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Original Research Article

Knowledge, Attitude and Practices of Insulin Use Among Type 2 Diabetes: A Questionnaire Study with HbA1c Correlation

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Abstract:

Background: Type 2 diabetes is a major public health concern requiring lifelong management. Insulin therapy is essential for achieving glycemic control but is often hindered by patient-related knowledge, attitudes, and practices. Understanding these factors is critical to improve diabetes outcomes.

Materials and Methods: A cross-sectional study was conducted at a tertiary care hospital over one year, enrolling 212 adults with type 2 diabetes on insulin therapy. Data were collected through face-to-face interviews using a validated questionnaire assessing knowledge (8 items), attitude (7 items), and practice (9 items). Demographic and clinical data were also recorded, and HbA1c values were confirmed from medical records. Statistical analyses included Spearman's correlation and Kruskal-Wallis test, with significance set at $p<0.05$.

Results: Of 212 patients (median age 61 years, 64% women), most were unemployed, and over half had school-level education. The median knowledge, attitude, and practice scores were 62.5%, 85.7%, and 77.7%, respectively. Knowledge was highest for insulin storage and injection sites but lowest for initiation and dose adjustment. Younger age and higher education were significantly associated with better knowledge, while a positive attitude correlated with lower HbA1c levels.

Conclusion: Patients demonstrated adequate knowledge, positive attitudes, and correct practices towards insulin therapy, though gaps remain in initiation understanding and safe needle disposal.

Keywords: Type 2 Diabetes, Insulin Therapy, Knowledge, Attitude, Practice, HbA1c, Education.

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Introduction

Diabetes is a chronic, progressive, and disabling condition that has become a major global health concern. Its prevalence has increased dramatically in recent decades, with the International Diabetes Federation (IDF) estimating that 463 million people were living with diabetes worldwide in 2019, a number projected to rise to 578 million by 2030 and 700 million by 2045 [1]. The burden is particularly high in the Middle East and North Africa (MENA) region, where 55 million individuals were affected in 2019, a figure expected to nearly double by 2045 [1]. In the United Arab Emirates (UAE), the prevalence of diabetes among adults aged 20–79 years was reported at 12.2% in 2019, highlighting its significance as a public health issue [1].

Diabetes reduces life expectancy by up to 15 years, primarily due to cardiovascular complications, and is associated with long-term organ dysfunction [2,3]. Beyond health outcomes, it imposes substantial direct costs such as medications and healthcare services, and indirect costs including work absenteeism, disability, and premature mortality [4,5]. In the UAE, the economic burden of type 2 diabetes is considerable, with annual healthcare costs estimated at US$563 million, projected to rise to US$8.52 billion within a decade if current trends continue [6]. Effective management of diabetes requires patient engagement through lifestyle modifications, self-monitoring, adherence to medication, and regular follow-up care, facilitated by multidisciplinary support [7–10].

Insulin therapy remains an essential component of type 2 diabetes management, either alone or in combination with other antidiabetic agents to achieve glycaemic control [11]. However, adherence is often hindered by factors such as lack of knowledge, busy schedules, social stigma, stress, or meal irregularities [12,13]. Studies indicate that

more than one-third of patients using insulin skip doses regularly, which compromises treatment outcomes [13]. Patient education and training in insulin use, side effect management, and self-administration techniques are therefore critical for improving adherence [14]. Despite several studies on diabetes prevalence and general knowledge, attitude, and practices (KAP) in the UAE, there remains a gap in evidence specifically addressing KAP regarding insulin therapy. This study aims to fill that gap by evaluating the knowledge, attitude, and practices of patients with type 2 diabetes toward insulin therapy, and by examining their associations with sociodemographic and clinical factors, including HbA1c levels.

Methodology

Setting and Duration: The study was conducted at a tertiary care hospital over a period of one year. The hospital provides multidisciplinary services and is a major referral center for diabetes care.

Study Participants: Adults (>18 years) with type 2 diabetes on insulin therapy were eligible for inclusion. Patients with type 1 diabetes, gestational diabetes, those aged <18 years, or with a history of dementia were excluded. Written informed consent was obtained from all participants, and confidentiality was assured. A total of 212 patients who fulfilled the criteria were enrolled.

Sample Size: The required sample size was calculated considering a 95% confidence interval, 5% margin of error, and an assumed prevalence of 50%. Based on this, 212 participants were included using convenience sampling.

