**Diabetes Self-Management among a Random Sample of University Students at Assiut University, Egypt**

**Abstract**

Diabetes Mellitus (DM) is one of the fast-growing public health problems. knowledge of effective self-care management of diabetes among university students usually faces a lot of barriers. The study's objectives were to determine the level of knowledge of diabetes self-care management among a random sample of Assiut University Students and to provide a set of recommendations to increase the level of knowledge about diabetes. The study was a quantitative, observational analytic cross-sectional study carried out at the Youth Friendly clinic at Assiut University where a random sample of 300 students seeking services provided by the Clinic were enrolled. Data was collected with a self-administered structured questionnaire filled out by the student, after signing a written informed consent under the researcher's supervision and after explaining the research objectives. Questionnaires covered the basic sociodemographic data, and the Diabetes Self-management Questionnaire, (DSMQ). The Ethical Committee of the Assiut Faculty of Medicine and Warwick University reviewed and approved the research proposal. Results showed that there was a marked deficiency in the overall knowledge of the students regarding items of the DSMQ, only 34% of the students had an accepted level of knowledge in the sum scale, with 70% deficient knowledge in items of the glucose monitoring domain, 68% deficiency in items of the dietary control domain, 58% in the physical activity domain, and 48% in the health care use domain.

Conclusion: Knowledge of university students about diabetes self-management is deficient in the majority of the self-care items.

Keywords: Knowledge, Diabetes, University, Students, Self-management

**Introduction:**

Diabetes Mellitus (DM) is one of the fast-growing public health problems, it is defined as a chronic, metabolic disease characterized by elevated levels of blood glucose (Rabe et, al, 2018). It is usually associated with serious health problems in the heart, blood vessels, kidneys, and nerves. WHO had anticipated that DM is going to become the seventh most significant primary cause of death worldwide by the year 2030 (WHO, 2017). The main types of DM include type 1 where the body stops making insulin and type 2 which is the more common type, usually in adults when the body becomes resistant to insulin or does not make enough insulin (Olorunfemi O, and Ojewole, F 2019).

In 2019, The International Diabetes Federation (IDF) estimated that Egypt is the 9th country worldwide with about 8,850,400 cases and a prevalence of 15.2% in adults. Furthermore, this report indicates that a further 4.5 million patients are undiagnosed, which is considered a very important cost-benefit intervention if its occurrence is to be prevented. By 2045, Egypt is expected to be the 7th country worldwide in terms of cases and prevalence in adults. **In Egypt, an annual cost analysis estimated that the economic burden of type 2 diabetes was $1.29 billion in 2010, this number excluded the cost associated with prediabetes and the cost associated with loss of productivity, and this figure will have doubled by the year 2030** (IDF, 2019).

**The high prevalence of diabetes in Egypt, together with the low rates of knowledge and compliance to diabetes self-management, where many diabetic patients fail to achieve satisfactory glycaemic control (despite effective methods of treatment) leads to an accelerated development of complications and increased mortality (**Ali et, al, 2021)**). Additionally, university students, in particular, are less committed to diabetes self-management due to newly acquired independence, erratic schedules, possible peer pressure, and rebellion, limited studies in Egypt have addressed compliance with diabetes treatment and its barriers, particularly among university students** (Ali et, al, 2021). **University students usually face a lot of barriers either known or hidden in the effective management of diabetes, furthermore, many physical and psychological barriers can hinder patients from following a healthy lifestyle (**Metwally, et, al, 2021)**. With diabetes, the main therapeutic goal is maintaining good glycaemic control to prevent micro and macrovascular complications. However, the majority of university students failed to achieve good glycaemic control. The reasons for this poor glycaemic control are multi-factorial and complex.** (Metwally, et, al, 2021) **Many previous studies into barriers to effective glycaemic control look at beliefs about the medication, complex regimens that are difficult to follow, side effects of the medications, lack of adequate knowledge about diabetic medication and treatment goals, as well as the costs associated with these medications** (Ali et, al, 2017). **Therapeutic or medication noncompliance includes failure to dispense or renew prescription medications, omission of doses, and premature discontinuation of the drug regimen. Another important category is dietary/exercise non-adherence in which the patient fails to follow the diet and exercise recommendations in addition to appointment nonadherence in which the patient fails to show up at the clinics for the scheduled check-up (**Robert and Al Darwish, 2019).

