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# Knowledge, Attitude and Practice Regarding Use of Insulin, Indication and Side Effects among Insulin-Dependent Diabetic Individual Attending Tertiary Care Centre

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## Abstract

# Background

Effective insulin therapy requires adequate patient knowledge, a positive attitude, and correct practice. Assessing the current status of these factors is crucial for improving diabetes management outcomes.

# Objectives

This study aimed to assess the knowledge, attitude, and practice (KAP) regarding insulin use, its indications, and side effects among insulin-dependent diabetic individuals attending a tertiary care centre.

# Methods

A descriptive cross-sectional study was conducted among 134 insulin-dependent diabetic patients. Data were collected using a structured questionnaire and analyzed using descriptive statistics (frequencies, percentages, mean ± SD). Associations were tested using appropriate statistical tests, and correlations between KAP scores were determined using Pearson's correlation coefficient.

# Results

The mean age of participants was 54.82 ± 13.05 years, with a majority being male (59.7%) and having Type 2 diabetes (91.8%). Critical knowledge gaps were identified: only 27.6% were aware of potential insulin side effects, and 29.1% knew the symptoms of hypoglycemia. While 88.1% believed insulin therapy is effective, 56.0% incorrectly agreed that diet and exercise are not needed after starting insulin. In practice, although most reported regular insulin intake (90.3%) and site rotation (92.5%), 38.8% never checked their blood sugar after administering insulin. Knowledge was significantly associated with sex ($p = 0.038$) and education status ($p = 0.017$). Practice was significantly associated with the duration of insulin intake ($p = 0.000$). Knowledge, attitude, and practice scores showed significant positive correlations with each other ($p < 0.001$ for all).

# Conclusion

Despite a high belief in insulin's efficacy, significant deficits in knowledge and potentially risky practices exist among patients. The findings underscore an urgent need for structured, reinforced patient education programs focusing on insulin side effects, hypoglycemia management, and the indispensability of diet, exercise, and self-monitoring alongside insulin therapy.

# Introduction

Diabetes mellitus (DM) is a heterogeneous group of chronic, metabolic disorders characterized by high blood sugar levels (hyperglycemia) due to absolute or relative deficit in insulin production or action. Chronic hyperglycemia leads to serious damage to end organs like heart, blood vessels, eyes, kidneys and nerves.(1)Diabetes mellitus is one of the most common endocrine disorders affecting almost 6% of the world's population.(2) Since T1DM is a disease primarily due to the absence of insulin, insulin administration through daily injections is a treatment of choice.(1)The etiology of diabetes mellitus involves both genetic susceptibility and environmental factors such as obesity, drugs ,location, physical inactivity, and viral infections. Environmental triggers often modify the expression of susceptible genes, contributing to the early onset of the disease, inadequate insulin secretion, insulin resistance, and abnormalities in glucose, fat, and protein metabolism.(2)Patients with type 1 DM and advanced type 2 DM face an elevated risk of cardiovascular disease, peripheral neuropathy, retinopathy, dermopathy, nephropathy and other macro vascular complications.(3) However, these complications can be prevented with optimal medications. Insulin replacement is the mainstay for patients with type 1 DM while diet and lifestyle modifications are considered the cornerstone for the treatment and management of type 2 DM. Insulin is also important in type 2 DM when blood glucose levels cannot be controlled by diet, weight loss, exercise and oral hypoglycemic agents.(4)The International Diabetes Federation (IDF) estimated an overall prevalence of diabetes mellitus to be 537 million in 2021, and predicted a rise to 643 million by 2030 and 783 by 2045. 3 out 4 adults have diabetes in low and middle income countries. (5)More than 60% of the people with diabetes live in Asia. The increasing prevalence of diabetes have occurred in developing countries due to rapid and ongoing socioeconomic transition and will likely lead to further rises.(6)

Proper understanding of insulin’s function, dosage, and administration techniques, along with awareness of potential side effects, is essential to ensure effective treatment. However, many diabetic individuals harbor misconceptions and fears about insulin therapy, which can lead to poor adherence and suboptimal diabetes control. These barriers are often fueled by a lack of education, fear of injections, concerns about side effects like hypoglycemia or weight gain, and myths that insulin is a "last resort" treatment.