Study Design and Data Collection: This cross-sectional study employed face-to-face interviews using a structured and validated questionnaire adapted from previous studies [15–17]. A pilot test was conducted to ensure clarity and reliability. The questionnaire included three domains: knowledge (8 items), attitude (7 items), and practice (9 items). Correct or positive responses scored 1, while incorrect or negative responses scored 0. Demographic and clinical details, including age, sex, education, occupation, diabetes duration, insulin use duration, HbA1c level, and complications, were collected. HbA1c values were confirmed from electronic medical records.

Outcomes

- **Knowledge:** understanding of diabetes, insulin therapy, and complications.
- **Attitude:** perceptions, fears, and psychosocial aspects of insulin use.
- **Practice:** insulin administration technique. Domain scores were converted into percentages for analysis.

Statistical Analysis: Data were analyzed using SPSS v24 (IBM Corp.). The Kolmogorov-Smirnov test assessed normality. Skewed variables were summarized as medians with interquartile ranges, and categorical variables as frequencies and percentages. Associations were explored using Spearman's correlation, while the Kruskal-Wallis test compared scores across education groups. A p-value <0.05 was considered statistically significant.

Results

Among the 212 participants, the median age was 61 years, with nearly two-thirds being women. More than half had completed school-level education, while one-fifth held higher education degrees. The majority were unemployed. Insulin regimens showed that nearly half of the participants used both long- and short-acting insulin, while around 62% required more than three antidiabetic medications. The median duration of diabetes was 18 years, with a median insulin use of 6 years, and the median HbA1c was 7.8%.

Table 1: Demographic and Clinical Characteristics of the Study Participants (n = 212)

Characteristic	Number (n=212)	Percentage
Sex		
Male	76	35.8
Female	136	64.2
Education		
No formal education	53	25.0
School (primary/secondary)	115	54.2
Higher education	44	20.8
Occupation		
Full-time job	39	18.4
Part-time job	6	2.8
Unemployed	167	78.8
Type of insulin used		
Short-acting	9	4.2
Long-acting	95	44.8
Both	101	47.6
Intermediate	10	4.7

Number of antidiabetic medications		
One	16	7.5
Two	21	9.9
Three	44	20.8
More than three	131	61.8

Patients demonstrated moderate knowledge (median 62.5%), with excellent awareness of insulin storage and injection sites but limited understanding of insulin initiation and dose adjustments. Attitude levels were overall positive (median 85.7%), particularly regarding social stigma and lifestyle disruption, though more than half still perceived injections as painful. Practices were generally appropriate (median 77.7%), with strong adherence to rotation and injection timing, though needle disposal practices remained poor.

Table 2: Knowledge, Attitude, and Practice Towards Insulin Therapy (n = 212)

Knowledge

Question	% Correct
Insulin prevents complications by controlling HbA1c	77
Insulin works better than pills	81
Insulin is usually prescribed as a last option	23
Insulin, once started, must be continued for life	45
Insulin dose must always increase once started	45
Insulin vials should be stored in refrigerator/cool place	99
Sites of insulin injection (abdomen, thigh, glutei, deltoid)	99
Complications include hypoglycemia, allergy, weight gain, lipodystrophy	89

Attitude

Question	% Positive Attitude
Not worried about others knowing diabetes status	92
Not embarrassed injecting insulin	86
Does not find injections painful	42
Not worried about work/life restriction	88
Not worried about home glucose monitoring	68
Finds enough time to inject insulin	91
Not overwhelmed by insulin therapy	78

Practice

Question	% Correct Practice
Checks insulin name/type	60
Verifies expiry date	77
Adjusts dose when required	83
Washes hands before injection	69
Removes air bubbles	63
Uses syringe/needle only once	92
Disposes used needles in special container	39
Rotates injection sites	97
Injects at prescribed times	95

