Redefining the Cycle Calendar: Unpacking the Multifaceted Impact of Menstrual Tracking Technologies

Dr. Monika Jain[1] and Dr. Anshika Jain[2]

Assistant professor, Dr. Ambedkar Institute of Management Studies and Research, Nagpur, India[1]

MD (Medicine), CMI Hospital, Dehradun[2]

monika_jain@daimsr.edu.in and j.anshika@gmail.com

Abstract: *Menstrual tracking applications are revolutionizing the management of menstrual health, providing more than just period predictions (McKenna et al., 2019). This review explores their extensive influence, highlighting how these applications not only facilitate self-knowledge but also enhance menstrual health literacy and deepen users' understanding of their menstrual cycles. Additionally, we address the critical issues of data privacy, security concerns, and inherent biases present within these technologies. By analysing the comprehensive effects of menstrual tracking apps, this review aims to broaden our understanding of their significant role in influencing women's health experiences. Adding to the discussion, we also examine the impact of these apps on the doctor-patient relationship, providing insights into how technology can bridge information gaps and foster more informed healthcare conversations. By unveiling the multifaceted impact of menstrual tracking technologies, this review aims to contribute to a more comprehensive understanding of their role in shaping women's health experiences.*

Keywords: Menstrual tracking App, Women's' Health, Data Privacy and Security

I. INTRODUCTION

Menstruation, a natural biological process experienced by women, has historically been shrouded in secrecy and stigma (Ward, 2006). This lack of open dialogue has contributed to a limited understanding of menstrual health, impacting women's well-being. However, the digital age has brought about a significant shift. The emergence of mobile menstrual tracking apps has empowered individuals to take charge of their menstrual health and gain valuable insights into their cycles (McKenna et al., 2019). These apps transcend the simplicity of traditional calendar-based period prediction, offering a multifaceted approach to menstrual health management.

This review delves into the extensive impact of menstrual tracking technologies, venturing beyond their core functionality. Here, we explore how these apps empower users by fostering self-awareness and promoting menstrual health literacy. Studies have shown that tracking menstrual cycles can enhance a woman's understanding of her body's natural rhythms and fluctuations (Wichstrøm et al., 2020). This newfound awareness can empower users to make informed decisions about their health and lifestyle choices.

Furthermore, menstrual tracking apps serve as educational tools, promoting knowledge and understanding of menstrual health. By providing users with access to informative content and educational resources, these apps can address the longstanding stigma and misinformation surrounding menstruation (Walker et al., 2018). This improved knowledge empowers users to advocate for their health needs and navigate healthcare conversations with more confidence.

However, alongside these advancements lie concerns regarding data privacy, security, and potential biases embedded within menstrual tracking apps. These critical aspects will be examined in the following sections of this review, aiming to contribute to a more comprehensive understanding of menstrual tracking technologies and their role in shaping women's health experiences.

Objective

- To investigate how menstrual tracking apps, empower users by promoting self-awareness, menstrual health literacy, and understanding of their menstrual cycles.
- To understand the challenges surrounding data privacy, security, and potential biases present in menstrual tracking apps.

II. RESEARCH METHODOLOGY

This review utilizes a systematic literature review methodology to comprehensively explore the multifaceted impact of menstrual tracking technologies, encompassing both their empowering aspects and the challenges they present. Relevant research was meticulously collected from academic databases and peer-reviewed journals. For this study, we conducted a targeted literature review using keywords such as 'menstrual tracking apps,' 'menstrual health,' 'data privacy,' 'security,' and 'bias.' Initially, this search yielded approximately 55 research articles. After a thorough review, we selected 19 articles that were directly relevant to our research objectives. The focus of the search was on identifying pertinent studies that investigated both the empowering facets of menstrual tracking apps and those that addressed data privacy, security concerns, and potential biases embedded within these technologies.

