Knowledge of hypoglycemia and associated factors in patients with Type 2 diabetes mellitus: A tertiary care center based cross-sectional study from kerala

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Abstract

Context: Hypoglycemia is a life-threatening complication frequently encountered in patients with diabetes. Awareness of risk factors, symptoms, complications, and initial treatment will prevent occurrence of hypoglycemia. We identified a dearth of studies and a gap in knowledge on various aspects of hypoglycemia in Kerala.

Aim: This study was carried out to estimate the level of knowledge of hypoglycemia among Type 2 diabetes mellitus patients and to determine its association with sociodemographic factors, disease, and treatment modality.

Materials and Methods: A hospital-based cross-sectional study was carried out in the medicine OPD of a tertiary care center in Central Kerala. One hundred diabetic patients who consented to take part in the study were interviewed using a pre-validated questionnaire. The level of knowledge of hypoglycemia and its association with selected variables was analyzed.

Results: Among the 100 participants, 57% were females and majority (56%) had secondary education. Good knowledge about hypoglycemia was seen in only 46% of the subjects. A prior personal experience of hypoglycemia, treating doctors being the source of information, and duration of diabetes of more than 10 years were factors significantly associated with good knowledge.

Conclusion: Awareness of remedial measures of hypoglycemia is very good. However, knowledge of other important aspects such as symptoms, precipitating factors, preventive measures, and complications is alarmingly lacking even in an educated group of patients. Health education and reinforcement at every visit by health-care professionals is the need of the hour. Usage of social media and other innovative strategies to spread awareness post-pandemic needs to be considered.

Key words: Health education, Hypoglycemia, Knowledge, Social media, Type 2 diabetes mellitus

Key messages: Knowledge of important aspects of hypoglycemia such as symptoms, precipitating factors, preventive measures, and complications is alarmingly lacking even in an educated group of patients. Concerted efforts by health-care professionals using innovative strategies and social media to spread awareness post-pandemic is the need of the hour

INTRODUCTION

Hypoglycemia is a life-threatening complication occurring as a result of strict glycemic control in patients with Type 2 diabetes. It is characterized by the classic Whipple's triad



of reduced plasma glucose, symptoms compatible with hypoglycemia, and rapid resolution of symptoms by correction of low glucose.^[1] Strict glycemic control is advocated universally. However, randomized control trials such as VADT, ADVANCE, ACCORD, and DCCT have reported an increase in mortality and threefold increase in hypoglycemia in patients with intensive glycemic control regimens targeting aggressive HbA1c levels (<6.5%).^[2] It leads to different adrenergic symptoms due to sympathetic nervous system activation and neuroglycopenic symptoms as a result of a decreased level of glucose in the brain.^[3] These symptoms help people understand that their blood

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sugar is low. If left untreated, it can adversely affect workplace productivity, result in impairment in cognitive function, and is even associated with an increased risk of mortality.^[4]

Awareness of risk factors of hypoglycemia, early recognition of hypoglycemic symptoms, self-monitoring of blood glucose (SMBG), and knowledge of correct initial treatment will minimize the risk of hypoglycemia and its complications. There is a paucity of studies and a gap in knowledge on various aspects of hypoglycemia in Kerala. Hence, this study was carried out to ascertain the level of knowledge of hypoglycemia and associated factors among Type 2 diabetes patients in central Kerala.

Objectives

The objectives of the study are as follows:

- 1) To estimate the level of knowledge of hypoglycemia among Type 2 diabetes mellitus patients
- 2) To determine the association of the knowledge of hypoglycemia with sociodemographic factors, disease and treatment profile of Type 2 diabetes mellitus patients.

MATERIALS AND METHODS

Study Design

This was a cross-sectional study.

Study Setting

The study was conducted in the Medicine outpatient department in a tertiary care hospital and medical college, Kerala.

Study Population

This study was carried out amongst Type 2 diabetes mellitus patients in central Kerala.

Operational Definitions

- a) Knowledge Refers to the state of being informed about the symptoms, risk factors, complications, preventive, and remedial measures of hypoglycemia
- Type 2 diabetic patients Patients already diagnosed with diabetes and have adopted life style modifications and/or taking medications which include oral hypoglycemic agents and/or insulin.

Inclusion Criteria

Patients with a diagnosis of Type 2 diabetes mellitus presenting to the outpatient department were included in the study.

Exclusion Criteria

The following patients were excluded from the study:

- a) Patients with gestational or Type 1 diabetes mellitus
- b) Patients with diabetes secondary to other systemic diseases.