**The overall goal of the study is to improve the knowledge of diabetes self-care among university students, with two specific objectives. First** To determine the level of knowledge of diabetes self-care management among a random sample of Assiut University Students, and second to provide a set of recommendations to increase awareness of the students about the importance of self-care management and adherence to treatment for better glycemic control.

**Research design and methods**

The study was a quantitative, observational, analytic cross-sectional study carried out at the Youth Friendly Clinic inside Assiut University, which is one of the units of the Public Health Department providing counseling and education about proper lifestyle and nutrition for all students in the university. It is a well-equipped site serving more than 80,000 university students., concerned with counseling and health education of all health problems of the students in the university from all faculties both medical and non-medical in the health disorders related to malnutrition (obesity, underweight, anemia, bone health, and skin health), counseling regarding mental stress related to exams, and screening of chronic diseases like diabetes and hypertension

The sample size was calculated using the Epi info version 7 Stat**-**Calc, based on the following assumption, a prevalence rate of 67.8% level of good diabetes self-care knowledge (Zerihun et al, 200), a level of confidence of 95%, precision of 5%, and design effect The calculated sample size was raised to 300 after adding 10% as anon-response rate.

Randomization was done at the level of working days of the clinic. As the clinic works 5 days every week, three days were randomly selected from the working five days. The study enrolled all those students who had come in on those days seeking the services of the clinic, who then agreed to participate after signing the informed consent form. The inclusion criteria were any students from the university during the academic year (2023/2024), who agreed to participate in the study - the fieldwork and data collection carried out for a three months duration from February to May 2023.

**Data collection tools:**

Data were collected through a self-administered structured questionnaire, the students filled out two questionnaires under the supervision of the researcher after he had explained the research objectives and answered any questions the students may have had.

Questionnaire (1) covered the basic information of the students, such as age, sex, telephone, residence, marital state college and grade, and socioeconomic status. Questionnaire (2) was the Diabetes Self-management Questionnaire, (DSMQ) which is a four-point Likert scale (to avoid a neutral response option and force a specific response). It incorporated the following response options: the first response ‘applies to me very much’ take (three points), the second ‘applies to me to a considerable degree’ take (two points), the third ‘applies to me to some degree’ take (one point), and finally ‘does not apply to me’ take (zero points).

The questionnaire was composed of 16 items which form the final scale, seven of these items formulated with positive responses and nine with negative responses regarding what is considered most effective in self-care management in diabetes care. The items can be summated to a sum scale score and divided into 4 subscale domains which included the following items: 1- The glucose Management Domain (items 1, 4, 6, 10, 12), 2- the Dietary Control Domain (items (2, 5, 9, 13), 3- the Physical Activity Domain (items (8, 11, 15), and 4- the Health-Care Use Domain (items (3, 7, 14), and the last item 16, which represents the overall rating of self-care and is to be included in the ‘Sum Scale’ only. The total Scale scores are calculated as sums of item scores and then transformed to a scale, ranging from 0 to 10 (raw score / theoretical maximum score \* 10) for example, for the subscale ‘Glucose Management’ a raw score of 12 leads to a transformed score of 12 / 15 \* 10 = 8) (Schmitt et al. 2016).

The higher scores reflect more optimal diabetes self-care knowledge, DSMQ score of more than 60% is a commonly used cut-off to assign ‘good’ and satisfied knowledge of diabetes self-care management, while a score of less than 60% is considered the unsatisfied level of knowledge, the full questionnaire is shown in table 5.

# **Pilot study**

Before starting to collect data, a pilot study was carried out to fulfill the following purposes, testing the questionnaire form, detecting and becoming familiar with its items, estimating the time needed to fill the questionnaire, and exposing the difficulties that may arise and how to deal with them.

