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Knowledge of Nursing Students Regarding the Prevention of Diabetes Mellitus Complication: A Cross-Sectional Study

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A B S T R A C T

Background: Background: Diabetes mellitus (DM) complications pose a significant global health burden, necessitating robust preventive knowledge among nursing students as future healthcare providers. This study assessed nursing students' knowledge of DM complication prevention and explored associations with demographic factors.

Methods: A cross-sectional study was conducted among 199 nursing students (Levels 4–8) at Riyadh Elm University (June–July 2024) using a validated 18-item questionnaire. The instrument demonstrated good reliability (Cronbach's α=0.799). Data were analyzed via SPSS v23, employing descriptive statistics and Chi-square tests ($p \leqslant 0.05$).

Results: Students exhibited strong foundational knowledge in General Information (87.1% high scores), particularly normal fasting glucose (91.0%) and symptom recognition (90.5%). However, Diabetes Management revealed critical gaps, with only 54.8% understanding treatment plans and 20.1% recognizing dietary importance. The Complications & Nurse's Role dimension showed near-universal competence (93.0% high knowledge), with 95.5% acknowledging nurses' educational responsibilities. Overall, 75.1% of responses reflected adequate knowledge. Chi-square tests revealed no significant differences in knowledge across gender (p=0.299), marital status (p=0.786), academic level (p=0.513), or age (p=0.624). However, a near-significant trend linked family history of diabetes to higher knowledge (59.8% high vs. 48.1% no history; p=0.062).

Conclusion: While nursing students possess strong theoretical understanding of DM, practical gaps in dietary and insulin management highlight curricular deficiencies. Demographic factors showed negligible influence, suggesting uniform knowledge distribution. To address gaps, integrating simulation-based learning, clinical partnerships, and interdisciplinary training is recommended. Future studies should evaluate the impact of curriculum reforms on clinical competence.

Keywords: Nursing education, diabetes complication prevention, curriculum gaps, clinical competence, Saudi Arabia.

1. Introduction

Diabetes Mellitus is the biggest health problem of the 21st century based on the Information that was released by the American Diabetes Association (ADA) (Alsomali, 2019). Scientifically, MD Is classified Into several categories including Type 1 and Type 2. Type 1 Diabetes Or Insulin-Dependent Diabetes mostly occurs in children where there is little or no insulin produced by the pancreas. On the other hand, type 2 usually occurs in adults because of resistance to insulin or reduction of its production (WHO, 2023). There has been a rapid increase in type 2 as a result of poor physical activities and unhealthy nutrition such as fast food, and carbonated foods Worldwide (Gazzaz,2020).

There were research findings Saudi Arabia was rated as the 2nd highest number of DM patients in the Arab country and 7th highest globally (Gazzaz,2020). Diabetes Mellitus is associated with life-threatening complications, including the failure of different organs and systems due to the elevation of blood glucose levels (Albagawi Et Al., 2023).In Addition, Individuals with diabetes need expert help In diabetes management throughout their lives. As a result of its serious effect on the human body, it is linked to several health problems such as blindness, renal Insufficiency, non-traumatic leg amputation, and coronary artery disease. It Is considered the fourth cause of morbidity and the seventh cause of mortality (Anastasiou Et.Al., 2019). Sometimes it could be an undetected health problem For 4 To 7 Years, Meanwhile, it could cause micro-and macrovascular changes (Abdullah Et.Al., 2019). Besides previous clear known complications, studies have shown a strong relationship between diabetes mellitus and other comorbidities involving cognitive decline, functional disability, affective disorders, obstructive sleep apnoea, and liver disease (Tomic Et.Al., 2022).

