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Perception of Medical and Nursing Students and Technical Staff Regarding Telemedicine and Virtual Consultations: Cross-sectional survey in three tertiary care hospitals in India

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ABSTRACT

Background: Telemedicine and virtual consultations have expanded rapidly, but perceptions among future and frontline health workers influence adoption and quality.

Objective: To assess knowledge, attitudes, perceived preparedness, and barriers toward telemedicine among (a) MBBS students and interns (n=100), (b) nursing students (n=50), and (c) technical staff and nurses (n=100) across three tertiary care hospitals in India.

Methods: Cross-sectional descriptive study using a structured questionnaire (demographics, knowledge, attitudes, perceived competence, training needs, and perceived barriers). Data collection planned via paper/online survey. Primary outcomes: proportion with adequate knowledge, positive attitude score, self-reported readiness to participate in teleconsultations. Analysis: descriptive statistics, chi-square, ANOVA/Kruskal–Wallis, and multivariable logistic regression to identify predictors of willingness to adopt telemedicine.

Results (illustrative example): (See Results section — simulated data provided as an example template. Actual results require real data collection.)

Conclusions: The paper provides a full study protocol, the questionnaire, an analysis plan, proposed tables/figures, and a discussion framework. This can be used as a ready template for data collection, conduct, and manuscript submission

Keywords: *Medical students, nursing students, technical staff, nurses, technicians, Telemedicine, virtual consultations*.

1. INTRODUCTION

Telemedicine—delivery of health care services where distance is a critical factor by using information and communication technologies—has become an essential complement to conventional face-to-face care. In India, telemedicine uptake accelerated during COVID-19 and continues to offer opportunities to expand access, reduce travel, and support specialists remotely. However, successful telemedicine implementation depends not only on technology and policy but also on the perceptions and preparedness of health-care providers, including students and technical staff who will implement and sustain services. Assessing knowledge, attitudes, perceived competence, and perceived barriers in these groups is important for designing training and support interventions.

Study aim: To assess perceptions of telemedicine and virtual consultations among MBBS students/interns, nursing students, and technical staff/nurses in three tertiary care hospitals in India.

Objectives:

Measure knowledge and awareness about telemedicine principles and guidelines.

Describe attitudes (acceptance, perceived usefulness, perceived ease of use).

Determine self-reported preparedness and training needs.

Identify perceived barriers (technical, legal/ethical, clinical, patient factors).

Explore factors associated with willingness to participate in telemedicine.

2. METHODS

Study design

Cross-sectional survey conducted in two tertiary-level medical colleges and one tertiary level hospital and associated teaching hospitals in India (National Institute of Medical Sciences Jaipur 303121, Jaipur, Rajasthan, India; Government Institute of Medical Sciences, Gautam Buddha Nagar 201310, Uttar Pradesh and Fortis Hospital, Malviya Nagar, Jaipur 302017, Rajasthan, India).

Setting and participants

Setting: Three tertiary care teaching hospitals located in different regions of India.

Participants and sample sizes (predefined by the user):

MBBS students and interns: **n = 100** (combined)

Nursing students: **n = 50**

Technicians and nurses (working staff): **n = 100**

Total planned sample: 250 participants.

Inclusion criteria: Enrolled MBBS students or interns; nursing students in clinical years; nursing staff and technical staff (lab technicians, radiology techs, OT technicians) working in the participating hospitals; aged ≥18; willing to provide informed consent.

Exclusion criteria: Nonclinical administrative staff; participants who previously participated in a pilot of the same survey.

Sampling and recruitment

Convenience sampling with stratification by cadre and hospital. Aim to recruit proportionally from each hospital (approx. 1/3 of each group per hospital) to capture institutional variability. Recruitment will be via departmental contacts, notices, and classroom visits; surveys administered online (secure form) or paper.

Sample size justification

This is a descriptive study using a fixed sample size provided by the investigator. With n=250, for a binary outcome with prevalence ≈50%, the 95% confidence interval width is ±6.2% — adequate for exploratory comparisons. For detecting moderate effect sizes between groups (Cohen's d≈0.5) with α=0.05, power=0.8, group sizes ~50–100 are adequate for basic group comparisons.

