

Enhancing Women's Health: An Assessment of Data Privacy and Security of Menopause FemTech Applications

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Abstract. Menopausal women increasingly rely on FemTech apps to manage their symptoms, as mobile applications can provide a convenient and easily accessible health solution. However, this scoping review and content analysis of 14 menopause apps available on Google Play in the European Union found that most applications categorisation is not aligning with their features as well as lack adequate data privacy and security sufficiency. Thereby sensitive health data of menopausal women are put at risk, highlighting the need for collaborative efforts between developers and regulators to implement effective and achievable data protection practices to enhance menopausal women's data safety.

Keywords. Women's health, Menopause, FemTech, EU General Data Protection Regulation, Mobile Health

1. Introduction

Gender inequality remains a major global challenge and it is estimated that it will take more than a century to eliminate the gender gap [1]. In healthcare, women often face misdiagnosis and inadequate treatment, leading to lower quality of life and higher complication rates [2]. The disparity is intensified by the gender data gap, which hinders the accurate analysis and representation of women's health data [3]. Technological advancements have paved the way for digital solutions, including female technology (FemTech) applications (apps), which have the potential to empower women and bridge the gender data gap [4].

Menopause, a crucial stage in women's lives, is often overlooked in discussions about gender health equality [5]; despite the growing number of menopausal women, there is a lack of support, data and research in both clinical and research settings. FemTech apps have emerged as promising tools for managing menopausal symptoms [6]. However, some apps may lack scientific evidence or rely on biased or outdated data, posing data privacy risks by collecting and sharing sensitive information without

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adequate safeguards or user consent [7]. To address privacy and data security concerns, the European Union (EU) introduced the General Data Protection Regulation (GDPR) in 2018, which established a new standard for data privacy and security [8]. Privacy policies play a crucial role to comply with the GDPR [9]. Assessment on data privacy and security of fertility tracking apps have shown that such mobile health apps often do not comply with GDPR, including filled charges against several [10,11]. Studies on menopause-specific apps have not been conducted yet. This study aims to enhance understanding of the data privacy and security practices employed in menopause FemTech apps.

2. Method

The methodology was divided into two primary sections: A menopause app scoping review and a data privacy and security content analysis of selected menopause apps. The scoping review involved identifying menopause-related apps on Sensor Tower, a mobile app data and insights platform, and conducting a thorough screening on Google Play within this jurisdiction of the GDPR [10]. This process included gathering information on app categories, download numbers, user ratings, and features. The subsequent data privacy and security content analysis focused on selected menopause apps, combining two existing assessments [10,12]. The analysis entailed reviewing the apps' privacy policies and evaluating their compliance with the GDPR using the EU online privacy auditing tool, Exodus Privacy [13]. The content analysis covered eight categories and 29 assessment items relevant to data privacy and security sufficiency, coded using a traffic light colour coding system.

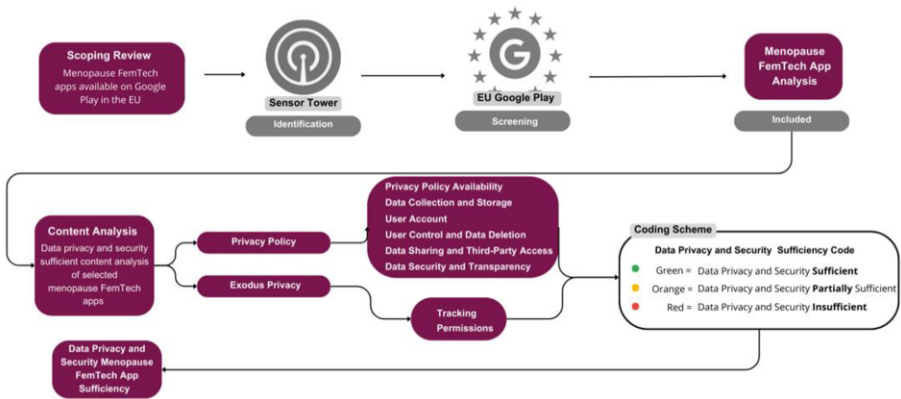


Figure 1. Study design of scoping review of menopause FemTech apps used in the EU on Google Play

3. Results

The findings of this study are presented in a two-stage format that includes both the scoping review of relevant FemTech apps for menopause and the content analysis of these apps concerning data privacy and security sufficiency.

3.1. Scoping Review

The selected apps were categorised according to their corresponding Google Play categories and subjected to analysis of their features. The final analysis encompassed 14 menopause-related apps, which collectively garnered a total of 305,225 user downloads during the data collection period of January and February 2023. Among the evaluated menopause-related apps, the majority (57%) fell under the 'Health & Fitness' category, which recorded the highest total downloads (66%) but had a low average rating (1.22). In the 'Shopping' category, there was only one app (7%) with a higher download share (33%) and an average rating of 3.8. In the 'Medical' and 'Lifestyle' categories, there were two apps each (14%), but with fewer downloads (both below 1%) and no publicly available user ratings. Finally, in the social category, there was one app (7%) with a download share of below 1% and no user ratings.

