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# KNOWLEDGE AND ATTITUDES TOWARD HYPOGLYCEMIA (FIRST AID AND RISK FACTORS) AMONG THE GENERAL POPULATION IN AL-BAHA REGION, SAUDI ARABIA

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**ABSTRACT**
Hypoglycemia is a frequent and potentially severe complication of diabetes mellitus that may cause considerable morbidity unless it is identified and treated promptly. Community awareness is essential for timely first-aid responses during hypoglycemic episodes. This cross-sectional observational study assessed knowledge and attitudes toward hypoglycemia risk factors and first-aid management among the general population in Al-Baha Region, Saudi Arabia. Data were collected from 480 adult residents using a self-administered online questionnaire distributed through social media platforms. The questionnaire covered sociodemographic characteristics, knowledge of hypoglycemia risk factors and symptoms, and attitudes and practices related to first-aid management. Overall, 71.0% of participants demonstrated an adequate level of knowledge. However, only 43.3% correctly identified a blood glucose level below 70 mg/dL as hypoglycemia. The most recognized risk factors were strenuous physical activity without sufficient food intake (61.9%), delaying or skipping meals (59.2%), and insulin overdose (50.0%). Dizziness (71.0%), trembling (67.4%), and sweating (59.5%) were the most frequently identified symptoms. Most participants (85.8%) correctly recognized fast-acting sugar, such as juice or candy, as appropriate first aid for a conscious person with hypoglycemia. Knowledge level was significantly associated with gender ($p < 0.001$), occupation ($p = 0.016$), and diabetes diagnosis ($p = 0.034$). The findings indicate generally adequate public awareness but highlight important gaps regarding the definition of hypoglycemia and the safe management of severe episodes.

**KEYWORDS:** hypoglycemia; first aid; diabetes mellitus; public knowledge; attitudes; Al-Baha; Saudi Arabia

## 1. INTRODUCTION

A global systematic review involving 39 thousand participants found that 23.2% of participants had impaired awareness regarding hypoglycemia [1]. Earlier research in Makkah among 1039 diabetic patients found that around 50% lacked knowledge of hypoglycemia, while a new cross-sectional study among 600 diabetic patients in Makkah showed that most participants reported good knowledge 68.3% and practice 61.8% [2,3]. A cross-sectional study assessed the knowledge of hypoglycemia in Al-Ahsa among 238 patients showed that 87% of patients demonstrated good knowledge [4]. A cross-sectional study was conducted in Tabuk in 2020 aiming to assess the knowledge among 434 primary school teachers towards students with diabetes, and only 68% demonstrated good knowledge [5]. In a cross-sectional study in 2023, 390 patients at the Al-Ahsa Diabetes Centre showed that 23.8% had impaired awareness [6].

A study conducted in Al-Qassim Found that impaired awareness of hypoglycemia in diabetic patients was 52.1% [7]. A cross-sectional study among 151 type 1 diabetes patients in Jazan showed that 25.2% had impaired awareness [8]. A study investigated awareness of hypoglycemia among people with insulin-treated type 2 diabetes in the Netherlands showed that 9.7% of participants had impaired awareness of hypoglycemia [9]. Another study assessed knowledge of hypoglycemia among 145 type 2 diabetic patients in Nigeria, found that only 24.8% had adequate knowledge of symptoms and 29% knew how to manage hypoglycemia [10]. A study among 94 children and adolescents with Type 1 diabetes in North of Jordan showed 6% of participants have impaired awareness of hypoglycemia [11]. A study in Norway among 10,202 adults with type 1 diabetes showed that 18% reported impaired awareness of hypoglycemia [12]. A cohort study in Malaysia among 1153 insulin-treated patients showed that impaired awareness was present in 48.0% type 1 diabetes and 36.9% type 2 diabetes of patients [13]. The aim of the current study is to assess the knowledge and attitudes toward hypoglycemia risk factors and first aid management among the general population in Al-Baha region, Saudi Arabia.