III. DISCUSSIONS

Empowering Menstruation: How Tracking Apps Foster Self-Awareness and Health Literacy

Menstrual tracking apps have emerged as powerful allies in women's health management, promoting self-awareness, menstrual health literacy, and a deeper understanding of menstrual cycles. These apps function as digital companions, enabling users to record and analyze various menstrual cycle aspects. This data encompasses the start and end dates of periods, flow intensity, physical symptoms, and even emotional fluctuations (McKenna et al., 2019). By logging this information, users embark on a journey of self-discovery, uncovering unique patterns within their cycles and gaining the ability to anticipate upcoming menstrual phases with greater accuracy (Wichstrøm et al., 2020). For instance, research by Sălățanu et al. (2021) highlights how menstrual tracking apps can help identify potential underlying health concerns. By recognizing abnormal patterns in cycle length, bleeding intensity, or symptom severity, users can be prompted to seek medical attention, potentially leading to earlier diagnoses and improved management of menstrual health conditions like Polycystic Ovary Syndrome (PCOS).

Menstrual tracking apps transcend mere data collection by offering a wealth of educational resources on menstrual health. Users can access informative content concerning menstrual disorders, reproductive health intricacies, and various contraception options (Neilands et al., 2018). This fosters a sense of empowerment by dismantling the stigma surrounding menstruation and normalizing open conversations about this natural biological process (Walker et al., 2018). Furthermore, research by Wijtjes et al. (2020) highlights a positive correlation between menstrual tracking app use and increased menstrual health literacy among users. By actively engaging with app features and informative content, users transform into informed participants in their healthcare, enabling them to make confident decisions concerning their menstrual well-being.

The empowerment extends beyond self-awareness and knowledge acquisition. These apps can act as bridges between users and healthcare providers. By facilitating the recording and sharing of menstrual data, users can present a clear picture of their menstrual cycles during consultations. This empowers them to take a more proactive approach to healthcare management and fosters more productive dialogue with medical professionals (Boonstra et al., 2019). A study by Lehto et al. (2020) found that healthcare providers welcomed the use of menstrual tracking apps by their patients. They viewed the data as valuable for diagnosis, treatment planning, and patient education. This improved communication empowers users to feel heard, understood, and actively involved in their healthcare decisions.

In conclusion, menstrual tracking apps serve as empowering tools, providing users with resources for self-discovery, menstrual health education, and improved communication with healthcare providers. Through these mechanisms, users gain valuable self-awareness, enhanced menstrual health literacy, and ultimately, greater control over their well-being.

Challenges Regarding Data Privacy, Security, and Bias in Menstrual Tracking Apps

Despite the manifold benefits they offer for women's health management, menstrual tracking apps are accompanied by significant concerns pertaining to data privacy, security, and potential biases. This section delves into these challenges, drawing insights from pertinent research:

Data Privacy Concerns

Extensive Data Collection and Sharing

Many apps gather a plethora of sensitive user data beyond mere menstrual cycle information, including details about sexual activity, mood swings, physical symptoms, and medication usage (Brown & Duncan, 2019). A concerning revelation from a study by Brown et al. (2019) indicates that 77% of popular menstrual tracking apps share user data with third-party entities, heightening apprehensions about the potential misuse of this sensitive health information.

Lack of Transparency

Frequently, apps lack transparent and easily understandable privacy policies, rendering it challenging for users to comprehend the process of data collection, storage, and utilization (Nguyen & Yeung, 2020). This lack of transparency impedes informed consent and exposes users to potential privacy breaches. Users deserve clear insights into the data collection process, its intended purposes, and the parties with whom it is shared.

Data Security Concerns

Vulnerability to Hacking

Given the highly sensitive nature of menstrual health data, it is susceptible to exploitation for various nefarious purposes such as targeted advertising, insurance discrimination, or even blackmail (Mulligan &Cotten, 2019). Studies underscore the risks associated with data breaches in health apps, underscoring the necessity for robust security measures to safeguard user privacy and prevent unauthorized access.

Inadequate Security Measures

Many apps may lack robust security measures, rendering them vulnerable to hacking and data breaches (Nguyen & Yeung, 2020). Such vulnerabilities compromise user privacy and expose sensitive health data to potential exploitation.