Understanding the KAP of diabetic individuals regarding insulin use is vital for developing interventions that promote better adherence and improve outcomes. This study aims to assess the KAP of diabetic patients with respect to insulin therapy, identify gaps in their knowledge, explore their attitudes and beliefs, and evaluate their practices concerning insulin intake and management of side effects. The findings will help design targeted educational programs and support systems to enhance the effectiveness of insulin therapy in diabetes management.

# Materials and Methods

# Study design, setting and study population

A descriptive cross-sectional study was carried out in Tribhuvan University Teaching Hospital (TUTH), Kathmandu, Nepal. TUTH is a 700 bedded tertiary level hospital providing specialized as well as general health services. This study was conducted among the insulin-dependent diabetic patients visiting the Department of Internal Medicine and Department of Endocrinology of TUTH. Patients with the age of 18 years or older and being diagnosed with Type 1 diabetes mellitus or Type 2 diabetes mellitus requiring insulin therapy for at least 6 months were included in this study. Patients with cognitive impairments or psychiatric condition that could affect their ability to answer the questionnaire were excluded.

## Sample size and sampling technique

The sample size for was calculated by using Cochrane formula, that is $n = Z^2 pq/d^2$. The proportion convenience sampling technique was used to select the study participants. Those participants who were readily available at TUTH during the data collection period were selected as study participants.

## Data collection

Face to face interview using structured questionnaire was used for data collection. The questionnaire consisted of four main sections. The first section consisted socio-demographic and medical information about the participants such as age, sex, ethnicity, religion, geographic origin, education, body mass index (BMI), type of diabetes mellitus, duration of diagnosis of diabetes mellitus. The second, third and fourth section consisted of questions related to knowledge (10 items), attitude (7 items) and practice (11 items) regarding insulin intake. For the knowledge and practice questions, a score of 1was assigned for each correct response and 0 for each incorrect response. The attitude section included statements measured on a five-point Likert scale, where 1 = Strongly Disagree and 5 = Strongly Agree.

The interview was carried out in Nepali language. Each interview took approximately 20 to 30 minutes to complete. Before conducting interview, all the participants were described about the objectives of the research. The interview was entirely voluntary and the participants were allowed to withdraw at any time. Both written and verbal consent was obtained from the participants.

## Data management and analysis

The data was entered, edited, coded, and cross checked in Microsoft Excel and data analysis was performed using IBM SPSS version 26. Univariate analysis was performed using frequency, percentage, mean, median, range, and standard deviation. T-test and ANOVA test was used for bivariate analysis. The difference in KAP score; sex, ethnicity, religion, and education status were assessed by an independent sample t-test, whereas ANOVA test was used for duration of patients being diagnosed with DM and duration of insulin intake by patients. All the statistical analysis was performed at 95% confidence interval. All the variables were considered statistically significant at p-value < 0.05.

### Ethical statement

The study was reviewed and approved by the Institutional Review Committee (IRC) of the Institute of Medicine (IOM), Tribhuwan University, Nepal. The participants' information was kept confidential and only used for the study purpose. No any harm was done during the study.

## Results

### Socio-Demographic and Medical Information of the Participants

The mean age of the participants was **54.82 ± 13.05 years.** Most of them (45.5%) belonged to age group 46 to 60 years. And, nearly 60% of them were female. Regarding the ethnicity, majority of them were **Brahmin/Chhetri (64.9%)**, followed by **Janajati (17. 9%).Most** of them (95.5%) followed Hinduism religion. In terms of geographic origin, the majority were from **Hilly region (75.4%)**, followed by **Terai (21.6%).** Nearly half of the participants (46.3%) had no formal education.

