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ORIGINAL ARTICLE

AWARENESS OF HYPOGLYCEMIC SYMPTOMS AMONG DIABETIC PATIENTS ON INSULIN

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ABSTRACT

Background: Diabetes is a leading cause of mortality and morbidity globally. Hypoglycemia is a rate-limiting issue in achieving rigorous glycemic control in diabetic patients. Many diabetic patients on insulin therapy are not aware of hypoglycemic symptoms. This study aimed to determine the prevalence of hypoglycemic symptoms in diabetic patients on Insulin.

Materials & Methods: A cross-sectional study was conducted from July to October 2023 at Khyber Teaching Hospital Peshawar. A convenient sampling technique was used for data collection, and data was collected using socio-demographic characteristics, Clark's questionnaire, and questions related to hypoglycemic symptoms. The sample size was determined using the WHO formula. Data were analyzed using SPSS 24. A p-value of <0.05 demonstrated statistically significant findings.

Results: The study included 345 diabetic patients. Among them, 156 (43.2%) were males and 189 (52.4%) were females. The majority of participants were uneducated, 250 (69.3%). About 18% of patients were aware of hypoglycemic symptoms. There was no association between the duration of diabetes and gender and awareness of hypoglycemic symptoms, while an association was found between education and awareness of hypoglycemic symptoms ($p<0.001$). Most participants said that they consume sugar when they experience hypoglycemic symptoms.

Conclusion: The majority of participants were unaware of hypoglycemic symptoms. These patients experience symptoms such as perspiration and trembling with hypoglycemia. The study also found an association between patients' awareness of their symptoms and educational attainment. Most participants admitted to consuming sugar in response to hypoglycemic symptoms.

KEY WORDS: Awareness; Hypoglycemia; Diabetes; Insulin.

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INTRODUCTION

Diabetes mellitus (DM) is a metabolic disease that causes persistent hyperglycemia. Its etiology may involve abnormalities in the secretion or action of Insulin.[1] The effects of diabetes mellitus on the cardiovascular system, eyes, kidneys, and nerves make it a leading cause of illness and mortality globally.[2] Nearly 463 million people worldwide had diabetes in 2019. By 2030, there will be 578 million more people on this count, and by 2045, there will be 700 million with diabetes, according to data released by the International Diabetes Federation in 2019.[3] The majority of cases 80% come from developing countries. The South Asian countries with the highest prevalence of T2D are India, China, Pakistan, Bangladesh, Maldives, and Sri Lanka.[4]

Hypoglycemia is the rate-limiting issue in achieving rigorous glycemic control in diabetes therapy. Poor glycemic control is caused by frequent episodes of hypoglycemia and the following hormonal reactions. The former may also be linked to morbidities related to the heart and brain.[5] There are numerous hypoglycemia symptoms. The severity of the symptoms may be age-related and non-specific. To effectively manage the episode and act to stop a recurrence, the subjects must be able to recognize and identify the onset of symptoms at an early stage.[6]

The American Diabetes Association specifies a <70

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mg/dl threshold and defines hypoglycemia as "any abnormally low plasma glucose concentration that exposes the subject to potential harm." [7] Since enhanced treatment frequently increases hypoglycemic occurrences, hypoglycemia is a common side effect linked to the use of exogenous insulin. It is thought to be a major obstacle to adequate glycemic control. [8]

The duration and extent of insulin therapy have a role in determining the reported prevalence of hypoglycemia incidents in individuals with type 2 diabetes.[9] In a study done in South India, 34% of individuals didn't grasp hypoglycemia very well in patients with type 2 diabetes. An older age, illiteracy, and a low socioeconomic status were all associated with inadequate knowledge.[6] In a survey of 2530 type 2 diabetic patients in America, the American Association of Clinical Endocrinology found that many patients were unaware of the triggers or causes of such episodes, even though more than half of the study population had previously experienced hypoglycemic episodes.[10]

There is a lack of available literature regarding the awareness of hypoglycemic symptoms and associated factors such as the duration of diabetes, level of education, and coping mechanisms adopted by patients in response to hypoglycemic symptoms in the Pakistani population. This study aimed to determine the awareness of hypoglycemic symptoms in diabetic patients on insulin in our setup, which will further help in the management of these patients.

MATERIALS AND METHODS

This cross-sectional study was conducted from July to October 2023 at Khyber Teaching Hospital, Peshawar. A convenient sampling technique was used for data collection. This study was conducted according to the Helsinki Declaration, and ethical approval was obtained from IREB Khyber Medical College, Peshawar. The study's inclusion criteria included patients 18 and older, giving informed consent, and having diabetes. Patients who were on treatment other than Insulin were excluded.

The sample size was calculated according to the WHO formula for sample size, z2 * p(1-p) / e2, taking the prevalence of hypoglycemia from the previous study, 66.1%, with a 95% confidence interval and a 5% margin of error.[6] Thus, we got a sample size of 345.

