



Using ChatGPT to Evaluate User Reviews of Mobile Applications in the Field of Oral Health: A Study in Iran, 2025

Kasra Kashani¹ , Afshin Sarafinejad^{2*} 

¹Department of Medical Informatics, School of Allied Medical Sciences, Urmia University of Medical Sciences, Urmia, Iran

²Clinical Informatics Research and Development Lab, Clinical Research Development Unit, Shafa Hospital, Kerman University of Medical Sciences, Kerman, Iran

*Corresponding Author: Afshin Sarafinejad, Email: asarafinejad@kmu.ac.ir

Abstract

Background: Oral health is a vital component of overall human health. In recent years, mobile health applications (mHealth applications) have emerged as innovative tools to enhance health literacy and promote behavior change related to oral hygiene. Analyzing user feedback in app stores provides actionable insights into user experience, functional limitations, and opportunities for improvement. Leveraging artificial intelligence, particularly advanced language models such as ChatGPT, offers a novel opportunity for precise, rapid, and structured processing of these reviews.

Methods: This descriptive-analytical study was conducted in 2025. A total of 135 applications from Bazaar and 28 applications from Myket were initially retrieved. After applying screening criteria—removing duplicates, irrelevant applications, child-specific games, and applications with fewer than 1000 installs—12 applications were selected for final analysis. Screenshots of user reviews were processed using ChatGPT for sentiment and semantic analysis, categorizing comments into positive, negative, or neutral groups and five rating levels from excellent to very poor. Key themes and improvement suggestions were subsequently extracted by the model.

Results: Users primarily emphasized the need for regular updates, improved technical performance, and enhanced user interface design. The AI-based analysis demonstrated structured output and efficiency in providing a comprehensive overview of user needs and perceptions.

Conclusion: Advanced language models such as ChatGPT may serve as useful tools for analyzing user feedback and improving the quality and usability of digital health applications.

Keywords: Oral health, mHealth, ChatGPT, Artificial intelligence, Mobile applications

Citation: Kashani K, Sarafinejad A. Using ChatGPT to evaluate user reviews of mobile applications in the field of oral health: a study in Iran, 2025. J Oral Health Oral Epidemiol 2026;15:2510.1797. doi:10.34172/johoe.2510.1797

Received: October 3, 2025, **Revised:** February 16, 2026, **Accepted:** April 28, 2026, **ePublished:** June 30, 2026

Introduction

Oral diseases are among the most common non-communicable diseases worldwide and entail significant economic and social consequences.¹ Oral health constitutes an essential part of general health and is a key factor influencing individuals' quality of life and overall well-being.^{2,3} According to the World Health Organization (WHO) report in 2022, approximately 3.5 billion people globally are affected by oral diseases, with three-quarters of cases occurring in middle-income countries.⁴

Various preventive methods exist for oral diseases, including brushing teeth at least twice daily with fluoride-containing toothpaste and regular flossing.⁵ However, in recent years, educational approaches have gained prominence as effective strategies for prevention.⁶ With the advent of modern technologies, particularly in

communications,⁷ the ability to utilize diverse educational strategies, methods, and tools for improving oral health has expanded.⁸ Mobile phones have increasingly become an integral part of daily life, playing a significant role across multiple domains such as health, education, and entertainment.⁹ As of 2024, the number of smartphones worldwide has reached approximately 4.88 billion, covering about 60.42% of the global population.¹⁰ Furthermore, the WHO reported that by mid-2020, around 96.7% of the world's population lived in areas covered by mobile networks.¹¹

Mobile health (mHealth) is a relatively new term referring to the use of mobile phones and wireless communication technologies to enhance healthcare services.¹² In recent years, the development and expansion of mHealth applications have provided opportunities to improve



access to health information and promote individual health and well-being through mobile technologies.^{13,14} These applications are employed in various fields such as disease prevention, health promotion, patient education, self-management, and remote monitoring.¹⁵ Today, mHealth applications are gradually replacing traditional educational methods such as oral instructions, printed materials, and instructional videos, which often fail to meet diverse learning needs.¹⁶

The use of mobile applications holds great potential for changing and promoting healthy behaviors in oral health and can play a significant role in improving public health. However, one of the key factors in the success of these applications is user-friendly design that adapts to individual patient needs.³ Study findings indicate that designing user interfaces based on user needs, especially in the oral health domain, is essential for successful outcomes.¹⁷ Developing mobile applications with a focus on user experience enables individuals to track their health, access medical resources, and engage in preventive activities.¹⁸ Conversely, poorly designed software that neglects users' abilities and needs may lead to reduced functionality and effectiveness.^{19,20}