Regarding the body mass index (BMI), more than half (56.7%) had a normal BMI, 38.8% were overweight and only 4.5% were underweight. Among all the diabetic patients, the majority of them (91.8%) had **Type 2 diabetes mellitus**. The **mean duration of diabetes** was **12.75 ± 8.72 years**. More than half of the participants (**53.7%**) had been diagnosed with diabetes for **more than 10 years**. The **mean duration of insulin use** was **50.34 ± 58.91 months**. Majority of the diabetic patients (**39.6%)** had been using insulin for **2–5 years**. *(Table 1)*

*Table 1: Socio-demographic and medical information of the participants (n=134)*

| Variables | Frequency (n) | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| Mean ± SD | 54.82 ± 13.05 | |
| Median (Min–Max) | 55 (22–86) | |
| 18-45 years | 32 | 23.9 |
| 46-60 years | 61 | 45.5 |
| Above 60 years | 41 | 30.6 |
| **Sex** | | |
| Male | 80 | 59.7 |
| Female | 54 | 40.3 |
| **Ethnicity** | | |
| Brahmin/Chhetri | 87 | 64.9 |
| Janajati | 24 | 17.9 |
| Madhesi | 17 | 12.7 |
| Dalit | 4 | 3.0 |
| Muslim | 2 | 1.5 |
| **Religion** | | |
| Hindu | 128 | 95.5 |
| Buddhist | 4 | 3.0 |
| Islam | 2 | 1.5 |
| **Geographic origin** | | |
| Terai region | 29 | 21.6 |
| Hill region | 101 | 75.4 |
| Himalayan region | 4 | 3.0 |
| **Educational Qualification** | | |
| No formal education | 62 | 46.3 |
| Primary level (1–8) | 28 | 20.9 |
| Secondary (10–12) | 26 | 19.4 |
| Bachelor | 11 | 8.2 |

| | | |
|---|---|---|
| Postgraduate or above | 7 | 5.2 |
| **BMI Category** | | |
| Underweight (BMI < 18.5) | 6 | 4.5 |
| Normal (BMI=18.5 to 24.9) | 76 | 56.7 |
| Overweight (BMI ≥ 25 | 52 | 38.8 |
| **Type of Diabetes Mellitus** | | |
| Type 1 | 11 | 8.2 |
| Type 2 | 123 | 91.8 |
| **Duration of Diagnosis of DM (years)** | Mean ± SD | 12.75 ± 8.72 |
| 0-5 years | 31 | 23.1 |
| 6-10 years | 31 | 23.1 |
| More than 10 years | 72 | 53.7 |
| **Duration of Insulin Intake (months)** | Mean ± SD | 50.34 ± 58.91 |
| Less than 2 years | 52 | 38.8 |
| 2 to 5 years | 53 | 39.6 |
| More than 5 years | 29 | 21.6 |

**Knowledge Regarding Insulin Intake Among Diabetic Patients (n=134)**

Among the 134 diabetic patients, around one-third (66.4%) correctly identified that the purpose of insulin is to lower blood sugar levels, while17.9% did not know its purpose. The majority of participants (79.9%) reported that insulin is given when diabetes is uncontrolled with oral agents. Majority of the patients (83.6%) were aware of insulin administration methods, with insulin pens being the most commonly known (76.9%). Regarding injection sites, almost all participants (97.0%) identified the periumbilical area as the most common site. More than half of the participants (56.7%) reported that insulin is administered multiple times a day, while 43.3% reported once daily administration. Only 27.6% reported that they were aware of potential side effects of insulin. Among those who were aware, the commonly reported side effects included headache (16.4%), followed by muscle pain/lipodystrophy (16.4%), and allergy/skin rash (9.7%). Around 29.1% knew the symptoms of hypoglycemia. Among those aware, sweating (21.6%), dizziness/headache (20.1%), trembling (14.2%), palpitation (13.4%), loss of consciousness (11.9%), and visual disturbance (3.7%) were noted. *(Table 2)*

