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KNOWLEDGE, ATTITUDE, AND PRACTICE REGARDING INTRAVENOUS CANNULATION AMONG INTERNS AND JUNIOR DOCTORS IN A TERTIARY CARE HOSPITAL: A DESCRIPTIVE CROSS-SECTIONAL STUDY

Dr. Savita Balaji Raghavan [1] , Dr. Sushma Naidu V[2]

[1]Associate Professor, pharmacology, The Oxford medical college, hospital and research centre, savirag@outlook.com
[2]Professor , Department of Pharmacology, PES University Institute of medical sciences and research, Bangalore, drsushmanaidu@gmail.com

ABSTRACT

Background: Intravenous (IV) cannulation is among the most common invasive procedures performed in hospitals. Competent technique and adherence to aseptic precautions are crucial for patient safety. However, improper cannulation practices can lead to complications such as phlebitis, infiltration, or bloodstream infections.

Objectives: To assess the knowledge, attitude, and practice (KAP) regarding IV cannulation among interns and junior doctors in a tertiary care teaching hospital.

Methods: A descriptive cross-sectional study was conducted among 120 participants (60 interns and 60 junior doctors) at a tertiary care teaching hospital in South India. A pre-validated semi-structured questionnaire consisting of 25 items assessing knowledge (10), attitude (7), and practice (8) related to IV cannulation was administered. Data were analyzed using descriptive statistics and chi-square tests to assess associations between knowledge and practice levels.

Results: The mean knowledge score was 7.2 ± 1.5 (out of 10), attitude score 28.6 ± 3.1 (out of 35), and practice score 20.4 ± 2.8 (out of 25). While 85% of participants identified hand hygiene as essential, only 62% consistently practiced it before cannulation. 78% reported using gloves routinely, and 65% used single-use tourniquets. Only 40% routinely documented date and time of cannula insertion. Significant positive correlation ($r = 0.48$, $p < 0.001$) was observed between knowledge and practice scores.

Conclusion: Although most participants demonstrated satisfactory knowledge and a positive attitude towards IV cannulation, gaps were observed in translating knowledge into safe clinical practice. Regular hands-on training sessions, competency checklists, and reinforcement of infection-control practices are recommended to improve adherence and patient safety.

Key words: intravenous cannulation, knowledge attitude practice, interns, junior doctors, aseptic technique, infection prevention

Introduction

Intravenous (IV) cannulation is one of the most common invasive procedures performed by health care professionals and a fundamental medical procedure crucial for administering medications,

fluids, and blood products directly into a patient's bloodstream. Proficiency in IV cannulation is a core skill expected of medical professionals, particularly interns and junior doctors who are often at the forefront of patient care. However, the efficacy and safety of this procedure heavily rely on the knowledge, attitude, and practice of healthcare providers.

Peripheral IV Cannulation also called peripheral line placement includes insertion of an indwelling single lumen plastic conduit across the skin into one of the peripheral veins. This overcomes the need for repeated needle insertion if the patient requires ongoing IV therapy . Blood samples are also drawn for laboratory analysis whenever required .

Nearly 25 Million people receive Intravenous treatments yearly worldwide through the IV cannula. This technique gives an easy access into the vascular system , particularly useful in emergencies, however it can cause various complications if appropriate care is not exercised.

A comprehensive understanding of these factors is essential for improving patient care and medical training. Adequate knowledge should be present prior to the procedure regarding the various sizes of catheters available, colour coding, gauge of the catheter, number of lumens, sites of insertion, common veins chosen for insertion including the risk of complications. Improper insertion can pose lot of challenges like thrombophlebitis, bleeding, sepsis, pain, extravascation, infiltration, pain and discomfort to the patient. They should also have knowledge of PIVC care, catheter duration, aseptic precautions and infection control measures. They should possess adequate skill and confidence in performing the procedure in order to reduce the complications. They should also follow the guidelines for following adequate aseptic precautions prior to the procedure. Interns and junior doctors are often the primary personnel responsible for performing IV cannulations, particularly in emergency and inpatient wards. Competence in IV cannulation requires adequate theoretical knowledge, correct procedural technique, and adherence to aseptic principles. However, studies from different regions have shown wide variation in knowledge and practice levels among junior medical professionals. Deficiencies in training and supervision, overconfidence, and inadequate reinforcement of infection control protocols may contribute to suboptimal practices.

