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A KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) STUDY ON PHLEBOTOMY AMONG NURSES IN A TERTIARY CARE HOSPITAL IN LAHORE

Shahraiz Ihsan*[1], Kousar Perveen[2], Sajida Batool[3]

*[1]*BSN, Superior University, College of Nursing, Lahore*
[2]*Associate Professor Superior University College of Nursing, Lahore*
[3]*Assistant Professor Superior University College of Nursing, Lahore*

*[1]shahraizihsan74@gmail.com, [2]kous84@gmail.com, [3]sajidabatool0@gmail.com

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Corresponding Author: *
Shahraiz Ihsan

Abstract

Background: *Phlebotomy is one of the most frequently performed invasive clinical procedures in healthcare delivery. Proper blood sampling technique is vital for pre-analytical diagnostic accuracy, patient safety, and the prevention of occupational hazards such as needle-stick injuries. Despite its routine nature, inadequate phlebotomy knowledge and substandard clinical practices among nurses can cause pre-analytical sample rejections, diagnostic errors, and hospital-acquired bloodborne infections.*

Objective: *To assess the level of knowledge, attitude, and self-reported practice (KAP) regarding phlebotomy among registered nurses at Choudhry Muhammad Akram (CMA) Teaching and Research Hospital, Lahore.*

Methodology: *A descriptive cross-sectional quantitative research design was employed among 110 registered bedside nurses at CMA Teaching and Research Hospital, Lahore. Participants were recruited through convenience sampling from medical, surgical, obstetrics/gynecology, emergency, and intensive care departments. Data were collected using a validated, structured self-administered questionnaire aligned with Clinical and Laboratory Standards Institute (CLSI) and World Health Organization (WHO) phlebotomy guidelines. The instrument captured demographics, 10 knowledge items, 10 attitude items, and 10 practice items. Data were analyzed using SPSS Version 26.0, employing descriptive statistics, chi-square tests, and domain comparisons, with statistical significance established at $p < 0.05$.*

Results: *The majority of participants were female (78.2%, n = 86), aged 26–35 years (36.4%, n = 40), held a B.Sc. Nursing degree (42.7%, n = 47), and worked as staff nurses (52.7%, n = 58). The overall mean knowledge score was 4.68 ± 2.42 out of 10 (46.8%), with only 22.7% showing Good knowledge, 57.3% Moderate knowledge, and 20.0% Poor knowledge. Serious theoretical deficits were observed regarding needle insertion angles (30.9% correct), tube additives for glucose (31.8% correct), and re-palpation of disinfected venepuncture sites (34.5% correct). The mean attitude score was 22.98 ± 8.51 out of 40 (57.5%), with 50.0% displaying Moderate and 35.5% Good attitude. The mean practice score was 19.82 ± 7.14 out of 30 (66.1%), with 48.2% reporting good*

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practice. However, alarmingly high frequencies of undesirable practices were reported, including pushing blood through needles into vacutainers (76.3% at least sometimes), drawing blood from existing IV cannula lines (75.5% at least sometimes), and decanting blood between tubes (78.2% at least sometimes).

Conclusion: *Bedside nurses demonstrated moderate overall attitudes and self-reported practices, but significant theoretical knowledge gaps and critical procedural deviations persist. The widespread occurrence of unsafe blood transfer practices poses severe risks of in-vitro hemolysis, spurious laboratory results, and needle-stick injuries. Urgent hospital-wide phlebotomy education, standardized CLSI-aligned procedural checklists, and regular clinical competency audits are essential.*

1. Introduction

Phlebotomy, the clinical practice of puncturing a vein to withdraw venous blood for diagnostic laboratory testing, is the single most commonly executed invasive procedure in clinical healthcare. Diagnostic pathology results guide up to 70% to 80% of clinical decisions regarding hospital admission, pharmacotherapy, surgical intervention, and patient discharge. The diagnostic pathway is conventionally separated into three interdependent phases: the pre-analytical phase, the analytical phase, and the post-analytical phase. Extensive laboratory medicine literature reveals that pre-analytical errors account for 60% to 70% of all laboratory diagnostic inaccuracies.

The pre-analytical phase is almost entirely manual, operator-dependent, and decentralized across diverse hospital inpatient units. It encompasses test requisition, positive patient identification, patient preparation, venepuncture technique, needle gauge selection, order of draw, correct tube additive filling, gentle specimen inversion, bedside tube labeling, and rapid specimen transport. Because bedside nurses carry primary operational responsibility for blood collection in inpatient hospital settings, their clinical knowledge, safety attitudes, and procedural competence directly govern pre-analytical specimen integrity.

Flawed phlebotomy practices trigger severe clinical consequences. Drawing blood above an active intravenous fluid infusion or collecting specimens through an indwelling peripheral cannula dilutes blood with infused fluids, producing falsely depressed electrolyte, hemoglobin, and glucose concentrations. Forcing blood under pressure through narrow-gauge hypodermic needles into vacuum tubes ruptures delicate red blood cell membranes, causing extensive in-vitro hemolysis. Beyond specimen integrity, phlebotomy presents critical occupational hazards for healthcare personnel through occupational needle-stick injuries (NSIs). Therefore, this study aims to systematically assess the level of knowledge, attitude, and self-reported practice (KAP) regarding phlebotomy among registered nurses at Choudhry Muhammad Akram (CMA) Teaching and Research Hospital, Lahore.

2. Methodology

2.1 Study Design and Setting

A quantitative descriptive cross-sectional research design was utilized. The study was conducted across inpatient units (medical, surgical, obstetrics/gynecology, emergency, and ICUs) at Choudhry Muhammad Akram (CMA) Teaching and Research Hospital, Lahore, Punjab, Pakistan.

