

A Cross-Sectional Study on the Level of Awareness of Symptoms of Hypoglycemia among Diabetic Patients in Urban Population of Chennai

Yamuna Devi¹, Muhammed Swalih², Kiruthika³, Arun Murugan⁴

¹Assistant Professor, Department of Community Medicine, Government Medical College Omandur Government Estate

²CRMI, Government Medical College Omandur Government Estate

³CRMI, Government Medical College Omandur Government Estate

⁴HOD, Department of Community Medicine, Government Medical College Omandur Government Estate

Received: 09-04-2026 / Revised: 17-05-2026 / Accepted: 03-06-2026

Corresponding author: Dr. Muhammed Swalih

Conflict of interest: Nil

Abstract

Background: This condition of hypoglycemia, which is very dangerous and can cause the death of the patient with diabetic mellitus, needs more recognition on the part of the patients. In the urban environment where diabetic mellitus is managed, prompt recognition of hypoglycemic events is important.

Objectives: Objective was to estimate the awareness of symptoms of hypoglycaemia amongst diabetic patients visiting outpatient and inpatient units of a tertiary care hospital located in an urban area of Chennai and to determine the factors contributing to this awareness.

Methods: This is a descriptive analytical study conducted among 180 diabetic subjects during a span of six weeks at Government Medical College & Hospital, Omandur Government Estate, Chennai. Convenient sampling method was adopted for selecting the sample group. The data was collected through the use of an elaborate proforma that consisted of sociodemographic variables and Modified Clarke's Questionnaire (MCQ) to check for hypoglycemia awareness.

Results: Out of 180 respondents, only 48.9% (n = 88) knew about the signs of hypoglycemia which reflects significant lack of awareness among respondents. Most of the respondents belonged to the age group 46-60 years (44.4%). There was a statistically significant relationship between the education level and hypoglycemia symptom awareness ($\chi^2 = 12.964$, $p = 0.012$). Knowledge of hypoglycemia signs was highly significantly related to confidence in recognizing symptoms of hypoglycemia ($\chi^2 = 41.215$, $p < 0.0001$). More than half of the respondents (46.7%) missed their hypoglycemic episodes owing to non-existence of symptoms.

Conclusion: There is a large lack of knowledge about hypoglycemia among diabetic patients living in urban areas of Chennai. Level of education acts as an important factor in this regard. Patient education programs especially for less educated patients need to be initiated immediately to overcome this problem.

Keywords: Hypoglycemia; Diabetes Mellitus; Awareness; Urban Population; Modified Clarke's Questionnaire; Chennai.

DOI: 10.25258/ijcpr.18.6.185

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Diabetes mellitus (DM) is an example of a metabolic disease where the body experiences a condition of hyperglycaemia caused by problems in insulin production and utilisation. It has become one of the most significant threats to global public health in the modern era with figures indicating that around 463 million adults had diabetes across the globe in 2019; by 2045, this number may exceed 700 million adults. [2] India has been a country that bears the brunt of diabetes and is often called the "capital of diabetes."

Of the immediate metabolic problems associated with diabetes mellitus, hypoglycemia assumes special significance. According to the American Diabetes Association (ADA), hypoglycemia is described as the presence of less than 70 mg/dL (or 3.9 mmol/L) of blood glucose levels. This condition can lead to the onset of hypoglycemia, which involves certain clinical manifestations, such as sweating, tremor, palpitations, confusion, and dizziness; failure to identify the symptoms and treat

the condition can result in seizures, unconsciousness, and even death. [2] The administration of drugs like insulin and hypoglycemics causes hypoglycemia.

Recognizing early signs of symptoms plays a crucial role in proper management of disease. Nevertheless, some researches prove that many diabetic patients lack the necessary knowledge about hypoglycemic symptoms, leading to late intervention and extended episodes of hypoglycemia. In Ethiopia, patients who lacked adequate knowledge regarding hypoglycemia had six times the risk of experiencing severe hypoglycemia than patients who had enough knowledge. Besides the direct effects on patients' health, hypoglycemia influences their quality of life negatively, causes more fear and anxiety, diminishes their working abilities and increases medical expenses.

The urban populations of India have a distinct epidemiology. The existence of high rates of diabetes, differences in education levels, and different rates of health literacy make urban Chennai an appropriate location to study awareness of hypoglycaemia. Although there is an increasing amount of literature focusing on hypoglycaemia, very little exists concerning the urban diabetics of South India.