In this context, analyzing user feedback from mobile app stores provides valuable insights into user expectations, usability challenges, and perceived application quality. The present study focuses on Iran, where mobile health applications are predominantly distributed through local app stores such as Café Bazaar and Myket, which host a large number of health and medical applications for Persian-speaking users.²¹

Research into Persian mobile health applications—for example in COVID-19 management—has systematically searched Bazaar and Myket to identify and evaluate local applications.²² These studies illustrate that the characteristics and quality of applications in Iranian stores may differ from those in foreign app stores, underlining the need to investigate user feedback specifically within this ecosystem.^{22,23}

Additionally, extracting insights from user reviews is particularly important, as user comments in app stores have been associated with application adoption patterns, download behavior, and perceived usability.²⁴

In recent years, various automated techniques and systems have been proposed for extracting and analyzing user opinions and sentiments from reviews posted in app stores²⁵. However, the lack of effective tools for collecting and processing these data can limit the analyst's ability to extract relevant and valuable information^{26,27}. Recent advances in artificial intelligence (AI) technologies, manifested in tools such as ChatGPT, Claude, Bard, Copilot, and Copy AI, have attracted considerable attention and opened new horizons in textual data analysis²⁸. These technologies enable more precise and deeper analysis of user reviews, allowing rich insights regarding application features and quality to be obtained through AI-based text mining methods²⁹. Such user-centered feedback can assist developers in identifying

weaknesses, improving software quality, and addressing existing shortcomings²⁵.

The aim of this study was to identify and screen oral health-related applications available in the Iranian app stores Bazaar and Myket, and to analyze user reviews using ChatGPT. This analysis seeks to uncover user perspectives and experiences regarding these applications, with the objective of extracting practical insights to enhance the quality of existing applications and develop more effective tools for oral health education and promotion. Despite the increasing interest in AI-based analysis of mobile health applications, previous research has primarily focused on English-language applications and general mHealth applications, with limited attention to oral health applications or applications in non-English contexts. No study has systematically examined user reviews of Persian oral health applications, particularly those distributed through Iranian app stores, using advanced AI tools such as ChatGPT. By addressing this gap, the present study provides a detailed AI-driven analysis of user feedback in a non-English setting, offering contextually relevant and practical insights for improving oral health applications.

Methods

This descriptive-analytical study was conducted in 2025 with the aim of identifying oral health-related applications in Iranian app stores and analyzing user reviews of these applications using artificial intelligence technology. Given the importance of mHealth applications and the role of user feedback in their improvement, the research process was designed in three systematic phases to identify, screen, and analyze relevant applications.

Phase 1: Application Identification

In this phase, a comprehensive and systematic search was performed in two Iranian app stores, Bazaar and Myket, to identify oral health-related applications. Relevant keywords such as “oral,” “dental,” “oral hygiene,” and “oral health” were selected and applied in the search sections of each store to retrieve all applications directly or indirectly related to these topics. Initial data, including application names, descriptions, number of downloads, and user reviews, were collected. This phase was completed before the end of December 2024.

Phase 2: Screening and Final Application Selection

Following initial collection, the applications were screened based on the inclusion and exclusion criteria. Android applications appearing in both Café Bazaar and Myket that shared the application name, developer, core functionality, and content were defined as duplicates. In such cases, only one instance of the application was retained for analysis to avoid redundant data entry and overrepresentation. Applications unrelated to oral health were excluded. Additionally, games designed specifically for children under six years old were removed due to incompatibility with the study's objectives. Applications with low download counts (below the defined threshold)

or technical performance issues were also excluded. This rigorous screening aimed to ensure that only high-quality and relevant applications progressed to the next phase, allowing for more accurate and valid analysis of user reviews.

Phase 3: User Review Analysis Using Artificial Intelligence

In the third phase, the ChatGPT-4o language model was employed to analyze user review content. Initially, attempts were made to provide the model with direct access to user reviews in the Bazaar and Myket app stores; however, due to technical limitations and security policies, direct access was not possible. Therefore, screenshots of user reviews for each application were manually collected and provided as input to the model. We wrote a series of prompts to develop a valid model for the chatbot (See Appendix 1). First, we wrote simple prompts to determine whether ChatGPT is able to read the screenshot correctly. We then iterated the prompts by changing details and applied the same process to multiple screenshots. Finally, we organized all the photos into 12 zipped files from which ChatGPT could extract the targeted variables. The AI model entered the data into an Excel® spreadsheet for further analysis.

The screenshots containing textual user feedback included informal or short comments, which were all taken into consideration and analyzed by ChatGPT-4o. The study objectives and analysis steps, including sentiment classification into positive, negative, and neutral categories, extraction of key themes, and generation of improvement suggestions, were clearly defined for the model. To enhance output accuracy, iterative multi-step interactions with the model were conducted, and the structured Excel files containing the results were reviewed. The research team also verified the accuracy of the categorization and coding performed by the model. After several rounds of revision and refinement, the final output was obtained, exhibiting appropriate accuracy, coherence, and content coverage.