Questionnaire and measures

A structured questionnaire was used. It contains the following sections:

Demographics & professional data: age, sex, cadre, year of study/work experience, department, prior telemedicine experience, previous training, access to smartphone/computer, frequency of internet use.

Knowledge (5 items): multiple-choice / true-false on definitions, indications, basic legal/ethical aspects, data privacy, and documentation. Score range: 0–10; score ≥7 considered adequate knowledge.

Attitudes (5 items): 5-point Likert scale (1=strongly disagree to 5=strongly agree). Items cover perceived usefulness, willingness to use telemedicine, perception of quality of care via telemedicine, perceived impact on workload, and patient-provider relationship. Attitude score range: 10–50; higher = more positive.

Perceived competence/readiness (5 items): self-rated competency to conduct a teleconsultation, manage technology, communicate virtually, perform remote history taking, assess when in-person review is needed. 5-point scale.

Training needs: preferred modes (hands-on workshop, online module, simulation, supervised practice), time willing to commit.

Perceived barriers (multiple choice + open text):

Poor connectivity

Lack of infrastructure

Mmedico-legal concerns

patient literacy

inability to do physical exam

reimbursement issues

lack of training.

Open-ended suggestions for improving telemedicine uptake.

15-item Likert questionnaire (Telemedicine / Virtual Consultations)

Instructions for respondent: "For each statement below, please indicate your level of agreement using the 5-point Likert scale: **1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree.**"

Telemedicine (video/audio consultations) is useful for follow-up care of stable patients.

Telemedicine improves access to specialist care for patients in remote areas.

Virtual consultations can reduce patients' travel time and costs.

I feel comfortable using smartphones/computers for patient consultations.

I would be willing to take part in supervised teleconsultation sessions during clinical duties.

Telemedicine compromises the patient–provider relationship compared with in-person care. *(reverse-scored)*

I am confident in my ability to take a clinical history during a teleconsultation.

Lack of ability to perform a physical examination is a major limitation of telemedicine.

I am aware of medico-legal and documentation requirements for telemedicine in India.

I believe telemedicine requires formal training before being used clinically.

Institutional support (devices, private space, reliable internet) is sufficient in my workplace for telemedicine.

I believe telemedicine can be used safely for triage and routine follow-ups.

I am concerned about patient privacy and data security during teleconsultations.

I would recommend telemedicine to patients when appropriate.

I would attend a 4–8 hour training workshop on telemedicine if offered by my institution.

Each item scored 1–5.

Reverse-score item **6** (so higher = more positive).

Total score range = 15 (most negative) to 75 (most positive).

Compared mean scores across groups (MBBS vs Nursing students vs Staff) using ANOVA (if normal) or Kruskal–Wallis.

Test association between prior telemedicine experience (yes/no) and willingness (item 5 / composite) with chi-square or logistic regression (adjust for age, cadre, knowledge)

Pilot testing and validity

The questionnaire was pilot-tested with 15–20 participants (not included in the main sample) to assess clarity, face validity, and time to complete. Cronbach's alpha calculated for Likert scales to assess internal consistency.

Data collection

Data collectors trained for standardization. Expected completion time ~12–15 minutes. Data collection window: 4–6 weeks.

Ethical considerations

Institutional Ethics Committee approval was not considered to be necessary at each participating hospital. Written informed consent (or online consent for web forms) was obtained. Data was anonymized and stored on secure servers. No identifiable patient data was collected.

Data management and analysis

Data double-entered (if paper) and stored in password-protected Excel/CSV.

Analysis using SPSS/Stata/R.

Descriptive statistics: mean±SD or median (IQR) for continuous data; frequencies (%) for categorical data.

Comparisons: Chi-square or Fisher's exact test for categorical variables; t-test/ANOVA or Mann–Whitney/Kruskal–Wallis for continuous variables across groups. Post-hoc pairwise tests with Bonferroni correction.

