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ASSESSMENT OF KNOWLEDGE AND PRACTICES RALATES TO INPATIENT GLYCEMIC CONTROL AMONG NURSES: A CROSS-SECTIONAL STUDY

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Abstract

Background: Diabetes mellitus is a major global public health challenge, and effective inpatient glycemic control is essential for reducing diabetes-related complications, improving patient safety, and enhancing clinical outcomes. However, inadequate knowledge and inconsistent clinical practices among nurses may adversely affect the quality of inpatient diabetes care. Objective: To assess the knowledge and practices regarding inpatient glycemic control among registered nurses working at Allama Iqbal Teaching Hospital dera ghazi khan and to determine the relationship between knowledge and clinical practices. Methodology: A descriptive cross-sectional study design was employed at Allama Iqbal Teaching Hospital dera ghazi khan. A total of 101 registered nurses were selected through simple random sampling. Data were collected using a structured, adapted questionnaire consisting of three sections: socio-demographic characteristics, knowledge regarding inpatient glycemic control (20 items), and practices regarding inpatient glycemic control (15 items). Data were analyzed using SPSS version 27. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the data. Inferential statistics, including the Independent Samples t-test, One-Way ANOVA, and Pearson correlation, were applied to determine associations and relationships. Statistical significance was considered at $p < 0.05$. Results: The findings revealed that the majority of participants were female (88.1%), aged 26–30 years (37.6%), and held a BSN degree (52.5%). Overall, 46.5% of the nurses demonstrated a moderate level of knowledge, while 41.6% had good knowledge regarding inpatient glycemic control. More than half of the participants (52.5%) demonstrated good clinical practices. The mean knowledge score was 16.28 ± 2.41, whereas the mean practice score was 61.84 ± 6.52. Previous diabetes-related training and educational qualification were significantly associated with both knowledge and practice scores ($p < 0.05$). A statistically significant moderate positive correlation was observed between knowledge and practice scores ($r = 0.468$, $p < 0.001$), indicating that higher knowledge was associated with better clinical practices. Conclusion: The study concluded that registered nurses possessed moderate to good knowledge and

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generally good clinical practices regarding inpatient glycemic control. Continuous professional education, competency-based training, and regular assessment of nursing competencies are recommended to strengthen evidence-based inpatient glycemic management and improve the quality and safety of patient care.

INTRODUCTION

Diabetes mellitus (DM) is one of the most prevalent chronic metabolic disorders worldwide and represents a major public health challenge due to its increasing incidence, associated complications, and substantial healthcare costs. The disease is characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Over the past two decades, the global burden of diabetes has increased dramatically, affecting individuals across all age groups and placing enormous pressure on healthcare systems. According to the International Diabetes Federation (IDF), approximately 537 million adults were living with diabetes worldwide in 2021, and this number is projected to increase to 643 million by 2030 and 783 million by 2045 if effective preventive and management strategies are not implemented (International Diabetes Federation, 2021). Similarly, the World Health Organization (WHO) recognizes diabetes as one of the leading causes of cardiovascular disease, kidney failure, blindness, lower-limb amputation, and premature mortality worldwide (WHO, 2023).

Inpatient diabetes management has become an increasingly important component of hospital care because a significant proportion of hospitalized patients either have pre-existing diabetes or develop stress-induced hyperglycemia during acute illness. Hospitalized patients with poorly controlled blood glucose levels are at increased risk of healthcare-associated infections, delayed wound healing, prolonged hospital stay, intensive care unit admission, increased healthcare costs, and mortality. Maintaining optimal inpatient glycemic control through regular blood glucose monitoring, timely insulin administration, nutritional management, and prevention of hypo- and hyperglycemia is therefore considered a critical indicator of quality nursing care. International clinical guidelines recommend maintaining individualized glycemic targets while minimizing episodes of hypoglycemia to improve patient outcomes and enhance patient safety (ADA, 2025; WHO, 2023).