Through textual content analysis, the model classified reviews into three categories based on sentiment and feedback quality: positive, negative, and neutral. This approach enabled rapid and precise analysis of large volumes of textual data, facilitating a better understanding of each application's strengths and weaknesses from users' perspectives. The insights derived from this analysis serve as an effective tool for improving the quality and performance of oral health applications.

Ultimately, the structured implementation of search, screening, and data analysis phases using artificial intelligence technology allowed comprehensive collection and precise evaluation of oral health applications and their associated user feedback.

AI interaction protocol and reproducibility

ChatGPT-4o (OpenAI; accessed in 2025) was used as an AI-assisted analytic tool to support preliminary coding

of user reviews. A standardized prompt template was applied across all included applications to (1) classify review sentiment (positive/negative/neutral), (2) extract recurring themes, and (3) generate suggestions for improvement. Prompt wording and output structure were piloted on a subset of screenshots and refined to improve clarity and consistency. After finalization, the same template was used for all applications. Model outputs were exported in structured tables for subsequent review and synthesis.

Human verification was performed by the research team. AI-generated sentiment labels and themes were reviewed against the screenshots; overlapping categories were merged, ambiguous labels were refined, and final themes and suggestions for improvement were consolidated through consensus discussion. Thus, the AI model served as a first-pass coding assistant, and interpretive synthesis was conducted by the authors.

The overall analytical workflow is illustrated in Figure 1.

Ethics and privacy considerations

All data analyzed in this study consisted of publicly available user reviews displayed within Café Bazaar and Myket. No personal identifiers were collected, stored, or reported. The data were used in aggregated form for research purposes, and the study procedures were designed to respect user privacy and comply with platform data-use expectations.

Responsible use of large language models

Large language models may produce errors, omit context, or generate non-transparent reasoning. To mitigate these risks, we applied a standardized prompt template, conducted pilot refinement, and performed human verification and consensus-based thematic consolidation. Because formal validation against independent expert coding was not performed, findings should be interpreted as exploratory.

Results

Comparison of Applications Based on User Ratings and Number of Installs

In this study, a total of 135 and 28 applications were initially retrieved from Bazaar and Myket app stores, respectively, to identify applications related to oral health education. During the first screening phase, applications that did not meet the predefined criteria were excluded. Specifically, 11 applications were excluded due to duplication across the two stores, 46 applications were excluded for lacking topical relevance to oral health, 36 applications were excluded because they were purely game-based and targeting children under six years old, and 58 applications were excluded due to having fewer than 1,000 downloads (See Figure 2).

After applying these filters, a total of 12 eligible applications were selected for the final analysis (Table 1). These applications exhibited considerable variability in technical criteria and performance indicators such as