## 2. MATERIALS AND METHODS

### 2.1. Study Design and Setting

This was an observational cross-sectional study carried out in the Al-Baha province of Saudi Arabia to determine the level of knowledge and attitudes towards the risk factors of hypoglycemia and first aid management among the general population. The research was focused on adult residents of the Al-Baha region and was aimed at assessing their level of awareness and perception about hypoglycemia and the proper way of responding to hypoglycemic attacks. An online self-administered questionnaire was used to collect the data and it was shared on well-known social media platforms, such as WhatsApp, Twitter, and Facebook, to ensure a large number of the local community are involved.

### 2.2. Participants and Sample Size

The Raosoft sample size calculator was used to estimate the sample size. The minimum required sample size was obtained as 384 participants based on a total population of 476,172 people in the Al-Baha region, a 95% confidence level, and a 5% margin of error. The participants were people living in the Al-Baha area irrespective of their nationality, as long as they were 18 years and above and were interested in taking part in the survey. Both male and female participants could be included. Those who were not residents of the Al-Baha region, persons under the age of 18 years and those who refused to take part as well as those who filled out questionnaires that were not complete were not included in the study.

### 2.3. Data Collection Tool and Procedure

The A validated online questionnaire was used to collect the data based on the previous studies that measured the knowledge and attitudes of hypoglycemia and its management as a first aid. The questionnaire was divided into three major sections. The initial part consisted of the questions concerning the sociodemographic factors like age, gender, educational level, and other variables of interest. In the second part, the questions aimed at testing the knowledge of the participants about hypoglycemia, its risk factors, symptoms, and the first aid. The third part tested the attitude of the participants to hypoglycemia and how they would react in case they met with a person who had suffered a hypoglycemic episode. All participants were informed electronically in the beginning of the questionnaire before data collection.

### 2.4. Ethical Considerations

The data collected were subject to high levels of confidentiality. No personally identifiable information was requested in the questionnaire and the responses were stored in a secure way which was only accessible to the research team. The privacy and anonymity of the participants were upheld during the study and no personal data of the participants was revealed during the data analysis and presentation of the research findings.

### 2.5. Statistical Analysis

After data collection, the responses were coded and computerized in a database to be analyzed statistically. The Statistical Package for the Social Sciences (SPSS), version 26.0 (IBM Corporation, Armonk, NY, USA) was used to conduct the statistical analyses. The data were summarized through descriptive statistics where the numerical variables were summarized with the help of the relevant parametric measures, and the categorical variables were presented in the form of frequencies and percentages. Relationships between variables were studied in terms of measures of association. Student t-test or MannWhitney U test was used to compare groups based on the data distribution. Categorical variables were analyzed by the chi-square test. A p-value lower than 0.05 was deemed to be statistically significant.

## 3. RESULTS AND DISCUSSION

### 3.1. Participant Characteristics

The study included 480 participants, where the most frequent age group was 18-29 years (35.8%), then there was 40-49 years (29.6%). The sample was slightly more female (51.5%). The majority of the participants were college educated (64.0%), next were high school educated (24.2%). On occupation, 42.3% were employees, 26.5% were unemployed, 21.5% were students and 9.8% were retired. The majority of the participants noted that they were not diabetic (84.8%), 8.8% were diabetic with type 2 and 6.5% were diabetic with type 1. Moreover, 46.9% stated that they had family members with type 1 diabetes, 33.1% stated that they had family members with type 2 diabetes, and 28.3% stated that their family had no history of diabetes (Table 1).

**Table 1. Demographic factors of the participants.**

| Variable | Category | Count | Column N % |
|---|---|---|---|
| Age | 18-29 | 172 | 35.8% |
| Age | 30-39 | 78 | 16.3% |

| Variable | Category | Count | Column N % |
|---|---|---|---|
| Age | 40-49 | 142 | 29.6% |
| Age | 50 or older | 88 | 18.3% |
| Gender | Male | 233 | 48.5% |
| Gender | Female | 247 | 51.5% |
| Educational level | Primary | 8 | 1.7% |
| Educational level | Intermediate | 23 | 4.8% |
| Educational level | High school | 116 | 24.2% |
| Educational level | College | 307 | 64.0% |
| Educational level | Postgraduate education | 26 | 5.4% |
| Occupation | Students | 103 | 21.5% |
| Occupation | Unemployed | 127 | 26.5% |
| Occupation | Employee | 203 | 42.3% |
| Occupation | Retired | 47 | 9.8% |
| Diagnosis with DM | No | 407 | 84.8% |
| Diagnosis with DM | Yes, Type 1 | 31 | 6.5% |
| Diagnosis with DM | Yes, Type 2 | 42 | 8.8% |
| Family history of DM | No | 136 | 28.3% |
| Family history of DM | Yes, I have one or more relatives who suffer from type 1 diabetes. | 225 | 46.9% |
| Family history of DM | Yes, I have one or more relatives who suffer from type 2 diabetes. | 159 | 33.1% |