*Table 2: Knowledge regarding insulin intake among diabetic patients (n=134)*

| Statements | Response Options | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Purpose of giving insulin** | To lower blood sugar levels | 89 | 66.4 |
| | Don’t know | 24 | 17.9 |
| | To cure diabetes | 19 | 14.2 |
| | To replace lost energy | 2 | 1.5 |
| **Insulin is given during** | Uncontrolled DM by oral agents | 107 | 79.9 |
| | Don’t know | 14 | 10.4 |
| | Type 1 DM | 7 | 5.2 |
| | During pregnancy | 3 | 2.2 |
| | On patient’s wish without glycemic control | 2 | 1.5 |
| | Emergency (DKA, Hyperkalemia) | 1 | 0.7 |
| **Know any methods of insulin administration** | Yes | 112 | 83.6 |
| | No | 22 | 16.4 |
| **If Yes, name the various methods of delivering insulin (multiple response) n=112** | | | |
| | Insulin Pen | 103 | 76.9 |
| | Inhaled insulin | 7 | 5.2 |
| | Vial and syringe | 44 | 32.8 |
| | Insulin pump | 2 | 1.5 |
| **Most common site of insulin injection (multiple response)** | | | |
| | Periumbilical | 130 | 97.0 |
| | Thigh | 48 | 35.8 |
| | Buttock | 7 | 5.2 |
| | Upper arm | 5 | 3.7 |
| | | | |
| **Frequency of insulin administration** | Multiple times a day | 76 | 56.7 |

| | | | |
|---|---|---|---|
| | Once a day | 58 | 43.3 |
| **Aware about the potential side effects of insulin** | Yes | 37 | 27.6 |
| | No | 97 | 72.4 |
| **If yes, mention the side effects (multiple response) n=37** | | | |
| | Headache | 22 | 16.4 |
| | Muscle pain/lipodystrophy | 22 | 16.4 |
| | Allergy/skin rash | 13 | 9.7 |
| | Hypoglycemia | 8 | 6.0 |
| | Weight gain | 8 | 6.0 |
| **Know the symptoms of hypoglycemia?** | Yes | 39 | 29.1 |
| | No | 95 | 70.9 |
| **If yes, mention the symptoms of hypoglycemia (multiple response) n=39** | Sweating | 29 | 21.6 |
| | Dizziness/headache | 27 | 20.1 |
| | Palpitation | 18 | 13.4 |
| | Loss of consciousness | 16 | 11.9 |
| | Visual disturbance | 5 | 3.7 |
| | Trembling | 19 | 14.2 |

**Attitude towards Insulin Intake Among the Diabetic Patients**

Most of the participants (88.1%) believed that insulin therapy is effective in controlling diabetes. More than half of respondents (56.0%) agreed that diet and exercise are not needed after starting insulin. About half of the participants (82.8%) believed that insulin improves quality of life. However, majority of them (61.9%) disagreed that insulin is more comfortable than multiple oral agents. The majority of the participants (81.3%) agreed that inappropriate insulin dosing can cause adverse effects. *(Table 3)*

*Table 3: Attitude towards insulin intake among the diabetic patients*

| Statements | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| Insulin therapy is effective in controlling diabetes | 4 (3.0%) | 4 (3.0%) | 8 (6.0%) | 34 (25.4%) | 84 (62.7%) |
| After starting insulin, diet and exercise are not needed | 16 (11.9%) | 4 (3.0%) | 13 (9.7%) | 26 (19.4%) | 75 (56.0%) |
| Insulin should be stopped when blood sugar becomes normal | 33 (24.6%) | 26 (19.4%) | 40 (29.9%) | 10 (7.5%) | 25 (18.7%) |
| Insulin can improve quality of life | 2 (1.5%) | 2 (1.5%) | 19 (14.2%) | 41 (30.6%) | 70 (52.2%) |
| Insulin is more comfortable to administer than multiple oral agents | 67 (50.0%) | 16 (11.9%) | 16 (11.9%) | 10 (7.5%) | 25 (18.7%) |
| Unnecessary high or low dose of insulin can cause adverse effects | 2 (1.5%) | 3 (2.2%) | 20 (14.9%) | 31 (23.1%) | 78 (58.2%) |
| I can administer insulin by myself | 19 (14.2%) | 6 (4.5%) | 3 (2.2%) | 5 (3.7%) | 101 (75.4%) |