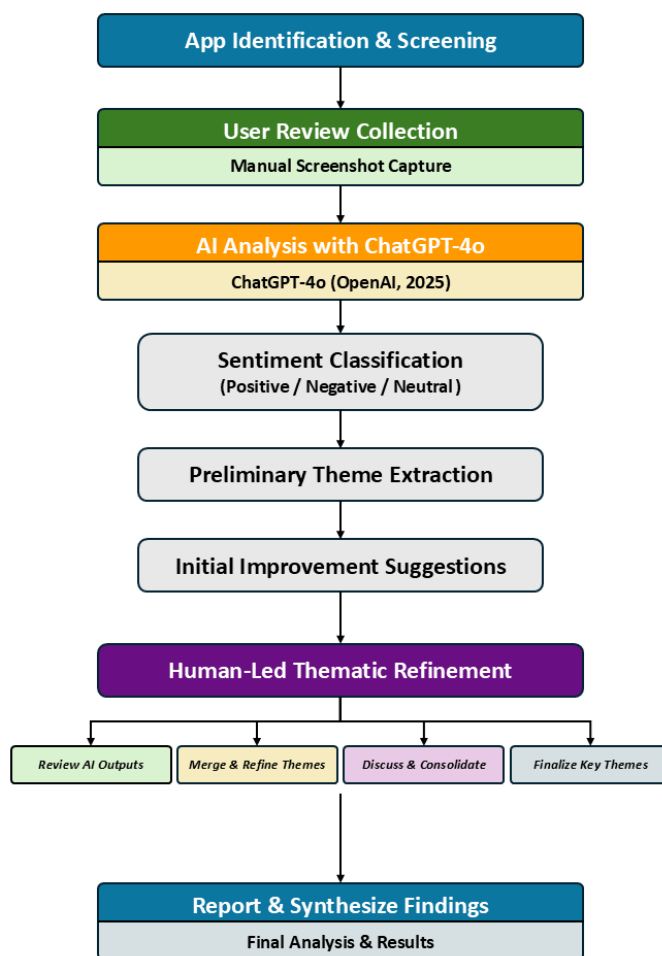


Figure 1. AI-assisted thematic analysis workflow

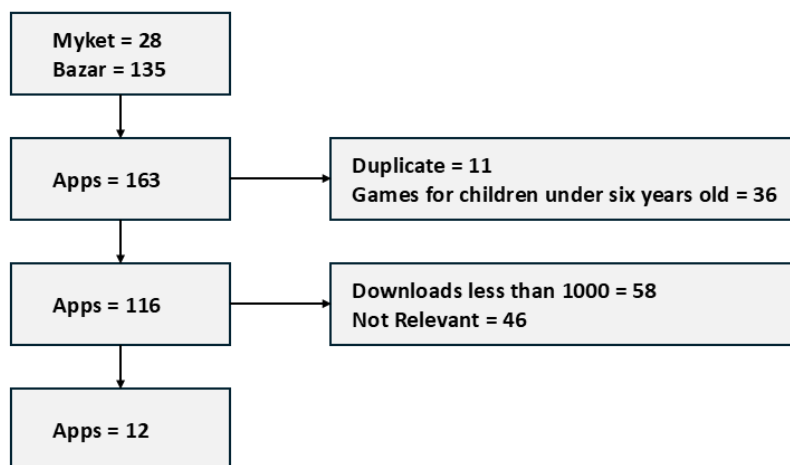


Figure 2. Screening process of retrieved applications

number of installs and user ratings. Some applications had install counts ranging from 1000 to 10,000 downloads, and their user ratings in the app stores were above 4 out of 5 stars. These characteristics may indicate a relative user satisfaction regarding user experience, educational content, and application performance quality.

Several applications included in the final list had lower

ratings and fewer installs. The reason for this lower user rating will be clarified in the next stage of analysis, which aims to provide valuable insights for developers and policymakers in the digital health domain.

Analysis of the Impact of User Feedback

User feedback, analyzed using the ChatGPT-4o artificial

Table 1. List of Dental and Oral Health Applications

#	App Name	Name	URL	Downloads	Star rating
1	Mouth and Teeth	App No. 1	https://cafebazaar.ir/app/com.ahmadi.dahandandan	5000	4.5
2	Dental Knowledge	App No. 2	https://cafebazaar.ir/app/dr.jamal.soltani.app	2000	4.6
3	Dental Medicine	App No. 3	https://cafebazaar.ir/app/ir.amozesh.dandanpezechke.d	2000	3.1
4	Teeth	App No. 4	https://cafebazaar.ir/app/kalale.dandanpezechki	1000	4.6
5	Teeth*	App No. 5	https://cafebazaar.ir/app/dandan.darmani.tiksestem	1000	4.6
6	Dental Medicine*	App No. 6	https://cafebazaar.ir/app/san.dandonpezechki	5000	4.3
7	Natural Tooth Pain Relievers	App No. 7	https://cafebazaar.ir/app/soha.dandan.farsibook	10000	4.3
8	White and Healthy Teeth	App No. 8	https://cafebazaar.ir/app/DandaneSefid.Salem	1000	4.5
9	Home Dental Treatments	App No. 9	https://cafebazaar.ir/app/ir.azadi.treatment	5000	3.7
10	Caring for Teeth	App No. 10	https://cafebazaar.ir/app/com.bookdroid.Dandaaan	2000	4.9
11	Dental Information	App No. 11	https://cafebazaar.ir/app/mosbat.ettelaatedandanvadandanpezechki	1000	3.5
12	Dental Consultation	App No. 12	https://cafebazaar.ir/app/com.soroush_clinic	2000	4.6

Some applications are marked with an asterisk (*) to avoid confusion with other applications with identical or very similar names.

intelligence model and categorized into three main themes—positive, negative, and neutral—can play a significant role in understanding the perceived quality of the applications. The analysis revealed a clear correlation between the content of user reviews and the overall application ratings in the app stores.

Applications that received the highest volume of positive feedback generally achieved higher user ratings and better rankings. These applications were predominantly appreciated for their stable performance, user-friendly design, and valuable educational content. In contrast, applications with predominantly negative reviews typically had lower ratings. Common criticisms included execution errors, insufficient content, and poor user experience.

These findings suggest that effective user engagement, responsiveness to user needs, and continuous improvement of application performance can directly influence user satisfaction and, ultimately, the ranking and credibility of applications available in app stores.

