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# Patterns, Purposes, and Perceptions of Mobile Health Application Use Among Medical Undergraduates

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## ABSTRACT

**Background:** Mobile health applications are increasingly used by health professionals and trainees for learning, clinical decision support, drug reference, and patient monitoring. Medical undergraduates are digital natives who may rely on smartphones for studying and clinical preparations.
**Methods:** A cross-sectional study was conducted using a pretested structured questionnaire administered to a representative sample of medical undergraduates. The questionnaire collected sociodemographic data, smartphone ownership and Internet access, types and frequency of mobile health application use, purposes (study, clinical, reference), perceived usefulness and reliability, barriers, and willingness to pay.
**Results:** A total of 177 medical undergraduates participated in this study. The mean age of the respondents ranged from 18 to 30 years. Most respondents were aware of mHealth apps. Eighty-five percent of students agreed or strongly agreed that mobile health applications contributed positively to their studies. More than 72% of the participants agreed or strongly agreed that mobile health platforms should be implemented in medical colleges or hospitals to aid learning and clinical exposure. Of the respondents, 91% rated them as moderately to very useful for speciality preparation and residency training purposes. Students demonstrated a high interest in integrating technological solutions into medical education.
**Conclusion:** This indicates a high level of awareness and adoption of mobile health applications among medical undergraduates. A strong and supportive attitude toward incorporating it into formal medical education is needed. Recognition of mobile health applications as valuable learning tools for both undergraduate and postgraduate preparations. The key limitations are affordability, technical reliability, and privacy.

***Keywords:*** Mobile health applications, Medical undergraduates, Medical colleges,

## INTRODUCTION

The rapid advancement of digital technology has significantly transformed the global healthcare landscape. [1] Mobile health applications encompass a wide range of digital tools delivered through mobile devices that support healthcare delivery, public health functions, patient engagement and clinical decision-making. With increasing smartphone penetration and improved Internet access, particularly among

young adults, mobile health systems have become more accessible and widely adopted. Their impact extends beyond patient care and increasingly contributes to medical education and clinical skills development.[2] Within medical education, mobile health applications are progressively being adopted as adjunct learning resources that facilitate interactive engagement, independent revision, virtual case exposure, and competency-oriented training. [3] Features such as drug formularies, clinical scoring systems, patient case simulators, electronic medical records, telemedicine platforms, and artificial intelligence–driven learning modules are gradually being embedded in training environments.[2]

With changing educational expectations, medical students are increasingly shifting away from exclusive reliance on textbooks toward digitally supported and mobile-assisted learning platforms. In countries such as India, where medical curricula are undergoing reforms emphasizing competency-based and technology-assisted learning, mHealth apps have gained particular relevance. Medical undergraduates represent an important group of early technology adopters, making them a key population for assessing digital readiness, usage behavior, perceptions and challenges.

Although mobile health tools are widely available, evidence on their real-world utilisation patterns and perceived educational value among medical students, particularly in India, is limited. Barriers such as cost, data privacy concerns, technical reliability and lack of institutional integration may influence adoption and sustained use. [4,5]

Therefore, this study aims to assess the awareness, usage patterns, perceptions, and expectations of medical undergraduates regarding mobile health applications

## METHODS

A quantitative, descriptive, cross-sectional study was conducted among undergraduate medical students at a private medical college in rural Bengaluru, Karnataka. The study was conducted over four months from November 2025 to February 2026. Necessary permissions and consent were obtained from the students. The study was approved by the ethical committee (IEC No: SSIMS/IEC/2025/104, dated 14/08/2025)

The target population consisted of all medical undergraduates enrolled at the institution during the study period. A universal sampling approach was used in which all eligible students were invited to participate. Of the approximately 500 undergraduate students, 177 provided digitally informed consent and completed the questionnaire in full, resulting in a final response rate of 35%. Only students who provided consent and submitted complete responses were included in this analysis.