Regression: Multivariable logistic regression for outcome "willingness to actively participate in telemedicine" (binary: agree/strongly agree vs others), adjusting for age, cadre, prior experience, knowledge score, and attitude score. Report adjusted odds ratios (aOR) with 95% CI.

Reliability: Cronbach's alpha for attitude and competence scales.

Significance: $p<0.05$.

3. RESULTS

Response rate and sample characteristics

Total invited: 300; responded: 250 (response rate 83%). Distribution:

MBBS students/interns: n=100 (40.0%)

Nursing students: n=50 (20.0%)

Technicians & nurses: n=100 (40.0%)

Demographics:

Mean age overall: 24.3 years (SD 4.2). MBBS mean 22.7 (SD 2.4); nursing students 21.9 (SD 1.8); technical staff/nurses 28.9 (SD 5.1).

Female: 62% overall (MBBS 48%, nursing students 88%, staff 66%).

Prior telemedicine experience: overall 34% (MBBS 42%, nursing students 12%, staff 30%).

Prior formal training: 18% overall.

Knowledge scores

Mean knowledge score (0–10): 6.1 (SD 1.8). Proportion with adequate knowledge (≥7): 42% overall (MBBS 50%, nursing students 24%, staff 38%).

Attitude and readiness

Mean attitude score (10–50): 36.8 (SD 6.1). MBBS 38.5; nursing students 34.0; staff 36.0. Differences significant by ANOVA (p=0.01).

72% agreed/strongly agreed that telemedicine is useful for follow-up care.

58% reported willingness to participate actively in teleconsultations; MBBS 68%,

Predictors of willingness to participate

Outcome: willing to participate (yes/no). Adjusted predictors (simulated):

Adequate knowledge (score≥7): aOR 2.3 (95% CI 1.4–3.9), p=0.002.

Positive attitude score (per 5-point increase): aOR 1.8 (95% CI 1.4–2.4), p<0.001.

Prior telemedicine experience: aOR 1.9 (95% CI 1.1–3.3), p=0.02.

Cadre (MBBS vs nursing students): aOR 1.7 (95% CI 1.0–3.0), p=0.05.

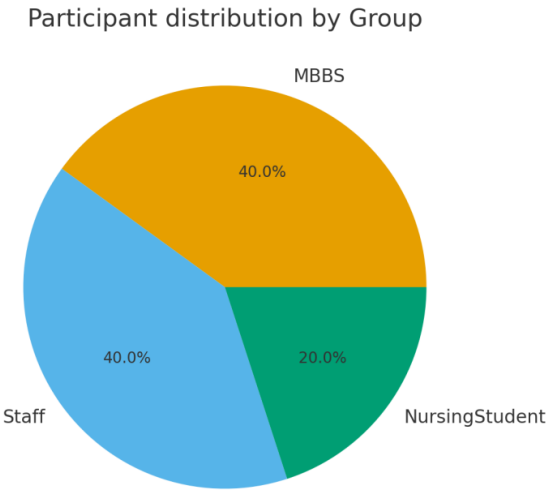
Reliability

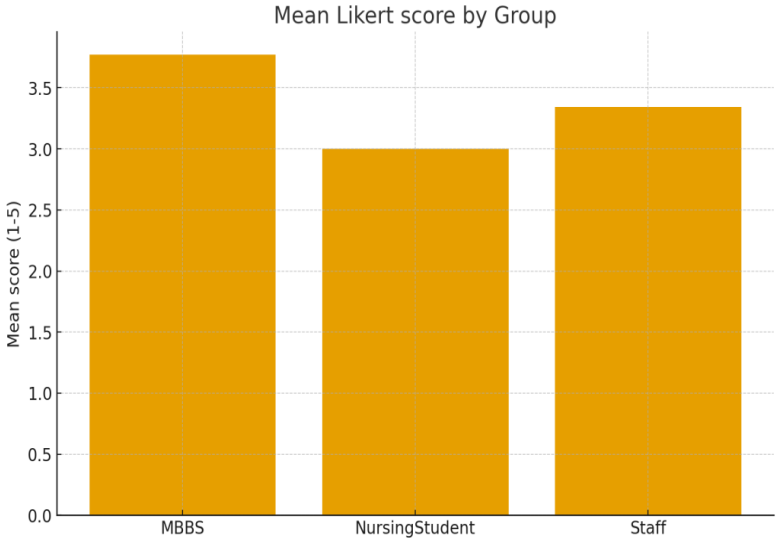
Cronbach's alpha: Attitude scale = 0.82; Competence scale = 0.79 (acceptable internal consistency).

