Assessment of Knowledge of Hypoglycemia Symptoms among Diabetic Patients

Attending El-Gameeh Diabetes Hospital in Dongola, Northern State, Sudan, 2026

Prepared by:

Amany Hamza Aldehaish Hamza

Madiha Mohammed Khalaf Allah Gibreel

Supervisor:

Dr: Ahmad Al-Zein

1. RESEARCH PROPOSAL TITLE

Assessment of Knowledge of Hypoglycemia Symptoms among Diabetic Patients Attending El-Gameeh Diabetes Hospital in Dongola, Northern State, Sudan, 2026.

This research proposal is prepared to assess patients' knowledge of hypoglycemia symptoms, causes, risk factors, immediate actions, and sources of information among diabetic patients attending El-Gameeh Diabetes Hospital in Dongola.

2. INTRODUCTION

2.1 Background

Diabetes is a common long-term disease around the world. The number of people living with diabetes is increasing, particularly in low- and middle-income countries, including Sudan. Diabetes requires continuous self-care, regular follow-up, and appropriate use of medicines to maintain blood glucose within a safe range. [1,10]

Hypoglycemia refers to an abnormally low blood glucose level and is an important complication of diabetes treatment. It can occur particularly in people using insulin or medicines that increase insulin secretion. Mild or moderate episodes may cause uncomfortable symptoms, while severe episodes can interfere with normal brain function and may result in seizures, loss of consciousness, or other serious consequences. [2,3]

The early symptoms of hypoglycemia may include sweating, shaking or tremor, hunger, fast heartbeat, dizziness, weakness, drowsiness, blurred vision, and anxiety. As blood glucose falls further, neuroglycopenic symptoms such as confusion, unusual behavior, difficulty concentrating, seizures, and loss of consciousness may occur. Recognizing these symptoms early is important because prompt action can prevent progression to severe hypoglycemia. [2,3,11]

Knowledge of hypoglycemia is therefore an important part of diabetes self-management. A patient needs to recognize the warning signs, understand possible causes and risk factors, and know the appropriate immediate response. In practical terms, early recognition may allow the patient to take a suitable fast-acting source of carbohydrate when able to do so and to seek further assistance when symptoms are severe or do not improve. [2,3,6,11]

Previous studies have shown that knowledge is not always complete among people with diabetes. A Sudanese study conducted in Khartoum among insulin-treated patients reported gaps in recognition of hypoglycemia symptoms and concluded that further patient education was needed. Studies from other countries have also identified differences in symptom recognition and gaps in patients' knowledge of what to do when hypoglycemia occurs. [7-9]

In Sudan, diabetes services are provided in different geographical settings, and patients attending facilities outside Khartoum may have different educational and service-access needs. El-Gameeh Diabetes Hospital in Dongola provides diabetes diagnosis, treatment, and follow-up for patients from Dongola and surrounding areas. Assessing knowledge in this setting can provide local information that is directly relevant to the patients receiving care there. [7,10]

Because hypoglycemia can become serious when symptoms are not recognized or managed promptly, assessing patients' knowledge is clinically relevant. The findings can help identify specific educational gaps and provide a basis for health education messages that are appropriate to the local setting. [2,3,11]

2.2 Problem Statement

Some patients with diabetes may not recognize low blood glucose or may not know the correct response when symptoms occur. Failure to recognize early symptoms can delay treatment and allow an episode to progress to more serious manifestations, including confusion, seizures, or loss of consciousness. [2,3]

Published evidence from Sudan has identified important gaps in knowledge of hypoglycemia among diabetic patients in Khartoum. However, the available study evidence does not provide a clear baseline description of hypoglycemia knowledge among diabetic patients attending El-Gameeh Diabetes Hospital in Dongola. Local information is important because patient education needs may vary according to the population served, access to health information, and the organization of diabetes care. [7]

The absence of local baseline information makes it difficult to identify which symptoms are least recognized, whether patients understand the causes and risk factors of hypoglycemia, what actions they would take during an episode, and where they currently obtain information about hypoglycemia. [7-9]

This study will therefore assess knowledge of hypoglycemia symptoms among diabetic patients attending El-Gameeh Diabetes Hospital in Dongola, Northern State, Sudan, in 2026. The study will also examine selected demographic and clinical factors that may be associated with knowledge. [7,8]

2.3 Rationale (Justification of the Study)

Clinical importance: Hypoglycemia is an important complication of diabetes treatment and, when severe, can become a medical emergency. A patient who does not recognize the warning symptoms may not take timely action or seek help. Assessing knowledge is therefore relevant to patient safety and diabetes self-management. [2,3,11]

