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# Understanding Undergraduate Perspectives on Forensic Pharmacology: A Study Among Second-Year MBBS Students.

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## Abstract

**Background:** Despite its importance, undergraduate medical curricula often provide only limited exposure to forensic pharmacology, typically restricted to general toxicology within forensic medicine. As a result, medical students may be inadequately prepared to handle drug-related medico-legal issues in their future clinical practice. Understanding their existing knowledge, attitude, and perception (KAP) toward forensic pharmacology is essential for identifying educational gaps and guiding curriculum strengthening. Objectives: To assess the level of knowledge regarding forensic pharmacology among second-year MBBS students; to evaluate their attitude toward the relevance and importance of forensic pharmacology and to analyse their perception regarding its applicability in future clinical and medico-legal roles;

**Materials and Methods:** A cross-sectional descriptive study was conducted during the academic year 2022–23 among second-year MBBS students of a medical college. All consenting students present during data collection were included (n = 140). A structured and validated questionnaire assessed demographic variables, knowledge (15 MCQs), attitude (6 Likert-scale statements), and perception (6 items). Knowledge scores were categorized as Good (≥75%), Moderate (50–74%), or Poor (<50%). Attitude was classified as Positive, Neutral, or Negative, while perception was categorized as Favorable, Neutral, or Unfavorable. Data were analyzed using SPSS v25. Descriptive statistics summarized the distribution of KAP scores, and Chi-square tests assessed associations between categorical variables, with $p < 0.05$ considered statistically significant. **Results:** Among the 140 participants, 56 (40%) demonstrated good knowledge, 63 (45%) had moderate knowledge, and 21 (15%) had poor knowledge of forensic pharmacology. A majority of students showed a positive attitude toward the subject (95; 67.9%), while 28 (20%) had a neutral and 17 (12.1%) a negative attitude. Perception analysis revealed that 84 students (60%) had a favorable perception regarding the relevance and usefulness of forensic pharmacology, whereas 39 (27.9%) reported neutral and 17 (12.1%) unfavorable perceptions. Gender-wise comparison showed no statistically significant association between gender and knowledge level ($\chi^2 = 1.20$, $p = 0.548$). However, knowledge level was strongly associated with attitude ($\chi^2 = 20.87$, $p = 0.0003$); students with good knowledge exhibited significantly more positive attitudes (85.7%) compared with those having moderate (63.5%) or poor knowledge (33.3%). This indicates that improved knowledge positively influences student attitudes toward the discipline. **Conclusion:** The study highlights that while most second-year MBBS students possess moderate to good knowledge of forensic pharmacology and generally hold positive attitudes and favorable perceptions, considerable gaps remain in achieving higher knowledge proficiency. The strong correlation between knowledge and attitude emphasizes the need for enhanced curricular focus on forensic pharmacology within undergraduate medical education. Strengthening teaching strategies, integrating case-based learning, and emphasizing medico-legal applications may help improve competency and preparedness among future physicians.

***Keywords: Forensic pharmacology; Knowledge; Attitude; Perception; Medical students; Undergraduate education; Medico-legal practice; Cross-sectional study; Curriculum evaluation.***

## Introduction

The intersection of pharmacology and medico-legal medicine has given rise to the subspecialty of forensic pharmacology, which applies pharmacological principles to legal and forensic contexts. Forensic pharmacology deals with a broad spectrum of medico-legal issues ranging from adverse drug reactions, overdose, drug interactions and poisoning, to drug abuse, doping, and the role of medications in behavioural or fatal outcomes. [1]

In particular, forensic pharmacologists provide critical expertise in interpreting pharmacokinetics and pharmacodynamics of substances in both living individuals and post-mortem samples — enabling accurate determination of causality in cases of suspected poisoning or overdose, establishing drug-related impairment in civil or criminal cases (e.g. impaired driving, drug abuse), and guiding courts through scientifically informed testimony. **[2]**

With the increasing availability and use of a vast array of therapeutic, prescription, over-the-counter, and illicit drugs — as well as emergence of novel psychoactive substances — the scope and importance of forensic pharmacology have expanded significantly. In many countries including India, there is growing recognition that pharmacologists trained in drug action, metabolism, toxicology and therapeutics can play a valuable role in medico-legal services and the justice system. **[3]**

Despite this importance, undergraduate medical education often provides limited exposure to forensic pharmacology. The traditional curriculum may cover basic toxicology as part of forensic medicine, but seldom delves into the detailed drug-specific pharmacology, medico-legal implications of drug use/abuse, or interpretation of toxicological data — areas where specialized knowledge is critical. Consequently, medical students — future doctors who may later encounter clinical situations with medico-legal overtones (e.g. overdose, adverse reactions, drug abuse, forensic reporting) — may lack adequate preparedness. **[4]**

Assessing the knowledge, attitude and perception (KAP) of medical students towards forensic pharmacology is thus important. A favorable attitude and correct perception, backed by adequate knowledge, can foster interest in forensic pharmacology, encourage more informed prescribing and drug usage practices, and build a foundation for future medico-legal competency. However, there is a paucity of published data assessing KAP among undergraduate medical students with respect to forensic pharmacology specifically.**[5]**

Therefore, in the present study, we aim to evaluate the knowledge, attitude, and perception regarding forensic pharmacology among second-year MBBS students at Surabhi Institute of Medical Sciences during academic year 2022–23. The findings may help identify gaps in undergraduate training and guide curricular modifications to strengthen medical education in this important, evolving domain.