*Note: DM = diabetes mellitus.*

### 3.2. Knowledge toward Hypoglycemia

Table 2 shows the knowledge of the participants regarding hypoglycemia. On the blood glucose level that is associated with hypoglycemia, 43.3% of them identified it as less than 70 mg/dl, and 26.5% of them indicated that they were not aware of it. With regard to risk factors, the most prevalent risk factors were strenuous physical activity and a lack of food (61.9%), postponing or skipping meals (59.2%), and insulin overdose (50.0%). Stress and anxiety (42.3%) and sleep deprivation (29.4%) were also other reasons. Regarding the symptoms, the most common symptoms identified were dizziness (71.0%), trembling (67.4%), and sweating (59.5%). Additional symptoms that were reported were palpitations (47.4%), and extreme hunger (45.7%).

**Table 2. Knowledge toward hypoglycemia.**

| Question/Domain | Response | Count | Column N % |
|---|---|---|---|
| What is the approximate blood sugar level at which hypoglycemia is considered? | < 40 mg/dl | 62 | 12.9% |
| What is the approximate blood sugar level at which hypoglycemia is considered? | < 70 mg/dl | 208 | 43.3% |
| What is the approximate blood sugar level at which hypoglycemia is considered? | < 90 mg/dl | 67 | 14.0% |
| What is the approximate blood sugar level at which hypoglycemia is considered? | < 120 mg/dl | 16 | 3.3% |
| What is the approximate blood sugar level at which hypoglycemia is considered? | I do not know | 127 | 26.5% |
| Risk Factors | An insulin overdose | 240 | 50.0% |
| Risk Factors | Delaying or skipping a meal | 284 | 59.2% |
| Risk Factors | Strenuous physical activity without sufficient food intake | 297 | 61.9% |
| Risk Factors | Lack of sleep | 141 | 29.4% |
| Risk Factors | Stress and anxiety | 203 | 42.3% |
| Risk Factors | Lack of physical activity | 132 | 27.5% |
| Risk Factors | Overeating | 68 | 14.2% |

| Question/Domain | Response | Count | Column N % |
|---|---|---|---|
| Risk Factors | High blood pressure | 59 | 12.3% |
| Risk Factors | I do not know. | 54 | 11.3% |
| Symptoms | Sweating | 285 | 59.5% |
| Symptoms | Trembling | 323 | 67.4% |
| Symptoms | Dizziness | 340 | 71.0% |
| Symptoms | Palpitations | 227 | 47.4% |
| Symptoms | Irritability or changes in behavior | 128 | 26.7% |
| Symptoms | Extreme hunger | 219 | 45.7% |
| Symptoms | Increased urine output | 117 | 24.4% |
| Symptoms | Fever | 19 | 4.0% |
| Symptoms | Diarrhea | 9 | 1.9% |
| Symptoms | Cough | 13 | 2.7% |
| Symptoms | Abdominal pain | 21 | 4.4% |
| Symptoms | I do not know. | 48 | 10.0% |

### 3.3. Practice, Attitude, and Overall Knowledge Level

Table 3 explains the practices and attitudes of the participants towards hypoglycemia. Most (85.8%) of the participants stated that the first aid to give to a conscious hypoglycemic patient is to give him/her fast-acting sugar in the form of juice or candy. On questioning what the right thing to do when a diabetic patient loses consciousness would be, 50.6% would call an ambulance and 42.9% would initiate the oral administration of sugar. Over half of the participants (53.1%) said that they or a close person had previously had low blood sugar. Concerning the level of confidence in responding to hypoglycemia, the majority of participants said that they would respond to the situation as they knew how to do it in case they noticed someone with the symptoms of low blood sugar (69.3%). Moreover, most of them had a strong agreement that it is significant to raise awareness of hypoglycemia and first aid among the general population in the Al-Baha region (85.2%).

