

Hypoglycemia awareness and its associated risk factors, in non-insulin-dependent diabetes in Hail region, Saudi Arabia

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Abstract. – OBJECTIVE: Hypoglycemia is one of the avoidable complications of diabetes mellitus type 1 or 2, which occurs in between 24% to 60% of diabetic patients. It is a state of low plasma glucose concentration, either with or without symptoms, that can expose the patient to risks. Hypoglycemia is associated with impaired brain function, cardiovascular and visual effects, and increased mortality. This study was conducted to assess the knowledge of hypoglycemia as a complication of diabetes mellitus type 2 and the awareness of risk factors among the Hail City population, Kingdom of Saudi Arabia.

SUBJECTS AND METHODS: We conducted a cross-sectional study targeting diabetic patients with type 2 in Hail province from April to August 2022. We used an online questionnaire distributed through popular social media, which included questions on age group, gender, BMI, social status, occupation, education, and income.

RESULTS: Approximately 48.2% of patients had episodes of hypoglycemia in the previous three months, while 43% did not have hypoglycemic episodes. Among patients, 424 (73.7%) had less than three hypoglycemic episodes during the previous three months, and 121 (21%) had 3-6 episodes.

CONCLUSIONS: Hypoglycemic episodes among diabetic patients have critical effects on the patient and may lead them to avoid diabetic drugs, causing hyperglycemia.

Key Words:

Hypoglycemia, Non-insulin, Diabetes mellitus type 1 or 2 complications, Diabetic drugs, Patients.

Introduction

Hypoglycemia is one of the avoidable diabetes mellitus type 1 or 2 complications, which happens in between 24 to 60% of diabetic patients¹. It is a state of low plasma glucose concentration, either with the presence or absence of symptoms that can expose the patient to risks². Hypoglycemia is associated with impaired brain function and cardiovascular and visual effects³. In addition, it increases mortality rates⁴. Nevertheless, higher emergency room visits and hospitalizations⁵ lead to a tremendous burden on patients and the country's economy and decreased quality of life due to recurrent hospitalization, patient anxiety, and anticipation of the next episode. Blood tests reveal low plasma glucose concentration levels below 70 mg/dL, but signs and symptoms may not occur until they drop below 55 mg/dL, disappearing through the correction of the blood glucose level. Due to the central nervous system's deprivation of glucose, patients may suffer from confusion, behavioral changes, seizures, coma, and death. Other signs and symptoms include anxiety, tremors, palpitations, hunger, diaphoresis, and paresthesia due to the release of catecholamines and acetylcholine in response to hypoglycemia⁶. Diabetes type 1 has more incidence of hypoglycemia than type 2, especially in long-standing diabetes. For those who use insulin for treatment, the miscalculation of the insulin will lead to an imbalance between glucose and body

demand⁷. Insulin levels in the blood and various glucose-lowering agents cause hypoglycemia in varying proportions. It happens in 7.3% of type 2 diabetic patients treated with insulin.

On the other hand, it will occur only in 0.8% of sulfonylurea users⁸ and much fewer incidents in patients treated with metformin or those managing the disease by dietary changes⁹. This condition is called iatrogenic hypoglycemia¹⁰. Other risk factors for hypoglycemia include skipped or delayed meals, inadequate carbohydrate intake as in poverty or a fasting state like Ramadan, excessive physical activity¹¹, infections, alcoholism, and stressful events¹².

Frequent hypoglycemia episodes in diabetic patients can result in hypoglycemia unawareness, a state in which the body fails to execute autonomic warning signs before reaching the neuroglycopenic state. In addition, frequent hypoglycemic episodes lower the average blood glucose threshold, and the body's natural control mechanism considers low blood glucose levels physiologically. Hypoglycemia during sleep is especially dangerous because it can result in death¹³. Patient education and self-monitoring of blood glucose (SMBG), dietary changes and regular exercise, medication changes, careful glucose monitoring by the patient, and attentive clinician follow-up are all effective methods for lowering the risk of hypoglycemia¹⁴.