## Objectives of the Study

1. To assess the level of knowledge regarding forensic pharmacology among second-year MBBS students of a medical college during the academic year 2022–23.
2. To evaluate the attitude of these students towards the relevance and importance of forensic pharmacology in medical education and medico-legal practice.
3. To analyse the perception of students about the applicability, usefulness, and need for forensic pharmacology in future clinical and medico-legal roles.
4. To determine the association between knowledge, attitude, and perception scores and selected demographic variables of the participants.

## Materials and Methods

### Study design and setting

Cross-sectional descriptive study conducted during the 2022–23 academic year at [Medical College name]. Written informed consent was obtained from all participants.

### Participants

All consenting second-year MBBS students (n = 140) were included. Inclusion: enrolled second-year MBBS students present during data collection. Exclusion: non-consenting or absent students.

### Tool and scoring

A structured questionnaire was developed based on literature and expert review. It contained:

- Demographics (age, gender).
- Knowledge: 15 multiple-choice items on basic forensic pharmacology (score 0–15). Score categories: Good ≥ 75% (≥12), Moderate 50–74% (8–11), Poor <50% (≤7).
- Attitude: 6 statements on 4-point Likert scale (Strongly agree, Agree, Disagree, Strongly disagree); aggregated into Positive/Neutral/Negative attitude.
- Perception: 6 items assessing perceived relevance, need for curriculum time, confidence to deal with medicolegal drug issues; summarized as Favorable/Neutral/Unfavorable.

Questionnaire pre-tested on 15 students and refined. Internal consistency for the knowledge section (Kuder-Richardson) and attitude/perception (Cronbach's alpha) were acceptable (KR-20/α values within acceptable range during pilot).

### Data collection and analysis

Self-administered anonymous questionnaires were distributed during a scheduled session. Data entered into Excel and analyzed using SPSS v25. Descriptive statistics (mean ± SD, frequencies, percentages) described the sample. Chi-square tests examined associations between categorical variables (gender, knowledge category, attitude, perception). $p<0.05$ was significant.

**Results**

**Table 1: Distribution according to knowledge, attitude and perception of the students**

| Variable | Category | n | % |
|---|---|---|---|
| Knowledge score | Good (≥75%) | 56 | 40.0 |
| | Moderate (50–74%) | 63 | 45.0 |
| | Poor (<50%) | 21 | 15.0 |
| Attitude | Positive | 95 | 67.9 |
| | Neutral | 28 | 20.0 |
| | Negative | 17 | 12.1 |
| Perception | Favorable | 84 | 60.0 |
| | Neutral | 39 | 27.9 |
| | Unfavorable | 17 | 12.1 |

The table presents the distribution of knowledge, attitude, and perception scores among the 140 second-year MBBS students included in the study.

**Knowledge scores** show that 56 students (40%) demonstrated *good* knowledge of forensic pharmacology, while 63 students (45%) had *moderate* knowledge. A smaller proportion, 21 students (15%), exhibited *poor* knowledge, indicating that although most students possess at least a moderate understanding, there remains a notable gap in higher-level knowledge.

Regarding **attitude**, the majority of students—95 (67.9%)—expressed a *positive attitude* toward forensic pharmacology. Meanwhile, 28 students (20%) showed a *neutral attitude*, and 17 students (12.1%) reported a *negative attitude*. This suggests general student receptiveness and interest in the subject.

In terms of **perception**, 84 students (60%) reported a *favorable perception* of the subject's relevance and usefulness. Another 39 students (27.9%) had a *neutral perception*, while 17 students (12.1%) reported an *unfavorable perception*. These findings indicate that most students acknowledge the importance of forensic pharmacology, though a proportion remains uncertain or less convinced about its applicability.

**Table 2: Distribution according to association between gender and knowledge**

| Gender | Good | Moderate | Poor | Total |
|---|---|---|---|---|
| Male (n=78) | 34 (43.6%) | 32 (41.0%) | 12 (15.4%) | 78 |
| Female (n=62) | 22 (35.5%) | 31 (50.0%) | 9 (14.5%) | 62 |
| **Total** | 56 | 63 | 21 | 140 |

Chi-square test: $\chi^2 = 1.20$, df = 2, p = 0.548 (no statistically significant association between gender and knowledge category).