**Table 3. Practice and attitude toward hypoglycemia.**

| Question | Response | Count | Column N % |
|---|---|---|---|
| What is the correct procedure for providing first aid to a conscious person suffering from hypoglycemia? | I don't know | 25 | 5.2% |
| What is the correct procedure for providing first aid to a conscious person suffering from hypoglycemia? | Giving him something that contains fast-acting sugar (such as juice or candy) | 412 | 85.8% |
| What is the correct procedure for providing first aid to a conscious person suffering from hypoglycemia? | Give him water | 7 | 1.5% |
| What is the correct procedure for providing first aid to a conscious person suffering from hypoglycemia? | Be taken to the hospital immediately. | 29 | 6.0% |
| What is the correct procedure for providing first aid to a conscious person suffering from hypoglycemia? | Encourage him to take a short walk to invigorate his body. | 5 | 1.0% |
| What is the correct procedure for providing first aid to a conscious person suffering from hypoglycemia? | Let him rest for a while. | 2 | 0.4% |
| What is the correct procedure if a diabetic patient loses consciousness? | Call an ambulance immediately | 243 | 50.6% |
| What is the correct procedure if a diabetic patient loses consciousness? | Trying to give him sugar orally | 206 | 42.9% |
| What is the correct procedure if a diabetic patient loses consciousness? | Trying to wake him up | 12 | 2.5% |
| What is the correct procedure if a diabetic patient loses consciousness? | I don't know | 19 | 4.0% |
| Have you or someone you know ever experienced low blood sugar? | No | 225 | 46.9% |

| Question | Response | Count | Column N % |
|---|---|---|---|
| Have you or someone you know ever experienced low blood sugar? | Yes | 255 | 53.1% |
| If you see someone experiencing symptoms of low blood sugar, know what to do. | Strongly disagree | 21 | 4.4% |
| If you see someone experiencing symptoms of low blood sugar, know what to do. | Disagree | 31 | 6.5% |
| If you see someone experiencing symptoms of low blood sugar, know what to do. | Neutral | 95 | 19.8% |
| If you see someone experiencing symptoms of low blood sugar, know what to do. | Agree | 161 | 33.5% |
| If you see someone experiencing symptoms of low blood sugar, know what to do. | Strongly agree | 172 | 35.8% |
| I believe that raising awareness about hypoglycemia and its first aid is essential for the general public in the Al-Baha region. | Strongly disagree | 3 | 0.6% |
| I believe that raising awareness about hypoglycemia and its first aid is essential for the general public in the Al-Baha region. | Disagree | 1 | 0.2% |
| I believe that raising awareness about hypoglycemia and its first aid is essential for the general public in the Al-Baha region. | Neutral | 12 | 2.5% |
| I believe that raising awareness about hypoglycemia and its first aid is essential for the general public in the Al-Baha region. | Agree | 55 | 11.5% |
| I believe that raising awareness about hypoglycemia and its first aid is essential for the general public in the Al-Baha region. | Strongly agree | 409 | 85.2% |

Figure 1 presents the general level of knowledge of the participants about hypoglycemia. The majority of participants (71.0%) showed adequate knowledge, while 29.0% showed inadequate knowledge.

