Etiological and Risk Factors for Hypoglycemia among Hospitalized Diabetic Patients

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Abstract: *To investigate the etiological and risk factors of hypoglycemia among diabetic patients. It has been observed that most of the time patients get hypoglycemia during hospital stay due to various physical and physiological factors. Aims: The aim of the study is to identify the clinical variables among the hypoglycemic diabetic patients and to assess the etiological and risk factors for the same. Settings and Design: The study was conducted at Dr L H Hiranandani Hospital tertiary care hospital, in Mumbai, India. A sample size of 100 was selected by non-probability convenience sampling technique. Methods and Material: A structured checklist was used for the study which focused on the duration of Diabetes Mellitus, glycemic control (HbA1c levels), kidney function (Creatinine levels), age & distribution, and factors contributing to hypoglycemia. Statistical analysis used: Data was collected and analysed by using Descriptive statistical method. Results: Key findings include inadequate food intake and late/missed meals were prominent contributors to hypoglycemia, affecting 87% and 50% of patients, respectively. Underlining the importance of patient and relatives education. Anticipation of hypoglycemia and sensitizing the nurse plays a vital role. These findings underscore the necessity for individualized treatment*

Keywords: Hypoglycemia, Etiological factors of Hypoglycemia, Risk factors of Hypoglycemia, Diabetes mellitus, glycemic control.

1. Introduction

Hypoglycemia is a common and potentially serious complication of Diabetes Mellitus (DM) treatment. It can lead to various adverse outcomes, including impaired cognitive function, increase incidences of cardiovascular events and diabetic coma. This leads to decreased quality of life.

The aim of the study is to examine the prevalence and associated factors of hypoglycemia in patients with DM. The main objective of the study is to determine various predisposing factors for hypoglycemia such as dietary factors, prolonged physical activity, sick day management and medication, etc.

As per American Diabetes Association (Guidelines 2023) hypoglycemia is defined as HGT (Hemo-glucose Test) Level 70 mg/dl or below. Using the threshold of glucose <70 mg/dl (3.9 mmol/l), the prevalence of inpatient hypoglycemia has been estimated to be 10.1% in the intensive care unit (ICU) and 3.5% in non-ICU settings. [10]

2. Literature Survey

The study led by Chic Pratiwi et al. explored inpatient hypoglycemia in an Indonesian hospital. They studied type 2 diabetes patients, finding 16.8% experienced hypoglycemia. Risk factors included prior hypoglycemia, insulin/sulfonylurea use, and poor nutrition. Those with hypoglycemia had longer hospital stays. [2]

The study by Vettath NM et al. investigated hypoglycemia awareness among Type 2 diabetes patients in Kerala, India. Among 100 participants, only 46% showed good knowledge due to their own experiences of hypoglycemia, information from doctors and duration of diabetes over 10 years. Deficiencies were found in understanding symptoms, triggers for hypoglycemia, prevention, and complications. The study suggests regular healthcare-driven education and innovative strategies like social media to improve hypoglycemia awareness post-pandemic is needed. [13]

The study led by Dr. Saumitra A. Singh and colleagues in Gujarat, India has found a significant link between hypoglycemia and disease duration, BMI, sedentary lifestyle, and insulin use. [4]

3. Methods/Approach

The research was conducted at a tertiary care hospital in India, focusing on hypoglycemic patients. The approach used was qualitative, employing an exploratory non-experimental design. The sample size was 100, selected through non-probability convenience sampling. Data was collected using a structured tool with various parameters. The study took place between January 2022 and May 2023. Data analysis involved descriptive statistics to summarize the findings. Overall, the research aimed to gain insights into hypoglycemia and its associated factors among hospitalized patients.

4. Results

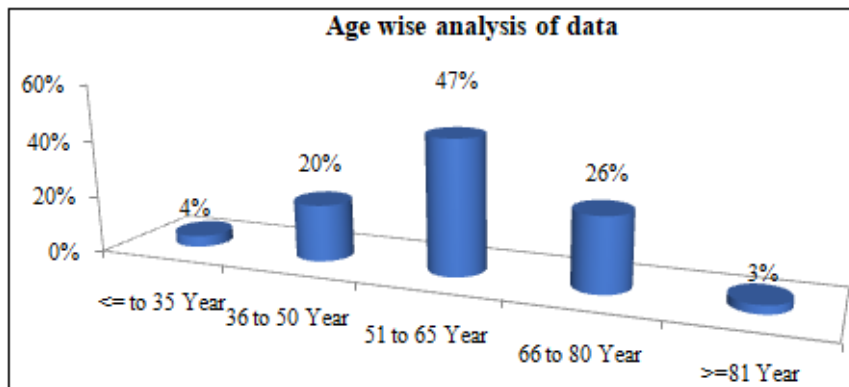## a) Section a: Distribution of Patient's data

Table 1: Distribution of patient's data as per following n = 100

Sr. No.	Patient's data		Patients (%)
1.	Gender	Male	55%
		Female	45%
2.	Duration of Diabetes	Less than 10 Years	46%
		11-19 Years	21%
		Above 20 Years	28%
		Current	4%
		non DM	1%
3.	Current HbA1c	Less Than 5.7	7%
		5.8 to 6.4	15%
		6.5 to 7.5	36%
		7.6 to 8.5	23%
		>=8.6	14%
		Not Available	5%
4.	Current Creatinine	>= 0.7	4%
		0.8 to 1.3	53%
		1.4 to 1.8	15%
		1.9 to 2.2	17%
		>= 2.3	11%