The table shows the distribution of knowledge scores across gender among the 140 second-year MBBS students. Among **male students** (n = 78), 34 students (43.6%) demonstrated *good* knowledge, 32 students (41.0%) had *moderate* knowledge, and 12 students (15.4%) showed *poor* knowledge. Among **female students** (n = 62), 22 students (35.5%) had *good* knowledge, 31 students (50.0%) had *moderate* knowledge, while 9 students (14.5%) demonstrated

**Table 3: Distribution according knowledge levels correlation with positive attitudes.**

| Knowledge | Positive attitude | Neutral | Negative | Total |
|---|---|---|---|---|
| Good (n=56) | 48 (85.7%) | 6 (10.7%) | 2 (3.6%) | 56 |
| Moderate (n=63) | 40 (63.5%) | 13 (20.6%) | 10 (15.9%) | 63 |
| Poor (n=21) | 7 (33.3%) | 9 (42.9%) | 5 (23.8%) | 21 |
| **Total** | 95 | 28 | 17 | 140 |

Chi-square test: $\chi^2 = 20.87$, df = 4, p = 0.0003 — indicating a significant association: higher knowledge levels correlated with more positive attitudes.

The table presents the distribution of attitudes (Positive, Neutral, Negative) across three levels of knowledge (Good, Moderate, Poor) among a total of 140 participants.

1. Good Knowledge Group (n = 56):

- Positive attitude: A large majority—48 participants (85.7%)—showed a positive attitude. Neutral attitude: 6 participants (10.7%) had a neutral attitude. Negative attitude: Only 2 participants (3.6%) reported a negative attitude.
- Interpretation: Participants with good knowledge predominantly demonstrated a positive attitude.

2. Moderate Knowledge Group (n = 63)

- Positive attitude: 40 participants (63.5%) showed a positive attitude. Neutral attitude: 13 participants (20.6%) had a neutral attitude. Negative attitude: 10 participants (15.9%) reported a negative attitude.
- Interpretation: Although the majority still had a positive attitude, the proportion is lower compared to the good knowledge group, and neutral/negative attitudes are more frequent.

3. Poor Knowledge Group (n = 21)

- Positive attitude: Only 7 participants (33.3%) had a positive attitude. Neutral attitude: 9 participants (42.9%) showed a neutral attitude. Negative attitude: 5 participants (23.8%) reported a negative attitude.
- Interpretation: Participants with poor knowledge were less likely to have a positive attitude, and neutral or negative attitudes were more common.

4. Overall Distribution (N = 140): 95 (67.9%) participants had a positive attitude. 28 (20%) had a neutral attitude. 17 (12.1%) had a negative attitude.

## Discussion

**As per table no. 1,** in our sample, 40.0% of participants had a 'good' knowledge score, 67.9% held a positive attitude, and 60.0% showed a favourable perception. These knowledge levels are lower than those reported in several large KAP studies (for example **Zhong et al**[6] reported very high knowledge levels among Chinese residents early in the COVID-19 outbreak, and **Tomar et al**[7] reported high KAP scores in an Indian web-based sample). A recent community antibiotic KAP survey in Bangladesh also reported substantially higher correct-knowledge rates (~73%). The differences are likely due to variation in study timing, sampling strategy (online or convenience samples often capture more educated respondents), topic-specific media attention, and instrument/cutoff differences. Our findings therefore highlight the need for targeted education and perception-change interventions in this population.

Many published studies used online, snowball or student/healthcare samples (often more educated/urban), which tend to inflate "good knowledge" and "positive attitude" percentages compared with representative community samples.[8]

**As per table no. 2,** good knowledge was slightly higher among males (43.6%) than females (35.5%). This suggests that male participants had a modest advantage in achieving higher knowledge scores. Moderate knowledge was more common among females (50%) than males (41%). This indicates that female participants tended to fall in the mid-knowledge category more often than demonstrating high or low knowledge. Poor knowledge levels were similar in both genders — 15.4% in males and 14.5% in females. This shows that the distribution of least knowledge is nearly identical across genders.

**Similar findings reported by Zhong et al**[6] found that although both genders had high COVID-19 knowledge, males scored slightly higher in specific knowledge items. **Paul et al**[8] reported no significant gender difference in knowledge scores in a population-based KAP survey. **Tomar et al**[7] also observed comparable knowledge between males and females, with minor variations not statistically significant.

These studies demonstrate that gender differences in knowledge tend to be small, aligning with our findings where both genders show broadly similar distributions across knowledge categories.

**Conclusion:** Participants with good knowledge predominantly demonstrated a positive attitude. Although the majority still had a positive attitude, the proportion is lower compared to the good knowledge group, and neutral/negative attitudes are more frequent. Participants with poor knowledge were less likely to have a positive attitude, and neutral or negative attitudes were more common.

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