1. Local evidence for Northern State: Published Sudanese evidence identified for this proposal includes research conducted in Khartoum. There is a need for local baseline information from Dongola to describe the knowledge of patients attending El-Gameeh Diabetes Hospital. Such information can help the hospital identify education needs in its own patient population rather than relying only on findings from other settings. [7]

2. Characteristics of the population served: The hospital serves patients from Dongola and surrounding areas, including patients who may have different levels of access to health information and diabetes-monitoring resources. These factors make it useful to assess knowledge directly among the patients attending the hospital rather than assuming that findings from other populations apply to them. [7,8]

3. Knowledge and prevention: Knowledge of symptoms, causes, risk factors, and appropriate immediate action is an important component of preventing complications from hypoglycemia. If the study identifies important knowledge gaps, the findings can support simple educational measures such as structured health-education sessions, Arabic-language posters, and patient leaflets. [2,3,11]

4. Economic consideration: Severe hypoglycemia can require urgent medical attention and may place a burden on patients, families, and health services. Improving recognition and early response through appropriate education may help reduce preventable complications and the need for

emergency care. [3,11]

5. Practical impact: The results can provide practical answers for El-Gameeh Diabetes Hospital, including which symptoms are least recognized, whether patients understand the difference between early autonomic symptoms and later neuroglycopenic symptoms, what actions they would take during an episode, and which sources of information are most commonly used. [7-9]

Therefore, the study is justified by its clinical relevance, its need for local epidemiological information, and its potential practical value for improving patient education at El-Gameeh Diabetes Hospital. [7-9]

3. RESEARCH OBJECTIVES

3.1 General Objective

To assess knowledge of hypoglycemia symptoms among diabetic patients attending El-Gameeh Diabetes Hospital in Dongola, Northern State, Sudan, in 2026.

3.2 Specific Objectives

1. To describe the social and demographic characteristics of the patients.
2. To assess patients' knowledge of the early signs of hypoglycemia.
3. To assess patients' knowledge of the causes and risk factors of hypoglycemia.
4. To find out whether patients know what to do when hypoglycemia occurs.
5. To identify where patients get information about hypoglycemia.
6. To examine the relationship between knowledge and factors such as age, sex, education, duration of diabetes, and type of treatment.

The general objective states the overall purpose of the study, while the specific objectives identify the individual areas that will be measured or examined to achieve that purpose.

4. SUMMARIES OF THREE VERY SIMILAR PUBLISHED PAPERS

4.1 Madani AM, et al. (2019), Khartoum, Sudan

Title: Assessing Knowledge of Hypoglycemia Symptoms among Type 2 Diabetic Patients Using Insulin, Khartoum, Sudan. *Pharmacology & Pharmacy.* 2019;10:21–30.

This single-centre, hospital-based analytical cross-sectional study was conducted among 125 adults with type 2 diabetes receiving insulin at the Ribat University Hospital Diabetes Clinic in Khartoum. A validated questionnaire assessed knowledge of hypoglycemia symptoms and sources of diabetes information. Overall, 52% of participants had poor knowledge. The most commonly recognized symptoms were hand tremor (67.2%), sweating (65.6%), and blurred vision (52.8%). Physicians were the main source of diabetes information (74.4%), while 25.6% reported regular visits to an education centre. The study found no significant association between hypoglycemia knowledge and the reported socio-demographic variables or diabetes duration. The authors concluded that further multidisciplinary education was needed. [7]

Relevance to the present study: This study is particularly relevant because it was conducted in Sudan and assessed hypoglycemia knowledge using a hospital-based approach. The present study applies a similar focus to patients attending El-Gameeh Diabetes Hospital in Dongola, allowing local knowledge gaps to be described in Northern State. [7]

4.2 Mohan V, et al. (2015), South India

Title: Knowledge of hypoglycemia and its associated factors among type 2 diabetes mellitus patients in a Tertiary Care Hospital in South India. *Indian Journal of Endocrinology and Metabolism.* 2015;19(3):378–382.