It is in this context that this current research was conducted to ascertain the level of knowledge of signs of hypoglycaemia among diabetic patients attending a tertiary healthcare institution in Chennai. The findings from this study will be critical in helping devise ways to address hypoglycaemia problems among diabetic patients in this particular community.

Materials and Methods

Study Design and Setting: The study involved carrying out a cross-sectional analysis among patients in the OPD/IPD Departments of Government Medical College & Hospital, Omandurar Government Estate, Chennai – 600002, Tamil Nadu, India. The data were collected for six weeks during the course of the study.

Study Population: The study sample involved patients suffering from type 1 and type 2 diabetes mellitus aged adults admitted to the hospital during the course of data collection. The convenience sampling technique was used.

Sample Size: A total of 180 participants were enrolled in the study.

Inclusion Criteria

1. All adult individuals who are 18 years old or older with known type 1 or type 2 diabetes mellitus;

2. Diabetics with at least a six-month history of the condition;
3. Patients enrolled in the follow-up clinic during the time of the study.

Exclusion Criteria

1. Patients suffering from acute diseases.
2. Patients who cannot communicate.
3. Women suffering from gestational diabetes mellitus.
4. Patients suffering from secondary diabetes.
5. Patients who did not give their consent.

Data Collection Tool: The data were obtained by administering a pre-tested structured proforma, which contained: (a) sociodemographic and clinical profile, and (b) Modified Clarke's Questionnaire (MCQ) for determining awareness of hypoglycemia.

The Modified Clarke's Questionnaire: Consists of 8 validated questions to assess impaired awareness of hypoglycemia (IAH). Scoring is done as 0 (normal response) or 1 (impaired response) for each item, providing a cumulative score between 0 and 8. The cut-off value for composite score of 0-3 is normal awareness of hypoglycemia; whereas, composite score of ≥ 4 reflects IAH.

The sociodemographic factors assessed include age, gender, place of residence, educational qualifications, occupation, socioeconomic status, body mass index (BMI), years of having diabetes, presence of co-morbidities, and family history of diabetes. All subjects were enquired regarding their awareness about hypoglycemia symptoms (Yes/No).

Ethical Considerations: Ethical clearance was obtained from the Institutional Ethics Committee (IEC) of Government Medical College, Omandurar Government Estate, and Chennai. Informed written consent was taken from all subjects before enrolling into the study. Confidentiality of the participants' data was strictly observed during the study period.

Statistical Analysis: All data analyses were performed using IBM SPSS Statistics, version 26.0. Frequencies and percentages have been used for categorical variables whereas mean $\pm$ standard deviation for continuous variables. Relationships among categorical variables were measured by means of Chi-square (χ^2) test. P value of less than 0.05 was deemed to be statistically significant.

Results

Demographic Characteristics: A total of 180 cases of diabetic patients were enrolled into the study. The demographic features of the study subjects are presented in Table 1.

Majority of the respondents (44.4%; n=80) belonged to the age group 46-60 years, followed by those of 31-45 years (32.2%, n=58).

Those above 60 years constituted 12.8% (n=23), while 10.0% (n=18) belonged to the age range of 18-30 years. Majority of them (40.0%, n=72) belonged to graduate or undergraduate levels. Those who had

education till school (upto 10th standard) formed 17.2% (n=31), while those with higher secondary education made up of 13.9% (n=25). Only 3.9% (n=7) had postgraduate education. 25.0% (n=45) had education level marked as 'Others'. 60.6% (n=109) of the respondents had a family history of diabetes, while 29.4% (n=53) had other diseases along with diabetes. Duration of illness in 48.3% (n=87) of them was of 1-5 years; 11.7% (n=21) had duration ranging from 6-10 years, while 10.6% (n=19) were suffering for more than 10 years. The remaining 29.4% (n=53) were either newly detected or had no diabetes.