Figure 2 illustrates the key features identified in menopause apps and their corresponding Google Play categories. The analysis indicates that menopause apps primarily emphasise symptom management, overall health and wellness, and peer/professional support. However, the categorisation of apps does not consistently align with their features, as multiple categories are assigned to the same app features. An overview of all collected app details is upon request.

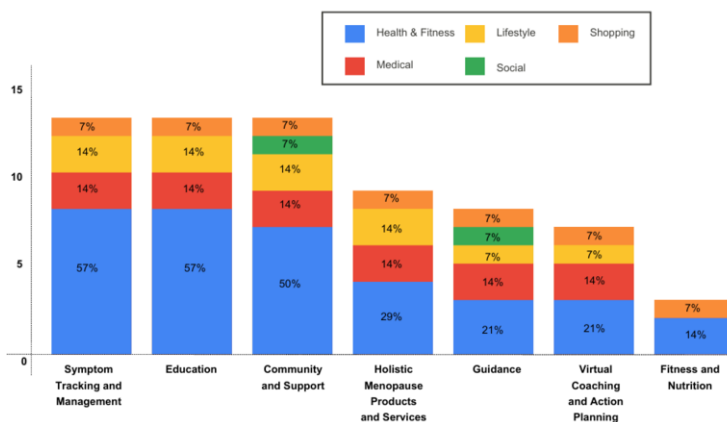


Figure 2. Menopause FemTech app features available in the EU on Google Play

3.2. Content Analysis

In the second phase of the study, a content analysis was conducted on the 14 menopause FemTech apps that were selected from the scoping review (Table 1). The results show that according to the criteria system used in the analysis, only 21% ($n=3$) of menopause FemTech apps met over 50% of the criteria for data privacy and security sufficiency. Further, 40% of the assessment criteria were data privacy and security sufficient, and 36% insufficient. A full record of the analysis is available upon request.

The privacy policy assessment results indicate that 40% of the apps were considered sufficient based on data privacy and security compliance, with 30% were considered being only partially sufficient and 30% insufficient; the results are derived from evaluating six categories. The analysis shown that privacy policies were available for all but one app, but six apps had misleading short versions that contradicted the full policies. Some apps lacked contact information for users. Regarding data privacy, 57% of the apps

are collecting sensitive personal information. User control and data collection were partially sufficient in 83% of the apps, with one app violating GDPR provisions by charging for data deletion. Data sharing practices were insufficient in 60% of the apps, with most enabling tracking and sharing data with third parties. Only 20% allowed users to modify sharing settings. Lastly, 60% of the apps lacked clarifications on data security.

As for the assessment by Exodus Privacy, the results indicated that 59% were data privacy and security insufficient, while 37% of the were deemed data privacy and security sufficient. The assessment of menopause FemTech apps found that most apps did not have detailed profile trackers, with two apps having installed such trackers related to mobile marketing. Identification trackers were present in 71% of the apps, while embedded advertisement trackers were found in 29% of the apps. Location trackers were absent in most of the apps. The majority of the menopause FemTech apps analysed had multiple "dangerous" permission requests, as identified by Google Play. Only two apps identified by Exodus Privacy did not have such requests.

Table 1. App content analysis: assessment of data privacy and security sufficiency

Criteria of data privacy and security	Sufficient	Partially Sufficient	Insufficient
	[%]	[%]	[%]
Privacy Policy Assessment	40	24	36
Privacy policy availability	40	30	30
Data collection and storage	64	17	19
User account	38	5	57
User control and data collection	17	83	0
Data sharing and third-party access	46	50	4
Data security and transparency	20	20	60
Exodus Privacy Assessment	37	4	59
Tracking	61	7	32
Permissions	14	0	86
Overall Assessment	40	24	36

4. Discussion and Conclusions

This study aimed to gain an understanding of the data privacy and security practices of menopause FemTech apps, with a specific focus on their compliance with GDPR regulations. The research identified the available menopause FemTech apps used in the EU on Google Play to identify market trends and data privacy and security sufficiency. The study's findings shed light on the gaps and inadequacies within the current menopause FemTech app landscape, particularly regarding their app store categorisation and data privacy and security. The emergence of menopause-related apps presents an opportunity to address the gender data gap and support women during this phase of their lives. However, there is a misalignment between app categories and features, leading to potential confusion for users. This highlights the need for stricter regulation and transparency measures to ensure the trustworthiness and accuracy of these apps. Further research is necessary to explore their integration into clinical care and their impact on health outcomes and gender health equity. This analysis raises ethical concerns about data privacy and security in menopause apps, with only three apps meeting over 50% of the sufficiency criteria. Many apps had inaccurate or inconsistent privacy policies, and transparency regarding data sharing practices was lacking. The use of tracking mechanisms and permissions without sufficient user control further highlights the need for privacy regulations and user awareness. Collaborative efforts between developers and

regulators are necessary to prioritize user privacy and ensure accountability in menopause app development.

With many apps lacking appropriate classification as medical apps, indicating a lack of adherence to medical standards. Compliance with regulations and the financial burden of certification pose challenges for developers, leading them to opt for alternative labels such as fitness or lifestyle [14]. Concerns about data ownership and control, as well as the need for clinical research, further complicate the development and implementation of menopause FemTech apps [15]. Collaboration between public health and digital development sectors is crucial to ensure compliance with regulations and enhance data security and equity.

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