This study was conducted to assess the knowledge of hypoglycemia as a complication of type 2 diabetes mellitus and the awareness of the risk factors that will lead to this condition among the Hail city population.

Literature Review

Table I shows the Results of comparing the study with some of the other studies. They were compared in terms of sample methods, results, and the contribution of each study^{13,31-41}.

Subjects and Methods

A descriptive cross-sectional study was conducted in Hail City between April 2022 and August 2022 to assess awareness of hypoglycemia and its associated risk factors, in non-insulin-dependent diabetes in Hail region. The target subjects were diabetic patients with type 2 in Hail, Saudi Arabia. Diabetic patients with type 2 not living in Hail, diabetic patients with type 1, and incomplete questionnaires were all excluded from the study. To gather data, we utilized an online questionnaire, a Google Form survey

(Google LLC, Mountain View, CA, USA) which was distributed electronically for data gathering through popular social media platforms such as Twitter, WhatsApp, and others. Our study had a sample size of over 500 participants. The questionnaire included various demographic and health-related questions, such as age group, gender, BMI (normal, overweight, obese), social status (married, non-married, divorced, and widower), occupation (student, employee, unemployed, soldier, and retired), educational level (illiterate, school, university, and high education), income (below 5,000 Rs or higher than 15,000 Rs), years with diabetes (less than five years or more than ten years), type of treatment (diet, tablet, insulin), physical activity (active or inactive), and frequency of hypoglycemic episodes. We also included a question to assess participants' awareness of diabetes symptoms such as hunger, thirst, diaphoresis, palpitation, shivering, tingling, loss of consciousness, disturbance of vision, and stammering.

Statistical Analysis

Data were analyzed by using the Statistical Package for the Social Sciences SPSS software (version 20, IBM Corp., Armonk, NY, USA). Categorical variables were summarized as numbers and percentages. Comparison between variables and significance testing was done using the Chi-square test as appropriate. A p -value <0.05 was considered statistically significant.

Results

Demographic Characteristics

Five hundred and seventy-five participants completed the survey questionnaire. The demographic characteristics of diabetic patients recruited in this study are given in Table II. Of 575 patients, 289 were male (50.3%), and 286 were female (49.7%). More than half of them, 315 (54.8%), were married, while 176 (30.6%) were single. 182 (31.7%) were aged between 20 to 30 years old, and 132 (23%) were aged between 31 and 40. A total of 209 (36.3%) participants had a BMI between 18.5-24.9, (34, 1%) between 25-29.9, 20.2% between 30-39, and only 9.4% <18.5 . In terms of the level of education, 51.7% had a bachelor's degree, 34.3% were educated up to elementary/high school, 5.9% were not educated, and 8.2% were postgraduate level.

Table I. Comparison between the results achieved and the results of previous related studies about hypoglycemia awareness.