Table 1: Demographic Characteristics of Study Participants (N = 180)

Variable	Category	n	%
Age Group (years)	18-30	18	10.0
	31-45	58	32.2
	46-60	80	44.4
	60+	23	12.8
Education Level	School (up to 10th)	31	17.2
	Higher Secondary (12th)	25	13.9
	Graduate / Undergraduate	72	40.0
	Postgraduate	7	3.9
	Other / Unknown	45	25.0
Family History of Diabetes	Yes	109	60.6
	No	71	39.4
Comorbidities	None	127	70.6
	Present	53	29.4
Duration of Diabetes	None / Not diabetic	53	29.4
	1-5 years	87	48.3
	6-10 years	21	11.7
	> 10 years	19	10.6

Hypoglycaemia Awareness and Recognition:

Table 2 shows the results obtained when the survey respondents' awareness about symptoms and signs associated with hypoglycaemia were assessed. In total, 48.9% (n=88) patients declared their awareness concerning hypoglycaemia, while the other half, i.e. 51.1% (n=92), was unaware of the condition. The results for the question of detecting low blood sugar prior to testing show that 12.8% (n=23) were always capable of doing that, while 38.3% (n=69) managed to detect the problem usually. On the contrary, 36.7% (n=66) could detect it only sometimes, and 12.2% (n=22) were unable to do that at all. The same applies to the recognition of symptoms of hypoglycaemia; 13.9% and 34.4% always and usually recognized symptoms associated with hypoglycaemia, while 37.2% and 14.4% recognized it only sometimes and never,

correspondingly. In terms of asymptomatic episodes in the previous six months, 43.9% (n=79) stated that they had occurred sometimes, 28.3% (n=51) - usually, and 4.4% (n=8) - always.

It is worth mentioning that only 23.3% did not experience asymptomatic episodes. Severe cases of hypoglycaemia with the need for help from others in the last six months occurred in 46.7% (n=84) 1-2 times, and in 9.4% (n=17) more than twice. Seizures or loss of consciousness caused by hypoglycemia had occurred in 28.9% (n=52) at least once, while 9.4% (n=17) had such experiences several times. Nearly half, that is, 46.7% (n=84) reported failure to detect hypoglycemia because they did not have any symptoms. However, only 51.1% (n=92) of them were certain about detecting hypoglycemia.

Table 2: Distribution of Hypoglycaemia Awareness and Recognition Responses (N = 180)

Question / Variable	Response	n	%
Knowledge of hypoglycaemia symptoms	Yes	88	48.9
	No	92	51.1
an tell blood sugar is low before checking	Always	23	12.8
	Usually	69	38.3
	Sometimes	66	36.7
	Never	22	12.2
Recognise symptoms when blood sugar is low	Always	25	13.9
	Usually	62	34.4
	Sometimes	67	37.2
	Never	26	14.4
Asymptomatic episodes in past 6 months	Never	42	23.3
	Sometimes	79	43.9
	Usually	51	28.3
	Always	8	4.4
Symptoms feel difficult to recognise	Never	32	17.8
	Sometimes	86	47.8
	Usually	42	23.3
	Always	20	11.1
Severe hypoglycaemia requiring help (past 6 months)	Never	79	43.9
	1–2 times	84	46.7
	More than 2 times	17	9.4
eizures or unconsciousness due to low blood sugar	Never	111	61.7
	Once	52	28.9
	More than once	17	9.4
Miss hypoglycaemia due to absent symptoms	Yes	84	46.7
	No	96	53.3
Confident in recognising hypoglycaemia	Yes	92	51.1
	No	88	48.9

Factors Associated with Knowledge of Hypoglycaemia Symptoms: Looking For Association between Awareness between Symptoms of Hypoglycemia with Educational Level, Confidence in Recognition and Missing Symptoms

A chi-square test was carried out to analyze whether there were any associations between different sociodemographic factors and clinical variables with respect to their knowledge about hypoglycaemic symptoms. The results are provided in Tables 3 and 4.

Educational status was significantly associated with the patient's knowledge regarding hypoglycaemic symptoms ($\chi^2 = 12.964$; $df = 4$; $p = 0.012$). Confidence in recognizing hypoglycaemia was found to be the most strongly associated with the awareness of symptoms ($\chi^2 = 41.215$; $df = 1$; $p < 0.0001$). In addition, missing a hypoglycaemic episode due to the absence of symptoms was significantly associated with the awareness of hypoglycaemia symptoms ($\chi^2 = 9.974$; $df = 1$; $p = 0.002$). On the other hand, age category ($\chi^2 = 4.013$; $p = 0.260$), family history of diabetes ($\chi^2 = 0.137$; $p = 0.712$), and comorbidity of disease ($\chi^2 = 0$)

Table 3: Chi-Square Analysis — Factors Associated with Knowledge of Hypoglycaemia Symptoms

Variable	χ^2 Value	p-Value	Result
Age group	4.013	0.260	Not significant
Education level	12.964	0.012*	Significant*
Family history of diabetes	0.137	0.712	Not significant
Comorbidities	0.213	0.644	Not significant
Confidence in recognition (Q8)	41.215	< 0.0001***	Significant***
Missing symptoms (Q7)	9.974	0.002**	Significant**

Note: * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$. Level of significance: $\alpha = 0.05$. ****Significance

Knowledge of hypoglycaemia symptoms was significantly associated with

- Education level
- Confidence in symptom recognition
- Ability to identify symptoms correctly.