Study Duration

The study duration was 3 months (January 2022–March 2022).

Sample Size

For sample size calculation, the formula 4 pq/d^2 was applied. Based on a previous study done by Shriraam *et al.*, the proportion of patients with good knowledge on hypoglycemia was 66%.^[5] The minimum sample size at 95% confidence limit and 15% allowable error was calculated to be 88. We included 100 patients in this study.

Data Collection

Diabetic patients who presented to the OPD were interviewed after obtaining an informed consent. Patients were recruited using convenient sampling. A pre-tested structured questionnaire was administered to the study participants by the primary investigator. Information on sociodemographic profile, disease history, and treatment profile of the study participants was collected. This was followed by questions testing the knowledge of patients about symptoms, risk factors, and complications of hypoglycemia. Few questions to assess their knowledge on preventive practices and immediate remedial measures that need to be adopted during an episode of hypoglycemia was also asked. The study included questions with a single correct option as the answer along with questions for which multiple options was considered as correct. Patients were asked to give a "yes," "no," or "I don't know" response. Participants who rightly answered the remedial measure along with at least three symptoms were considered as having "good knowledge" on hypoglycemia.

Statistical Analysis

The data were entered in "Microsoft Excel" software and analyzed using SPSS software. The categorical variables were summarized using frequency and percentage. To determine the association of knowledge of hypoglycemia with selective demographic and other variables, Chi-square test or Fischer's exact test was performed. P < 0.05 was considered as statistically significant.

Ethical Considerations

Institutional research and ethics committee approval was obtained before initiating the study. Confidentiality was ensured by maintaining participant anonymity when filling out the questionnaire.

RESULTS

The study included 100 patients who had Type 2 diabetes mellitus. The mean age of the study population was 63.98 ± 11.31 years. Among the participants, 57% of patients were females and majority (56%) had secondary education while

30% were graduates. Based on monthly income, population was almost evenly distributed with slight inclination toward income of Rs.10,000–20,000/- (34%). Majority of the participants were employed (53%), 36% unemployed or homemakers and the rest retired [Table 1].

Among the comorbidities along with diabetes, hypertension was found to be the most common disease (56%), followed by dyslipidemia (48%). Other diseases that were reported include coronary artery disease, chronic kidney disease, thyroid disorders, asthma etc., while 27% did not have any comorbidity [Figure 1].

Majority of the patients were diagnosed with diabetes for more than 10 years (43%), and 63% were taking oral hypoglycemic agents alone. Half the participants have a positive family history of diabetes and 63% reported to have had experienced hypoglycemia in the past while 28% had witnessed a family member go through hypoglycemia [Table 2].

The hypoglycemic alert value (70 mg/dL) was only known to 11%. The symptoms more commonly known to the participants were tremor (48%), sweating (38%) and confusion/disorientation (26%). Symptoms like pallor and seizure were known to a lesser extent as seen in Table 3. Three or more symptoms of hypoglycemia were known to 49 patients while 22 could not identify any symptom. The main precipitating factors identified by patients were skipping/missing meals (37%) and taking excess medication (32%). Remedial measures such as taking fast carbohydrates like glucose and sugar was known to most (79%) of the patients. Knowledge of complications of hypoglycemia was generally poor with heart problems being most commonly cited (27%). Around half the population were aware of and even practised measures to prevent hypoglycaemia such as taking medication on time (55%), keeping regular appointments (42%) and self-blood glucose monitoring (sbgm) (40%).Regarding source of



Figure 1: Prevalence of other co-morbidities along with diabetes

information on hypoglycemia, 35% of the study subjects attributed it to their treating doctors. Health magazines and newspaper were the source for 27% and 23% heard about it from their friends and family members. However, 43% were not informed about hypoglycemia [Figure 2].Good knowledge about hypoglycemia was seen in 46% of the subjects [Figure 3].

Knowledge of hypoglycemia decreases with increase in age (among senior citizens), but the difference is not statistically significant. There is fair distribution of good knowledge among both sexes and no association was seen between gender and knowledge level. There is no statistical difference in knowledge of hypoglycemia with varying levels of education, monthly income, occupational status, or type of diabetic treatment.

A prior personal experience of hypoglycemia is a major determinant of having good knowledge of hypoglycemia (P = 0.037) with the difference being statistically significant. Duration of diabetes is another determining factor of



Figure 2: Source of information about hypoglycaemia



Figure 3: Knowledge about hypoglycaemia

knowledge of hypoglycemia (P = 0.034). A patient having diabetes for more than 10 years had significantly more knowledge on hypoglycemia than those with diabetes for < 10 years. Among the various sources of information, treating doctors significantly contributed to good knowledge about hypoglycemia (P = 0.004) [Table 4].