# **Ethical Considerations**

# The research proposal was reviewed and approved by the Ethical Committee of the Assiut Faculty of Medicine, administrative permission was obtained from the University Authority, informed written consent was obtained from all students before being included in the study, and privacy and confidentiality of the data were assured.

**Statisticalanalysisof data*:***

Datawascleaned and verified, then entered using software SPSS version 22 for Windows. Descriptive statistics were carried out (Frequencies, mean and standard deviation), then inferential statistics: X2 test,was carried out*.* The probability of less than 0.05 was used as the cut-off point for all significant tests.

**Results**

Table 1 shows that males represent 62% of those studied, the majority of the students were from rural residences (84%), 44 % of the students were from Medical faculties, more than half of the students were in their second year in their faculties, one-third of the students (32%) have family members with diabetes, and about one-quarter of the students were either engaged or married.

Table 2 shows that there was a marked deficiency in the overall knowledge of the students regarding items of the self-care management of diabetes, as only 34% of the students have an accepted level of knowledge in the sum scale, with 70% not having an accepted level of knowledge in items of glucose monitoring scale, 68% with a deficient knowledge in dietary control domain items, 58% in physical activity items and 48% in health care use items.

Table 3 shows the relationship between the different socio-demographic characteristics of the students and the level of knowledge of the self-care questionnaire. It reveals no statistically significant difference in the level of knowledge between males and females and between rural and urban residents, while medical students have a higher level of knowledge than non-medical with a statistical significance (P= 0.016). Students in the second year have a higher level of knowledge than other years (P = 0.032), students who have positive diabetes family history have a higher level of knowledge than those with negative family history, and single unmarried students have a higher level of knowledge than the non-single (P= 0.03).

Table 4 shows the response of the students to the 16 items of the diabetes self-care management questionnaire and demonstrates a marked deficiency in all items of the questionnaire. Only 30% of the students reported the importance of food choices for the achievement of tight glycaemic control, (applies to them very much), 40% only addressed the importance of doctor appointments, 30% addressed the importance of taking medication on time, 12% addressed the importance of regular recording of the blood glucose, 6% the importance of seeing the medical practitioner more often, and 16% the importance of not skipping planned physical activity.

**Discussion:**

For all individuals with diabetes, the main therapeutic **goal is maintaining good glycaemic control to prevent micro and macrovascular complications. Diabetes self-care management is an effective solution, with patient education essential for proper diabetes control (**Yigazu and Desse, 2017). It is widely accepted that proper and good self-care management of diabetes can protect from many diabetes complications in both types, and patients should be actively engaged in diabetes management (Albisser et al, 2001). Studies have shown that illness knowledge, perception, and beliefs about medication for type 2 DM are commonly linked with adherence to medication and in return better glycaemic control (Hussein, et al. 2017), Hence the importance of this research is to address the concept of self-management to reduce complications from the disease and improve overall health outcomes (Robert and Al Darwish, 2019).

This study aimed to improve the knowledge of diabetes self-care among university students and provide a set of recommendations to increase awareness of the students about the importance of self-care management and adherence to treatment for better glycemic control.

The results of the study reveal a marked deficiency in the overall knowledge of the students regarding items of diabetes self-care management as shown in Table 2, as only 34% of the students have an accepted level of knowledge in the sum scale. Furthermore, the level of knowledge was less than that reported in a study conducted in Ethiopia aimed to assess diabetic self-care knowledge and its associated factors among adults, which found that, more than half of the study respondents (67.8%) had good diabetes self-care knowledge (Zerihun et, al, 2020). This reflects a very serious fact about the implementation of self-care management in diabetes care: university students are assumed to have a reasonable amount of knowledge more than the public, Yet the finding of a very low level of knowledge among university students shows the opposite and accordingly, must be taken seriously and corrected quickly. Moreover, this low level of knowledge was found in the four domains of the questionnaire; more in items related to the importance of glucose monitoring and dietary control, and less in the importance of healthcare use items. It is important to correct such an imbalance in knowledge levels as other studies have documented that individual knowledge about diabetes enables people to manage their disease more actively (Weymann et al, 2016).