Table 4: Cross-tabulation — Symptom Knowledge vs. Confidence in Recognition

Knowledge of Symptoms	Confident: Yes	Confident: No	Total
Yes (knows symptoms)	67 (76.1%)	21 (23.9%)	88 (100%)
No (does not know)	25 (27.2%)	67 (72.8%)	92 (100%)
Total	92 (51.1%)	88 (48.9%)	180 (100%)

Note: $\chi^2 = 41.215$, $df = 1$, $p < 0.0001$. Values in parentheses represent row percentages.

Discussion

This study was a cross-sectional study to find out the extent of awareness of the symptoms of hypoglycaemia among 180 diabetic patients receiving treatment at a tertiary care hospital in the urban part of Chennai city. Results indicate a high lack of awareness concerning hypoglycaemia, where only 48.9% reported having some level of awareness about the symptoms of hypoglycaemia, indicating the need for patient education in this regard.

This is in line with results found in similar settings elsewhere in developing countries. A cross-sectional study done by Kenean Tadesse et al. (2021) in Adama, Ethiopia, found poor knowledge regarding the symptoms of hypoglycaemia among diabetic patients, which influenced the possibility of having hypoglycemic episodes.³ Another study on the awareness of hypoglycaemia among patients with type 2 diabetes mellitus in Saudi Arabia found a significant number lacking awareness. [5]

The main age category observed in our research was 46-60 years, corresponding to the peak incidence of type 2 diabetes among Indians. It is also noteworthy that age itself did not have a significant association with hypoglycemia awareness ($p=0.260$). This implies that age-based variables, including the duration of illness or polypharmacy, cannot automatically imply a heightened awareness about the symptoms of hypoglycemia; therefore, patient education needs to be proactive and continuous irrespective of age.

Another factor found to be statistically significant in our study was the participant's educational level ($\chi^2 = 12.964$, $p = 0.012$). Patients who were more educated were better able to name symptoms related to hypoglycemia. Indeed, there exists ample evidence in the literature connecting an individual's educational background to the capacity to engage in self-management practices, particularly with regards to chronic diseases. [6]

In our case, since 17.2% of participants had a primary education or below, it is vital to note that patient education material will need to be easy-to-understand and visually aided, in addition to being written in Tamil.

The significant correlation between confidence in recognising hypoglycaemia and awareness of the symptoms ($\chi^2 = 41.215$, $p < 0.0001$) is quite predictable and clinically important. In those respondents who were aware of the symptoms,

76.1% had confidence in recognition, while only 27.2% of those without symptoms knowledge felt that way. The bi-directional nature of this finding implies that knowledge-based interventions will have the effect of increasing self-management behaviour not only objectively but subjectively as well.

The occurrence of missed episodes of hypoglycaemia as a result of lack or unawareness of symptoms (46.7%) is especially concerning. Impaired awareness of hypoglycaemia (IAH) is a well-known condition wherein frequent exposure to hypoglycaemia leads to blunting of autonomic and symptomatic responses. [7] As found in the Dutch Diabetes Pearl Cohort study, type 2 diabetes patients receiving insulin treatment suffered from IAH and its risks.

It may also be true for the Chennai urban diabetic community, and therefore calls for proper screening for IAH using standardized instruments in clinical practice.

More than half of the respondents experienced severe hypoglycaemia with the requirement of assistance from others during the last six months (56.1%), and one-third of patients suffered from hypoglycaemic seizures or coma in the same period. The high prevalence of such clinical consequences suggests an evident level of morbidity related to hypoglycaemia.

As expected, no significant association was found between having any comorbidity or a family history of diabetes and hypoglycaemia awareness among our respondents. This shows that being related to someone who has diabetes does not necessarily mean that the person will have adequate knowledge about it. Proper education is thus required for achieving a good awareness status.