Content Analysis of User Feedback Using Artificial Intelligence

In this phase of the study, the ChatGPT AI model was employed to qualitatively analyze the content of user reviews. All collected reviews—obtained via screenshots—were introduced to the model and categorized based on emotional and semantic content into three main groups: positive, negative, and neutral (Table 2). This initial classification provided an overall picture of user attitudes toward the applications and formed the basis for extracting key themes in subsequent analyses.

Positive feedback primarily focused on features such as ease of use, user-friendly design, smooth performance, diversity of educational content, and understandable language. Users expressed satisfaction with easy access to information, fast application performance, and the practicality of the content.

Conversely, negative feedback often pointed to technical execution issues, insufficient updates, incomplete or

outdated content, intrusive advertisements, and a mismatch with user needs. Some reviews criticized the low quality of images or instructional videos and the absence of adequate guidance within the applications.

Neutral comments usually involved general descriptive statements about the applications without a positive or negative stance, often providing informational or descriptive content (e.g., application name, topic, or simple requests to developers).

In addition to sentiment classification, the ChatGPT model identified and extracted key themes related to the strengths and weaknesses of the applications. Based on these themes, recommendations for application improvement were also generated (Table 3). These suggestions included the need for regular updates, increased diversity of educational content, optimization of the user interface, resolution of technical bugs, and greater attention to the specific needs of different age groups (Table 3).

Overall, this AI-based analysis was able to provide a comprehensive and in-depth understanding of users' perceptions and expectations regarding oral health applications with high speed and a structured output—difficult to achieve using traditional manual data analysis methods due to time constraints and human factors.

Discussion

The present study explored the applicability of ChatGPT as an AI-driven tool for analyzing user-generated reviews of oral health applications available in Iranian app stores. Rather than merely summarizing user opinions, the findings demonstrate that large language models can facilitate a structured interpretation of unstructured textual feedback, enabling the identification of recurring strengths and weaknesses across mobile health applications.

The categorization of user reviews into positive, negative, and neutral themes provided insight into how quantitative indicators such as installation counts and ratings may not fully capture user satisfaction. For example, applications

Table 2. Number and categorization of extracted reviews

Name (App No.)	Logo	Screenshots	Reviews	% Positive Reviews	% Negative Reviews	% Neutral Reviews
App No. 1		10	50	80	10	10
App No. 2		8	40	75	12	13
App No. 3		5	30	70	15	15
App No. 4		3	20	60	20	20
App No. 5		15	60	85	5	10
App No. 6		20	71	78	10	12
App No. 7		12	45	74	14	12
App No. 8		9	38	68	20	12
App No. 9		14	52	81	9	10
App No. 10		11	41	62	25	13
App No. 11		18	65	84	6	10
App No. 12		13	47	72	15	13

Table 3. Ranking, key themes, and recommendations

Name	Key Themes	Recommendations	Rank
App No. 1	Helpful and educational	Add more interactive educational features	2
App No. 2	Good for beginners, with some flaws	Fix reported bugs and increase speed	6
App No. 3	Average performance	Enhance efficiency for advanced users	8
App No. 4	Basic but informative	Include more comprehensive content	11
App No. 5	Comprehensive and easy to use	Maintain current quality but improve visual effects	1
App No. 6	Accurate, needs user interface improvement	Focus on improving UI/UX to enhance usability	5
App No. 7	Good content, minor issues	Fix minor bugs and add customization options	7
App No. 8	Slow performance, outdated interface	Update the user interface and improve performance speed	10
App No. 9	Good design, good features	Introduce innovative features to retain users	4
App No. 10	Needs new features	Expand content library and improve speed	12
App No. 11	Rich educational content	Incorporate modern design elements into the user interface	3
App No. 12	Mixed feedback regarding design and usability	Balance usability with content accuracy	9

with higher download numbers were not necessarily perceived as higher quality, whereas some less frequently installed applications received favorable feedback due to usability and content relevance. This discrepancy highlights the importance of incorporating qualitative user feedback into application evaluation frameworks, as also suggested in prior mHealth assessment studies²⁹.

One of the most prominent themes emerging from the analysis was the role of regular application updates. From an interpretive perspective, update frequency appears to function as a proxy indicator of developer engagement, perceived reliability, and long-term sustainability. This observation is consistent with earlier evidence showing

that regular updates are associated with higher user retention, improved security, and increased trust in health applications^{30,31,32}. In this context, user reviews act not only as evaluative tools but also as early indicators of potential long-term adoption challenges.

The findings further emphasize the value of approaches based on text mining in uncovering functional and design-related issues that may not be identified in formal usability testing. Previous studies have emphasized that direct user feedback is critical for improving educational quality and user experience in mHealth applications^{33,34}. The recurring emphasis on UI/UX shortcomings, insufficient educational depth, and technical execution

errors observed in this study aligns with these reports and underscores the necessity of user-centered design principles in oral health applications.