2.2 Population and Sampling

The target population comprised all registered bedside nurses performing blood sampling in target units. Using Slovin's mathematical formula for finite populations (N=150) at a 95% confidence level and 5% margin of error, a sample size of 110 was calculated and achieved (N=110) using non-probability convenience sampling.

2.3 Data Collection Instrument

Data were gathered using a structured self-administered questionnaire aligned with CLSI GP41 and WHO guidelines, comprising four sections: Section A (Demographic Profile), Section

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B (10-item Knowledge Scale scored 0–10), Section C (10-item Attitude Scale scored 10–40 on a 4-point Likert scale), and Section D (10-item Clinical Practice Scale scored 10–30 on a 3-point Likert scale with reverse-scoring for hazardous shortcuts). Cronbach's alpha values were 0.82 for knowledge, 0.79 for attitude, and 0.81 for practice.

2.4 Data Analysis

Data were analyzed using SPSS Version 26.0. Descriptive statistics and inferential statistics (Chi-square tests of independence and Pearson correlation) were executed at $p < 0.05$.

3. Results

A total of 110 validated questionnaires were analyzed. The sample comprised 78.2% female nurses (n=86) and 21.8% male nurses (n=24). The largest age category was 26–35 years (36.4%). Regarding education, 42.7% held a B.Sc. Nursing degree, 38.2% a Diploma (GNM), and 19.1% an M.Sc. Nursing degree. Staff Nurses constituted 52.7% of the sample.

Table 1: Collective Demographic Data of the Participants (N = 110)

Sr. No.	Demographic Variables	Category	Frequency (n)	Percentage (%)
01	Gender of the Participants	Female	86	78.2%
		Male	24	21.8%
02	Age Group (Years)	< 26 years	36	32.7%
		26–35 years	40	36.4%
		> 35 years	34	30.9%
03	Educational Qualification	GNM / Diploma	42	38.2%
		B.Sc. Nursing	47	42.7%
		M.Sc. Nursing	21	19.1%
04	Designation	Staff Nurses (GN/RN)	58	52.7%
		Nursing Officer	40	36.4%
		Senior Nursing Officer	12	10.9%
05	Working Department	Medical Ward	20	18.2%
		Surgical Ward	18	16.4%
		Obs & Gynae	18	16.4%
		Trauma & Emergency	18	16.4%
		ICUs	23	20.9%
		Others (HDU, HICC, BB)	13	11.8%

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Table 2: Comparison Across KAP Domains (N = 110)

KAP Domain	Mean Score	Std. Deviation	Mean Percentage	Good Level %
Knowledge (out of 10)	4.68	2.42	46.8%	22.7%
Attitude (out of 40)	22.98	8.51	57.5%	35.5%
Practice (out of 30)	19.82	7.14	66.1%	48.2%

The mean knowledge score was 4.68 ± 2.42 out of 10 (46.8%). Major theoretical knowledge deficits were identified regarding proper needle insertion angles (30.9% correct), tube additives for glucose (31.8% correct), and re-palpation of disinfected sites (34.5% correct). Self-reported practice averaged 19.82 ± 7.14 out of 30 (66.1%). However, alarmingly high frequencies of hazardous shortcuts were reported:

Table 3: Prevalence of Hazardous Undesirable Phlebotomy Practices

Undesirable Practice Item	Always %	Sometimes %	Never % (Recommended)
P6: Pushing blood through needle into vacutainers	41.8%	34.5%	23.6%
P7: Drawing blood from existing peripheral IV cannulae	47.3%	28.2%	24.5%
P10: Decanting/pouring blood between additive tubes	50.0%	28.2%	21.8%

4. Discussion

This empirical investigation establishes that registered nurses at CMA Hospital possess moderate overall attitudes (57.5%) and self-reported practices (66.1%), but exhibit poor theoretical knowledge (46.8%) regarding phlebotomy standards.

The severe knowledge gaps regarding needle insertion angles (>45° vs. recommended 15°–30°), glucose specimen tube selection, and re-palpation of disinfected sites reflect common pre-analytical vulnerabilities. Steep needle angles easily pierce posterior venous walls, inducing severe hematomas and nerve pain, while re-palpation directly contaminates puncture sites.

Most concerningly, over 75% of nurses reported engaging in hazardous shortcuts at least sometimes, including forced syringe plunger transfer (76.3%), IV cannula drawing (75.5%), and decanting blood between tubes (78.2%). Syringe pressure causes intense shear stress resulting in mechanical hemolysis and spurious electrolyte elevations, while decanting causes severe cross-additive contamination. Pearson correlation ($r = 0.384$, $p < 0.001$) confirmed that higher theoretical knowledge is essential to eradicate these dangerous clinical shortcuts.

5. Conclusion & Actionable Recommendations

Although self-reported practice scores appear moderate, critical theoretical knowledge deficits and dangerous procedural shortcuts persist among bedside nurses at CMA Hospital, Lahore. The following actions are recommended:

1. Standard Operating Procedure (SOP) Posters: Post laminated CLSI-aligned SOP posters across all ward preparation counters detailing the order of draw, insertion angles, and tube inversion rules.

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2. Closed Vacuum Hardware Procurement: Procure closed vacuum collection systems, multi-sample needle adapters, and safety transfer devices to replace open syringe sampling.

3. Mandatory Phlebotomy Skills Workshops: Implement a mandatory 2-day simulation workshop on phlebotomy technique and pre-analytical error prevention for all nursing staff.

4. Prohibition of Hazardous Shortcuts: Enforce a strict zero-tolerance policy against decanting blood between tubes and routine drawing from indwelling IV lines.

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