We collected data using the interview method. Data was collected on socio-demographic characteristics, diabetes mellitus, use of insulin, and duration of diabetes mellitus. We used Modified Clark's questionnaire to assess patient knowledge regarding awareness of hypoglycemia symptoms. Clark's questionnaire is a validated questionnaire for awareness of hypoglycemic symptoms. Modified Clarke's questionnaire consists of eight specific items, with Items 5 and 6 combined to derive one score. A total score of "0" to "7" and a higher score indicate a decreased awareness of hypoglycemia symptoms. Cutoff scores four and above indicate impaired awareness of hypoglycemia, two or less than two scores indicate normal awareness, and score 3 indicates an undetermined awareness status.[11]

Statistical analysis was done using the statistical package for the social sciences (SPSS, version 24), which was used for data entry and analysis. Frequency and percentages were calculated for categorical variables. Mean and standard deviation for continuous variable. Chi-square and Fisher exact tests were used to assess the association of categorical variables. P value ≤ 0.05 was considered significant.

RESULTS

The study included 345 diabetic patients. 156 (43.2%) were males, and 189 (52.4%) were females. The mean age of study participants was 53.05 ($\pm$13.985) years. Most participants were uneducated, 250 (69.3%) (Table 1).

Table 1: Demographic Characteristics of study participants

Background Data	Number (%)
Sex	
Male	156 (43.2%)
Female	189 (52.4%)
Education	
Primary Education	26 (7.2%)
Secondary Education	48 (13.3%)
Tertiary Education	21 (5.8%)
Uneducated	250 (69.3%)
Duration of DM	
Less than 1 year	113 (31.3%)
1 to 5 years	144 (39.9%)
5 to 10 years	53 (14.7%)
More than 10 years	35 (9.7%)

A total of 77.6% participants had impaired awareness of hypoglycemia, with scores $\geq$ 4 on Clarke's Questionnaire. About 18% of Participants had good knowledge of hypoglycemic symptoms (Figure 1).

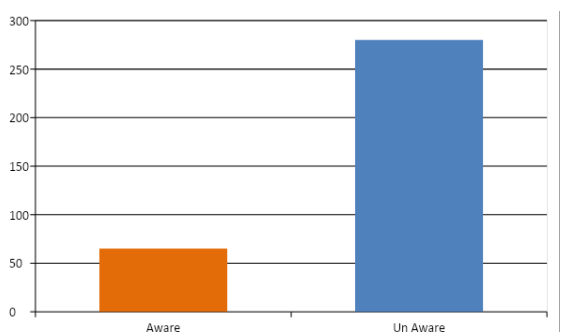

Figure 1: Awareness of hypoglycemic symptoms

The majority of diabetic patients were aware of shakiness (55.1%), sweating (52.9%), and hunger (53.2%) as symptoms of hypoglycemia, whereas other symptoms are given in Table 2.

Table 2: Knowledge of symptoms of hypoglycemia among diabetic patients on Insulin

Symptoms	Number (%)
Shakiness/Trembling	199 (55.1%)
Sweating	191 (52.9%)
Feeling anxious/irritable	106 (29.4%)
Weakness/Fatigue	185 (51.2%)
Confusion /Difficulty concentrating	122 (33.8%)
Dizziness/Lightheadedness	179 (49.6%)
Hunger	192 (53.2%)
Blurred vision	160 (44.3%)
Headache	142 (39.3%)
Nausea/Vomiting	100 (27.7%)

There was no association between duration of diabetes ($p = 0.97$), gender ($p = 0.65$), and awareness of hypoglycemic symptoms, while an association was found between education and awareness of hypoglycemic symptoms ($p<0.001$).

When participants were asked if they were aware of any cause of hypoglycemic symptoms, the majority of 261 (72.3%) responded that meal skipping was the leading cause; at the same time, some said that changes in physical activity were the leading cause (47, 13%).

The majority of participants, 192 (53.2%), said that they consume sugar (Figure 2) when they experience hypoglycemic symptoms. Some 144 (39.9%) said they consume fast-acting carbohydrates.

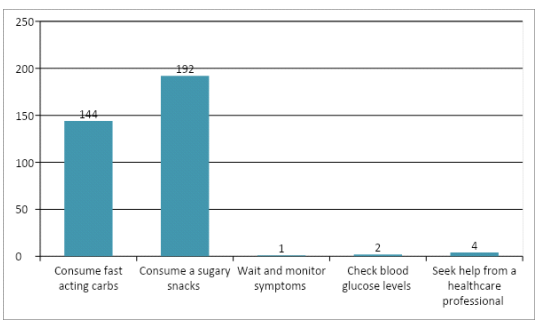

Figure 2: Frequency of food intake by participants in response to symptoms of hypoglycemia

DISCUSSION

Diabetes mellitus poses a significant health burden globally due to its detrimental effects on various organ systems, including the cardiovascular system, eyes, kidneys, and nerves. The resulting complications contribute substantially to illness and mortality rates across diverse populations.[12] One of the primary challenges in managing diabetes effectively lies in achieving optimal glycemic control while minimizing the risk of hypoglycemia. Hypoglycemia, characterized by abnormally low plasma glucose concentrations, presents a major obstacle to rigorous glycemic control, particularly in individuals undergoing insulin therapy.[12] The prevalence of hypoglycemic events varies widely and is influenced by factors such as the duration and intensity of insulin therapy.[13] This study aims to find the prevalence of awareness of hypoglycemic symptoms among diabetic mellitus patients on insulin and also to find any significant association with gender, age, education, and duration of diabetic mellitus.