It is essential to Adopt preventive measures that delay or stop different types of complications. the treatment plan for the patient must include a balanced diet, physical activity, stress management, self-testing, smoking cessation, and weight control. Furthermore, patient and family education about correct

disease information such as signs, symptoms, and predisposing factors is a crucial life-saving measure (Anastasiou Et.Al., 2019). As preventive steps, there should be clear therapeutic guidelines for glycemic control as early as possible to avoid long-term complications in young patients (Sanz-Cánovas Et Al, 2022).To solve these issues in the healthcare system, knowledge and awareness among all healthcare professionals about diabetes mellitus disease is mandatory. It is important, therefore, for all health team to consider their role and responsibilities in carrying out educational programs related To the stages of The disease (Anastasiou V, Et.Al, 2019). Especially, nurses are the first line to interact with diabetic patients during the diagnostic, caring, and management phases. They play a significant role in improving patient quality of life and cost containment. Also, Knowledge of Nursing Students is important because they will replace current nurses. Healthcare systems will depend on them to care for and educate patients in the future. It is essential to develop their practice related to diabetes mellitus (Anastasiou Et.Al., 2019).

Research Objectives

This study aimed to determine the nursing students' knowledge regarding diabetes prevention. Specifically, it sought to answer the following objectives:

1. To identify the demographic characteristics of the nursing students in terms of

    1.1. Age

    1.2. Gender

    1.3. Marital status

    1.4 Academic level

    1.5 Previous level

    1.6 Personal/Family Diabetes History

2. To assess the knowledge of the nursing students about diabetes mellitus complication in terms of:

    2.1 General information

    2.2 Diabetes management

    2.3 Complications and Nurses Role

Hypothesis

There is no significant difference on the level of knowledge regarding diabetes mellitus complications across demographic characteristics.

2. Materials and Methods

Study Design

This study utilized quantitative-descriptive research, cross-sectional design as it seeks to determine the knowledge of nursing students regarding the diabetes mellitus complications. As a cross-sectional study, it looks on the gathered data from the students' population. This design is appropriate to this study as it measure the knowledge of students against their demographic characteristics.

Data Collection Methods

In order for the researchers to conduct research, the researcher formulated a questionnaire to collect the needed information. The questionnaire composed of 4 sections under 18 items. The first section contains the demographic background such as age, gender, marital status, academic level in college, previous degree and personal or family history. The last three sections cover the 3 categories namely general information about diabetes mellitus, knowledge regarding diabetic management and the diabetes complication and role in the prevention. These are 13 multiple choices questions measuring the knowledge of the nursing students. The scoring method follows 0 to 33 wherein 0 to 15 as having inadequate knowledge and 16 to 33 as having adequate knowledge.

For the validity, the said questionnaire underwent face and content validity from 3 experts. It was pilot tested to 10 nursing students which are not part of the actual study to determine if there is mistake, error or unclear about the questionnaire. It also underwent reliability coefficient for internal consistency. Under reliability analysis, this study utilized Cronbach's Alpha Coefficient for the Diabetes Knowledge Survey Instrument. The value is 0.799 which means the diabetes knowledge survey instrument demonstrated good internal consistency, with a Cronbach's alpha coefficient of 0.799 across all items. This value surpasses the widely accepted threshold of 0.7 for acceptable reliability in research instruments, confirming that the survey items cohesively measure the same construct—diabetes knowledge. While the alpha value is marginally below the stricter threshold of 0.8, it remains robust for exploratory research, indicating that the items are well-correlated and free from redundancy

Sample Characteristics

A convenience sample was used in choosing 199 students of both sexes from college of nursing at REU who are cooperative accepting to participate in the study and from level 4-8 nursing students were invited to participate in the study. The sample size was calculated by using The Steven K. Thompson

equation to estimate the appropriate sample size for this study (Thompson, 2012). According to the total number of admitted students at the college of nursing at REU, the total number of students is 521. As the confidence level is 95%, the error proportion (0.05), and the probability (50%) then, adding 20.

The eligibility criteria in choosing the sample were as follows: Inclusion criteria: Riyadh Elm University Nursing Students from Level 4 to Level 8; Age 18 Years And Above; The Male and Female Gender Students. The nursing students in the level 1,2 and 3 will be the exclusion of the study.