This cross-sectional study assessed knowledge of hypoglycemia among 366 patients with type 2 diabetes attending an outpatient department. Every fifth patient was interviewed during a four-month period using a questionnaire. The commonly recognized symptoms were dizziness (81.4%), weakness (73.8%), and drowsiness (72.1%). Overall, 66.1% were classified as having good knowledge based on recognition of symptoms, precipitating factors, and a remedial measure. Older age, illiteracy, and low socioeconomic status were associated with poorer knowledge, while treatment with insulin plus oral hypoglycemic agents was associated with better knowledge. The study also identified gaps in knowledge of target blood glucose levels and complications. [8]

Relevance to the present study: The study demonstrates the value of examining demographic and treatment-related factors alongside knowledge. Similar factors are included among the specific objectives of the Dongola study. [8]

4.3 Study from KwaZulu-Natal, South Africa (2016)

Title: Knowledge of symptoms and self-management of hypoglycaemia among patients attending a diabetic clinic at a regional hospital in KwaZulu-Natal, South Africa.

This hospital-based cross-sectional descriptive study involved 200 adult diabetic patients attending a regional diabetic clinic in northern KwaZulu-Natal. A validated questionnaire collected demographic information, medication details, knowledge of hypoglycemia, and patients' responses to symptoms. Most participants had fair to good knowledge of hypoglycemia; however, fewer than one quarter knew what action to take when they experienced symptoms suggestive of hypoglycemia. The study highlighted the importance of patient education on the practical, stepwise management of hypoglycemia and prevention of life-threatening complications. [9]

Relevance to the present study: This study supports the inclusion of immediate actions and self-management in the assessment, rather than measuring symptom recognition alone. The present study similarly assesses whether patients know what to do when hypoglycemia occurs. [9]

4.4 Summary of the Evidence Gap

The three studies show that hypoglycemia knowledge can vary between populations and that recognition of symptoms does not necessarily mean that patients know how to respond appropriately. The Sudanese study provides local evidence from Khartoum, while the studies from India and South Africa demonstrate the importance of considering demographic characteristics, treatment, and practical self-management. The proposed study extends this line of work to patients attending El-Gameeh Diabetes Hospital in Dongola. [7-9]

5. MATERIALS & METHODS

5.1 Study Design

A descriptive, hospital-based cross-sectional study will be conducted. Information will be collected from patients at one point in time. The design is appropriate for describing the current level of knowledge of hypoglycemia and examining associations between knowledge and selected demographic and clinical factors.

5.2 Study Area

The study will take place at El-Gameeh Diabetes Hospital in Dongola, the capital of Northern State, Sudan. The hospital provides diagnosis, treatment, and follow-up care for patients from Dongola and nearby areas.

5.3 Study Population

The study will include adults aged 18 years or older who have type 1 or type 2 diabetes and attend the hospital for treatment or follow-up during the study period.

Inclusion criteria: Adults aged 18 years or older; diagnosed with diabetes for at least six months; willing to give informed consent and take part.

Exclusion criteria: Patients who are critically ill or unable to communicate; patients with cognitive or psychiatric conditions that affect understanding; and patients who do not wish to participate.

5.4 Sample Size

The sample size will be calculated using the single population proportion formula: $\mathbf{n = Z^2P(1 - P) / d^2}$. The values will be Z = 1.96 for a 95% confidence level, P = 0.50, and d = 0.05. Convenience sampling will be used. Eligible patients who are available and willing to participate during the study period will be selected until the required sample size is reached.

Sampling:
Convenience Sampling.

5.5 Methods of Data Collection

Data will be collected using a structured questionnaire administered by an interviewer. It will ask about patients' social and clinical information, knowledge of symptoms, causes and risk factors, immediate actions, and sources of information.

The questionnaire will be prepared in English and translated into Arabic. It will then be translated back into English to check accuracy. Before the main study, it will be tested with a small group of patients (about 5% of the sample) at another health facility.

5.6 Study Variables

Dependent variable: Knowledge of hypoglycemia symptoms and immediate management, categorized according to the pre-specified scoring system.

Independent variables: Age, sex, educational level, duration of diabetes, type of diabetes, type of treatment, and source of information about diabetes or hypoglycemia.

5.7 Data Analysis

The researcher will check completed questionnaires each day. Data will be coded, entered, and analyzed using SPSS version 26 or later. Frequencies, percentages, means, and standard deviations will describe the participants and their knowledge scores.

Each correct answer will receive a score. The total score will be classified as good, fair, or poor knowledge using a cut-off point decided before analysis. The Chi-square test will be used to examine relationships between knowledge and social or clinical factors. A p-value below 0.05 will be considered statistically significant. Results will be shown in tables and figures.

5.8 Ethical Clearance

Ethical approval will be obtained from the relevant research ethics committee, and permission will be requested from the hospital before data collection. Each participant will be told about the study and asked for verbal informed consent.