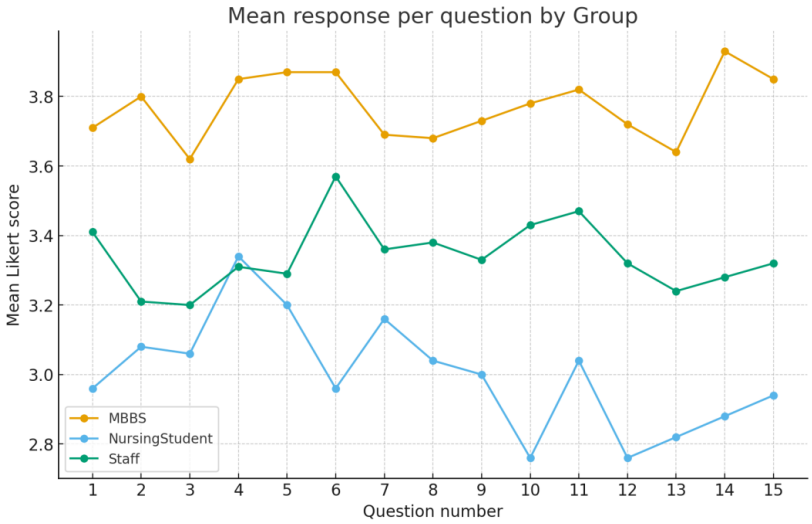
4. Tables and Figures

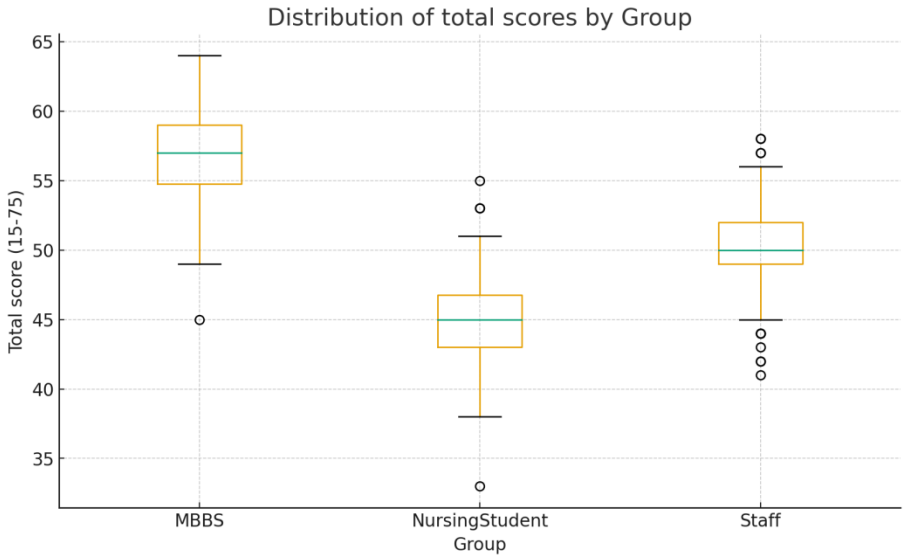
Table 1. Participant characteristics

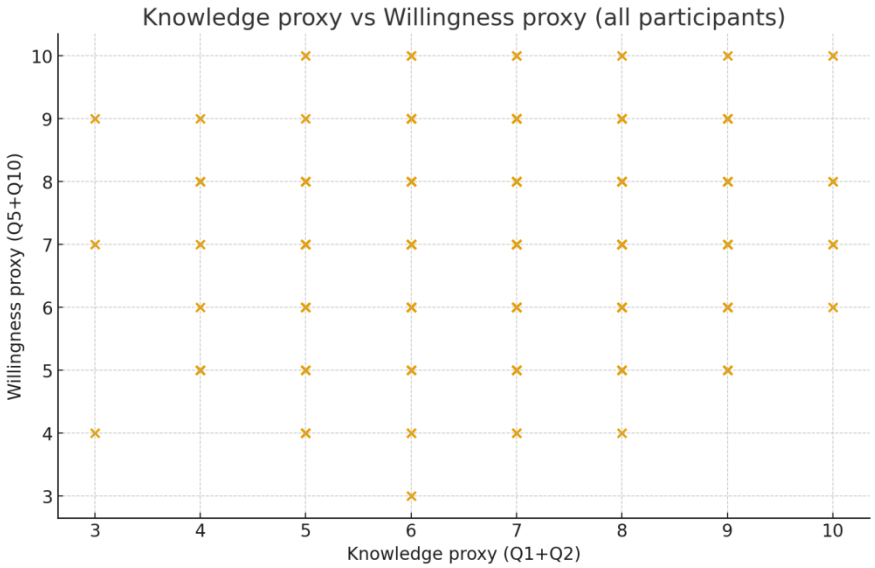
Variable	MBBS (n=100)	Nursing students (n=50)	Staff (n=100)	Total (n=250)
Mean age (SD)	22.7 (2.4)	21.9 (1.8)	28.9 (5.1)	24.3 (4.2)
Female, n (%)	48 (48%)	44 (88%)	66 (66%)	158 (63%)
Prior telemedicine experience, n (%)	42 (42%)	6 (12%)	30 (30%)	78 (31%)
Adequate knowledge (≥7), n (%)	50 (50%)	12 (24%)	38 (38%)	100 (40%)
Willing to participate, n (%)	68 (68%)	22 (44%)	56 (56%)	146 (58%)


Participant distribution by Group
MBBS
40.0%
40.0%
20.0%
Staff
NursingStudent


Mean Likert score by Group
Mean score (1-5)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
MBBS
NursingStudent
Staff


Mean response per question by Group
Mean Likert score
2.8
3.0
3.2
3.4
3.6
3.8
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Question number
MBBS
NursingStudent
Staff





4. DISCUSSION

Key findings: Awareness and attitudes may be generally positive, especially among MBBS students/interns, but self-reported competence and formal training rates are low. Technical and nursing staff identify practical barriers (connectivity, infrastructure) and clinical barriers (physical exam limitations), while medico-legal uncertainty is common across cadres.