Article Ref.	Sample & Methodology	Results	Contribution of the Study
31	<p>Sample: 300 patients with type 1 and type 2 diabetes underwent a cross-sectional examination.</p> <p>Methods: During medical consultations, a standard questionnaire adapted from Stanford Patients Education Research Center was administered to all patients 18 years of age or older</p>	<p>The study showed a strong correlation between hypoglycemia and several clinical traits and risk factors. It may be possible to create cutting-edge strategies for enhancing glycemic control and reducing the occurrence of hypoglycemia by understanding how sociodemographic, environmental, or other disease-related risk factors interact with diabetes.</p>	<p>The contribution of this study looked for and classified factors that increased the frequency of hypoglycemic episodes in people with diabetes mellitus. With the help of this research, chronically ill patients with a high prevalence of hypoglycemia will get more individualized therapy.</p>
32	<p>Sample: A cross-sectional investigation including 270 people with type 1 and type 2 diabetes was conducted.</p> <p>Methods: All participants in this cross-sectional study completed a standardized questionnaire on their sociodemographic characteristics, way of life, medical history, cognitive performance, anxiety, and depression. Gender, birthday, marital status, income, and education are just a few examples of socio-demographic data.</p>	<p>Age mean (SD) for the 270 eligible patients was 45.2. There were 63% males and 37% women present (12.9). 41% just have a high school diploma, and 67% are married. 37% of people worked for the government, while 20% were jobless. 83% of people had no hypoglycemia in the preceding month, whereas 46% of people had high blood pressure, 6% had cardiac problems, 37% had a BMI above 30, 15% used sulphonylurea (SU) and metformin, 48% used metformin and insulin, and 37% just took metformin.</p>	<p>The contribution of this study is to examine adult patients with T2DM in the Asir area of Saudi Arabia's knowledge of hypoglycemia caused by diabetic medications.</p>
33	<p>Sample: The study included 400 patients with DM.</p> <p>Methods: A questionnaire-based, cross-sectional observational research including 400 Saudi adult patients with T1DM or T2DM, aged 18 to 65, was carried out.</p>	<p>The results of our study showed that hypoglycemia occurred in diabetic individuals in 22.5% of instances. Patients with type 1 diabetes are more affected by HG (82.5%) than those with type 2 diabetes are (12.5%).</p>	<p>The study's contribution is to evaluate the likelihood of hypoglycemia among diabetic individuals as well as its contributing variables.</p>
31	<p>Sample: The study population consisted total of 273 respondents.</p> <p>Methods: Between August and November 2021, cross-sectional research was conducted. Data from the participants were gathered using a practical non-probability sampling approach. The 23rd edition of the Statistical Package for Social Science was used to code, input, and analyze the data.</p>	<p>1-Most of the participants were in the 26 to 35 age brackets, and 84.6% of them were taking medication to treat their diabetes. 2-The most frequent (42.5%) source of participant information of hypoglycemia attacks was family/friends/colleagues. 3-Insufficient knowledge about hypoglycemia episodes was found in 62.6% of subjects.</p>	<p>The study's contribution is to gauge diabetic patients' awareness of hypoglycemia episodes and investigate the association between that awareness and other socio-demographic variables.</p>
34	<p>Sample: The study population consisted of 800 patients.</p> <p>Methods: Based on medical records, a cross-sectional study was conducted. The study comprised all adult patients admitted to internal medicine wards and isolation units. Information on demographics, reasons for admission, test results, and outcomes were gleaned from the medical records.</p>	<p>DM was present in 49.9% of hospitalized patients. Among patients with DM, hypertension (HTN; 73.2%) and dyslipidemia (43.1%) were the most common risk factors and causes of hospitalization. Other less common reasons for hospitalization were heart failure (20.6%), COVID-19 (17.8%), chronic kidney disease (CKD; 14.5%), pneumonia (12.3%), and stroke (10%).</p>	<p>This study's goal was to assess the prevalence of DM (both type 1 and type 2 diabetes) among hospitalized patients and the circumstances surrounding their admission to the medical unit at the King Abdul-Aziz University Hospital (KAUH) in Jeddah, Saudi Arabia.</p>

Continued

Hypoglycemia awareness and risk factors in diabetes type 2 patients

Table 1 (Continued). Comparison between the results achieved and the results of previous related studies about hypoglycemia awareness.