Knowledge:

A comprehensive understanding of IV cannulation begins with knowledge of relevant anatomy, indications, contraindications, equipment, techniques, and potential complications. Interns and junior doctors should possess theoretical knowledge acquired through medical education and training programs. This includes understanding the anatomy of veins, recognizing suitable sites for cannulation, selecting appropriate catheters, and comprehending aseptic techniques to prevent infections.

Attitude:

Attitude plays a pivotal role in shaping healthcare professionals' approach to IV cannulation. Positive attitudes foster confidence, diligence, and a commitment to patient safety. Conversely, negative attitudes, such as fear of causing discomfort or reluctance to perform the procedure, can impede proficiency and patient care. Understanding interns' and junior doctors' attitudes towards IV cannulation requires examining their perceptions of its importance, their confidence levels, and any barriers they face in performing the procedure.

Practice:

Practice reflects the application of knowledge and attitude in real-world clinical settings. Proficiency in IV cannulation is achieved through repetitive practice under supervision, allowing interns and junior doctors to refine their skills and overcome challenges. However, access to opportunities for hands-on training, feedback from experienced mentors, and exposure to diverse patient populations can significantly influence practice. Factors such as time constraints, stress, and organizational culture may also impact the frequency and quality of IV cannulation performed by interns and junior doctors

A study reported that rate of phlebitis, hematoma, infiltration and extravascation were 21, 12, 7 and 3.5% respectively. Another study reported that rate of increased infection related to IV cannulation procedure was approximately 12.94%. Assessment of the knowledge, attitude, and practice (KAP) of IV cannulation among young doctors can help identify gaps in competency and guide targeted

educational interventions. This study was therefore undertaken to evaluate the KAP regarding IV cannulation among interns and junior doctors in a tertiary care teaching hospital.

Objectives

1. To assess the level of knowledge, attitude, and practice regarding IV cannulation among interns and junior doctors.
2. To identify areas of deficiency in knowledge and practice.
3. To determine the association between knowledge, attitude, and practice scores.

Materials and Methods

Study Design and Setting

A **descriptive cross-sectional study** was conducted between April and June 2025 at PES Institute of Medical Sciences and Research, a tertiary care teaching hospital in Bengaluru, India.

Study Population

Participants included:

- **Interns (House Surgeons)** who had completed at least six months of internship, and
- **Junior Doctors** (Postgraduates in 1st year and recently graduated MBBS doctors) involved in routine patient care.

Sample Size and Sampling

Assuming a 50% expected prevalence of adequate knowledge and a 10% margin of error at 95% confidence, the minimum sample size was calculated as 96. To improve representation, **120 participants** were included using **convenience sampling** (60 interns and 60 junior doctors).

Inclusion Criteria

- Willing to provide informed consent
- Currently performing IV cannulations as part of their routine duties

Exclusion Criteria

- Doctors not directly involved in patient care
- Those who had undergone formal advanced IV therapy certification courses

Data Collection Tool

A **semi-structured, pre-validated questionnaire** was designed based on literature review and expert input from pharmacology and nursing departments. It consisted of four sections:

1. **Demographics:** age, gender, designation, department, and experience.
2. **Knowledge (10 items):** covering anatomy, aseptic technique, complications, and catheter care.
3. **Attitude (7 items):** Likert scale statements (strongly agree–strongly disagree) assessing perception of importance and safety practices.
4. **Practice (8 items):** frequency-based questions on routine cannulation behaviors.

The total possible score was 10 (knowledge), 35 (attitude), and 25 (practice).