The results show no statistically significate difference in the knowledge of diabetes self-care management between males and females and also residence has no role in knowledge difference (Table 3), our results are matched with a study conducted in Ethiopia by Zerihun et, al, 2020, which stated that urban residency was found to be one of the independent factors affecting diabetic self-care knowledge. Such findings may be attributed to the fact that access to education is the same for both sexes and all regions either urban or rural without any discrimination of the quality of education especially at the university level.

Students of the medical faculties had a higher level of knowledge than the non-medical students as evident in a statistical significance (P= 0.016), this is an expected finding as students in the Medical faculties are usually exposed to more knowledge about diabetes than the non-medical faculty students. The same findings were reported in students who had a positive diabetes family history, having a higher level of knowledge than those with a negative family history, (P= 0.03). This discrepancy might be attributed to the differences in the socio-economic status of the students, their access to diabetic information, and their educational level (Adibe et, al, 2011).

Regarding the response of the students towards each item of the diabetes self-care management questionnaire, (Table 4), only 30% of the students emphasized the importance of food choices in achieving tight glycemic control, (applies to them very much), which could be argued is an underestimation of the significance of such an important item. This finding was repeated in the role of physical activity as only 12 % of the students addressed the importance of regular recording of blood glucose and 6% addressed the importance of seeing the medical practitioner more often. Despite the importance of such items in diabetes self-care management, students failed to detect the values of such items and, therefore, have deficiencies in knowledge regarding the importance of such items in diabetes management. Moreover, this level of knowledge is lower than a study conducted in Nigeria to assess the magnitude of knowledge of diabetes and the consequences of uncontrolled diabetes which was found to be 77.5% meaning that more than three-quarters of the study participants had a good level of knowledge (Jackson et al, 2014). Such inconsistency and the discrepancy in these results might be due to differences in the sociodemographic characteristics of the study participants.

Although knowledge of any disease by itself other than diabetes may be insufficient to motivate behavioural change in patients and thereby improve their health outcomes, many studies have stated that this is not the situation with diabetes, As specific knowledge of diabetes self-care is usually associated and combined with better and effective glycaemic control (Kugbey, et al, 2017 & Van der Heide et al, 2014). The provision and availability of health education tools for diabetes self-care management to university students are highly recommended, these facts are documented in many studies. Milewski J and, Chan Y, (2010), emphasize the importance of health education and counseling in better control and management of diabetes. Accurate knowledge about diabetes self-care management among university students will counteract false, unstructured, and contradictory information about how to deal with this very important public health problem.

In a study conducted in Germany, to evaluate, how participation in structured diabetes self-management education (DSME) programs is associated with an increased level of knowledge and information about diabetes, it concluded that DSME is a very important tool for improving individual knowledge about diabetes. Moreover, it should focus more on the psychosocial aspects, as those taking the education sessions showed a higher level of diabetes knowledge compared to those not participating in DSME. The odds ratio is 2.53, and 95% confidence intervals (1.48–4.33) (Heise, et al, 2022)

**Conclusion:**

We conclude from the results that knowledge of university students about diabetes self-management is deficient in the majority of the self-care items of the questionnaire, the knowledge was very low in the importance glucose monitoring domain, followed by the dietary control domain, followed by the physical activity domain and lastly the health care use domain. Males and females had the same level of knowledge, students of faculties of medical background had more knowledge than the nonmedical, and students who have positive diabetes family history had a higher level of knowledge than those with negative family history.

**Recommendations:**

Based on the results of the study it is possible to draw up a set of recommendations to improve the overall knowledge of the university students.

1. The addition of a chapter on Diabetes Self-Management in the teaching curriculum in the different faculties of the university, especially the non-medical faculties.
2. Efforts should be directed toward raising university students' awareness through mass and social media such as Facebook, WhatsApp, and other social media tools.
3. Regular health education campaigns should be run with materials such as leaflets and posters containing the essential basics of diabetes self-care management knowledge.
4. The study could be used to pave the way for better detection of the level of knowledge as well as the known and *hidden* barriers toward effective glycemic control among university students. This in turn will help postpone and decrease diabetes complications in both the short and long term.