Article Ref.	Sample & Methodology	Results	Contribution of the Study
35	<p>Sample: The study population consisted of 429 samples of adult males.</p> <p>Methods: In this cross-sectional study, 429 adult men in Saudi Arabia with insulin-treated diabetic mellitus (ITDM) were chosen as a representative sample and answered a structured questionnaire.</p>	480 ITDM patients were contacted, and 89.3% of them completed the questionnaire; moreover, 429 of them agreed to be interviewed and participate in the study. More than half of the sample (59.7%) had ITDM for at least 15 years, where as less than half of the sample (51.3%) had been using insulin for less than five years.	The study's contribution is to assess the connection between a patient's knowledge of hypoglycemia and their likelihood of experiencing it.
36	<p>Sample: 378 patients in all took part in this trial.</p> <p>Methods: An Arabic-language questionnaire was employed in this cross-sectional study of adult diabetes patients.</p>	More attacks occurred during day period and led to breaking the fasting by all affected patients. Most of patient was not given instructions regarding self-care immediately before or during Ramadan.	The study's contribution is to look at how common hypoglycemia is among diabetic patients who visit a primary healthcare facility during Ramadan in the Abha, Aseer region of Saudi Arabia, as well as the risk factors that go along with it.
37	<p>Sample: There were 361 adult diabetes patients involved in total (208 (57.6%) women and 153 (42.4%) males).</p> <p>Methods: A cross-sectional study was conducted utilizing a newly created self-administered questionnaire, and one-way ANOVA and the Student's <i>t</i>-test were used for inferential statistics.</p>	The study comprised of 361 participants, of which 208 (57.6%) were women and 153 (42.4%) were men. Most participants (341; 94.5%) had Type 2 diabetes. Based on the scoring system used in the study, a score of 31.5 or higher indicated good knowledge, a score between 21 to 31.5 indicated a moderate level of knowledge, and a score below 21 indicated weak understanding. The mean knowledge score of the participants was 32.0 (with a standard deviation of 8.2).	The purpose of this study was to evaluate adult diabetes patients' awareness of hypoglycemia and how to treat it.
38	A 1,039 diabetes individual's cross-sectional study. A well-structured questionnaire served as the data gathering method.	Approximately 50% of the individuals lacked knowledge of hypoglycemia's symptoms.	The contribution of study is assessing diabetic patients' knowledge of hypoglycemia symptoms and the factors that might be related to such knowledge.
39	420 people were chosen at random to participate in this cross-sectional study. Data were gathered using a pre-tested questionnaire. The data gathered were examined using SPSS, which stands for Statistical Package for the Social Sciences.	The results of this research showed that the general people in Saudi Arabia had a high degree of knowledge concerning hypoglycemia attacks. Most participants (n=335, 79.8%) were characterized as having a good level of awareness, whereas 85 (20.2%) had a low level of awareness.	This study aimed to assess the general public's knowledge about hypoglycemic attacks in Saudi Arabia and investigate the link between that level of awareness and other sociodemographic characteristics
40	<p>Sample: Using an online version, 600 diabetes patients in all were gathered.</p> <p>Methods: Using a standardized questionnaire, a cross-sectional research of Makkah city residents in Saudi Arabia was carried out.</p>	Most of the respondents (68.3%) reported having strong understanding about hypoglycemia, and 371 (61.8%) of them had evidence of good practice in preventing it.	The present study aims to assess DM patients in the Makkah area of Saudi Arabia's awareness and preventative practices for hypoglycemia and its contributing variables.
41	A descriptive cross-sectional study including 200 diabetes individuals was conducted. A validated questionnaire was used to gather demographic information, details about current medications, understanding of hypoglycemia, and how patients reacted to the symptoms.	Less than 25% of the patients understood what to do when they encountered symptoms that may indicate hypoglycemia, even though the majority of them had fair to excellent awareness about hypoglycemia.	This study aimed to close this knowledge gap by evaluating how adult DM patients reacted to early signs of hypoglycemia and their understanding of these symptoms in general, in order to guarantee early and effective care.

Table II. Demographic characteristics of diabetic patients (n=575).