Scoring Criteria

- Knowledge: ≥ 8 = good, 6–7 = average, ≤ 5 = poor
- Attitude: ≥ 28 = positive, < 28 = negative
- Practice: ≥ 20 = good, < 20 = poor

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee. Written informed consent was obtained from all participants. Data confidentiality was maintained.

Data Analysis

Responses were entered in Microsoft Excel and analyzed using SPSS v26. Descriptive statistics (mean, SD, frequency, percentage) were calculated. Chi-square test was used to assess associations between categorical variables, and Pearson correlation was applied to test relationships between KAP scores. $p < 0.05$ was considered statistically significant.

Results

Participant Characteristics

Of 120 participants, 68 (56.7%) were females and 52 (43.3%) males. The mean age was 25.1 ± 1.3 years. The average clinical experience was 10.6 ± 3.2 months among interns and 2.1 ± 0.8 years among junior doctors.

Knowledge

The **mean knowledge score** was **7.2 ± 1.5** out of 10.

- 52 (43.3%) had good knowledge,
- 54 (45%) average, and
- 14 (11.7%) poor knowledge.

Specific knowledge gaps were noted:

- Only 60% correctly identified the ideal cannula size for adult medical wards.
- 72% knew that the maximum recommended dwell time for a peripheral IV cannula is 72–96 hours.
- 85% recognized the need for hand hygiene before the procedure.
- 68% knew that visible phlebitis warrants immediate removal of the cannula.

Attitude

Overall, participants showed a **positive attitude** (mean = 28.6 ± 3.1/35).

- 90% agreed that IV cannulation is a skill requiring periodic retraining.
- 87% believed aseptic precautions are critical to patient safety.
- 70% felt that supervision and feedback from seniors improve competence.
- However, 28% considered IV cannulation a "routine procedure that does not require supervision," indicating overconfidence among some respondents.

Practice

The **mean practice score** was **20.4 ± 2.8** out of 25.

- 68 participants (56.7%) demonstrated good practice.
- 52 (43.3%) had suboptimal practice.

Key observations:

- 62% always performed hand hygiene before cannulation.
- 78% routinely used gloves.
- 65% used single-use tourniquets, while 35% reused them occasionally.
- 72% flushed the cannula after medication administration.
- Only 40% consistently documented insertion date and time.
- 25% reported occasionally reusing extension sets, highlighting infection-control concerns.

Association Between KAP Scores

A significant positive correlation was observed between knowledge and practice scores ($r = 0.48$, $p < 0.001$), and between attitude and practice ($r = 0.36$, $p = 0.002$). Junior doctors had significantly higher mean knowledge and practice scores compared to interns ($p = 0.01$). Gender and department were not significantly associated with KAP levels.

Table 1. Socio-Demographic Characteristics of Participants (n = 120)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	23–25	68	56.7
	26–28	45	37.5
	>28	7	5.8
Gender	Male	52	43.3
	Female	68	56.7
Designation	Intern	60	50.0
	Junior Doctor	60	50.0
Mean Clinical Experience (months)	—	—	14.2 ± 5.1

Table 2. Distribution of Knowledge, Attitude, and Practice Levels

Variable	Category	Interns (n=60)	Junior Doctors (n=60)	Total (n=120)
Knowledge	Good	24 (40%)	28 (46.7%)	52 (43.3%)
	Average	28 (46.7%)	26 (43.3%)	54 (45%)
	Poor	8 (13.3%)	6 (10%)	14 (11.7%)
Attitude	Positive	50 (83.3%)	58 (96.7%)	108 (90%)
	Negative	10 (16.7%)	2 (3.3%)	12 (10%)
Practice	Good	30 (50%)	38 (63.3%)	68 (56.7%)
	Poor	30 (50%)	22 (36.7%)	52 (43.3%)

Table 3. Mean Knowledge, Attitude, and Practice Scores

Parameter	Mean ± SD (Interns)	Mean ± SD (Junior Doctors)	p-value
Knowledge (out of 10)	6.8 ± 1.4	7.6 ± 1.3	0.012*
Attitude (out of 35)	27.9 ± 3.2	29.3 ± 2.7	0.041*
Practice (out of 25)	19.8 ± 2.5	21.1 ± 2.7	0.018*

