decisions(26). Furthermore, concerns related to patient confidentiality, data privacy, and cybersecurity risks have increased due to the extensive use of digital technologies and online health platforms.

### **Accessibility and Engagement Challenges:**

Although digital interventions provide convenient access to healthcare information, unequal access to internet services, smartphones, and digital literacy creates a significant digital divide, especially among rural and underserved populations(18). Long-term patient engagement also remains a challenge, as many users discontinue digital health applications and educational platforms over time. Limited personalization of digital tools further reduces their effectiveness in addressing individual patient needs and preferences.(25)

### **Limitations of the Present Review:**

The present review has certain limitations. The study is entirely based on secondary data collected from previously published literature, which may affect the generalizability of findings. Only English-language articles were included, which may have excluded relevant studies published in other languages. Variations in study design, study population, intervention methods, and awareness assessment tools among the included studies may also influence consistency of results. In addition, limited availability of long-term clinical and behavioural outcome studies restricted comprehensive evaluation of the sustained effectiveness of digital pharmaceutical marketing strategies and digital health interventions in PCOS management.

Overall, digital pharmaceutical marketing and health technologies offer considerable potential in improving PCOS awareness and management; however, challenges related to misinformation, regulation, accessibility, patient engagement, and ethical concerns must be

addressed to ensure safe, reliable, and patient-centered healthcare communication.

## VI. RECOMMENDATIONS

Based on the thematic analysis, several directions for future research can be identified to enhance the effectiveness of digital interventions in the management of Polycystic Ovary Syndrome (PCOS). Future studies should focus on developing and evaluating comprehensive health education models that go beyond basic awareness and improve in-depth understanding of PCOS, including its etiology, complications, and long-term management. There is also a need for rigorous research on the development of evidence-based digital content, with emphasis on ensuring accuracy, reliability, and reduction of misinformation through collaboration among healthcare professionals, pharmacists, and academic institutions.

Integration of digital health technologies with conventional clinical care should be prioritized to improve continuity of care and patient outcomes. Studies evaluating personalized digital tools, such as tailored diet plans, exercise modules, and behavioural interventions, are required to determine their effectiveness in improving patient engagement and self-management. In addition, more evidence is needed to assess the impact of regulatory frameworks on digital pharmaceutical marketing and their role in minimizing misinformation.

The role of pharmacists in digital health platforms should be further expanded particularly in patient counselling, medication management, and awareness programs. Longitudinal studies are recommended to evaluate the sustainability of lifestyle modification programs delivered through digital technologies. Moreover, research should focus on developing effective patient engagement strategies that ensure long-term adherence and active participation in disease management.

Finally, further studies are required to address challenges related to digital inequality, accessibility, and digital literacy, particularly in underserved populations. Ethical considerations, including data privacy, security, and confidentiality, should be systematically evaluated to build trust in digital health systems. A multidisciplinary research approach involving healthcare providers, digital health developers, and pharmaceutical stakeholders is essential for advancing sustainable and effective digital interventions in PCOS management.

## VII. CONCLUSION

Polycystic Ovary Syndrome (PCOS) is still one of the key health problems faced by women in their reproductive ages. However, awareness about the disease, including its complications and management, is still in its early stages. It is still found that women rely more on unverified sources of information about the disease. The current review highlights the importance of digital pharmaceutical marketing in the management of the disease. It is found that digital health interventions have become one of the key tools in the management of the disease. The availability of information through platforms like social media, health applications, webinars, and online educational tools has improved the awareness of the disease in the general public, especially in the urban population. The role of pharmacists in the management of the disease is significant in providing information about the disease. The key issues associated with the management of the disease include the availability of misinformation about the disease, lack of regulatory control over the information provided through digital platforms, lack of accessibility in the rural population, and the lack of engagement with the digital interventions in the long term. It is found that awareness about the disease is not enough in the management of the disease. In the end, it can be concluded that digital health interventions have great potential in the management of the disease; however, it is still in the early stages of development. The key areas that need

improvement include the integration of digital interventions with the healthcare system, the involvement of healthcare professionals in the management of the disease, the regulation of the content provided through digital platforms, and the development of inclusive strategies in the management of the disease. It is found that the implementation of these areas can lead to improved lifestyle practices in the general public.

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