**Limitations of the Study**

1. The DSMQ version is in English format and no valid Arabic version was used, the researcher had to explain the meaning of some items of the questionnaire to those who were not fluent in English especially non-medical faculties students
2. Obtaining ethical approval from the ethical committee of the faculty of medicine was a particularly time-consuming and complicated process.
3. Data collection - the collection of 300 questionnaires within 3 months meant that the researcher had to work very hard and many hours to finish this task in this very short period.

**Conflict-of-interest statement**

The author declares that there is no conflict of interest

Disclaimer (Artificial intelligence)

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Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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Details of the AI usage are given below:

1.

2.

3.

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**Tables**

**Table (1): Sociodemographic characteristics of the study participants (n=300).**

| **Variables** | **Categories** | **Frequency** | **Percentage (%)** |
| --- | --- | --- | --- |
| **Sex** | **Male**  **Female** | 186  114 | 62  38 |
| **Residence** | **Urban**  **Rural** | 48  252 | 16  84 |
| **Faculty** | **Non-Medical**  **Medical** | 168  132 | 56  44 |
| **Study year** | **First-year**  **Second year**  **Third year**  **Fourth-year**  **Fifth year** | 78  156  42  12  12 | 26  52  14  4  4 |
| **Diabetes family history** | **Yes**  **no** | 96  204 | 32  68 |
| **Social status** | **Single**  **Engaged**  **Married** | 228  60  12 | 76  20  4 |

**Table (2): Level of Knowledge Satisfaction of the Students’ Self-care Subscale Domains (N=300).**

| **Self-care domains** | **Not accepted (≤ 60%)** | | **Accepted (> 60%)** | |
| --- | --- | --- | --- | --- |
| **No.** | **%** | **No.** | **%** |
| **Glucose monitoring** | 210 | 70 | 90 | 30 |
| **Dietary control** | 204 | 68 | 96 | 32 |
| **Physical activity** | 174 | 58 | 126 | 42 |
| **Health care use** | 144 | 48 | 156 | 52 |
| **Sum scale of all Domains** | 198 | 66 | 102 | 34 |

**Table (3): Relationship between participants' Sociodemographic characteristics and knowledge self-care level (N=300).**

| **Self-care items** | | **Not accepted**  **(n=198)** | | **Accepted**  **(n=102)** | | **p. value (Sig.)** |
| --- | --- | --- | --- | --- | --- | --- |
| **No.** | **%** | **No.** | **%** |
| **Gender** | **Male** | 120 | 60.6 | 66 | 64.7 | 0.49NS |
| **Female** | 78 | 39.4 | 36 | 35.3 |
| **Residence** | **Urban** | 36 | 18.2 | 12 | 11.7 | 0.15 NS |
| **Rural** | 162 | 81.8 | 90 | 88.3 |
| **Faculty** | **Medical** | 108 | 54.5 | 60 | 58.8 | 0.016 \* |
| **Nonmedical** | 90 | 45.5 | 42 | 41.2 |
| **Study year** | **1st year** | 42 | 21.2 | 36 | 35.3 | **0.032\*** |
| **2nd year** | 108 | 54.5 | 48 | 47.1 |
| **3rd year or more** | 48 | 24.3 | 18 | 17.6 |
| **Diabetes family history** | **No** | 72 | 36.4 | 24 | 23.5 | **0.001\*\*** |
| **Yes** | 126 | 63.6 | 78 | 76.5 |
| **Marital status** | **Single** | 162 | 81.8 | 66 | 64.7 | **0.03\*** |
| **Not single** | 36 | 18.2 | 36 | 35.3 |