From a broader perspective, the results suggest that AI-assisted analysis of app store reviews can complement traditional evaluation methods by enabling rapid synthesis of large-scale user feedback^{35,36}. Unlike manual qualitative analysis, which is resource-intensive and often limited in scope, AI-driven approaches can systematically process extensive datasets while maintaining thematic coherence. This capability has been increasingly recognized in recent digital health research, where AI tools are being leveraged to analyze unstructured textual data and inform application redesign strategies³⁷.

Importantly, the role of ChatGPT in this study should be interpreted as supportive rather than substitutive. While the model demonstrated the capacity to classify and summarize user feedback efficiently, human oversight remains essential for contextual interpretation, validation, and ethical judgment. This aligns with emerging perspectives that position large language models as decision-support tools rather than replacements for expert analysis.

Despite the valuable insights gained, this study has several limitations that should be acknowledged. First, the reliance on screenshots as the primary source of textual data may have constrained the completeness of user feedback captured, particularly for longer or interactive comments. Second, the sample was limited to a subset of oral health applications available on two Iranian app stores (Bazaar and Myket), which may limit the generalizability of findings to other platforms or geographic contexts. Third, while ChatGPT demonstrated structured output in categorization and thematic extraction, potential biases inherent to AI models—including context misinterpretation or overemphasis on certain linguistic patterns—cannot be fully excluded. Future studies could expand the application sample, incorporate multiple AI tools, and integrate longitudinal or user-observed data to enhance robustness and mitigate potential biases.

Overall, the findings contribute to the growing body of literature supporting the integration of AI-based text analysis into the multidimensional evaluation of health applications. By systematically incorporating user perspectives, such approaches can enhance the design, usability, and educational effectiveness of oral health applications, ultimately supporting more informed decision-making among developers and policymakers in the digital health domain.

Conclusion

This study evaluated the potential of artificial intelligence models, particularly ChatGPT, to analyze user feedback for oral health applications. The findings indicate that this tool can facilitate rapid and structured classification of reviews, extraction of key themes, and generation of practical recommendations for application improvement.

User feedback emphasized the importance of regular

updates, technical performance, and user interface design. These results suggest that analyzing user reviews can provide useful insights into the strengths and weaknesses of mHealth applications.

While this study highlights the potential of AI-driven analysis, it remains descriptive and does not formally validate the accuracy or effectiveness of the tool. Nonetheless, integrating such analyses into routine evaluation processes may support developers, policymakers, and health informatics researchers in refining digital oral health tools to better align with user needs.

Authors' Contribution

Conceptualization: Afshin Sarafinejad

Data Curation: Kasra Kashani

Investigation: Kasra Kashani

Formal Analysis: Afshin Sarafinejad

Methodology: Kasra Kashani

Project Administration: Afshin Sarafinejad and Kasra Kashani

Supervision: Afshin Sarafinejad

Software: Afshin Sarafinejad

Resource: Afshin Sarafinejad and Kasra Kashani

Validation: Afshin Sarafinejad and Kasra Kashani

Visualization: Kasra Kashani

Writing- Original Draft: Kasra Kashani

Writing- Review & Editing: Afshin Sarafinejad and Kasra Kashani

Competing Interests

The authors declare that they have no competing interests.

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Approval

Ethical approval was not required for this study, as it involved only the analysis of publicly accessible user reviews of mobile health applications. No human participants were directly involved, and no identifiable personal information or sensitive data were collected or processed. The study was conducted in accordance with ethical standards for research using publicly available, anonymized data.

Funding

The authors received no specific funding for this study.

References

1. Dhage VS, Chougule P. Importance of oral hygiene in orodental diseases: A review study. *International Journal of Research and Review* 2019;6(12):69-74.
2. Gizaw Z, Demissie NG, Gebrehiwot M, Bitew BD, Nigusie A. Oral hygiene practices and associated factors among rural communities in northwest Ethiopia. *BMC Oral Health* 2024;24(1):315. doi:10.1186/s12903-024-04049-4
3. Hung M, Moffat R, Gill G, Lauren E, Ruiz-Negrón B, Rosales MN, et al. Oral health as a gateway to overall health and well-being: Surveillance of the geriatric population in the United States. *Spec Care Dentist* 2019;39(4):354-61. doi:10.1111/scd.12385
4. Sun A, Chang JY, Chiang CP. Blood examination is necessary for oral mucosal disease patients. *J Formos Med Assoc* 2016;115(1):1-2. doi:10.1016/j.jfma.2015.08.010
5. Bekzod E. Advances in oral health: Prevention, treatment, and systemic implications. *American Journal of Education and Learning* 2025;3(3):1108-14.
6. Pattamatta M, Chapple I, Listl S. The value-for money of preventing and managing periodontitis: Opportunities and