Data were collected using a pretested semi-structured questionnaire administered via Google Forms. The final questionnaire consisted of the following domains: sociodemographic profile (gender, year of study), access and readiness for digital tools, mobile health application usage frequency, categories of applications used, purpose of mobile health application use, perceived usefulness and reliability of mobile health applications, barriers to adoption, willingness to pay, and preferred application features.

## RESULTS

The study consisted of a total 177 undergraduates out of which 44.1% were the first-year students forming the largest group of respondents**,** indicating that the survey results are heavily influenced by early-stage undergraduate perspectives. Out of study population, 13% were the second-year students**.** 23.2% were the third**-**year students suggesting moderate participation from students with more academic experience. Final-year students made up to 12.4 % a significant portion of respondents**,** indicating limited representation of students nearing program completion, and 7.3% were the interns which constituted the smallest segment, suggesting minimal input from participants with practical experience.

Of the study subjects, 77.4% of respondents were aware of mobile health applications, indicating overall high awareness and exposure to digital health technologies, and 22.6% of the students reported no awareness of mobile health applications.

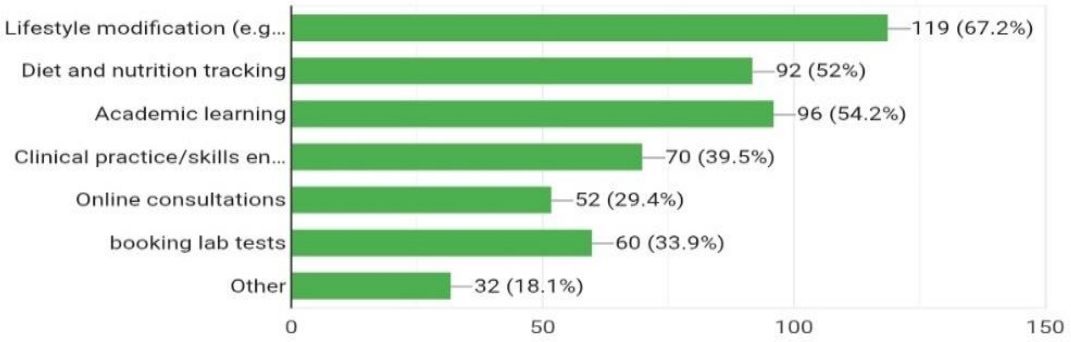


**Figure 1: Distribution of study subjects based on purpose of mobile health applications (n=177)**

Figure 1 shows the various uses and the patterns of the mobile health app done by the study subjects where a maximum of the (67.2%) respondents use mobile health applications for lifestyle modifications,

**Table 1: Data analysis of positive contribution of mobile health applications to health (n=177)**

| Response | Percentage of Respondents |
|---|---|
| Strongly Agree | 16.9% |
| Agree | 54.2% |
| Neutral | 27.7% |
| Disagree | 1.1% |

Among the total study population, 71.1% of respondents believed that mobile health applications contributed positively to their health status (Table no 1) and 64.4% of the respondents felt it positively contributed to their studies (Table no 2)

**Table 2: Analysis of positive contribution of mobile health applications on studies (n=177)**

| Response | Percentage of Respondents |
|---|---|
| Strongly Agree | 17.5% |
| Agree | 46.9% |
| Neutral | 31.1% |
| Disagree | 4.5% |

Almost half of the students (57.1%) responded that cost-related issues are the most prominent challenge but there were other concerns like data privacy etc (Figure no 2)