Nurses play a central role in achieving effective inpatient glycemic control because they are directly responsible for blood glucose monitoring, insulin preparation and administration, recognition of hypo- and hyperglycemia, medication documentation, patient assessment, and diabetes education during hospitalization. Since nurses remain in continuous contact with patients, their knowledge and clinical practices significantly influence glycemic outcomes and the prevention of diabetes-related complications. Evidence suggests that inadequate knowledge regarding insulin therapy, inappropriate blood glucose monitoring techniques, medication errors, and inconsistent adherence to evidence-based guidelines may compromise patient safety and negatively affect the quality of diabetes care. Consequently, enhancing nurses' competencies in inpatient glycemic management has become an international priority for improving healthcare quality and reducing preventable adverse events (ADA, 2025; IDF, 2021).

Assessing the knowledge and practices of registered nurses regarding inpatient glycemic control will provide valuable baseline information for hospital administrators, nursing educators, and policymakers. The findings of the present study may assist in identifying deficiencies in nurses' competencies, planning targeted continuing nursing education programs, developing evidence-based institutional protocols, and improving adherence to current diabetes management guidelines. Ultimately, strengthening nurses' knowledge and clinical

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practices is expected to enhance patient safety, reduce diabetes-related complications, improve clinical outcomes, and promote high-quality nursing care for hospitalized patients with diabetes. Therefore, this study aims to assess the knowledge and practices regarding inpatient glycemic control among nurses working working in Allama Iqbal Teaching Hospital Dera Ghazi khan.

Literature Review

Diabetes mellitus (DM) is one of the most common chronic metabolic disorders and has become a major global public health concern due to its rapidly increasing prevalence and associated complications. The increasing number of people living with diabetes has substantially increased hospital admissions related to diabetes and stress-induced hyperglycemia. Hospitalized patients with diabetes frequently experience fluctuations in blood glucose levels because of acute illness, surgery, infection, medications, and changes in nutritional intake. These fluctuations increase the risk of adverse clinical outcomes, making effective inpatient glycemic control an essential component of quality hospital care (Nematollahi & Omoregie, 2023; Thabit & Schofield, 2024).

Inpatient glycemic control refers to maintaining blood glucose levels within recommended target ranges throughout hospitalization while preventing both hyperglycemia and hypoglycemia. Evidence demonstrates that uncontrolled inpatient hyperglycemia is associated with delayed wound healing, increased incidence of healthcare-associated infections, prolonged hospitalization, higher treatment costs, intensive care unit admission, and increased mortality. Likewise, severe hypoglycemia may result in neurological complications, cardiac arrhythmias, and poor patient outcomes. Recent systematic reviews of international clinical practice guidelines emphasize that routine blood glucose monitoring, appropriate insulin therapy, and individualized glycemic targets are fundamental components of safe inpatient diabetes management (Schulman-Rosenbaum, 2023; Management of Diabetes and Hyperglycemia in the Hospital: A Systematic Review of Clinical Practice Guidelines, 2025).

Methodology

Study Design

A quantitative, descriptive cross-sectional research design will be used to assess the knowledge and practices regarding inpatient glycemic control among registered nurses working at Allama Iqbal Teaching Hospital dera ghazi khan, Punjab, Pakistan.

Study Setting

The study was conducted in Allama Iqbal Teaching Hospital dera ghazi khan, Punjab, Pakistan.

Study Duration

The study was completed over a period of six months following ethical approval from the Research Ethical Committee (REC).

Study Population

The target population comprised registered nurses working in various department of the hopsital.

Sample Size

A sample of 101 participants was determined using OpenEpi software.

Sampling Technique

Participants were selected using simple random sampling to ensure equal probability of inclusion and to minimize selection bias.

Inclusion Criteria

- Registered nurses
- Minimum of six months' experience.
- Direct involvement in nursing care
- Willingness to participate and provision of informed consent

Exclusion Criteria

- Healthcare providers in administrative positions or not directly involved in patient care
- Individuals on extended leave (maternity,

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study, or medical)
- Contract-based employees
- Those who were unwell during data collection.

Research Instrument

Data collected by using a structured, self-administered questionnaire adapted from an open-access instrument on inpatient glycemic control and recent evidence-based diabetes management guidelines. The questionnaire prepared in the English language and consists of three sections.

Section A: Demographic Information: This section included participants' demographic and professional characteristics, including age, gender, educational qualification, years of clinical experience, working department, previous diabetes-related training, and duration of clinical practice.