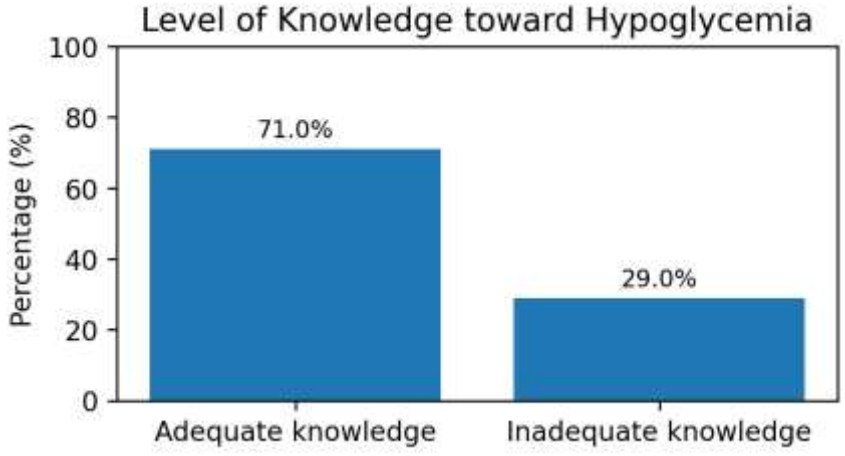


**Figure 1. The level of knowledge toward hypoglycemia among participants.**

### 3.4. Factors Associated with Knowledge Level

Table 4 indicates the correlation between the level of knowledge and demographics. The level of knowledge and age ($p = 0.511$) or educational level ($p = 0.934$) did not show a significant relationship. Nonetheless, gender had a strong correlation with the level of knowledge ($p < 0.001$) with females having more adequate knowledge than males. The level of occupation was also found to be significantly related to the level of knowledge ($p = 0.016$). Moreover, there was a considerable correlation between the level of knowledge and the diagnosis of diabetes (p

= 0.034) with the participants who were diagnosed with diabetes having more adequate levels of knowledge than those who were not.

**Table 4. Association between level of knowledge and demographic factors.**

| Variable | Category | Inadequate, n | Inadequate, % | Adequate, n | Adequate, % | p-value |
|---|---|---|---|---|---|---|
| Age | 18-29 | 46 | 26.7% | 126 | 73.3% | 0.511 |
| Age | 30-39 | 27 | 34.6% | 51 | 65.4% | 0.511 |
| Age | 40-49 | 38 | 26.8% | 104 | 73.2% | 0.511 |
| Age | 50 or older | 28 | 31.8% | 60 | 68.2% | 0.511 |
| Gender | Male | 86 | 36.9% | 147 | 63.1% | <0.001* |
| Gender | Female | 53 | 21.5% | 194 | 78.5% | <0.001* |
| Educational level | Primary | 5 | 62.5% | 3 | 37.5% | 0.934 |
| Educational level | Intermediate | 8 | 34.8% | 15 | 65.2% | 0.934 |
| Educational level | High school | 42 | 36.2% | 74 | 63.8% | 0.934 |
| Educational level | College | 76 | 24.8% | 231 | 75.2% | 0.934 |
| Educational level | Postgraduate education | 8 | 30.8% | 18 | 69.2% | 0.934 |
| Occupation | Students | 29 | 28.2% | 74 | 71.8% | 0.016* |
| Occupation | Unemployed | 24 | 18.9% | 103 | 81.1% | 0.016* |
| Occupation | Employee | 68 | 33.5% | 135 | 66.5% | 0.016* |
| Occupation | Retired | 18 | 38.3% | 29 | 61.7% | 0.016* |
| Diagnosis with DM | No | 127 | 31.2% | 280 | 68.8% | 0.034* |
| Diagnosis with DM | Yes, Type 1 | 6 | 19.4% | 25 | 80.6% | 0.034* |
| Diagnosis with DM | Yes, Type 2 | 6 | 14.3% | 36 | 85.7% | 0.034* |

*Note: * indicates statistical significance at $p < 0.05$; DM = diabetes mellitus.*

### 3.5. Discussion

The current paper evaluated the level of knowledge, attitude, and first aid patterns in the context of hypoglycemia among the general population in Al-Baha in Saudi Arabia. In general, the results revealed the moderate to good awareness of the participants, as over two-thirds of the participants displayed the necessary knowledge about hypoglycemia. This result is in contrast to what reported in several previous studies, including one study conducted in Qassim region, Saudi Arabia, reporting that 52.1% and 53.5% of the diabetic patients had inadequate awareness toward hypoglycemia according to two scales [7]. In addition, another study showed that only 27.6% of the participants had adequate level of knowledge [14]. On the other hand, two previous studies conducted in Saudi Arabia reported good level of knowledge toward hypoglycemic attack similar to our results [15,16]. However, a number of knowledge gaps were also found, especially when it comes to the precise blood glucose level that constitutes hypoglycemia and the way to react to severe hypoglycemic incidents.

In terms of the general awareness, about 43.3% of the respondents accurately determined the level of blood glucose that was related to hypoglycemia to be below 70 mg/dl. This result shows that the level of knowledge is moderate but also shows that a significant number of the population does not have the correct information regarding the diagnostic threshold of hypoglycemia. The international clinical guidelines usually state that hypoglycemia is a blood glucose level lower than 70 mg/dL, a level that must be recognized and controlled immediately to avoid serious complications [17,18].