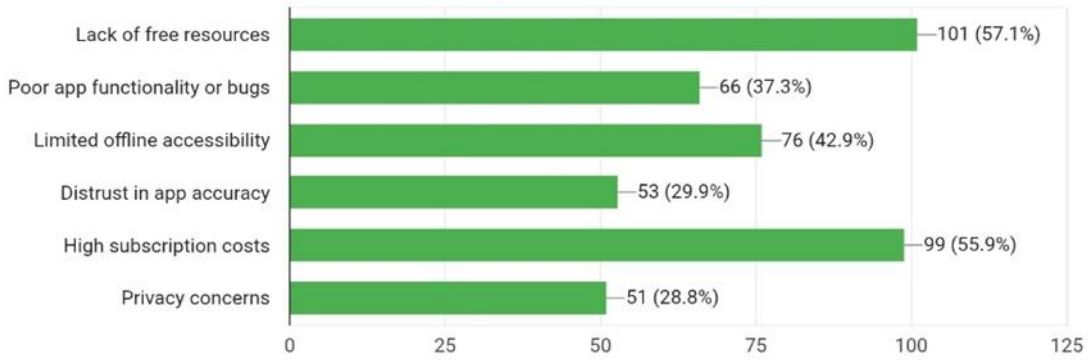


**Figure 2: Analysis of challenges faced while using mobile health applications (n=177)**

The majority of the students felt that medical colleges should take the initiative regarding providing access to mobile health applications (Table no 3)

**Table 3: Response analysis of implementation of mobile health applications in medical colleges/hospitals (n=177)**

| Response | Percentage of Respondents |
|---|---|
| Strongly Agree | 28.8% |
| Agree | 42.9% |
| Neutral | 24.3% |
| Strongly Disagree | 0.6% |
| Disagree | 4% |

Out of the respondents (75.1%) agreed that mobile health applications can improve healthcare accessibility, whereas (19.2%) remain neutral, indicating cautious optimism or limited first-hand experience with mobile health solutions in underserved settings. (Table no 4)

**Table 4: Response analysis of implementation of mobile health applications can improve accessibility of healthcare services in rural/underserved areas (n=177)**

| Response | Percentage of Respondents |
|---|---|
| Strongly Agree | 28.2% |
| Agree | 46.9% |
| Neutral | 19.2% |
| Disagree | 5.6% |
| Strongly Disagree | 0.6% |

Respondents showed strong interest in all listed technologies, as each technology received both highest interest (Rating 5) and moderate interest (Rating 4) responses. The technologies mentioned were- Virtual reality, augmented reality, AI assistants and gamification (Figure 3) and figure 4 showing the educational features to be added in the app.

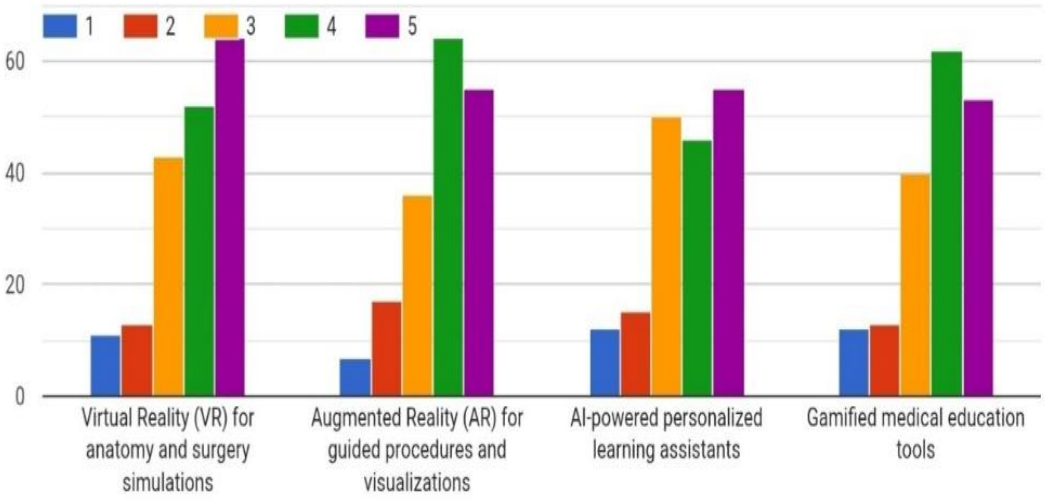


**Figure 3: Analysis of interest in the mentioned technologies of mobile health applications for medical education (n=177)**