Section B: Knowledge Regarding Inpatient Glycemic Control: This section consists of **20 multiple-choice questions** assessing nurses' knowledge regarding inpatient glycemic control, including blood glucose monitoring, target glycemic ranges, insulin administration, recognition and management of hypoglycemia and hyperglycemia, medication safety, and evidence-based diabetes management. Each correct response scored as **1**, while an incorrect response scored as **0**. The total knowledge score ranged from **0 to 20**, with higher scores indicating better knowledge.

Section C: Practices Regarding Inpatient Glycemic Control: This section consists of **15 practice statements** measured on a five-point Likert scale ranging from **1 = Never** to **5 = Always**. The items assessed nurses' routine clinical practices related to blood glucose monitoring, insulin administration, documentation, patient assessment, management of glycemic emergencies, infection prevention, and patient education. The total practice score ranged from **15 to 75**, with higher scores indicating better clinical practices regarding inpatient glycemic control.

Validity of the Instrument

The questionnaire was adapted from an open-access validated instrument and updated according to the latest evidence-based recommendations for inpatient diabetes management. To ensure content validity in the local context, the questionnaire reviewed by a panel of **five experts** in nursing research, medical-surgical nursing, endocrinology, and diabetes care. Their suggestions regarding clarity, relevance, simplicity, and cultural appropriateness incorporated before final data collection.

Reliability of the Instrument

The reliability of the questionnaire assessed through a pilot study using **Cronbach's alpha coefficient**. A Cronbach's alpha value of **0.70 or above** considered acceptable for internal consistency.

Pilot Study

A pilot conducted among **10% of the calculated sample size** in a hospital other than the study setting. The purpose of the pilot study evaluated the clarity, feasibility, comprehensibility, and reliability of the questionnaire. Data collected during the pilot study were not included in the final analysis.

Data Collection Procedure

After obtaining ethical approval from the Institutional Ethical Review Committee and administrative permission from the Medical Superintendent and Nursing Administration of Allama Iqbal Teaching Hospital Dera Ghazi khan, eligible registered nurses approached during their duty hours. The purpose of the study explained, and written informed consent obtained from each participant. Participants assured that their participation is voluntary and that all information remained confidential. The questionnaires distributed personally by the researcher and collected immediately after completion or at a mutually agreed time. Each completed questionnaire checked for completeness before data entry.

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Data Analysis

Data entered, cleaned, and analyzed using the **Statistical Package for the Social Sciences (SPSS) version 27.0**. Descriptive statistics used to summarize the study variables. Frequencies, percentages, means, and standard deviations will be calculated for demographic characteristics, knowledge scores, and practice scores. Inferential statistics used to answer the research objectives. The relationship between knowledge and practice scores will be determined using **Pearson's correlation coefficient** after assessing the normality of the data. If the assumptions of normality are not met, **Spearman's rank correlation** used instead. The association between demographic variables and knowledge or practice scores assessed using the **Independent Samples t-test**, **One-Way Analysis of Variance (ANOVA)**, or their non-parametric equivalents where appropriate. A **p-value of <0.05** considered statistically significant.

Ethical Considerations

- All ethical standards were maintained in accordance with institutional guidelines:
- Approval was obtained from the Research Ethical Committee (REC) of Hospital.
- Written informed consent was obtained from each participant.
- Confidentiality and anonymity were maintained throughout the study.
- Participants were informed of their right to withdraw at any stage without penalty.
- No harm or risk was associated with participation in the study.

Results

Table 1 presents the demographic characteristics of the 101 registered nurses who participated in the study. Regarding age, the largest proportion of participants 38 (37.6%) belonged to the 26–30 years age group, followed by 24 (23.8%) participants aged 31–35 years, 20 (19.8%) aged 20–25 years, 13 (12.9%) aged 36–40 years, and 6 (5.9%) were above 40 years of age. With respect to gender, the majority of participants were female (89, 88.1%), whereas only 12 (11.9%) were male, indicating that the nursing workforce in the selected hospital was predominantly female. Regarding educational qualification, more than half of the participants 53 (52.5%) possessed a Bachelor of Science in Nursing (BSN) degree. In addition, 24 (23.8%) held a Diploma in Nursing, 17 (16.8%) were Post RN graduates, and only 7 (6.9%) had an MSN qualification. Concerning professional experience, 30 (29.7%) nurses had 4–6 years of clinical experience, followed by 28 (27.7%) with 1–3 years, 22 (21.8%) with 7–10 years, 11 (10.9%) with more than 10 years, and 10 (9.9%) with less than one year of experience. Based on the working unit, the highest number of participants 28 (27.7%) were working in the Medical Unit, followed by 22 (21.8%) in the Surgical Unit, 21 (20.8%) in the Intensive Care Unit (ICU), 18 (17.8%) in the Emergency Department, and 12 (11.9%) in other specialty units. Regarding previous diabetes-related training, 62 (61.4%) participants reported that they had not received any formal diabetes-related training, whereas 39 (38.6%) had attended previous diabetes education or training programs.Overall, the study participants were predominantly female BSN-qualified nurses aged 26–30 years, with 4–6 years of professional experience, mainly working in medical and surgical units, and the majority had not received previous diabetes-related training.