Taking part will be voluntary. Participants may stop at any time without affecting their medical care. Names will not be written on the questionnaires, and the information will be kept confidential and used only for this research.

6. RESEARCH PLAN AND TIME-LINE

The study will take place from 20 September 2026 to 10 December 2026.

Activity	20–30 Sep	1–31 Oct	1–30 Nov	1–10 Dec
Proposal writing and literature review	■			
Ethical approval and permissions	■	■		
Questionnaire development and pre-test	■			
Data collection		■	■	
Data entry and cleaning			■	
Data analysis			■	■
Report writing				■
Submission and sharing results				■

7. BUDGET BREAKDOWN

The following costs are estimates in Sudanese pounds.

No.	Item	Estimated cost (SDG)
1	Printing questionnaires, consent forms, and stationery	150
2	Transportation	200
3	Data entry and statistical analysis	200
4	Report printing and binding	100
	Total	**650**

8. REFERENCES

1. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels: International Diabetes Federation; 2021.

2. American Diabetes Association. Glycemic targets: standards of medical care in diabetes-2023. Diabetes Care. 2023;46(Suppl 1):S97-S110.

3. Cryer PE. Hypoglycemia in type 1 diabetes mellitus. Endocrinol Metab Clin North Am. 2010;39(3):641-654.

4. Elhadd TA, Al-Amoudi AA, Alzahrani AS. Epidemiology, clinical and complications profile of diabetes in Saudi Arabia: a review. Ann Saudi Med. 2007;27(4):241-250.

5. Ahmed AM, Ahmed NH, Abdella N. Pattern of complications of diabetic patients attending a diabetic clinic in Khartoum, Sudan. Sudan Med J. 2001;39(1):5-8.

6. Alsairafi ZK, Taylor KM, Smith FJ, Alattar AT. Patients' management of type 2 diabetes in Middle Eastern countries: review of studies. Patient Prefer Adherence. 2016;10:1051-1062.

7. Madani AM, Mahmoud AN, Abdelrahim HM, El-Hadiyah TM, Yousif AK. Assessing Knowledge of Hypoglycemia Symptoms among Type 2 Diabetic Patients Using Insulin, Khartoum, Sudan. Pharmacology & Pharmacy. 2019;10:21-30. doi:10.4236/pp.2019.101003.

8. Mohan V, et al. Knowledge of hypoglycemia and its associated factors among type 2 diabetes mellitus patients in a Tertiary Care Hospital in South India. Indian J Endocrinol Metab. 2015;19(3):378-382.

9. Knowledge of symptoms and self-management of hypoglycaemia amongst patients attending a diabetic clinic at a regional hospital in KwaZulu-Natal. S Afr Med J. 2016.

10. World Health Organization. Global report on diabetes. Geneva: World Health Organization; 2016.

11. Fisher M. Hypoglycaemia: aetiology, pathogenesis, diagnosis and management. In: Grossman AB, editor. Endocrinology and Diabetes. London: Springer; 2015. p. 211-222.

12. Bahammam A, Alshaqha O, Algarni A, Alharbi A. Assessment of knowledge and practice of hypoglycemia among diabetic patients. Int J Med Sci Public Health. 2020;9(5):320-326.

9. ANNEXES

Annex 1: Proposed Questionnaire Domains

Section A: Socio-demographic characteristics: age, sex, education and related information.

Section B: Diabetes history and treatment: type of diabetes, duration of diabetes, treatment type and related clinical information.

Section C: Knowledge of hypoglycemia symptoms: recognition of early autonomic symptoms and later neuroglycopenic symptoms.

Section D: Causes and risk factors of hypoglycemia: medication-related factors, food intake, physical activity and other relevant circumstances.

Section E: Immediate actions and prevention measures: what the patient would do when symptoms occur and measures used to prevent recurrence.

Section F: Sources of information about diabetes and hypoglycemia: health professionals, educational materials, relatives, media and other sources.

Annex 2: Knowledge Scoring Approach

Each correct knowledge response will receive one point, while incorrect or unknown responses will receive zero points. The total score will be calculated for each participant. Knowledge categories (good, fair, or poor) will be defined using a cut-off point specified before analysis. The final questionnaire and scoring criteria will be finalized and pre-tested before the main data collection.

Annex 3: Participant Consent

Participants will receive an explanation of the study purpose, procedures, voluntary nature of participation, confidentiality of information, and their right to stop participation at any time without affecting their medical care. Consent will be obtained before the questionnaire is administered.