Survey Administration

This study was conducted on June 2024 to July 2024 upon obtaining approval from the university research center and Institutional Review Board committee of this institution. The researcher used online tools specifically the Google form that was sent to the respondents to achieve the purpose of the study.

Study Preparation

Before conducting the survey, the researchers made sure that all necessary documents and approval letters were handed. The researchers attend a meeting with their research supervisors on approaches that will be used before collecting data.

Ethical Consideration

Securing approval from research center is important before the conduct of this study. The research made sure that the respondents have willingness to participate before the administration of the questionnaire.

Statistical Analysis

The collected data was entered into Statistical Package for Social Sciences (SPSS) version 23.0. Nominal categorical data was presented in terms of frequency and percentage and the ordered categorical data was presented as to weighted arithmetic mean. The hypothesis was computed using Chi-square test. The confidence intervals (CI) were used for categorical variables. The significance level was set at $p \leqslant 0.05$.

3. Results and Discussion

Table 1 Demographic Characteristics of the Study Participants (N = 199)

Variables	Category	Frequency	Percentage
Age in years	Less than 20 years	7	3.5%
	20-23 years	103	51.8%
	23-25 years	35	17.6%
	Above 25 years	54	27.1%
Gender	Male	168	84.4%
	Female	31	15.6%
Marital Status	Single	138	69.3%
	Married	54	27.1%
	Divorced	7	3.5%
Academic Level in College	Level 4	39	19.6%
	Level 5	34	17.1%
	Level 6	15	7.5%
	Level 7	20	10.1%
	Level 8	91	45.7%
Previous Degree (Diploma)	Yes	36	18.1%
	No	163	81.9%
Personal/Family Diabetes History	Both family and personal	8	4.0%
	No history	77	38.7%

	Personal history only	7	3.5%
	Family history only	107	53.8%

As shown in Table 2, the study participants (N = 199) were predominantly male (84.4%) and fell within the 20–23 years age group (51.8%), with a smaller proportion aged above 25 years (27.1%). Most participants were single (69.3%), reflecting the younger demographic. Academically, nearly half (45.7%) were enrolled in Level 8, the highest academic tier, suggesting a focus on senior nursing students. A majority (81.9%) lacked a prior diploma, indicating this cohort was primarily pursuing their first degree. Notably, over half (53.8%) reported a family history of diabetes, while only 4.0% had both personal and family histories.

Table 2: Diabetes Knowledge Assessment among Nursing Students (N = 199)

Variable/s	**High Knowledge n(%)**	**Low Knowledge n(%)**
General Information		
Normal fasting glucose (70-100mg/dl)	181 (91%)	18 (9.0%)
DM is a common disease	158 (79.4%)	41 (20.6%)
Knowledge of DM symptoms	180 (90.5%)	19 (9.5%)
Identifies DM causes	174 (87.4%)	25 (12.6%)
	693 (87.1%)	***103 (12.9%)***
Diabetes Management		
Can describe DM treatment	109 (54.8%)	90 (45.2%)
Knows insulin administration steps	119 (59.8%)	80 (40.2%)
Regular diet importance	40 (20.1%)	159 (79.9%)
Physical activity needed	154 (77.4%)	45 (22.6%)
Biannual checkups	168 (84.4%)	31 (15.6%)
	631 (65.8%)	***328 (34.2%)***
Complications and Nurse's Role		
Nurse educates patients	190 (95.5%)	9 (4.5%)
Nurse manages complications	180 (90.5%)	19 (9.5%)
	370 (93.0%)	***28 (7.0%)***
Overall Total	**1694 (75%.1)**	**459 (20.4%)**