In this table, the data reveals that 55% of patients are male, while 45% are female. Understanding the gender distribution is crucial in analyzing potential gender-specific differences in diabetes management. For instance, 7% of patients have an HbA1c level of <= 5.7, while 36% of patients fall within the HbA1c range of 6.5 to 7.5. 33 % of patients were having Creatinine higher than 1.3 mg/dl which can be prevented by controlling the sugar level. The data sheds light on the prevalence of kidney dysfunction in the studied diabetic population.

b) Section- b: - Age wise Analysis of data, n = 100

Graph 1: Age wise analysis of data

In this table, we present the distribution of patients across different age categories. The percentage of patients and the count in each age group are provided. For instance, 73% of patients are aged between 51 to 80 years, while only 4% of patients are aged up to 35 years.

c) Section- c: - Analysis of data on basis of Factors Contributing to Hypoglycemia

Table 2: Factors Contributing to Hypoglycemia n = 100

S. No.	Factor	Yes (%)	No (%)
1	Admission due to Hypo.	13%	87%
2	SMBG at Home	64%	36%
3	**Aware about "sick day rule"**	10%	**90%**
4	**Inadequate Food**	**87%**	13%
5	**Late/Missed Meal**	**50%**	50%
6	Fasting	0%	100%
7	Mal-nourishment	0%	100%
8	Excess Insulin	1%	99%
9	Excess Medication	0%	100%
10	Prolonged Physical Activity	3%	97%
11	Unplanned Physical Activity	4%	96%
12	**Hypoglycemia Unawareness**	**63%**	37%

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The table provides information on various factors that contribute to hypoglycemia in hospitalized patients with diabetes. It presents the percentage of patients who experienced hypoglycemia due to specific factors. For instance, 87% of patients experienced hypoglycemia due to inadequate food intake. 90% of patients were not aware about "Sick Day Rule", 63% of patients were not aware of hypoglycemia. The data provides insights into the impact of specific factors on hypoglycemia occurrence.

5. Discussion

Current study focused on analyzing data related to the duration of Diabetes Mellitus (DM) and its association with various clinical parameters and risk factors for hypoglycemia in hospitalized patients. The analysis involved a sample of 100 patients from tertiary care hospital, providing valuable insights into the diabetes management and care of this vulnerable population.

Duration of Diabetes Mellitus: The data revealed that the average duration of Diabetes Mellitus among the studied patients was 12 years. The minimum duration observed was less than a year (newly diagnosed cases) while the maximum duration reached 40 years (indicating long-standing diabetes).

HbA1c Levels: Current HbA1c levels serve as a vital indicator of long-term glycemic control in diabetic patients. The distribution of patients based on their HbA1c levels indicated that 36% of patients fell within the target range of 6.5 to 7.5, while 23% had HbA1c levels between 7.6 to 8.5. However, it is noteworthy that 14% of patients had HbA1c levels above 8.6, indicating the need for improved Glycemic management in this subgroup.

Creatinine Levels: The analysis of current Creatinine levels, a marker for kidney function, showed that the majority of patients (53%) had levels between 0.8 to 1.3 and 33 % of patients were having Creatinine higher than 1.3 mg/dl which can be prevented by controlling the blood sugar level. The data sheds light on the prevalence of kidney dysfunction in the studied diabetic population.

Age Distribution and Gender: The age-wise report demonstrated that the highest percentage of patients (73%) fell within the age group of 51 to 80, indicating the presence of diabetes in middle-aged and older individuals. The gender distribution revealed that 55% of patients were male and 45% were female.

Factors Contributing to Hypoglycemia: Several factors contributing to hypoglycemia were assessed in the study. The data indicated that 87% of patients experienced hypoglycemia due to inadequate food intake, emphasizing the importance of proper nutrition in diabetes management. Additionally, 50% of patients reported hypoglycemia triggered by late/missed meals, necessitating consistent meal timing and adherence to diabetes management plans. The data revealed that 63% of patients were not aware of hypoglycemia, underscoring the significance of continuous glucose monitoring and patient education to prevent severe hypoglycemic events.

Hypoglycemia remains a significant clinical concern worldwide. This metabolic disorder can have severe consequences for various organ systems and poses substantial risks to individuals suffering from diabetes, endocrine disorders, and other related conditions. While hypoglycemia is often associated with diabetes management, it can also occur independently in non-diabetic individuals, making it a multifaceted and complex medical challenge.

Understanding the underlying etiological factors responsible for the development of hypoglycemia is of paramount importance for clinicians, researchers, and public health professionals. Although the condition has been extensively studied, there still exists a need for comprehensive investigations into the various causative factors, their interactions, and their impact on different patient populations.

6. Conclusion

This comprehensive analysis of the duration of Diabetes Mellitus and its association with various clinical parameters and risk factors for hypoglycemia in hospitalized patients provides valuable insights for optimizing diabetes management and improving patient care. The findings emphasize the need for individualized treatment plans and education to reduce the burden of hypoglycemia in this population.

7. Future Scope

With the help of this study data, other researchers can able to conduct this study on larger population and results can be utilize for the benefit of many diabetic patients.

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