



MEDTECH LITERACY AMONG UNDERGRADUATE MEDICAL STUDENTS: A CROSS-SECTIONAL STUDY ASSESSING INFRASTRUCTURE, CLINICAL USE, AWARENESS, AND PERCEIVED BARRIERS

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Abstract

Background: Digital transformation has reshaped clinical practice and medical learning. However, the extent of MedTech preparedness among medical students remains uncertain.

Objectives: To assess MedTech literacy, usage patterns, awareness of emerging technologies, and perceived barriers among medical students.

Methods: A validated structured questionnaire was administered to undergraduate students. A composite MedTech Literacy Score (0–40) was calculated. Data were summarized using descriptive statistics, chi-square tests, and ANOVA.

Results: Among 312 respondents, smartphone ownership was 100%, laptops 78.8%, and reliable internet 68.9%. Only 41.3% reported frequent use of clinical decision-support apps. Awareness of AI in diagnostics was moderate (mean $3.2 \pm 1.0/5$), while only 18.6% were familiar with the

Internet of Medical Things. Overall literacy was high in 34.9%, moderate in 47.8%, and low in 17.3%. Higher literacy correlated with senior year ($p = 0.003$) and prior digital-health training ($p < 0.001$). Major barriers included lack of training (61.2%) and subscription costs (42.0%).

Conclusion: Students show strong access to technology but gaps in structured clinical application and conceptual digital-health readiness. Integrating digital-health modules and faculty training may improve preparedness.

Keywords - MedTech Literacy, Medical Technology, Undergraduate Medical Students, Digital Health, Health Technology Education

Methods

Study Design and Setting: A descriptive cross-sectional survey was conducted among undergraduate medical students at Maharishi Markandeshwar Medical College & Hospital, MM University, GIMS, JNMC, KAHER, SIMS and TMC institution between September 2024 and November 2024.

Participants: All MBBS students from first year through internship were invited. Participation was voluntary and anonymous.

Instrument: The questionnaire contained four domains: infrastructure & usage, clinical application, awareness of emerging technologies, and perceptions/barriers. Content validity was performed by three subject experts, and pilot testing was conducted on 20 students.

Scoring: Responses generated a MedTech Literacy Score (0–40) and were classified as

- low (<15),
- moderate (15–27),
- or high (>27).

Ethics: Electronic informed consent was obtained from all participants.

Statistical Analysis: Data were analyzed using descriptive statistics, chi-square testing, and one-way ANOVA. Significance was set at $p < 0.05$.

Results

Table 1: Participant Characteristics

Variable	n (%)
Total participants	312
Female	172 (55.1)
Male	140 (44.9)
Phase I	84 (26.9)
Phase II	91 (29.2)
Phase III	89 (28.5)
Internship	48 (15.4)

Table 2: Infrastructure and Usage

Item	n (%)
Smartphone ownership	312 (100)
Laptop/Desktop	246 (78.8)
Tablet	99 (31.7)
Reliable high-speed internet	215 (68.9)
>5 hours screen time daily	138 (44.2)

Figure 1: Device Ownership and Internet Access

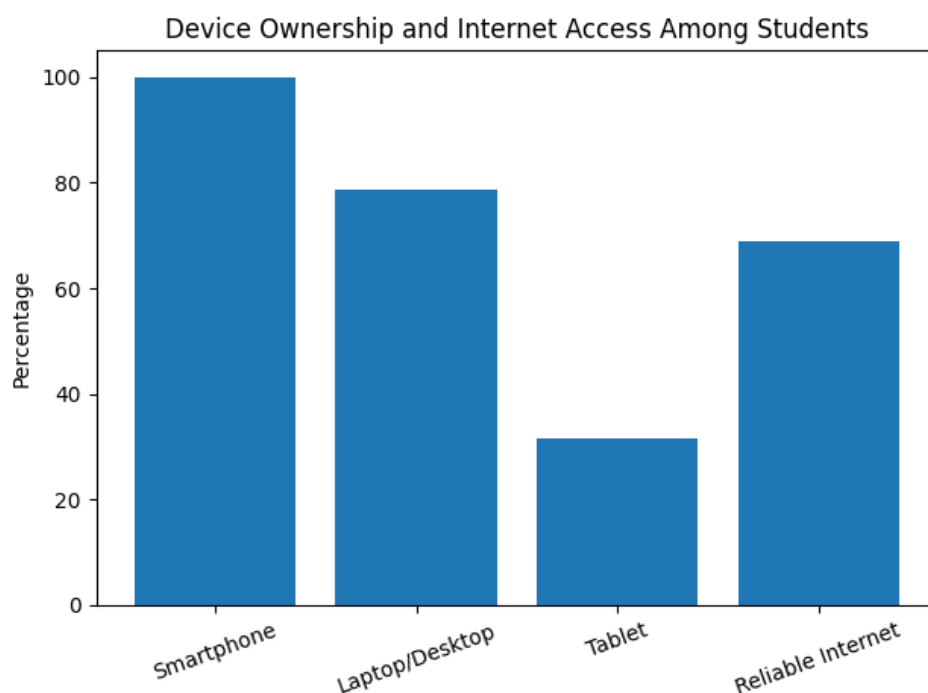
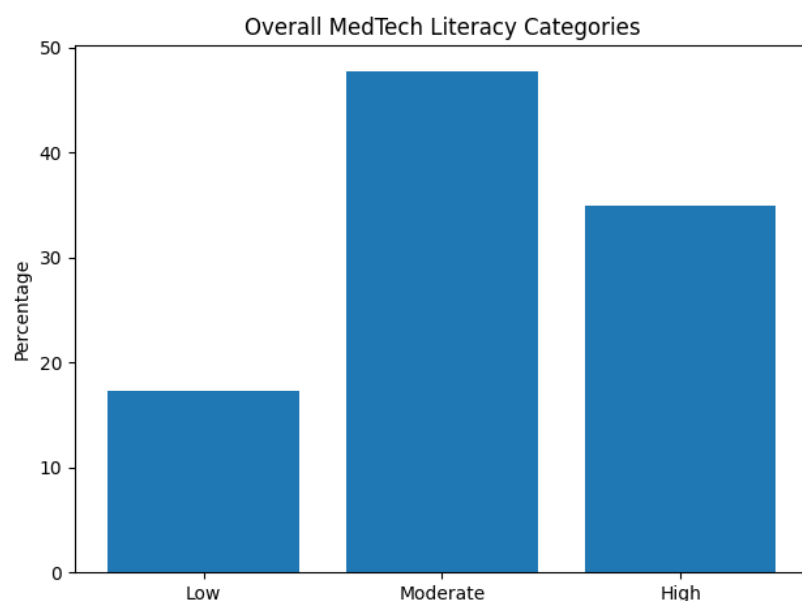