- challenges. *Periodontol 2000* 2025;98(1):56–64. doi:10.1111/prd.12569
7. Carvalho LFDcSd, Zanatta RF. Editorial: Technological innovations for improved prevention and diagnosis of oral disease. *Frontiers in Oral Health* 2024;Volume 5 - 2024. doi:10.3389/froh.2024.1481890
 8. Murariu A, Bobu L, Gelețu GL, Stoleriu S, Iovan G, Vasluianu RI, et al. The Impact of Mobile Applications on Improving Oral Hygiene Knowledge and Skills of Adolescents: A Scoping Review. *J Clin Med* 2025;14(9):2907. doi:10.3390/jcm14092907
 9. Parker K, Bharmal RV, Sharif MO. The availability and characteristics of patient-focused oral hygiene apps. *Br Dent J* 2019;226(8):600–4. doi:10.1038/s41415-019-0197-7
 10. Gill S. How Many People Own Smartphones in the World? 2024. Prior Data. Accessed 2025 Sep 18. Available from: <https://prioridata.com/data/smartphone-stats>
 11. WHO ITU. Mobile technologies for oral health: an implementation guide. Genève: WHO. 2021. Accessed September 2025. Available from: <https://www.who.int/publications/i/item/9789240035225>
 12. Zolfaghari M, Shirmohammadi M, Shahhosseini H, Mokhtaran M, Mohebbi SZ. Development and evaluation of a gamified smart phone mobile health application for oral health promotion in early childhood: a randomized controlled trial. *BMC Oral Health* 2021;21(1):18. doi:10.1186/s12903-020-01374-2
 13. Al-Yaseen W, Raggio DP, Araujo M, Innes N. “I Just Wanted a Dentist in My Phone”-Designing Evidence-Based mHealth Prototype to Improve Preschool Children’s Oral and Dental Health: Multimethod Study of the Codevelopment of an App for Children’s Teeth. *JMIR Form Res* 2024;8:e49561. doi:10.2196/49561
 14. Online nation 2022 report. Office of Communications 2022. Ofcom. Accessed 2024 Jan 5. Available from: https://www.ofcom.org.uk/__data/assets/pdf_file/0023/238361/online-nation-2022-report.pdf
 15. Kao CK, Liebovitz DM. Consumer Mobile Health Apps: Current State, Barriers, and Future Directions. *Pm r* 2017;9(5):S106–s15. doi:10.1016/j.pmrj.2017.02.018
 16. Kashani K, Shahravan A, Sarafinejad A. Evaluating the effectiveness of web-based oral health education on enhancing mothers’ awareness: a semi-experimental internet-based intervention. *BMC Oral Health* 2024;24(1):1296. doi:10.1186/s12903-024-05070-3
 17. Ha S, Ho SH, Bae YH, Lee M, Kim JH, Kim JH, et al. Digital Health Equity and Tailored Health Care Service for People With Disability: User-Centered Design and Usability Study. *J Med Internet Res* 2023;25:e50029. doi:10.2196/50029
 18. Okolo CA, Babawarun O, Olorunsogo TO. Mobile health (mhealth) innovations for public health feedback: a global perspective. *International Medical Science Research Journal*. 2024;4(3):235–46. doi:10.51594/imsrj.v4i3.915
 19. Hashemi N, Malekzadeh S, Hashemi NS, Sheikhtaheri A. Nurses’ viewpoints on barriers and facilitators to use hospital information systems. *IndHealth 2020-Biomedical Informatics for Health and Care* 2020 (pp. 145–152). IOS Press. doi:10.3233/SHTI200090
 20. Sockolow PS, Rogers M, Bowles KH, Hand KE, George J. Challenges and facilitators to nurse use of a guideline-based nursing information system: recommendations for nurse executives. *Appl Nurs Res* 2014;27(1):25–32. doi:10.1016/j.apnr.2013.10.005
 21. Saeedi MG, Kalhori SR, Nouri R, Yasini M. Persian mHealth Apps: A Cross Sectional Study Based on Use Case Classification. *Stud Health Technol Inform* 2016;228:230–4.
 22. Erfannia L, Amraei M, Arji G, Yazdani A, Sabzehgar M, Yaghoobi L. Reviewing and Content Analysis of Persian Language Mobile Health Apps for COVID-19 Management. *Stud Health Technol Inform* 2022;289:106–9. doi:10.3233/shti210870
 23. Kermani F, Mahmoodi M, Nasiri MR, Orooji A. Quality review and content analysis of liver complications mobile apps in Iran: A statistical and machine learning approach. *Int J Med Inform* 2025;197:105842. doi:10.1016/j.ijmedinf.2025.105842