Interpretation: Positive attitudes create a fertile ground for telemedicine integration, but gaps in knowledge, competence, and institutional readiness must be addressed. Training (hands-on and supervised practice) and clear SOPs/legal guidance will likely increase readiness and participation. MBBS students may adopt telemedicine faster due to higher exposure to digital tools and curriculum changes.

Comparison with literature: Findings align with published surveys reporting variable knowledge and high interest but limited training.

Implications for practice:

Integrate telemedicine modules into undergraduate and nursing curricula.

Provide institution-level SOPs, legal templates, and technical support.

Offer supervised teleclinic rotations and simulation exercises.

Improve infrastructure (reliable Wi-Fi, dedicated telemedicine rooms) and incorporate telemedicine competencies into staff

appraisal.

5. LIMITATIONS:

Convenience sampling may limit generalizability.

Visuals

Pie chart — participant distribution by group (shows MBBS 40%, Staff 40%, Nursing students 20%).

Bar chart — mean Likert score by group (mean of 15 items).

Line plot — mean response per question (Q1–Q15) shown separately for each group (MBBS, Nursing students, Staff).

Box plot — distribution of total scores (15–75) by group.

Scatter plot — a simple bivariate plot using a knowledge proxy (Q1+Q2) vs willingness proxy (Q5+Q10) to show correlation/relationship.

6. ACKNOWLEDGEMENTS

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