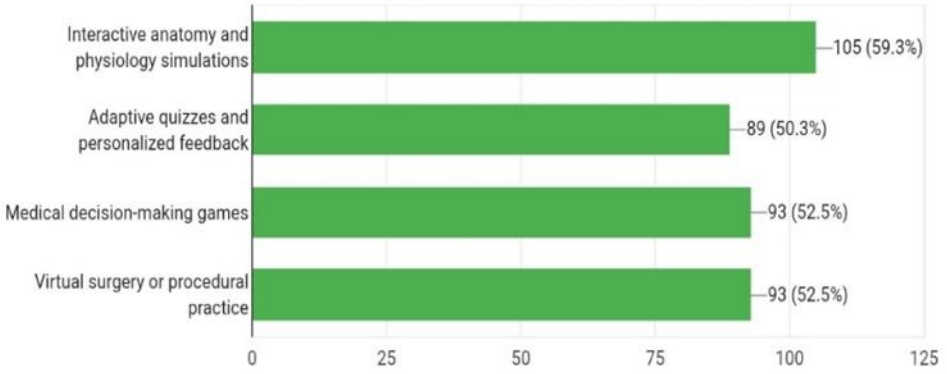


**Figure 4: Analysis of types of educational features to prioritise in future mobile health applications (n=177)**

These responses suggested a strong demand for interactive, simulation-based, and personalised educational features to enhance the effectiveness of future mobile health applications.

Regarding the usefulness of the application, a majority of respondents perceive high usefulness, with 32.8% rating the application as highly useful. Only a small proportion rated the application as less useful (4.0%) or not useful (5.1%), reflecting minimal dissatisfaction. Overall, the findings highlight positive perceptions toward real-life patient case simulation, emphasising its potential value in enhancing clinical reasoning and practical learning through mobile health applications

On asking opinion on mobile health applications with integrated diagnostic tools (84.2%) prefer mobile health applications with integrated diagnostic tools, such as AI-powered symptom checkers or calculators, for bedside learning, whereas only a small proportion (15.8%) do not prefer such features, indicating limited resistance to the use of advanced diagnostic support tools.

(70.6%) agree that telemedicine platforms integrated with student training can enhance clinical skills. Only a small minority disagreeing shows a generally positive perception of telemedicine integration, highlighting its potential value in improving clinical skill development among students.

A large majority of respondents consider peer-to-peer collaboration important; only a small proportion viewed it as not important, suggesting low resistance. Overall, the findings emphasise strong support for incorporating peer-to-peer collaboration tools in mobile health applications to enhance learning, interaction, and shared professional growth.

Whereas while voting on the benefit of mobile health applications to provide real-time updates on research, clinical trials and guidelines, a strong majority (88.1%) of respondents perceive high benefit with very few respondents (11.8%) view the application as not beneficial, suggesting minimal opposition to such a digital tool. Overall, the findings demonstrate strong acceptance and perceived value of a real-time update application for supporting evidence-based practice and informed decision-making.

In the topic of interest in applications teaching global health policies, epidemiology and public health strategies, a majority of respondents show a high level of interest, with 32.2% being very interested and 50.8% moderately interested only 5.1% of respondents report no interest, indicating minimal disengagement. Overall, the results reflect a positive inclination toward epidemiology and public health, highlighting potential readiness for further education or involvement in these fields.

On asking about the usefulness of mobile health applications in preparation for advanced training or residency, a large majority of respondents (45.2%) consider mobile health applications useful for

advanced training or residency with a very few respondents (2.8%) consider mobile health applications not useful, indicating minimal resistance or dissatisfaction overall suggesting strong acceptance and perceived value of mobile health applications in supporting advanced training and residency programs.

## DISCUSSION

The study findings indicate a high level of awareness and favourable attitudes toward mobile health application use for both academic purposes and personal health management, highlighting the growing role of digital tools in contemporary medical training. Most participants reported using mobile health apps for lifestyle modification, academic learning, clinical reference, examination preparation, and health monitoring.