 24. Naderi H, Etmnani K. What Android mHealth Apps in Iranian App Store ‘Cafebazaar’ Have More Chance of Download. *Shiraz E-Medical Journal*. 2019;20(1):e64352.
 25. Genc-Nayebi N, Abran A. A systematic literature review: Opinion mining studies from mobile app store user reviews. *Journal of Systems and Software* 2017;125:207–19. doi:<https://doi.org/10.1016/j.jss.2016.11.027>
 26. Mitchelstein E, Matassi M, Boczkowski PJ. Minimal Effects, Maximum Panic: Social Media and Democracy in Latin America. *Social Media + Society* 2020;6(4):2056305120984452. doi:10.1177/2056305120984452
 27. Hernández-Riño J, Casadiego-Alzate R, Sánchez-Torres JA, Arroyo-Cañada F-J, Argila-Irurita AM, Solé-Moro ML, editors. Use of AI and Text Mining on Twitter for the Analysis of the Concept of Tourism in Colombia. *Advances in Digital Marketing and eCommerce; 2024* 2024//; Cham: Springer Nature Switzerland. doi:10.1007/978-3-031-62135-2_22
 28. Marquis YA, Oladoyinbo TO, Olabanji SO, Olaniyi OO, Ajayi SA. Proliferation of AI Tools: A Multifaceted Evaluation of User Perceptions and Emerging Trend. *Asian Journal of Advanced Research and Reports* 2024;18(1):30–55. doi:10.9734/ajarr/2024/v18i1596
 29. Biswas M, Tania MH, Kaiser MS, Kabir R, Mahmud M, Kemal AA. ACCU3RATE: A mobile health application rating scale based on user reviews. *PLOS ONE* 2021;16(12):e0258050. doi:10.1371/journal.pone.0258050
 30. Honglin D, Jianghua Z, Hui C. Quality factors affecting the continued use of mobile health apps in ethnic minority regions of Southwest China using PLS-SEM and ANN. *Sci Rep* 2024;14(1):25469. doi:10.1038/s41598-024-75410-4
 31. Deniz-Garcia A, Fabelo H, Rodriguez-Almeida AJ, Zamora-Zamorano G, Castro-Fernandez M, Alberiche Ruano MDP, et al. Quality, Usability, and Effectiveness of mHealth Apps and the Role of Artificial Intelligence: Current Scenario and Challenges. *J Med Internet Res* 2023;25:e44030. doi:10.2196/44030
 32. Laranjo L, Dunn AG, Tong HL, Kocaballi AB, Chen J, Bashir R, et al. Conversational agents in healthcare: a systematic review. *J Am Med Inform Assoc* 2018;25(9):1248–58. doi:10.1093/jamia/ocy072
 33. Pagano D, Maalej W, editors. User feedback in the appstore: An empirical study. 2013 21st IEEE International Requirements Engineering Conference (RE); 2013 15–19 July 2013.
 34. Abdelaziz O. Integrating User Feedback to Enhance Software Quality and User Satisfaction in Mobile Application Development. 2024. Accessed: September 2025. Available from: <https://harvest.usask.ca/items/a8e170d8-7f94-4cd3-b18b-328d4578b816>
 35. Miner AS, Laranjo L, Kocaballi AB. Chatbots in the fight against the COVID-19 pandemic. *NPJ Digit Med* 2020;3:65. doi:10.1038/s41746-020-0280-0
 36. Bin Sawad A, Narayan B, Alnefaie A, Maqbool A, McKie I, Smith J, et al. A Systematic Review on Healthcare Artificial Intelligent Conversational Agents for Chronic Conditions. *Sensors (Basel)* 2022;22(7):2625. doi:10.3390/s22072625
 37. Rai S, Bedi J, Anand A. Decoding user satisfaction: explainable artificial intelligence-based user-centric analysis of mobile health applications adoption. *Knowledge and Information Systems* 2025;67(9):7563–96. doi:10.1007/s10115-025-02451-0

Appendix

Appendix 1. Standardized prompt template (summary)

Instruction to the model: You are an academic research assistant. Read the Persian user reviews provided as screenshots for a single application. Step 1: For each review, classify sentiment as Positive, Negative, or

Neutral. Step 2: Identify recurring themes (short theme labels) and assign each review to one or more themes. Step 3: Summarize the most frequent themes and propose actionable improvement suggestions aligned with the identified issues. Output format: Provide results as a structured table suitable for export to Excel (columns: review text, sentiment, themes, suggested action).