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Figure 4.1 Age Distribution of Participants

Distribution of participants according to age group (N = 101).

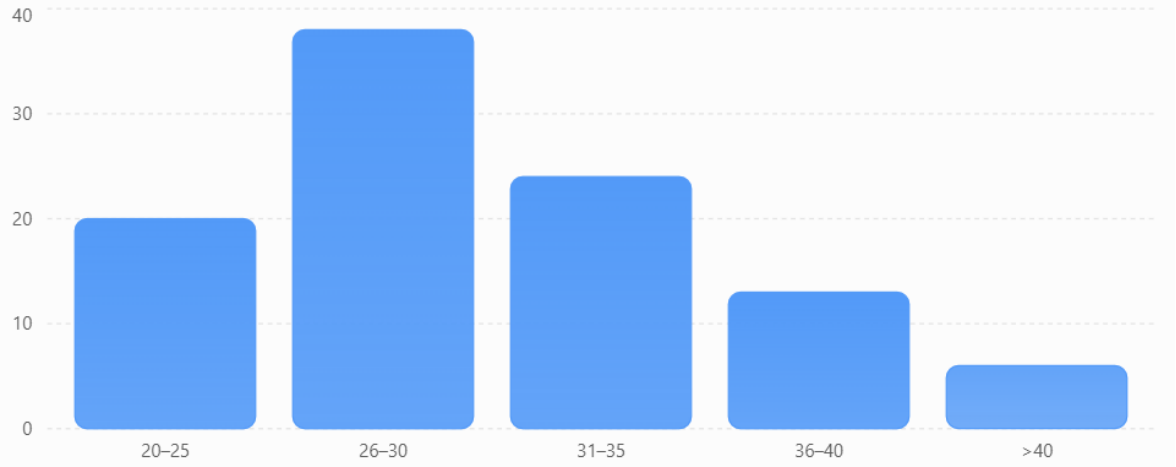


Figure 4.2 Gender Distribution

Distribution of participants according to gender (N = 101).



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Figure 4.3 Educational Qualification

Educational qualification of participants (N = 101).

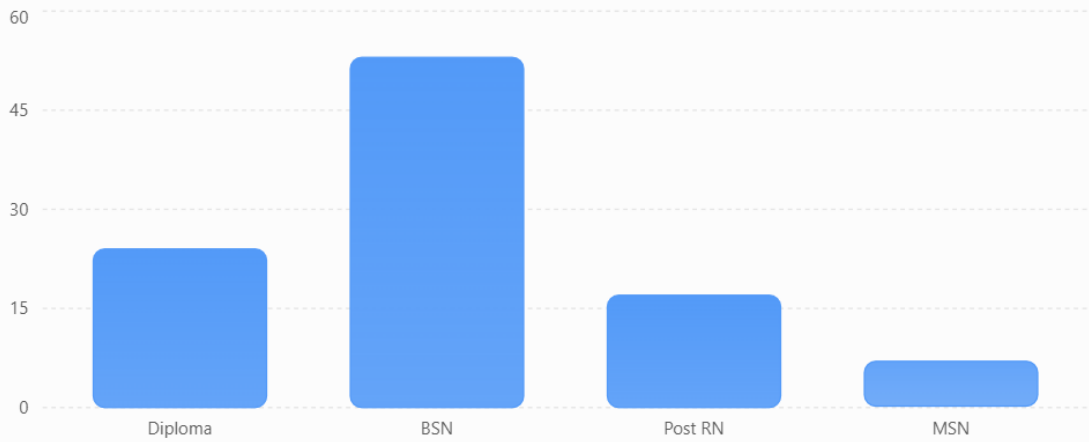


Figure 4.4 Years of Experience

Distribution of participants according to years of experience (N = 101).