Table 4. Correlation Between Knowledge, Attitude, and Practice Scores

Variables Compared	Pearson's Correlation (r)	p-value	Interpretation
Knowledge vs Practice	0.48	<0.001	Moderate positive correlation
Attitude vs Practice	0.36	0.002	Weak positive correlation
Knowledge vs Attitude	0.29	0.008	Weak positive correlation

Table 5. Specific Practice Patterns Observed

Practice Item	Always (%)	Sometimes (%)	Rarely/Never (%)
Hand hygiene before cannulation	62	30	8
Use of sterile gloves	78	18	4
Use of single-use tourniquets	65	25	10
Flushing cannula after use	72	20	8
Documentation of insertion date/time	40	38	22
Removal at first sign of phlebitis	68	24	8
Reuse of extension sets	8	17	75

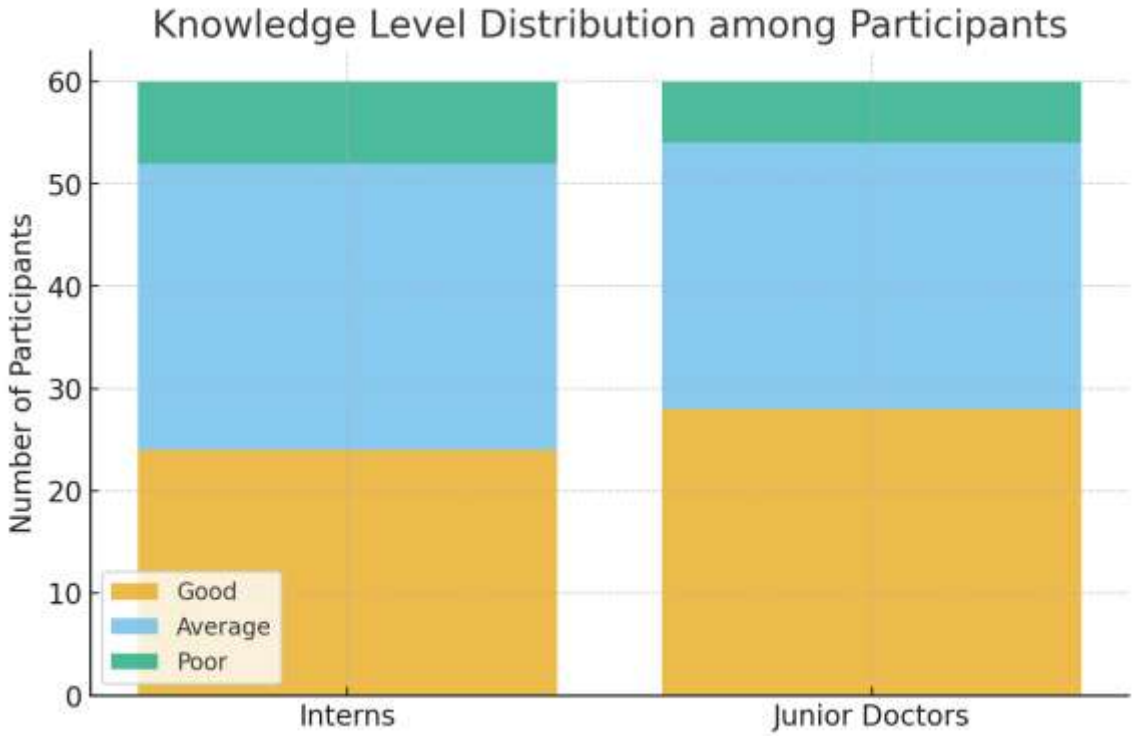


Figure 1: stacked bar chart showing good, average, and poor knowledge levels among interns and junior doctors.