Characteristics	Frequency	Percent %
Age		
20-30	182	31.7
31-40	132	23.0
41-50	129	22.4
51-60	99	17.2
More than 60	33	5.7
Total	575	100.0
Gender		
Female	286	49.7
Male	289	50.3
Total	575	100.0
Social status		
Divorced	48	8.3
Married	315	54.8
Single	176	30.6
Widowed	36	6.3
Total	575	100.0
Bmi		
Between 18.5-24.9	209	36.3
Between 25-29.9	196	34.1
Between 30-39	116	20.2
Less than 18.5	54	9.4
Total	575	100.0
Job		
Governmental job	156	27.1
Military	57	9.9
Non-employed	110	19.1
Police officer	51	8.9
Retired	81	14.1
Student	120	20.9
Total	575	100.0
Education		
Bachelor	297	51.7
Elementary/high school	197	34.3
No education	34	5.9
Post-graduate	47	8.2
Total	575	100.0
Monthly salary per riyals		
10,000-15,000	140	24.3
5,000-10,000	132	23.0
Less than 5,000	226	39.3
More than 15,000	77	13.4
Total	575	100.0

Diabetes Mellitus-Related Characteristics

Regarding the duration of diabetes, 30% were diagnosed with diabetes 5-10 years ago, 43.5% had diabetes for less than five years, and 25.9% were diagnosed more than five years ago (Table III). Among participants, 79.5% went for regular follow-up. The remaining 20.5% had no routine follow-up Table III. Regarding the current treatment question, 197 (34.3%) of participants were on anti-diabetic medication, 109 (19%) were on anti-diabetic medicines and insulin, 144 (25%) were on a diet, and 125 (21.7%) only on insu-

lin Figure 1. Of most participants, 241 (41.9%) exercise once or twice weekly. However, 33.6% do not exercise at all. About 48.2% of patients had episodes of hypoglycemia in the previous three months. At the same time, 43% do not have hypoglycemic episodes. Most of the patients, 424 (73.7%), had less than three hypoglycemic episodes during the previous three months, and 121 (21%) had 3-6 episodes ($p=0.023$) (Table III).

Knowledge and Awareness About Symptoms and Precipitating Factors of Hypoglycemia

Table IV details the knowledge and awareness about symptoms of hypoglycemic attack concerning age. 51-60 years patients have more understanding of signs of hypoglycemia (66.7%), followed by 58.8% in the age group of 20-30 years and 57.6% in the category >60 years. 45.5% of patients were aware of signs of hypoglycemia and belonged to the age category of 31-40 years. This was followed by 36.4% of the more than 60 age group. Only 34.9% were in the age group of 41-50 years ($p=0.23$). Regarding the question, "Do you get fatigued when you have hypoglycemia?" Most of the patients from different age groups, 421 (73.2%) selected "yes", 20.5% of patients selected "no", but only 6.3% selected "do not know".

84.1% of patients who get dizziness during the hypoglycemic episode belonged to the age group 20-30 years, and 78.7% belonged to the age >51 years. However, 25.6% of patients between 41-50 years and 19.2 of patients between 51-60 years do not experience dizziness.

More than half of patients between 20-30 years get palpitations during hypoglycemic episodes 70.3%, and 59.1% between 31-40. 37.2% of patients aged 41-50 years do not get palpitation. While 18.2% aged >60 were unaware of palpitations during the hypoglycemic episode.

Discussion

For diabetic patients, hypoglycemia is a critical problem and is viewed as a limiting element in glycemic control. In the treatment of type 1 diabetes, hypoglycemia is well-acknowledged as a significant problem. While it has traditionally been viewed as a minor problem for type 2 diabetic patients, misperception based on inadequate information may lead to underestimating the importance of hypoglycemia in type 2 diabetes. The

Table III. Diabetes mellitus-related characteristics.

Characteristics	Frequency	Percent
Years of diabetes since diagnosis		
From 5-10 years	176	30.6
Less than five years	250	43.5
More than ten years	149	25.9
Total	575	100.0
Regular follow up		
No	118	20.5
Yes	457	79.5
Total	575	100.0
B		
3-4 times per week	107	18.6
Five times per week or more	34	5.9
No exercise	193	33.6
Once or twice per week	241	41.9
Total	575	100.0
Episodes of hypoglycemia in the previous three months		
Do not know	51	8.9
No	247	43.0
Yes	277	48.2
Total	575	100.0
Number of episodes of hypoglycemia		
3-6 times	121	21.0
Less than three times	424	73.7
More than six times	30	5.2
Total	575	100.0

heterogeneity of the diseases in type 2 diabetes mellitus can affect the frequency of hypoglycemia, especially when the patient has cardiovascular diseases. Hypoglycemia can result from several factors, including insulin therapy, sulfonylurea medication, delaying or missing a meal, physical exercise, or alcohol consumption¹⁵⁻¹⁶. The occurrence of hypoglycemia episodes in type 2 diabetes patients is well recognized¹⁷.