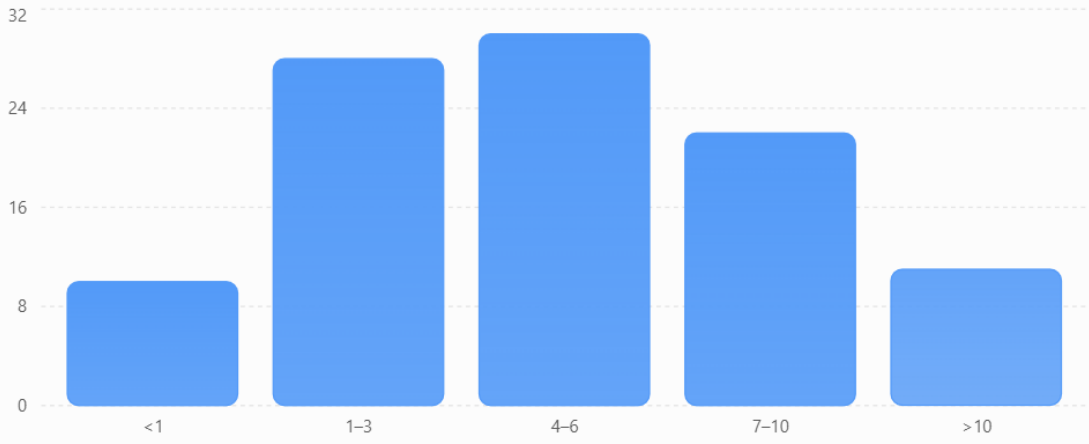


Table 1: Sample Distribution (N = 101)

Variable	Frequency	Percentage
Age (years)		
20–25	20	19.8
26–30	38	37.6
31–35	24	23.8

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Variable	Frequency	Percentage
36–40	13	12.9
>40	6	5.9
Gender		
Male	12	11.9
Female	89	88.1
Qualification		
Diploma	24	23.8
BSN	53	52.5
Post RN	17	16.8
MSN	7	6.9
Previous Diabetes Training		
Yes	39	38.6
No	62	61.4

Table 2 presents the overall knowledge level of registered nurses regarding inpatient glycemic control. The findings revealed that 42 (41.6%) participants had a good level of knowledge, 47 (46.5%) had a moderate level of knowledge, while only 12 (11.9%) demonstrated a poor level of knowledge. The overall mean knowledge score was 16.28 ± 2.41 out of a maximum possible score of 20, indicating that the majority of registered nurses possessed a moderate to good level of knowledge regarding inpatient glycemic control. Although most participants demonstrated satisfactory knowledge, a considerable proportion still exhibited moderate knowledge, suggesting the need for continuous professional education and regular diabetes-related training programs to further enhance nurses' knowledge.

Table 02: Level of Knowledge

Level	Frequency	Percentage
Poor	12	11.9
Moderate	47	46.5
Good	42	41.6

Table 3 illustrates the overall practice level of registered nurses regarding inpatient glycemic control. Among the 101 participants, **53 (52.5%)** demonstrated **good clinical practices**, **39 (38.6%)** had **moderate practices**, whereas only **9 (8.9%)** showed **poor practice** regarding inpatient glycemic control. The overall mean practice score was **61.84 ± 6.52** out of a maximum possible score of 75, indicating that the majority of nurses reported **good clinical practices** related to inpatient glycemic control. These findings suggest that although nursing practices were generally

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satisfactory, a substantial proportion of nurses still demonstrated moderate practice levels, highlighting the importance of ongoing clinical training, adherence to evidence-based protocols, and continuous professional development programs to further improve the quality of diabetes care.