Potential Biases

Algorithmic Bias

Menstrual tracking apps often employ algorithms to predict cycles and provide recommendations; however, these algorithms can be biased based on the data upon which they are trained (Wächter et al., 2019). Such biases may result in inaccurate predictions or skewed information, particularly for users with non-standard cycles or health conditions such as PCOS.

Limited Representation

Many apps cater to a narrow demographic, potentially excluding diverse experiences such as irregular cycles, PCOS, or those of transgender and non-binary individuals (Johnson et al., 2020). This lack of inclusivity may alienate users and deter their continued engagement with the app.

IV. FINDINGS

This review uncovers a double-edged sword when it comes to menstrual tracking apps. While they offer significant potential for empowerment and improved menstrual health literacy, concerns regarding data privacy, security, and bias remain. The findings highlight the transformative potential of these apps. They act as powerful tools for self-discovery, enabling users to:

- Gain insights into their unique menstrual cycles (McKenna et al., 2019)
- Identify potential patterns and anticipate upcoming phases (Wichstrøm et al., 2020)
- Make informed decisions about health and lifestyle choices (Sălăţanu et al., 2021)
- Furthermore, menstrual tracking apps can empower users by:
- Facilitating improved communication with healthcare providers (Boonstra et al., 2019)

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- Enhancing patient engagement and promoting proactive healthcare management (Lehto et al., 2020)
- Providing access to educational resources on menstrual health and various health concerns (Neilands et al., 2018)
- Dismantling the stigma surrounding menstruation and fostering open conversations (Walker et al., 2018)

V. SUGGESTIONS FOR MENSTRUAL APP USERS

First and foremost, users should prioritize privacy by selecting menstrual tracking apps with transparent and concise privacy policies. Opt for apps that offer robust data encryption and refrain from sharing your information with third-party entities without explicit consent. Additionally, carefully consider the information you input into the app, avoiding overly personal details that could potentially be misused. While utilizing cycle prediction features can be beneficial, it's essential to remain vigilant of their accuracy and rely on your body's natural signals and symptoms to confirm cycle phases. If user encounter any privacy concerns or security breaches within an app, promptly report them to the app developer and relevant authorities. Exploring open-source menstrual tracking apps that emphasize user privacy and data security could also be a wise alternative.

Suggestions for Policy Makers

To address the growing concerns surrounding data privacy and security in menstrual tracking apps, stringent data protection regulations should be implemented within the health app industry. These regulations ought to mandate user consent for data collection, restrict the amount of data gathered, and enforce robust data security measures. Furthermore, transparency requirements should be imposed, necessitating menstrual tracking apps to provide clear and accessible privacy policies that elucidate data collection practices and user rights. Regular audits of app algorithms to identify and rectify potential biases should also be mandated to ensure accurate predictions and unbiased information. Moreover, policymakers should encourage the development of inclusive menstrual tracking apps that cater to diverse experiences, including irregular cycles, PCOS, and the needs of transgender and non-binary individuals. Launching educational campaigns to raise awareness about data privacy concerns associated with menstrual tracking apps and empower users to make informed choices is also imperative. Through collaborative efforts, users and policymakers can contribute to the responsible and ethical use of menstrual tracking technologies, ultimately promoting women's health and well-being.

VI. CONCLUSION

Menstrual tracking apps offer a promising avenue for empowerment and improving menstrual health literacy (Boonstra et al., 2019; Neilands et al., 2018). However, concerns regarding data privacy, security, and potential biases within these apps necessitate action to ensure responsible and ethical use (Brown & Duncan, 2019; Mulligan &Cotten, 2019; Wächter et al., 2019). Regulatory measures and increased transparency from app developers are crucial to safeguard user privacy and promote inclusivity within menstrual tracking apps (Nguyen & Yeung, 2020). Despite these challenges, the potential benefits of menstrual tracking technologies in shaping women's health experiences are substantial, highlighting the importance of continued research and development in this area (Johnson et al., 2020). These challenges necessitate a multi-pronged approach. App developers must prioritize user privacy and security by implementing robust data protection measures and fostering transparency. Additionally, ensuring inclusivity within app design and addressing potential biases in algorithms is crucial. Regulatory bodies also have a role to play in establishing stricter data protection frameworks for the health app industry.

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