**Practice of Insulin Intake Among Diabetic Patients**

Most participants (70.1%) stored insulin in a refrigerator, and 67.9% checked the expiry date before use. Half of the respondents (50.7%) stored insulin above the freezing point. Insulin was most commonly taken 15 minutes before meals (66.4%), and most of them (95.5%) administered it subcutaneously at a 90° angle. Most participants reported rotating injection sites (92.5%) and taking insulin regularly (90. 3%).However, only 15.7% always checked their blood sugar after administering insulin, while 38.8% never did. The majority monitored blood glucose once every three months (77.6%). About one-quarter (24.6%) had experienced insulin-related side effects. *(Table 4)*

*Table 4: Practice of insulin intake among diabetic patients (n=134)*

| Statements | Frequency (n) | Percentage (%) |
|---|---|---|
| **Where do you store insulin?** | | |
| Refrigerator | 94 | 70.1 |
| Cupboard | 36 | 26.9 |
| Table | 4 | 3.0 |
| **If in refrigerator, at what temperature you store insulin?** | | |
| Above freezing point | 68 | 50.7 |
| At room temperature | 57 | 42.5 |
| Below freezing point | 9 | 6.7 |
| **Do you check expiry date of insulin before use?** | | |
| Yes | 91 | 67.9 |
| No | 43 | 32.1 |
| **When do you take insulin?** | | |
| 15 minutes before food | 89 | 66.4 |
| 15 minutes after food | 17 | 12.7 |
| Anytime | 28 | 20.9 |
| **How do you take insulin?** | | |
| Retracting the injected surface, with the needle at 90 degree, subcutaneously | 128 | 95.5 |
| Retracting the injected surface, with needle at 45 degree, subcutaneously | 6 | 4.5 |
| **Do you rotate your sites?** | | |
| Yes | 124 | 92.5 |
| No | 10 | 7.5 |
| **Do you take insulin regularly?** | | |
| Yes | 121 | 90.3 |
| No | 13 | 9.7 |
| **How often do you check your blood sugar after administering insulin?** | | |
| Always | 21 | 15.7 |

| | | |
|---|---|---|
| Never | 52 | 38.8 |
| Rarely | 23 | 17.2 |
| Sometimes | 38 | 28.4 |
| **How often do you check your sugar blood level?** | | |
| Once in 3 months | 104 | 77.6 |
| Once in 6 months | 28 | 20.9 |
| Annually | 2 | 1.5 |
| **Have you ever experienced any side effects of insulin?** | | |
| Yes | 33 | 24.6 |
| No | 101 | 75.4 |
| **Do you take chocolates or any source of glucose when you go out?** | | |
| No | 75 | 56.0 |
| Yes | 59 | 44.0 |

**Factors Associated with Knowledge, Attitude and Practice (KAP) regarding Insulin Intake among the Study Participants**

This study found that knowledge regarding insulin intake was associated with sex (p-value=0.038), and education status (p-value=0.017) of the participants. The attitude was associated with sex (p-value=0.008), ethnicity (p-value=0.013), and education status (p-value=0.007), whereas practice of insulin intake was found to be associated with duration of insulin intake (p-value=0.000). *(Table 5)*