Table 3: MedTech Literacy Scores

Category	n (%)
Low	54 (17.3)
Moderate	149 (47.8)
High	109 (34.9)

Figure 2: Overall MedTech Literacy Distribution



Discussion

This study demonstrates that although digital access among medical students is universal, MedTech literacy remains uneven. While smartphones and laptops are widely available, structured use of clinical applications and telemedicine tools lags behind.

Students' express enthusiasm toward AI and virtual simulation tools but demonstrate limited awareness of national initiatives such as NDHM and ABHA. The observed association between higher academic year and higher literacy suggests experiential learning contributes significantly to competency acquisition. Lack of structured training, high subscription costs, and exam-centered curriculum remain major obstacles. Integrating digital health modules across postings, reinforcing responsible app usage, and providing institutional platform access may bridge readiness gaps.

Conclusion

Medical students possess strong technological access but remain only moderately prepared for digitally enabled health systems. Systematic curriculum integration, faculty sensitization, and institutional support can meaningfully improve readiness and patient-care outcomes in the digital era.

Author Contributions

Dr. Jhilli Basu: Conceptualization, supervision, manuscript drafting.

Dr. Omkar Sonavane: Questionnaire refinement, statistical analysis, manuscript editing.

Dr. Akash Gadgade: Validation, literature review, critical revision.

Dr. Smitha S, Dr. Nikita Kulgod, Dr. Sahana Manoharan, Sreeya Lingareddy: Questionnaire survey distribution among the students

All authors approved the final manuscript.

Conflict of Interest

None declared.

Funding

No external funding was received.

References

1. Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. *Nat Med*. 2019;25(1):44–56.
2. Wartman SA, Combs CD. Medical education must move from the information age to the age of artificial intelligence. *Acad Med*. 2018;93(8):1107–1109.
3. O'Connor S, Hanlon P, O'Donnell CA, Garcia S, Glanville J, Mair FS. Understanding factors affecting patient and public engagement and recruitment to digital health interventions: a systematic review of qualitative studies. *BMC Med Inform Decis Mak*. 2016; 16:120.
4. Mehta NB, Hull AL, Young JB, Stoller JK. Just imagine: new paradigms for medical education. *Acad Med*. 2013;88(10):1418–1423.
5. Vincent A, Semple JL, Sanmugalingam T, Hanna WC, Detsky AS. Virtual care for surgeons: a narrative review and future directions. *Ann Surg*. 2022;275(4): e630–e635.
6. Mian A, Khan S. Medical education during pandemics: a UK perspective. *BMC Med*. 2020; 18:100.
7. Lin SY, Mahoney MR, Sinsky CA. Ten ways artificial intelligence will transform primary care. *J Gen Intern Med*. 2019;34(8):1626–1630.
8. O'Donoghue O, Doody O, Lyons R, et al. Barriers and facilitators to the implementation of eHealth services: systematic review. *JMIR Med Inform*. 2021;9(7):e23873.
9. Shortliffe EH, Sepúlveda MJ. Clinical decision support in the era of artificial intelligence. *JAMA*. 2018;320(21):2199–2200.
10. Thiagarajan A, Grant C, Griffiths F, Atherton H. Exploring patients' and clinicians' experiences of video consultations in primary care: a systematic scoping review. *BJGP Open*. 2020;4(1): bjgpopen20X101020.
11. McCoy LG, Nagaraj S, Morgado F, Harish V, Das S, Bhattacharya S. What do medical students actually learn from EHR-based training? A scoping review. *BMC Med Educ*. 2020;20:200.
12. Frank JR, Snell L, Sherbino J, editors. *CanMEDS 2015 Physician Competency Framework*. Ottawa: Royal College of Physicians and Surgeons of Canada; 2015.
13. Mesko B, Györfy Z. The rise of the empowered physician in the digital health era: viewpoint. *J Med Internet Res*. 2019;21(3):e12490.
14. Compton S, Barash D, Vernorio A, et al. Development and implementation of a digital health curriculum for undergraduate medical education. *MedEdPORTAL*. 2020;16:10958.
15. Greenhalgh T, Wherton J, Shaw S, Morrison C. Video consultations for covid-19. *BMJ*. 2020;368:m998.