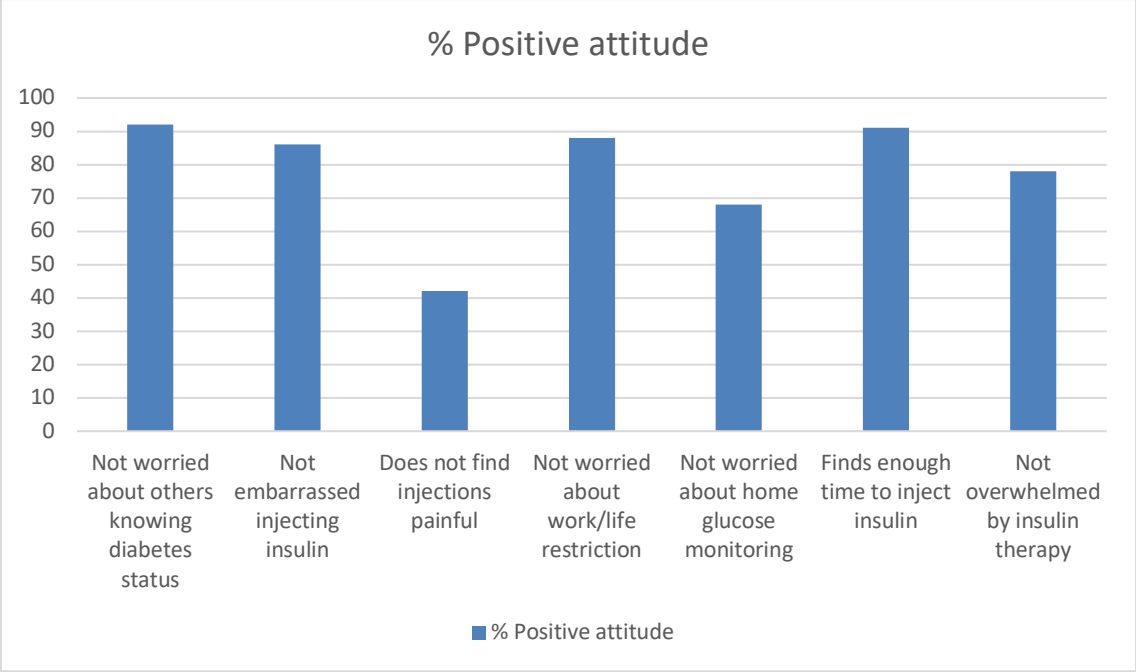

Figure 1: Attitude Towards Insulin Therapy (n = 212)

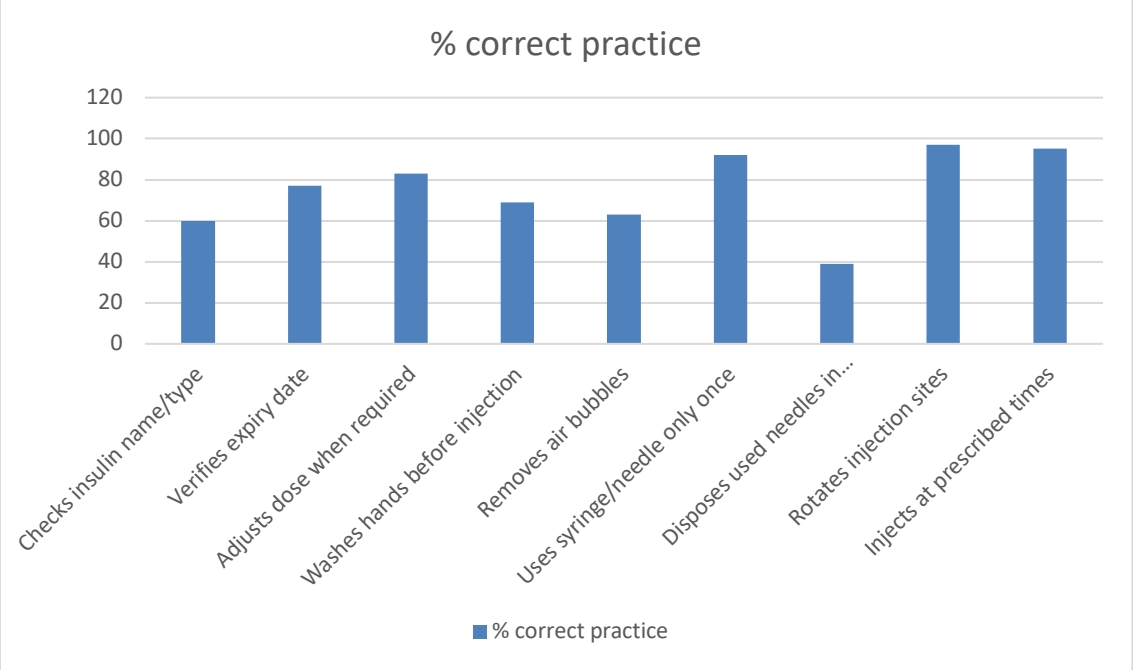

Figure 2: Practice Towards Insulin Therapy (n = 212)

The analysis revealed that age was negatively associated with knowledge, suggesting younger patients had better awareness. Patients with higher education displayed significantly stronger knowledge scores compared to those with no formal education. Importantly, a higher positive attitude towards insulin correlated with lower HbA1c levels, reflecting improved glycemic control, whereas knowledge alone showed no such association.