*Table 5: Factors associated with knowledge, attitude and practice (KAP) regarding insulin intake among the study participants*

| | Knowledge | | Attitude | | Practice | |
|---|---|---|---|---|---|---|
| | Mean ± SD | p-value | Mean ± SD | p-value | Mean ± SD | p-value |
| **Sex** | | | | | | |
| Male | 5.20 ± 1.38 | 0.038* | 31.68±3.98 | 0.008* | 6.76± 1.56 | 0.902 |
| Female | 4.66± 1.52 | | 29.79± 3.97 | | 6.79± 1.52 | |
| **Ethnicity** | | | | | | |
| Brahmin/Chhetri | 5.09 ± 1.40 | 0.251 | 31.56 ± 3.86 | 0.013* | 6.77 ± 1.46 | 0.951 |
| Other | 4.78 ± 1.55 | | 29.74 ± 4.22 | | 6.78 ± 1.69 | |
| **Religion** | | | | | | |
| Hindu | 4.95 ± 1.48 | 0.146 | 30.88 ± 4.12 | 0.511 | 6.77 ± 1.57 | 0.718 |
| Other | 5.83 ± 0.75 | | 32.00 ± 3.03 | | 7.00 ± 0.63 | |
| **Education status** | | | | | | |
| Educated | 5.26 ± 1.33 | 0.017* | 31.81 ± 3.90 | 0.007* | 6.96 ± 1.58 | 0.142 |
| No formal education | 4.66 ± 1.55 | | 29.90 ± 4.07 | | 6.56 ± 1.49 | |
| **Duration of being diagnosed with DM** | | | | | | |
| Less than 6 years | 4.70 ±1.82 | 0.486 | 30.12 4.47 | 0.405 | 6.32 1.44 | 0.050 |
| 6 to10 years | 5.03 ±1.44 | | 30.83 4.05 | | 6.54 1.41 | |
| >10 years | 5.08 ±1.28 | | 31.30 3.91 | | 7.06 1.59 | |
| **Duration of insulin intake** | | | | | | |
| Less than 2 years | 4.88 ± 1.55 | 0.819 | 30.21 ± 4.30 | 0.099 | 6.13 ± 1.34 | 0.000* |
| 2 to 5 years | 5.05 ± 1.43 | | 30.90 ± 3.81 | | 7.01 ± 1.59 | |
| >5 years | 5.03 ± 1.37 | | 32.24 ± 3.92 | | 7.48 ± 1.37 | |

**Correlation between Knowledge, Attitude and Practice**

This study showed that knowledge was positively correlated with both attitude ($r = 0.337$, $p < 0.001$) and practice ($r = 0.282$, $p = 0.001$), and attitude was also positively correlated with practice ($r = 0.335$, $p=0.000$), indicating that higher knowledge and positive attitudes were associated with better practices. *(Table 6)*

*Table 6: Correlation between knowledge, attitude and practice*

| Characteristics | Pearson correlation coefficient (r) | | |
|---|---|---|---|
| | **Knowledge** | **Attitude** | **Practice** |
| **Knowledge** | 1 | | |
| **Attitude** | 0.337 (p= 0.000) | 1 | |
| **Practice** | 0.282 (p = 0.001) | 0.335 (p =0.000) | 1 |

# Discussion

This study assessed the knowledge, attitude, and practice regarding insulin use among a cohort of insulin-dependent diabetic patients at a tertiary care center in Nepal. The findings reveal a patient population that, despite demonstrating faith in insulin therapy and reporting adherence to certain technical routines, exhibits significant and potentially dangerous gaps in essential knowledge and self-care practices. The most critical knowledge deficits pertained to safety: only 27.6% were aware of potential insulin side effects, and a mere 29.1% could identify symptoms of hypoglycemia. A significant proportion (17.9%) did not know insulin's fundamental purpose. Attitudes were paradoxically mixed; while 88.1% believed in insulin's efficacy, which aligned with the study conducted by *Parmar et.al*(7), a majority (56.0%) held the dangerous misconception that diet and exercise are unnecessary after insulin initiation. Practices revealed a concerning disconnect; despite high reported adherence to injection routines (90.3% taking insulin regularly, 92.5% rotating sites), proactive safety monitoring was severely lacking; 38.8% never checked blood glucose after an injection, and 77.6% only monitored it once every three months which aligns with the finding from *Wolde et.al*(8)