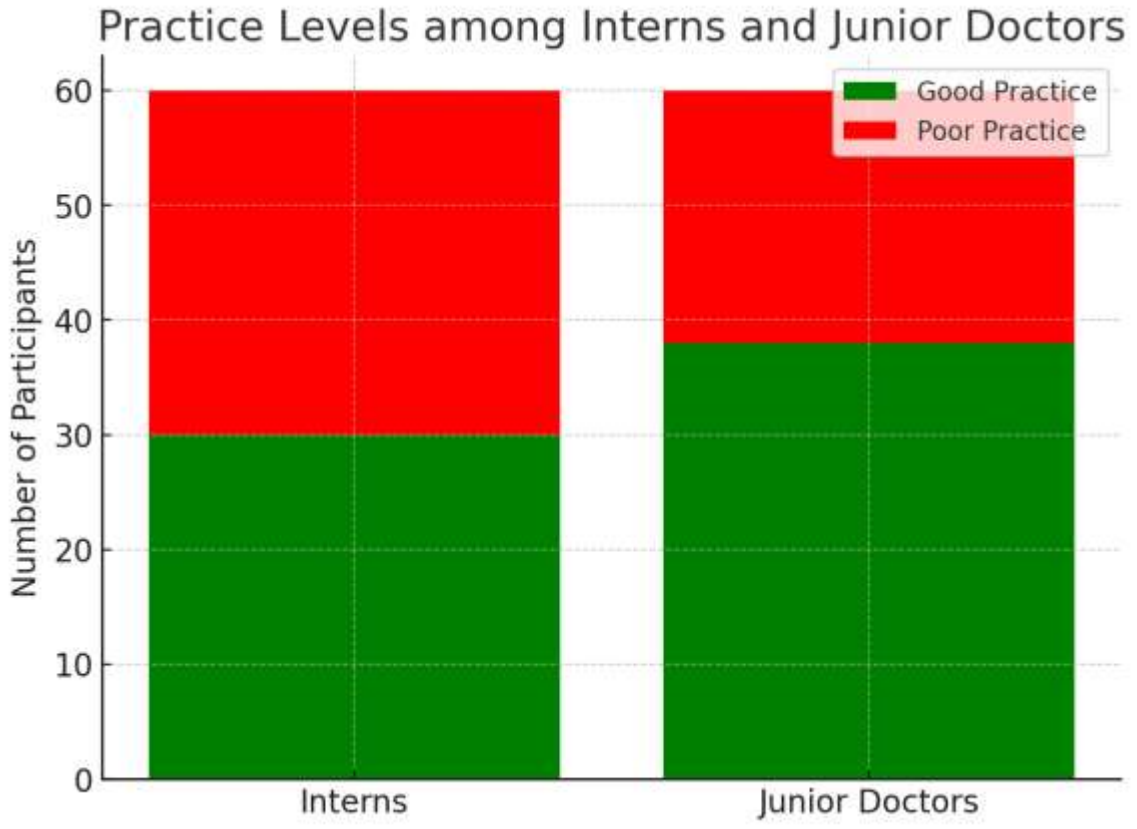


Figure 2: Bar chart comparing good vs. poor practice levels across both groups.