Table 03: Level of practices

Level	Frequency	Percentage
Poor	9	8.9
Moderate	39	38.6
Good	53	52.5

The association between demographic characteristics and knowledge scores regarding inpatient glycemic control among registered nurses was examined using the Independent Samples t-test and One-Way ANOVA. The findings revealed that there was **no statistically significant difference** in knowledge scores between male and female nurses (t = -1.73, **p = 0.087**), indicating that gender had no significant influence on knowledge levels. However, nurses who had received previous diabetes-related training demonstrated significantly higher knowledge scores (Mean = **17.54 ± 1.82**) compared with those who had not received training (Mean = **15.49 ± 2.36**) (t = 4.89, **p < 0.001**). Furthermore, a statistically significant difference in knowledge scores was observed among different age groups (F = 2.91, **p = 0.025**). Similarly, educational qualification was significantly associated with knowledge scores (F = 5.62, **p = 0.001**), with nurses holding MSN qualifications achieving the highest mean knowledge score. These findings suggest that diabetes-related training, age, and educational qualification were associated with better knowledge regarding inpatient glycemic control.

Table 04: Association of Demographic Variables with Knowledge Scores

Variable	Category	n	Mean ± SD	Test Value	p-value
Gender	Male	12	15.42 ± 2.61	t = -1.73	0.087
	Female	89	16.41 ± 2.28		
Previous Diabetes Training	Yes	39	17.54 ± 1.82	t = 4.89	<0.001
	No	62	15.49 ± 2.36		
Age (Years)	20–25	20	15.60 ± 2.44	F = 2.91	0.025
	26–30	38	16.72 ± 2.10		
	31–35	24	16.45 ± 2.31		
	36–40	13	15.84 ± 2.54		
	>40	6	17.17 ± 1.47		
Qualification	Diploma	24	15.33 ± 2.43	F = 5.62	0.001
	BSN	53	16.55 ± 2.02		
	Post RN	17	16.76 ± 2.18		
	MSN	7	18.14 ± 1.07		

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The association between demographic characteristics and practice scores regarding inpatient glycemic control was also analyzed using the Independent Samples t-test and One-Way ANOVA.The results showed that there was **no statistically significant difference** in practice scores between male and female nurses (t = -1.42, **p = 0.158**).In contrast, nurses who had previously received diabetes-related training demonstrated significantly better practice scores (Mean = **65.36 ± 4.82**) than those without training (Mean = **59.64 ± 6.03**) (t = 5.64, **p < 0.001**).Additionally, statistically significant differences in practice scores were found across different age groups (F = 2.64, **p = 0.039**) and educational qualifications (F = 4.97, **p = 0.003**). Nurses with higher educational qualifications achieved better practice scores. These findings indicate that diabetes-related training, age, and educational qualification were significantly associated with nurses' practices regarding inpatient glycemic control.

Table 05: Correlation Between Knowledge and Practice Scores (N = 101)

Variables	Mean ± SD	Pearson Correlation (r)	p-value
Knowledge Score	16.28 ± 2.41		
Practice Score	61.84 ± 6.52	0.468	<0.001

Pearson's correlation analysis was performed to determine the relationship between nurses' knowledge and practices regarding inpatient glycemic control.

The analysis demonstrated a **moderate positive correlation** between knowledge and practice scores (**r = 0.468**), and the relationship was found to be **statistically significant** (**p < 0.001**). This finding indicates that nurses with higher knowledge regarding inpatient glycemic control tended to report better clinical practices.

As the p-value was less than the predetermined level of significance (0.05), the null hypothesis was rejected and the alternative hypothesis was accepted. Therefore, it can be concluded that a statistically significant positive relationship exists between knowledge and practices regarding inpatient glycemic control among registered nurses.

Discussion

The present study was conducted to assess the knowledge and practices regarding inpatient glycemic control among registered nurses working at Allama Iqbal Teaching Hospital dera ghazi khan. The findings revealed that most participants demonstrated moderate to good knowledge regarding inpatient glycemic control, with an overall mean knowledge score of 16.28 ± 2.41. These findings indicate that although nurses possessed satisfactory knowledge regarding blood glucose monitoring, insulin administration, recognition of hypo- and hyperglycemia, and evidence-based diabetes management, important knowledge gaps still exist. The findings of the present study are consistent with those reported by Farzaei et al. (2023), who found that nurses had moderate knowledge and practice regarding inpatient diabetes management despite having positive attitudes toward diabetes care. Similarly, Koyuncu et al. (2025) reported that although intensive care nurses had satisfactory general knowledge, deficiencies remained in insulin therapy, glycemic targets, and recognition of hypoglycemia. These similarities may be attributed to comparable nursing responsibilities and the limited availability of continuous competency-based diabetes education in hospital settings.