This observation is consistent with evidence from earlier studies like done Wang Y[6] and Xu Q et al [7], which showed an increasing dependence on mobile technology as a complementary component of traditional medical education. Similar trends have been reported across medical institutions in diverse international settings, including Asia and Europe, where mobile applications are increasingly viewed as effective educational support tools.[8]

A key finding of this study is that a large proportion of respondents perceived mHealth apps as beneficial for academic learning and future residency preparation. This suggests a transition from incidental use to more structured, goal-oriented engagement with mobile health applications. Additionally, strong support for institutional integration reflects the readiness for formal adoption within the medical curriculum. Previous literature indicates that formal institutional support enhances application credibility, promotes consistent use, and improves educational outcomes. [9]

Despite these positive perceptions, several challenges were identified. Cost-related barriers, limited offline functionality, technical issues, privacy concerns, and uncertainty regarding content reliability have been commonly reported. These challenges reflect observations from global research that emphasises inconsistent content quality, insufficient regulatory oversight, and limited clinical validation of many applications.

Overall, the findings highlight the substantial potential of mobile health applications to enhance medical education and learner engagement. However, systematic evaluation, cost accessibility, and structured integration strategies remain essential to ensure sustainable and equitable implementation. [9,10]

### Limitations of the Study

Although this study provides meaningful insights into the awareness, perception, and usage patterns of mobile health applications among undergraduate medical students, it has certain limitations that must be acknowledged.

1. The study captures responses at a single point in time; therefore, it does not assess changes in behaviour, perception, or technology adoption over time. The findings rely on participants' self-reported responses, which may be influenced by recall bias, subjective interpretation, or social desirability bias.
2. The study was conducted at a private medical college in rural Bengaluru, which may limit the generalizability of the results to other regions, government institutions, or medical colleges with differing technological infrastructure or academic culture.
3. Universal sampling was attempted; however, only 35% of the participants responded. This response rate may have led to a non-response bias.

## CONCLUSION

This study provides valuable insights into the awareness, usage patterns, and perceptions of mobile health applications among undergraduate medical students at a private medical college in rural Bengaluru. The findings indicate high awareness and widespread use of mobile health

applications, particularly for academic learning, clinical referencing, examination preparation, and health monitoring. Most respondents demonstrated positive perceptions of the educational and professional utility of mHealth tools, and more than two-thirds supported their formal integration into the medical curriculum.

Despite this positive outlook, several barriers have been identified, including subscription costs, data privacy concerns, limited institutional endorsement, and challenges related to technical accessibility. These barriers highlight the need for structured frameworks, validated content, affordable access models and faculty-guided implementation strategies.

Overall, the results suggest that mHealth apps hold significant potential to enhance medical education and improve learner engagement, digital competency, and clinical preparedness. As the medical field continues to progress toward technology-driven healthcare and competency-based education, integrating standardised and reliable solutions may serve as an important step in preparing medical students for digitally enabled clinical practice and for lifelong learning.

Mobile health application technologies are increasingly transforming medical education and healthcare delivery through interactive learning, clinical decision support, patient engagement and remote health services. With growing smartphone penetration and recent shifts toward digital learning environments, understanding the adoption, perception, and challenges related to mobile health application usage among medical undergraduates is essential.

However, challenges such as subscription costs, limited offline functionality, privacy concerns, and uncertainty regarding application reliability have emerged as key barriers. Despite these obstacles, the participants demonstrated a strong interest in advanced technological formats, including artificial intelligence-based learning, virtual/augmented reality modules, simulation tools, and gamified education.

In conclusion, the results suggest that mHealth apps hold significant potential to enhance medical education and support clinical competency development. Institutional policies, curated application recommendations, improved accessibility, and ongoing evaluation are required to ensure effective integration and sustainable use.

## *Declaration by Authors*

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**Conflict of Interest:** The authors declare no conflict of interest.

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