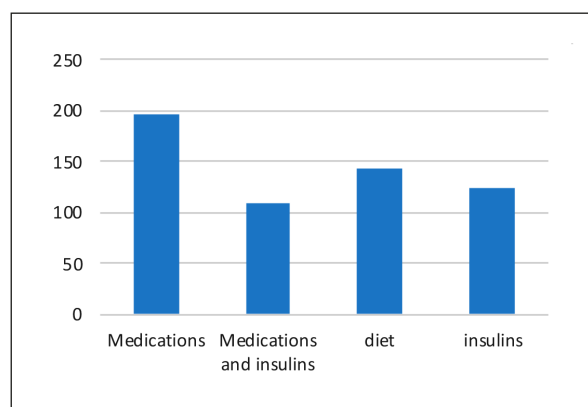


Figure 1. Diabetes treatment regimen among diabetic patients.

Despite being potentially preventable, hypoglycemia in type 2 diabetes incurs substantial personal and societal burden and is widely recognized as a significant and potentially preventable cause of morbidity, mortality, high costs, decreased productivity, and a lower quality of life¹⁷.

This study aimed to explore the level of knowledge regarding hypoglycemia as a complication of type 2 diabetes mellitus and the awareness of the risk factors that lead to this condition among the population of Hail City. Our findings demonstrate that out of 575 respondents, only slightly more than half of the diabetic participants have good knowledge about the symptoms of hypoglycemia. Hence, our findings point to a modest level of expertise on hypoglycemia symptoms, which is consistent with other studies¹⁸⁻¹⁹ performed in the Middle East. While these findings were higher than those reported by Thenmozhi and Vijayalakshmi²⁰. Who said 16.67% of Indian patients had poor knowledge about the symptoms of hyperglycemia²⁰. Nearly half of the diabetic patients in this study had a hypoglycemic episode during the previous three months.

A strong relationship was revealed in terms of age, indicating that middle-aged adults (ages

Table IV. Knowledge and awareness about symptoms of hypoglycemic attack concerning age.

		Age					Total
		20-30	31-40	41-50	51-60	More than 60	
Awareness about the symptoms of hypoglycemia	Aware of signs of hypoglycemia	58.8%	45.5%	54.3%	66.7%	57.6%	56.0%
	Kind of awareness about signs of hypoglycemia	30.2%	45.5%	34.9%	31.3%	36.4%	35.3%
	Not aware of signs of hypoglycemia	11.0%	9.1%	10.9%	2.0%	6.1%	8.7%
Fatigability during hypoglycemia	Do not know	2.7%	6.8%	12.4%	6.1%	0.0%	6.3%
	No	15.9%	23.5%	22.5%	21.2%	24.2%	20.5%
	Yes	81.3%	69.7%	65.1%	72.7%	75.8%	73.2%
Dizziness during hypoglycemia	Do not know	4.4%	5.3%	10.9%	2.0%	6.1%	5.7%
	No	11.5%	18.2%	25.6%	19.2%	15.2%	17.7%
	Yes	84.1%	76.5%	63.6%	78.8%	78.8%	76.5%
Palpitations during hypoglycemic episode	Do not know	7.1%	7.6%	16.3%	9.1%	18.2%	10.3%
	No	22.5%	33.3%	37.2%	34.3%	39.4%	31.3%
	Yes	70.3%	59.1%	46.5%	56.6%	42.4%	58.4%
Palpitations during hypoglycemic episode	Do not know	7.1%	7.6%	16.3%	9.1%	18.2%	10.3%
	No	22.5%	33.3%	37.2%	34.3%	39.4%	31.3%
	Yes	70.3%	59.1%	46.5%	56.6%	42.4%	58.4%

35-51 years) had good knowledge about hypoglycemia signs. This result was consistent with that of another study¹⁸, who found no relationship between age and patient knowledge of diabetes¹⁸.