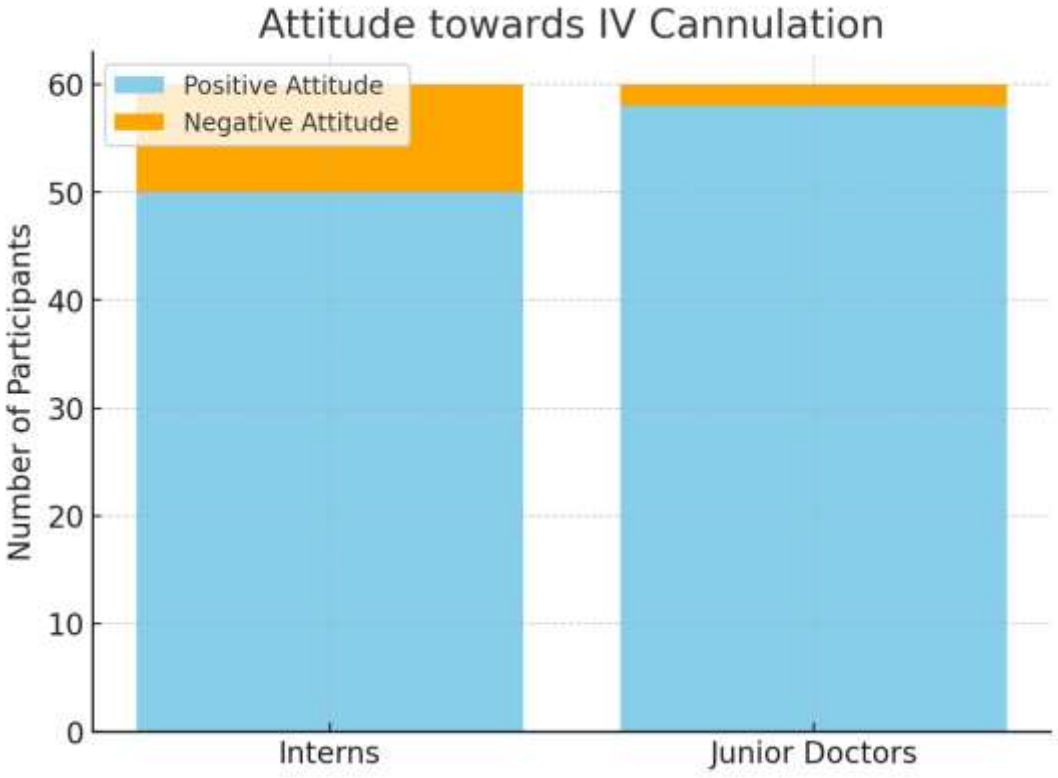


Figure 3: Attitude Distribution – illustrates the prevalence of positive and negative attitudes toward IV cannulation.

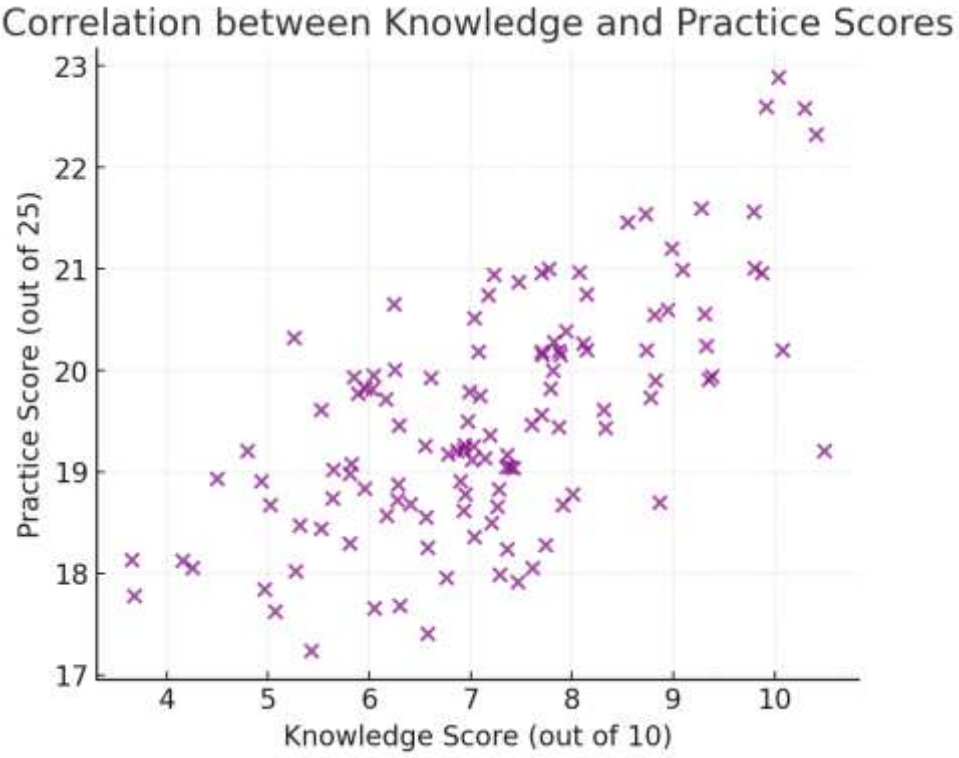


Figure 4: Correlation Scatter Plot – demonstrates the positive correlation between knowledge and practice scores (r ≈ 0.48).