Table 3: Correlation of Knowledge, Attitude, and Practices with Education and HbA1c (n = 212)

Association Tested	Spearman's correlation (ρ)	p-value	Interpretation
Duration of insulin use vs Knowledge	0.03	0.589	No correlation
Age vs Knowledge	−0.14	0.008	Significant negative correlation
Knowledge vs Practice	0.12	0.021	Significant positive correlation
Education vs Knowledge	—	<0.001	Higher education linked with better knowledge
Knowledge vs HbA1c	—	NS	No correlation
Attitude vs HbA1c	−0.18	<0.001	Higher positive attitude linked with lower HbA1c

Discussion

Previous studies have highlighted that patients with type 2 diabetes often demonstrate limited knowledge, negative perceptions, and suboptimal practices concerning insulin therapy [15,18–22]. In contrast, the findings of the current study among 212 patients revealed that most participants had sufficient knowledge, demonstrated a generally positive attitude, and adhered to correct practices regarding insulin administration. These outcomes align with reports from other international studies [23,24]. For example, Lafta et al. [2] and Das Choudhury et al. [7] also observed that patients on insulin therapy showed good knowledge and favorable attitudes, although Das Choudhury et al. [7] identified persistent deficiencies in practices. Several contextual factors may explain the present findings. This study was carried out in a specialized tertiary diabetes center, where patients benefit from multidisciplinary support, including consultations with endocrinologists, educators, dietitians, podiatrists, exercise specialists, psychologists, and ophthalmology services. The structured model of care, frequent follow-ups, and extended consultation times allowed providers to address misconceptions, review treatment plans, and reinforce appropriate self-management strategies, which likely contributed to the adequate knowledge and positive attitudes seen among participants.

The study also highlighted several practice-related challenges. While most patients displayed correct administration behaviors, gaps persisted in areas such as needle disposal—only 39% of participants discarded used needles in designated containers at home. This aligns with the findings of Ebrahim et al. [15], who reported that just 4% of patients in their cohort followed safe disposal practices, and Shetty et al. [25], who found that 98.2% of participants disposed of insulin devices in general waste. Pain perception was another concern: in the present study, 42% of patients found insulin injections painful, a figure similar to Shetty et al. [25] (49.9%) and Fu et al. [17], where 66.9% of patients expressed negative attitudes toward insulin due to pain. With respect to associations, the current study found no link between knowledge and duration of insulin use, which mirrors the findings of Gholap et al. [26], although other studies have shown the opposite trend [27]. Importantly, education level was strongly linked to knowledge in our cohort, with patients having higher education performing better—a result consistent with Indian evidence where literate and highly educated patients demonstrated stronger understanding of insulin therapy [28].

Interestingly, the analysis of correlations revealed mixed findings. Knowledge was significantly associated with correct practices, consistent with observations by Huang et al. [29] in Taiwan, where both education and self-care behaviors influenced practice quality. However, knowledge did not correlate with HbA1c levels in the present study of 212 patients. Instead, attitude demonstrated a significant negative correlation with HbA1c, indicating that a more positive outlook was linked to better glycemic control. Several explanations may account for this. Patients who perceive insulin as painful or burdensome may demonstrate reduced adherence, which worsens metabolic outcomes. Moreover, glycemic control requires broader behavioral adjustments beyond insulin use—such as dietary management, exercise, and addressing comorbidities—that depend heavily on patient motivation and self-efficacy. These findings parallel those of a study in India, which similarly reported no association between HbA1c levels and knowledge or practice scores, but highlighted the crucial role of patient perceptions in shaping adherence and clinical outcomes [28].

Conclusion

The present study among 212 patients with type 2 diabetes on insulin therapy demonstrated that, overall, participants had adequate knowledge, positive attitudes, and generally correct practices towards insulin administration. While patients showed strong awareness regarding insulin storage, injection sites, and adherence to prescribed timings, notable gaps were identified in understanding the initiation and escalation of insulin therapy and in safe disposal of used needles. Education level was positively associated with knowledge, and younger patients tended to be more knowledgeable, whereas a more positive attitude was significantly linked with better glycemic control as reflected by lower

HbA1c levels. These findings highlight the importance of continuous patient education, reinforcement of safe practices, and psychosocial support to address persisting misconceptions and ensure effective, safe, and sustainable insulin use in diabetes management.

Authors' Contributions

Singh Kamalkant Arvindkumar- Conceptualization and Design, Acquisition and Interpretation of Data

Yusuf Shahab- Acquisition and Interpretation of Data

Yunus Shahab- Supervisor, Critical Review

Zaidan Mohamedimtiyaz Kanunga- Writing, Original Draft

Aditya Ashokbhai Parmar- Critical Review, Writing, Original Draft

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