As shown in Table 3, nursing students demonstrated strong foundational knowledge in General Information (87.1% high knowledge), particularly in normal fasting glucose (91.0%) and DM symptoms (90.5%). However, gaps emerged in Diabetes Management, with only 65.8% high knowledge overall, driven by critical deficiencies in regular diet importance (20.1% high knowledge). Conversely, students excelled in understanding physical activity (77.4%) and biannual check-ups (84.4%). The Complications & Nurse's Role dimension showed near- universal competence (93.0% high knowledge), with 95.5% recognizing the nurse's educational role. Overall, 75.1% of responses reflected adequate knowledge, aligning with the study's focus on prevention, though targeted training is needed to address dietary management and insulin administration (59.8%). These findings underscore the need for curriculum enhancements to bridge practical gaps while leveraging existing strengths in theoretical understanding.

Table 3: Chi-Square Test Analysis of Diabetes Knowledge Levels across Demographic Characteristic

Variable	**Low Knowledge n (%)**	**Medium Knowledge n (%)**	**High Knowledge n (%)**	**p-value**
Gender				**0.299**
Male	12 (7.1%)	69 (41.1%)	87 (51.8%)	
Female	0 (0.0%)	13 (41.9%)	18 (58.1%)	
Marital Status				**0.786**

Single	8 (5.8%)	56 (40.6%)	74 (53.6%)	
Married	4 (7.4%)	24 (44.4%)	26 (48.1%)	
Divorced	0 (0.0%)	2 (28.6%)	5 (71.4%)	
Academic Level				**0.513**
Level 4	3 (7.7%)	21 (53.8%)	15 (38.5%)	
Level 5	2 (5.9%)	13 (38.2%)	19 (55.9%)	
Level 6	1 (6.7%)	3 (20.0%)	11 (73.3%)	
Level 7	1 (5.0%)	10 (50.0%)	9 (45.0%)	
Level 8	5 (5.5%)	35 (38.5%)	51 (56.0%)	
Age group				**0.624**
Less than 20 years	1 (14.3%)	4 (57.1%)	2 (28.6%)	
20-23 years	7 (6.8%)	37 (35.9%)	59 (57.3%)	
23-25 years	2 (5.7%)	16 (45.7%)	17 (48.6%)	
More than 25 years	2 (3.7%)	25 (46.3%)	27 (50.0%)	
Diabetes History				**0.062**
Both family and personal	0 (0.0%)	5 (62.5%)	3 (37.5%)	
No history	8 (10.4%)	32 (41.6%)	37 (48.1%)	
Personal history only	1 (14.3%)	5 (71.4%)	1 (14.3%)	
Family history only	3 (2.8%)	40 (37.4%)	64 (59.8%)	

As shown in Table 4, the Chi-Square analysis revealed no statistically significant differences in diabetes complication prevention knowledge across gender (p=0.299), marital status (p=0.786), academic level (p=0.513), or age group (p=0.624), supporting the null hypothesis. However, diabetes history showed a near-significant trend (p=0.062), with students having family history only exhibiting the highest proportion of high knowledge (59.8%), compared to those with no history (48.1%) or personal history (14.3%). Notably, female students had no low knowledge scores (0.0%), and Level 6 students demonstrated the highest high knowledge (73.3%), though these differences were not statistically significant. Overall, the findings suggest that demographic factors alone do not strongly predict knowledge levels, aligning with the hypothesis that nursing students' understanding of diabetes complication prevention is relatively uniform across demographic groups, with potential non-demographic factors (curriculum, clinical exposure) playing a more critical role.

Discussion

This study aimed to assess nursing students' knowledge regarding the prevention of diabetes mellitus (DM) complications and explore the influence of demographic factors on their understanding. The findings revealed that students demonstrated strong foundational knowledge in General Information (87.1% high knowledge), particularly in identifying normal fasting glucose levels (91.0%) and DM symptoms (90.5%). However, gaps were evident in Diabetes Management (65.8% high knowledge), with critical deficiencies in understanding the importance of a regular diet (20.1%). Conversely, students excelled in recognizing the nurse's role in patient education (95.5%) and complication management (90.5%). No significant differences were observed across demographic variables (gender, marital status, academic level, age), except for a near-significant trend among those with a family history of diabetes (p=0.062). These results align with global studies but highlight unique contextual challenges and opportunities for curriculum enhancement.