The knowledge gaps observed, particularly regarding hypoglycemia and side effects, are a major clinical concern as they directly increase patient risk. Poor recognition of hypoglycemia symptoms delays self-treatment, potentially leading to severe episodes. This finding aligns with other studies in similar settings. For instance, a study conducted in Vietnam reported that only 19 % of their participants could correctly list symptoms of hypoglycemia(9). The prevalent misconception that lifestyle modifications can be abandoned after insulin initiation is a particularly detrimental attitude, suggesting patients may view insulin as a substitute rather than a complement to healthy behavior.

The positive correlation between knowledge, attitude, and practice scores is a robust and encouraging finding, validating the foundational principle that improving knowledge can foster a more positive attitude, which in turn enables better self-care. This linear relationship has been demonstrated in other studies as well(9) The association between better practice and longer duration of insulin use is intuitive, suggesting experience improves efficacy of administration which is also explained by Reddy et.al(10). However, it also starkly highlights that patients newly initiated on insulin are a uniquely vulnerable group with the poorest practices, necessitating targeted support. Furthermore, the significant association of higher knowledge and more positive attitude with formal education underscores the persistent challenge of health literacy in patient education strategies which aligns with other similar studies in India(11,12)

This study has several strengths, including a robust sample size, a detailed and pretested questionnaire, and a high participation rate, which enhance the reliability of the findings. However, limitations must be considered. The single-center, cross-sectional design limits generalizability and prevents causal inference. Data on practices were self-reported and subject to social desirability bias; actual practices may be less optimal than reported. Furthermore, the study did not correlate KAP scores with objective clinical outcomes like HbA1c, which would strengthen the clinical relevance of the findings.

Overall, this study identifies a critical disconnect: patients entrusted with a complex self-administered therapy lack essential safety knowledge and hold attitudes that contradict effective diabetes management. They perform the mechanics of injection but often neglect the vital monitoring that makes it safe and effective. To address these gaps, we recommend implementing a structured, mandatory insulin education protocol at the diabetes clinic, with dedicated sessions focusing on hypoglycemia management and the rationale for self-monitoring. The development and use of low-literacy educational aids are crucial for the 46.3% of participants with no formal education. Establishing a "New Insulin Starter" program could provide intensive, hands-on training for the most vulnerable group. Future research should focus on designing and evaluating the impact of such targeted educational interventions on both KAP scores and objective glycemic control.

# Conclusion

This study identifies a clear gap between insulin administration and its safe, effective self-management among patients. While technical injection skills are adequate, profound deficits in safety knowledge—especially regarding hypoglycemia—and misconceptions about lifestyle modification coexist with infrequent monitoring, creating significant clinical risk. The findings underscore an urgent need for mandatory, structured patient education programs that move beyond injection technique to prioritize hypoglycemia preparedness, reinforce lifestyle adherence, and promote routine self-monitoring, with particular focus on newly-initiated and vulnerable patients.

# Abbreviations

KAP: Knowledge, Attitude and Practice

DM: Diabetes Mellitus

# Declarations

**Ethical Approval:** Ethical approval was obtained from Institutional Review Committee, Tribhuvan University, Teaching Hospital and conducted in accordance with the Declaration of Helsinki.

**Consent for Participate**: Informed consent was obtained from all individual participants included in the study.

**Clinical Trail**: Not Applicable

**Availability of Data and Material:** The datasets used during the study are available from corresponding author on reasonable request.

**Competing Interest:** The author declares no competing interests.

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**Authors Contributions:**

B.B.: Conception, Design of Work, Analysis, Revision

B.B. and D.A., : Writing and Editing of Original Draft

A.S., and R.B.: Data Collection

A.R.: Data Analysis

Su.T. and S.T.: Supervision and Monitoring

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