Recognizing and promptly addressing hypoglycemic symptoms are crucial aspects of diabetes management. Despite experiencing hypoglycemic episodes, a substantial proportion of participants lacked adequate knowledge of the associated symptoms, predisposing them to potential harm and hindering effective self-management.[7] However, our findings reveal a concerning gap in awareness among diabetic patients, particularly those on insulin therapy.

In this study, about 18% of patients were aware of hypoglycemic symptoms, whereas the remaining were unaware. There was no association between the duration of diabetes and gender and awareness of hypoglycemic symptoms, while an association was found between education and awareness of hypoglycemic symptoms ($p<0.001$).

This study differs from the previous one conducted in Peshawar, which had 561 patients aged 15 to 65, comprising 76.6% males and 23.4% females. Notably, only 22.3% of the respondents had received prior diabetes education, while the majority, accounting for 77.7%, had not undergone any formal education on diabetes management.[14] While both studies investigated awareness among diabetic patients, their scope and focus differed. The previous research primarily assessed the prevalence of awareness and complications associated with diabetes. In contrast, our study extended beyond these parameters to explore additional factors such as the duration of diabetes, level of education, and coping mechanisms adopted by patients in response to hypoglycemic symptoms.

Another similar study has been done in Saudi Arabia. This study, involving 429 insulin-treated diabetic patients, unveiled a diverse awareness of hypoglycemic symptoms, with tremors, hunger, and sweating being the most recognized symptoms among 90.68%, 85.78%, and 85.31% of respondents, respectively. In contrast, our study, comprising 345 diabetic patients, demonstrated a predominant awareness of shakiness (55.1%), sweating (52.9%), and hunger (53.2%) as hypoglycemic symptoms [15] While both studies identified a substantial proportion of patients with

impaired awareness of hypoglycemia, our research uniquely explored additional factors such as the duration of diabetes and education level. Notably, our findings revealed a significant association between education and awareness of hypoglycemic symptoms ($p < 0.001$). Furthermore, our study delved into the coping mechanisms adopted by patients during hypoglycemic episodes, with the majority reporting consumption of sugar or fast-acting carbohydrates. This comprehensive analysis extends beyond the scope of the previous study, providing valuable insights into the multifaceted aspects of hypoglycemia management among diabetic patients.

In our study, we observed that 18% of participants were aware of their condition, indicating that a significant portion of the population did not recognize their diabetes. However, concerning hypoglycemia, the prevalence of severe episodes in the preceding year stood at 5.9%, highlighting a concerning aspect of diabetes management. Furthermore, impairment in hypoglycemia awareness, evaluated using the Gold and Clarke methods, revealed rates of 19.6% and 13.7%, respectively.[11] These findings underscore the importance of heightened awareness and tailored interventions to address the complexities of diabetes management effectively.[11]

Moreover, our findings elucidate the coping mechanisms adopted by diabetic patients in response to hypoglycemic symptoms. The prevalent practice of consuming sugar or fast-acting carbohydrates underscores the importance of fostering proactive strategies for managing hypoglycemia and mitigating its adverse effects on patient well-being.

This study, in detail, explored awareness of hypoglycemia in our region using a reliable and valid tool. Interestingly, our analysis identified a significant association between education level and awareness of hypoglycemic symptoms, underscoring the importance of educational initiatives tailored to the diverse academic backgrounds of diabetic patients. This highlights the need for healthcare providers to prioritize patient education and support, particularly for individuals with limited formal education, to effectively enhance their ability to manage diabetes-related complications. The limitations of our study were: 1) a convenient sampling technique, which may limit generalizability, and 2) a single hospital study, which may not detect variability in patients' populations and healthcare practices.

CONCLUSION

In conclusion, the majority of participants were unaware of hypoglycemic symptoms. These patients experience symptoms such as perspiration and trembling with hypoglycemia. The study also found an association between patients' awareness of their symptoms and educational attainment. Most participants admitted to consuming sugar in response to hypoglycemic symptoms.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	ZK, IU
Acquisition, Analysis or Interpretation of Data:	ZK, IU, NM, IK, NG, AA
Manuscript Writing & Approval:	ZK, IU, NM, IK, NG, AA

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.