Discussion

This study assessed the knowledge, attitude, and practice regarding IV cannulation among interns and junior doctors in a tertiary care teaching hospital. The findings revealed that although overall knowledge and attitude were satisfactory, there existed a noticeable gap between theoretical

understanding and consistent application of safe practices. A similar cross-sectional study by Al-Qahtani et al. (2022) among Saudi medical interns reported 74% good knowledge but only 58% good practice, mirroring our findings. Another Indian study by Ramesh et al. (2019) found that only 48% adhered to hand hygiene protocols before IV cannulation. Thus, the issue appears universal across developing and developed contexts.

Knowledge and Training

More than 40% of participants demonstrated only average knowledge. This aligns with previous studies by Sharma et al. (2021) and Banerjee et al. (2020), which reported similar deficiencies among interns. The gaps regarding dwell time and catheter selection suggest limited reinforcement during clinical postings. Regular bedside demonstrations and simulation-based skill training could improve procedural understanding.

Attitude and Perception

Most respondents acknowledged the importance of aseptic technique and supervision, reflecting a positive outlook towards safe cannulation practices. However, the perception by some that supervision is unnecessary indicates a possible false sense of proficiency, often seen when interns gain early exposure without formal assessment. Periodic competency assessments could correct such misconceptions.

Practice Patterns

Although the majority claimed to follow aseptic precautions, actual adherence rates (e.g., hand hygiene = 62%) were lower than expected. Studies have shown self-reported practices often overestimate actual compliance. Reuse of tourniquets and extension sets highlights potential lapses in infection prevention, possibly due to supply limitations or time pressure in busy wards. Documentation of cannula insertion was also poor, increasing the risk of delayed removal and phlebitis.

The observed positive correlation between knowledge and practice indicates that better-informed participants were more likely to follow safe practices, underscoring the importance of knowledge reinforcement. Junior doctors performed better than interns, likely due to experience and repetition.

Implications for Training

Competency in IV cannulation is a core clinical skill that should be objectively assessed during internship. The results indicate the need for:

1. Structured Skill Workshops: Periodic simulation-based hands-on sessions emphasizing aseptic technique and troubleshooting complications.
2. Checklist-Based Supervision: Senior doctors or nurses should observe and certify interns before independent practice.
3. Infection Control Reinforcement: Integrating cannulation care bundles and regular audits in wards.
4. Policy Implementation: Ensuring single-use tourniquets, sterile dressings, and proper documentation of insertion and removal.

Strengths and Limitations

Strengths:

- Inclusion of both interns and junior doctors allows comparison across experience levels.
- Use of a validated questionnaire ensures reliability.

Limitations:

- Self-reported data may overestimate good practices.
- Conducted in a single institution, hence findings may not be generalizable.
- Direct observation of procedures was not done due to feasibility constraints.

Conclusion

The study revealed that while interns and junior doctors possessed adequate knowledge and a positive attitude towards IV cannulation, several gaps remained in consistent application of aseptic practices. Key deficiencies were observed in hand hygiene compliance, documentation, and equipment reuse. Enhancing hands-on training, supervision, and periodic evaluation can bridge the knowledge-practice gap and reduce procedure-related complications. The following Recommendations can be considered. Conduct mandatory workshops on IV cannulation for all interns at the beginning of internship, Introduce competency-based assessment checklists for procedural certification, Reinforce infection-control principles through posters and reminders in wards, Ensure adequate supply of disposable items (tourniquets, dressings) to prevent reuse, Perform periodic audits of cannulation practices and complication rates.

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