DISCUSSION

The study was conducted among 100 patients with Type 2 diabetes mellitus presenting to the medicine outpatient department of a tertiary care hospital in central Kerala. Even though a majority were from rural areas, 99% were literate. Overall, 46% of the participants had knowledge of at least three symptoms of hypoglycemia and its remedial measure (i.e., good knowledge).

Table 1: Sociodemographic factors of the study participants

Background characteristics	Frequency (%)
Sex	
Male	43
Female	57
Education	
No formal education	1
Primary (1–5)	13
Secondary (6–12)	56
Graduate or more	30
Monthly income	
<rs. -<="" 10,000="" td=""><td>24</td></rs.>	24
Rs. 10,000–20,000/-	34
Rs. 20,000–30,000/-	20
>Rs. 30,000/-	22
Occupation	
Unemployed	36
Employed	53
Retired	11
Residence	
Urban	30
Rural	70

Table 2: Relevant background characteristicsrelated to diabetes

Background characteristics	Frequency (%)
Type of diabetic treatment	
Lifestyle modifications only	4
Only oral hypoglycemic agents	61
Oral hypoglycemic agents and insulin	27
Only insulin	8
Duration of diabetes	
<5 years	36
6–10 years	21
>10 years	43
Family history of diabetes	50
Hypoglycemic experience	
Personal	63
Family	28

A prior personal experience of hypoglycemia and a greater duration of diabetes of more than 10 years, were factors significantly associated with a good knowledge of hypoglycemia as was also found in another study.^[6]

Knowledge of hypoglycemia was found to improve with educational status; graduates faring better. It was less among senior citizens, probably attributable to a decline in cognition and memory. However, monthly income, residential or occupational status, and modality of diabetic treatment did not have any significant bearing on the same. However, another study done in South India reported a positive association of younger age, educational status, and treatment modality; that is, use of insulin along with oral hypoglycemic agents, with good knowledge of hypoglycemia.^[5]

Among the symptoms of hypoglycemia, tremor and sweating were the most commonly known (48% and 38%, respectively), whereas neuroglycopenic symptoms such as seizure was known only to a handful (8%). This is similar to the frequency of occurrence of these symptoms during a hypoglycemic episode as observed in another study.^[7] It is possible that this knowledge is related to the recollection of a prior personal experience of hypoglycemia which was seen in a majority (63%) of subjects in this study

Table 3: Knowledge of hypoglycemia among theparticipants

Knowledge about	Frequency (%)	
Symptoms		
Tremor	48	
Sweating	38	
Confusion/disorientation	26	
Hunger	24	
Headache	16	
Slurred speech	16	
Pallor	13	
Seizure	8	
Precipitating factors		
Skipping/delaying meals	37	
Excess medication	32	
Excess consumption of alcohol	7	
Vomiting	4	
Remedial measure		
Take fast carbohydrate like sugar and glucose	79	
Complications		
Heart problems	27	
Loss of vision	12	
Coma	10	
Stroke like	10	
Seizures	5	
Preventive measures		
Timely medication	55	
Regular appointment	42	
SBGM	40	
Refer doctor when infected	19	
Refer doctor when going on a fast	11	
Refer doctor when in rigorous exercise regimen	6	

SBGM: Self blood glucose monitoring

and similar to another study held in Mysore.^[6] However, around one-fifth (22%) were unable to identify even a single symptom. It is imperative that patients are aware of all possible presentations of hypoglycemia for the timely institution of preventive or remedial measures.

Skipping or delaying meals and excess medication intake were the common factors known to cause hypoglycemia. However, excessive alcohol consumption and vomiting were least known. Similar results were found in a study held in Rishikesh.^[8]

Knowledge of complications of hypoglycemia was alarmingly poor. Only a tenth or less were aware of serious neurological complications such as stroke like symptoms, coma, and seizures. Multiple studies have reported similar unfamiliarity with complications.^[1,4] Patients and their relatives must be able to recognize and promptly report to a hospital or clinic in the wake of such potentially life-threatening events.