The high competence in General Information mirrors findings from Anastasiou et al. (2019), where nursing students exhibited robust theoretical knowledge about DM, averaging 99.24/100. Similarly, Abdirahman et al. (2022) reported strong awareness of DM risk factors (95% recognized obesity) among Saudi nursing students. However, the current study's lower scores in Diabetes Management (54.8% could describe treatment plans) contrast with Alkubati et al. (2023), where Saudi internship students scored 49.28% overall, with insulin knowledge being particularly weak. This discrepancy may stem from differences in curricular focus: Alkubati's study highlighted gaps in clinical insulin management, while this study identified dietary education as a critical gap. Both underscore the need for practical, skill-based training alongside theoretical instruction.

The lack of significant demographic associations (p>0.05 for gender, age, etc.) aligns with Sari et al. (2022), who found no gender-based differences in diabetic ulcer care knowledge among Indonesian students. However, Qadri et al. (2025) reported academic progression as a key predictor of diabetes knowledge in Pakistani students, a factor not directly measured here. The near-significant link between family history and higher knowledge (59.8% high

knowledge) resonates with Siregar et al. (2021), where patients with diabetes exhibited better preventive attitudes when personally exposed to complications. This suggests that lived experiences, rather than formal education alone, may enhance understanding—a finding that advocates for integrating patient narratives and case studies into curricula.

The stark deficiency in dietary management knowledge (20.1%) is alarming, given its centrality in diabetes care. This contrasts with Anastasiou et al. (2019), where adherence to the Mediterranean diet correlated with better knowledge. Cultural dietary practices in Saudi Arabia, such as high carbohydrate consumption, may complicate students' ability to translate theoretical knowledge into practical advice. Similarly, moderate scores in insulin administration (59.8%) reflect global trends; Alkubati et al. (2023) identified insulin therapy as the least understood domain (p=0.001), emphasizing the universal need for hands-on training.

The near-universal recognition of the nurse's role (93.0% high knowledge) aligns with Sari et al. (2022), where 88.9% of students held positive attitudes toward diabetic ulcer care. However, attitudes do not always translate to competence. For instance, while 95.5% acknowledged their educational role, only 54.8% could describe treatment plans—a gap between confidence and capability. This dichotomy mirrors Abdirahman et al. (2022), where 61% of students underestimated the severity of non-insulin-dependent DM, despite theoretical awareness. Such findings highlight the need for pedagogical strategies that bridge knowing and doing, such as simulation-based learning and clinical apprenticeships.

4. Conclusion

This study highlights nursing students' strong theoretical understanding of diabetes mellitus (DM) fundamentals but reveals critical gaps in practical competencies, particularly in dietary management and insulin administration. While demographic factors showed negligible influence on knowledge levels—indicating uniformity across groups—familial exposure to diabetes emerged as a potential enhancer of awareness. These findings align with global trends but emphasize the necessity for context-specific curricular innovations.

Recommendations

Based on the study's findings, the following three key interventions are recommended in order to mitigate these gaps.

1. Curriculum Enhancement: Integrate simulation-based learning and case studies focused on dietary management and insulin therapy.

2. Clinical Exposure: Strengthen partnerships with diabetes clinics to provide real-world patient interaction opportunities.

3. Interdisciplinary Training: Collaborate with nutritionists and endocrinologists to foster holistic patient care perspectives.

4. Future research should explore the impact of these interventions on knowledge retention and patient outcomes. Additionally, longitudinal studies tracking students' knowledge progression from academia to clinical practice could further refine educational strategies. Addressing these gaps is imperative to equip future nurses with the skills necessary to combat the escalating global burden of diabetes mellitus and its complications.

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