Strengths and Limitations: Use of the Modified Clarke's Questionnaire in the study has proven helpful as it is an established and extensively used scale in measuring the awareness of hypoglycaemia. The study was performed in a tertiary hospital that caters to a wide spectrum of patients from the urban community in Chennai. This makes the results generalizable to the local context.

However, some limitations need to be noted. First, convenient sampling was done owing to logistical and time restrictions; hence, there would be sampling bias. Second, since the study employed a cross-sectional research design, causality cannot be

established. Third, self-reporting symptoms could also be subjected to social desirability bias. Finally, no clinical information, such as the patients' HbA1c level, medication and frequency of glucose testing, was obtained. **Conclusion**

This study shows that hypoglycaemic awareness of symptoms in diabetic patients in urban Chennai is still very low, with less than half of the subjects having awareness of the symptoms of hypoglycaemia. Education and hypoglycaemic awareness confidence are the two factors that contribute largely towards hypoglycaemic awareness. Participants were seen to have reported many cases of severe hypoglycaemia and missed hypoglycaemia because they did not realise they had hypoglycaemia. It is evident that the results from this study present a strong need for the implementation of hypoglycaemia education in diabetes management.

The education should be based on the educational level of the patients, provided in their local languages, and done during every clinical visit. Medical practitioners in diabetes outpatient clinics need to identify patients with hypoglycaemia awareness problems and refer them for self-management training.

Improvement in the hypoglycaemia awareness in patients can play an instrumental role in increasing safety and also reduce the costs spent managing emergencies and hospitalisation as well.

References

1. Saeedi P, Petersohn I, Salpea P, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Res Clin Pract.* 2019;157:107843.
2. Diagnosis and classification of diabetes mellitus. American Diabetes Association. *Diabetes Care.* 2005;28(Suppl 1):S37–S42.
3. Kenean Tadesse, Hussien Mekonnen, Teshome Habte, et al. Knowledge of hypoglycemia symptoms and associated factors among diabetic patients in Adama Hospital Medical College, Adama, Ethiopia: A cross-sectional study. *Clin Epidemiol Glob Health.* 2024;28:101702.
4. Kalra S, Mukherjee JJ, Venkataraman S, et al. Hypoglycemia: the neglected complication. *Indian J Endocrinol Metab.* 2013;17(5):819–834.
5. AlToway A, Alharbi S, Aldeham M, et al. Awareness level of hypoglycemia among diabetes mellitus type 2 patients. *Cureus.* 2023;15(3):e36393.
6. Tabish SA. Is diabetes becoming the biggest epidemic of the twenty-first century? *Int J Health Sci (Qassim).* 2007;1(2):V–VIII.
7. Cryer PE. Hypoglycemia in Diabetes: Pathophysiology, Prevalence, and Prevention. 3rd ed. Alexandria, VA: American Diabetes Association; 2016.
8. van Meijel LA, de Vegt F, Abbink EJ, et al. High prevalence of impaired awareness of hypoglycemia and severe hypoglycemia among people with insulin-treated type 2 diabetes: the Dutch Diabetes Pearl Cohort. *BMJ Open Diabetes Res Care.* 2020;8(1):e000935.
9. Davis TM, Brown SG, Jacobs IG, Bulsara M, Bruce DG, Davis WA. Determinants of severe hypoglycemia complicating type 2 diabetes: the Fremantle diabetes study. *J Clin Endocrinol Metab.* 2010;95(5):2240–2247.
10. Leese GP, Wang J, Broomhall J, et al. Frequency of severe hypoglycemia requiring emergency treatment in type 1 and type 2 diabetes: a population-based study of health service resource use. *Diabetes Care.* 2003;26(4):1176–1180.
11. Hepburn DA, Deary IJ, Frier BM, Patrick AW, Quinn JD, Fisher BM. Symptoms of acute insulin-induced hypoglycemia in humans with and without IDDM. *Diabetes Care.* 1991;14(11):949–957.
12. Kachroo S, Kawabata H, Colilla S, et al. Association between hypoglycemia and fall-related events in type 2 diabetes mellitus. *J Manag Care Spec Pharm.* 2015;21(3):243–253.
13. Tripathi BK, Srivastava AK. Diabetes mellitus: complications and therapeutics. *Med Sci Monit.* 2006;12(7):RA130–147.
14. Abdelmalek BM. Acute metabolic complications of diabetes mellitus. *Med J Ahmed Maher Teach Hosp.* 2012;1:779–781.