Regarding knowledge of hypoglycemia symptoms, most patients experience dizziness and fatigue during hypoglycemic episodes, while less than two-thirds of the respondents experienced palpitations during hypoglycemia. A study¹⁸ done in Sudan reported that the most common symptoms known to their patients were dizziness (40%), sweating (65.6%), tremor of hand (67.2%), and blurred vision (52.8%), as intensive glucose control increases the risk of severe hypoglycemia^{21,22}.

Consequences of hypoglycemia in the elderly can include acute and long-term cognitive changes, serious falls, cardiac arrhythmia and myocardial infarction (MI)²³, frailty, and possibly death²⁴.

Risk factors for episodes of hypoglycemia in patients with Type 2 diabetes mellitus include behavioral factors such as missed meals or irregular meals²⁵. Lifestyle factors are also prominent in hypoglycemia, such as alcohol intake and inappropriate use of glucose-lowering medication. Other physiological factors associated with the risk of hypoglycemia include older age, renal im-

pairment, and duration of diabetes²⁶⁻²⁷. Although hypoglycemia risk factors can be avoided, identifying these factors and decreasing the adverse complications of hypoglycemia requires effort. This can be achieved through developing a program that addresses the treatment and prevention of diabetes complications, in addition to education programs²⁸.

Healthcare professionals are advised to provide adequate education to patients on how self-manage hypoglycemic events, as education has been shown to significantly improve the knowledge and attitude of diabetic patients toward hypoglycemia. This leads to improving practices for people with diabetes and decreases the hypoglycemic episodes in these patients^{29,30}.

Limitations

The study has certain limitations that need to be acknowledged. Firstly, an online questionnaire was used, which was distributed *via* various social media platforms such as Twitter, WhatsApp, and others. While this method allowed for a larger sample size, it may have resulted in a biased sample as not all individuals have access to or use these platforms. Additionally, the study was conducted solely in the Hail region of Saudi Arabia, which may limit the generalizability of the

findings to other regions or populations. Despite these limitations, the study was able to gather data from a sample size of over 500 participants, providing valuable insights into the attitudes and behaviors of this population.

Conclusions

Hypoglycemic episodes among diabetic patients have acute effects on the patient, ranging from limiting daily activity to death, and may lead patients to avoid diabetic drugs, causing hyperglycemia. In this study, approximately half of the patients in Hail, Saudi Arabia, experienced hypoglycemic episodes, and the other half were also aware of hypoglycemia.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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Authors' Contribution

Conceptualization, N.A. and A.A.; methodology, A.A. and Sh.A.; software, A.A., T.A. and A.A.; validation, S.A., A.A. and N.H.; formal analysis, N.A., A.A. and Th.A.; investigation, A.A. and Th.A.; resources, A.A. and Sh.A.; data curation, A.A., A.A. and A.A.; writing—original draft preparation, A.A.; writing—review and editing, T.A. and A.A.; visualization, S.A., and N.H.; supervision, N.H. and Th.A.; project administration, N.A. and T.A.; funding acquisition, A.A. and Th.A. All authors have read and agreed to the published version of the manuscript.

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Data Availability

The data used to support the findings of this study are included in the article.

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Ethics Approval

The Committee of Scientific Research & Conferences in the Faculty of Medicine, University of Hail (H-2023-113) has reviewed the study protocol and ethically approved the study. The current study complies with the Declaration of Helsinki.

Informed Consent

All participants understand the purpose of the research and agree to participate voluntarily. Informed consent was obtained from all individual participants included in the study.

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