Table 4: Association of good knowledgeon hypoglycemia with certain backgroundcharacteristics

Background characteristics	Good (%)	Poor (%)	Р
Age		. ,	
Upto 50 vears	8 (50)	8 (50)	
51–60 vears	11 (64.7)	6 (35.3)	0.185
Above 60 years	27 (40.3)	40 (59.7)	
Sex	()	()	
Male	22 (51.2)	21 (48.8)	0.368
Female	24 (42.1)	33 (57.9)	
Education	, ,	,	
Till secondary	28 (40)	42 (60)	0.066
Graduate or more	18 (60)	12 (40)	
Monthly income	· · /	· · · ·	
Less than Rs. 20,000/-	26 (44.8)	32 (55.2)	0.782
More than Rs. 20,000/-	20 (47.6)	22 (52.4)	
Occupation			
Unemployed	15 (41.7)	21 (58.3)	0.514
Employed/Retired	31 (48.4)	33 (51.6)	
Residence			
Rural	33 (47.1)	37 (52.9)	0.726
Urban	13 (43.3)	17 (56.7)	
Type of diabetic treatment			
Without insulin	29 (44.6)	36 (55.4)	0.705
With insulin	17 (48.6)	18 (51.4)	
Personal experience of hypoglycemia			
Yes	34 (54)	29 (46)	0.037#
No	12 (32.4)	25 (67.6)	
Family experienced hypoglycemia			
Yes	15 (53.6)	13 (46.4)	0.343
No	31 (43.1)	41 (56.9)	
Duration of diabetes			
< 10 years	21 (36.8)	36 (63.2)	0.034#
More than 10 years	25 (58.1)	18 (41.9)	
Source of information on hypoglycemia			
Treating Doctor	23 (65.7)	12 (34.3)	0.004#
Others	23 (35.4)	42 (64.6)	
# p < 0.05 - Eactors significantly associated with c	lood knowled	ae of	

hypoglycemia

The importance of timely medication intake and regular visits to the treating doctor was known to most patients with regard to the measures to prevent hypoglycemia. SMBG is a pillar of effective diabetes self-management aiding in prevention of hypoglycemia and in glycemic control. It helps in rightly modifying diet, exercise, and pharmacotherapy.^[9] SMBG was known to less than half (40%) the patients and the hypoglycemia alert value (70 mg/dL) to even fewer (11%), in spite of a majority living with diabetes for more than 10 years. The need of approaching the doctor in the event of anticipated fasting and rigorous exercise was less known to the patients.

Most of the patients with good knowledge attributed it to their treating doctors and the association was also found to be statistically significant. It has been observed that health education imparted from either physician or nurse is better.^[6] Moreover, these education and training programs are crucial for control of diabetes.^[10] Surprisingly, only a handful (5%) of the patients reported social media as their source of knowledge on hypoglycemia. Use of social media to dissipate knowledge and in helping people with diabetes through interventions has proved beneficial.^[11] Health institutions, clinicians, and other stakeholders who aim at improving the knowledge of diabetic patients on hypoglycemia should consider use of this method to spread awareness.

Although there is a great emphasis in diabetes selfmanagement education^[12] including various aspects such as diet, exercise, lifestyle modification, medication, and prevention of complications, a majority of participants predominantly residing in rural areas are still ill informed on the various aspects of hypoglycemia as noted in this study. This may be due to the fact that focus has shifted toward the pandemic during these times with the absence of regular follow-up visits and access to healthcare leading to the lack of reinforcement through health education and counseling sessions.^[13] Ill-informed individuals may fail to recognize hypoglycemic episodes and repeated episodes of severe hypoglycemia can result in long-term cognitive dysfunction and even brain death.^[14,15]

This study gives us an insight into the level of knowledge regarding various aspects of hypoglycemia – a potentially grave but preventable complication of diabetes, among patients presenting to the outpatient department of a tertiary care Medical College Hospital in central Kerala. It helps us in identifying and addressing aspects of the knowledge gap in relation to hypoglycemia. Treating doctors, being the main source of information on hypoglycemia should focus more on educating patients regarding the possible symptoms, precipitating factors, prevention, and complications that can occur due to the condition. Counseling and distribution of educational pamphlets on hypoglycemia were undertaken as part of the study to minimize the risk of future episodes and thereby improve quality of life in these patients.

The limitation of the study is that it is hospital-based and the sample size was small.

CONCLUSION

Although awareness of remedial measures of hypoglycemia is seen to be very good, knowledge of other important aspects such as symptoms, precipitating factors, preventive measures, and complications is alarmingly lacking even in an educated group of patients. Health education on various aspects of hypoglycemia and reinforcement at every visit by the treating doctors and nurses is the need of the hour. Renewed effort using potent tools of information dissipation like social media and social networking platforms and other innovative strategies need to be considered in improving awareness and preventing hypoglycemia. Similar studies to assess the knowledge of different aspects of hypoglycemia among the general public can be conducted post-pandemic at the community level.

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