Regarding clinical practice, the present study demonstrated that more than half of the nurses exhibited good practices, with a mean practice score of 61.84 ± 6.52. Most participants reported

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routinely monitoring blood glucose, documenting results accurately, administering insulin according to hospital protocols, recognizing abnormal glucose values, and communicating critical findings appropriately. Nevertheless, a considerable proportion of nurses still demonstrated only moderate practice levels, indicating opportunities for further improvement.

These findings are comparable with those of Dailah (2024), who concluded that nurse-led interventions significantly improve diabetes management, treatment adherence, patient education, and overall patient outcomes. Likewise, Hensley et al. (2024) reported that structured diabetes education combined with standardized communication strategies significantly enhanced nurses' confidence, competency, and glycemic management practices. These findings collectively emphasize that improving nurses' competency through structured educational interventions positively influences clinical performance and patient safety.

The present study further revealed that nurses who had received previous diabetes-related training achieved significantly higher knowledge and practice scores than those without previous training ($p < 0.001$). This finding indicates that continuing professional education plays an essential role in improving nurses' competency regarding inpatient glycemic management.

This result is supported by Piya et al. (2022), who demonstrated that structured diabetes education significantly improved adherence to inpatient glycemic management protocols, increased confidence in insulin administration, and enhanced blood glucose outcomes among hospitalized patients. Similarly, Hensley et al. (2024) concluded that continuing education programs strengthen evidence-based nursing practice and improve nurses' self-efficacy in diabetes care. These findings reinforce the importance of implementing regular in-service diabetes education programs for nursing staff.

The study also found that educational qualification was significantly associated with both knowledge and practice scores, with nurses holding higher qualifications demonstrating better performance. This finding may be explained by the greater exposure of highly qualified nurses to evidence-based practice, research, and advanced clinical education.

This finding is consistent with Rahman et al. (2024), who reported that nurses' diabetes awareness varied according to educational qualification and professional experience. Likewise, Koyuncu et al. (2025) concluded that higher educational preparation contributed to better competency in inpatient diabetes management and recommended continuous professional development to improve patient safety.

A statistically significant moderate positive correlation was found between knowledge and practice scores ($r = 0.468$, $p < 0.001$). This indicates that nurses with higher knowledge regarding inpatient glycemic control were more likely to demonstrate better clinical practices. These findings support Patricia Benner's Novice to Expert Theory, which proposes that increasing theoretical knowledge and clinical experience leads to improved clinical competence and safer nursing practice.

The observed relationship is also supported by Dailah (2024) and Piya et al. (2022), who emphasized that improvements in nurses' knowledge through education and competency-based training translate into better evidence-based clinical practices and improved patient outcomes.

The demographic findings of the present study showed that the majority of participants were female nurses aged 26–30 years, most held a BSN qualification, and more than half had not received previous diabetes-related training. These findings are comparable to previous Pakistani studies by Haider et al. (2024) and Rahman et al. (2024), which also reported that the nursing workforce was predominantly female and identified deficiencies in evidence-based diabetes management among nurses. Both studies recommended structured educational interventions and regular competency assessments to improve diabetes care.

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Conclusion

The present study assessed the knowledge and practices regarding inpatient glycemic control among registered nurses working at Allama Iqbal Teaching Hospital dera ghazi khan. The findings revealed that the majority of registered nurses possessed moderate to good knowledge and good clinical practices regarding inpatient glycemic control. The overall mean knowledge score (16.28 ± 2.41) and practice score (61.84 ± 6.52) indicated that nurses had a satisfactory understanding of blood glucose monitoring, insulin administration, recognition of hypo- and hyperglycemia, documentation, and evidence-based diabetes management.

The study further demonstrated that previous diabetes-related training and higher educational qualification were significantly associated with both knowledge and practice scores, while no statistically significant association was observed with gender. In addition, a moderate positive statistically significant correlation ($r = 0.468$, $p < 0.001$) was found between knowledge and practice scores, indicating that nurses with higher knowledge were more likely to demonstrate better clinical practices regarding inpatient glycemic control.

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