The chi-square test was used

NS not significant \* Significant (p<0.05) \*\* Significant (p<0.01

**Table 4: Responses of the Students to Questions about Diabetes Self-Management**

| **Questions on self-care activities (over the last 8 weeks)** | **This applies to me very much (%)** | **This applies to me to a considerable degree (%)** | **This applies to me to some degree (%)** | **Does not apply to me (%)** |
| --- | --- | --- | --- | --- |
| I check my blood sugar levels with care and attention. Blood sugar measurement is not required as a part of my treatment. | 126 (42%) | 72 (24%) | 72 (24%) | 30 (10%) |
| The food I choose to eat makes it easy to achieve optimal blood sugar levels | 90 (30%) | 108 (36) | 90 (30%) | 12 (4%) |
| I keep all doctors’ appointments | 120 (40%) | 102 (34%) | 60 (20%) | 18 (6%) |
| I take my diabetes prescription (e.g. insulin, tablets) as advised. | 90 (30%) | 120 (40%) | 54 (18%) | 36 (12%) |
| Occasionally I eat lots of sweets or other foods rich in carbohydrates | 48 (16%) | 60 (20%) | 132 (44%) | 60 (20%) |
| I record my blood sugar levels regularly | 36 (12%) | 84 (28) | 108 (36) | 72 (24) |
| I tend to avoid diabetes-related doctor’s appointments. | 96 (32) | 102 (34) | 72 (24) | 30 (10) |
| I do regular physical activity to achieve optimal blood sugar levels. | 84 (28) | 84 (28) | 120 (40) | 12 (4) |
| I strictly follow the dietary recommendations given by my doctor or diabetes specialist. | 78 (26) | 84 (28) | 120 (40) | 18 (6) |
| I do not check my blood sugar levels | 78 (26) | 84 (28) | 108 (36) | 30 (10) |
| I avoid physical activity, though it would get better. | 78 (26) | 72 (24) | 96 (32) | 54 (18) |
| I tend to forget to take or skip my diabetes medication (e. g. insulin, tablets). Diabetes medication/insulin is not required as a part of my treatment. | 120 (40) | 48 (16) | 96 (32) | 36 (12) |
| Sometimes I have real ‘food binges’ | 36 (12 ) | 120 (40 ) | 108 (36 ) | 36 (12 ) |
| Regarding my diabetes care, I should see my medical practitioner (s) more often. | 18 (6) | 114 (38) | 126 (42) | 42 (14) |
| I tend to skip planned physical activity. | 48 (16) | 102 (34) | 114 (38) | 36 (12) |
| My diabetes self-care is poor. | 78 (26) | 78 (26) | 96 (32) | 48 (16) |

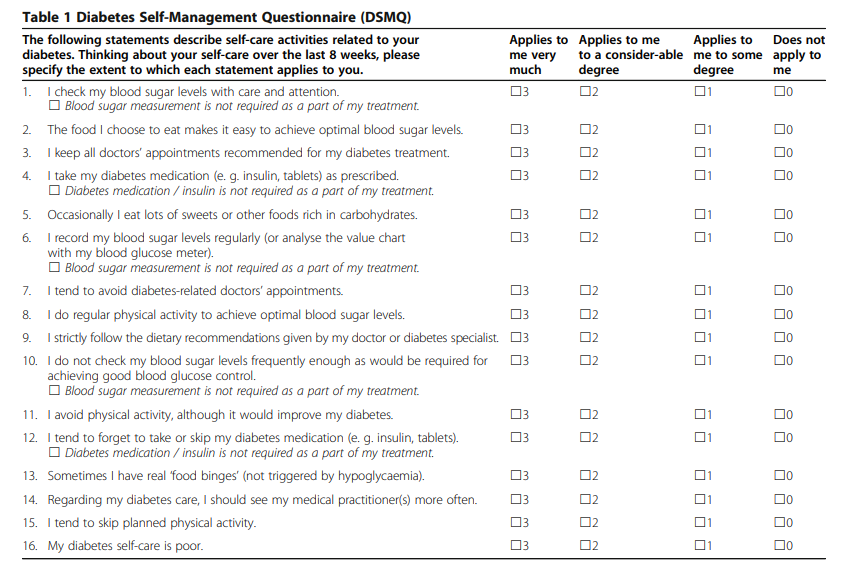


Table (5) the Diabetes self -Management Questionnaire (DSMQ).