Concerning risk factors, most of the participants were correct in identifying some of the most prevalent triggers of hypoglycemia such as excessive physical activity without adequate food consumption, postponing or missing meals and insulin overdose. The results are in line with existing clinical evidence that hypoglycemia is most prevalent in patients receiving insulin or other glucose-lowering interventions in case of the disproportion between medication and food consumption and exercise [19,20]. Other previous investigations have also documented that missed meals and excessive physical exercise are considered to be among the most commonly identified causes of hypoglycemic episodes among patients and the overall population [21].

The study participants had a good understanding of the symptoms of hypoglycemia. Dizziness, trembling, and sweating, the most common symptoms found, are common autonomic symptoms of hypoglycemia. The results are in line with the earlier studies that have shown that symptoms of sweating, tremor, palpitations, and dizziness are largely known warning signs of hypoglycemia [19,22]. The need to identify these symptoms early is due to the fact that timely treatment can help avoid the development of severe hypoglycemia and its related complications such as seizures, lapse of consciousness and possible neurological damage [19].

The current research also assessed the level of knowledge of the participants on first aid management of hypoglycemia. A large percentage of the respondents were right in stating that the correct first aid to a conscious person with hypoglycemia is the provision of fast-acting carbohydrates like juice or candy. This finding is indicative of a fairly sound knowledge of the suggested primary management approach. Clinical practice guidelines underline that the first aid management of mild to moderate hypoglycemia should be based on the immediate administration of rapidly absorbable carbohydrates, which promptly increases the level of blood glucose and relieves the symptoms [23,24].

However, certain misconceptions were noted regarding the treatment of severe hypoglycemia. Despite the fact that approximately one-half of the respondents said that they would call an ambulance in case a diabetic patient lost consciousness, a significant number of them said that they would consider providing sugar orally. This reaction can be due to the ignorance of the dangers of oral intake of food or fluids into an unconscious patient and the possibility of choking or aspiration [25].

The researchers also determined that over half of the respondents had either personal or indirect experience with hypoglycemia either directly or indirectly. These experiences can help to enhance better symptom recognition and better knowledge of how to respond. The past studies have indicated that those who are directly exposed to diabetes or hypoglycemic events tend to have more knowledge regarding the condition and its management [4,26].

The evaluation of the factors related to the knowledge levels indicated that there were some important relations. The knowledge was also strongly related to gender as the female gender had higher levels of adequate knowledge than the male gender. The same results are reported in a number of studies on the topic of health literacy in the population, as women tend to be more health literate and show more interest in health-related information [27]. Such differences could be mediated by the difference in health seeking behavior and utilization of health education resources [27].

There was also a strong relationship between occupation and the levels of knowledge. Unemployed participants and students had quite high rates of appropriate knowledge than other occupational groups. The observation could indicate increased exposure to the educational content, health information on social media, or individual interest in health-related issues [5]..

There was a strong relationship between the level of knowledge and the diagnosis of diabetes. The knowledge levels of the participants with diabetes were higher than those without diabetes. Such a result is not surprising since patients with diabetes are typically subjected to ongoing instruction on the importance of blood glucose monitoring, symptoms of hypoglycemia, and how to manage them as part of their regular medical treatment. Past studies always show that diabetic patients are more aware of hypoglycemia and its management than the general population [28].

## 4. CONCLUSIONS

The general results of this study highlight the need to reinforce public education about hypoglycemia and its first-aid management in the Al-Baha region. Although most participants demonstrated adequate overall knowledge and correctly recognized fast-acting sugar as appropriate first aid for a conscious person with hypoglycemia, important gaps remain regarding the diagnostic threshold of hypoglycemia and the safe management of unconscious patients. Enhanced community awareness can support early intervention during hypoglycemic attacks and may improve health outcomes among people at risk. Future public health campaigns should provide simple messages on recognizing symptoms, responding safely, and seeking emergency help in severe episodes. This study is limited by its cross-sectional design and online self-administered survey approach, which may affect representativeness and introduce response bias; however, it provides useful regional evidence to guide targeted health education efforts.

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