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Original Research Article

An Observational Study of Common Causes of Hypoglycemia in Diabetic as well as in Non-Diabetic Patients in Western Rajasthan

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Abstract:

Background: Hypoglycemia is a common, potentially life-threatening emergency in both diabetic and non-diabetic individuals, associated with significant morbidity and mortality. While frequently related to anti-diabetic therapy, hypoglycemia in non-diabetic patients often arises from comorbid illnesses such as liver dysfunction, sepsis, or alcohol use. This study aimed to evaluate and compare the common causes and clinical correlates of hypoglycemia in diabetic and non-diabetic patients in Western Rajasthan.

Methods: An observational study was conducted at Mahatma Gandhi Hospital, Jodhpur, including 50 diabetic and 50 non-diabetic patients aged 18–90 years presenting with documented hypoglycemia (blood glucose <70 mg/dL). Demographic, clinical, and biochemical data were collected, and comorbidities were assessed. SPSS was used for the statistical analysis, and $p < 0.05$ was chosen as the significance level.

Results: Among non-diabetic patients, hypoglycemia was significantly associated with lower random blood sugar (48.96±10.8 mg/dL vs. 117.16±16.96 mg/dL), higher postprandial glucose, elevated AST, bilirubin, and raised beta-hydroxybutyrate levels, suggesting altered metabolism and ketogenesis. Chronic liver disease was a significant comorbidity linked to hypoglycemia. In diabetic patients, hypoglycemia correlated with low random blood sugar (46.40±11.42 mg/dL vs. 175.4±75.62 mg/dL), higher postprandial glucose, and elevated serum creatinine. Chronic kidney disease showed a significant association with hypoglycemia.

Conclusion: Hypoglycemia occurs with comparable frequency in diabetic and non-diabetic patients but arises from different underlying mechanisms. In non-diabetics, liver dysfunction and ketogenesis are key contributors, whereas in diabetics, impaired renal function plays a major role. Early recognition, targeted monitoring, and preventive strategies, including patient education and treatment adjustments, are essential to reduce complications.

Keywords: Hypoglycemia, Diabetes mellitus, non-diabetic hypoglycemia, Chronic liver disease, Chronic kidney disease, Western Rajasthan.

Introduction

Hypoglycemia is the acute complication of diabetes mellitus and the commonest diabetic emergency associated with considerable morbidity and mortality. Hypoglycemia is a life-threatening emergency. It can lead to various forms of cognitive dysfunction and death [1]. Hypoglycemia, defined as a blood glucose level below 70 mg/dL, is a critical condition that can affect both diabetic and non-diabetic individuals [2]. It is more commonly encountered in diabetic patients on treatment but also occurs in non-diabetic individuals due to a variety of causes such as liver disease, sepsis, alcohol intake, and critical illnesses. Depending on the blood glucose level, hypoglycemia symptoms might differ from person to person and even within the same individual depending on the situation [3]. It can range from severe hypoglycemia and neurological impairment (< 40 mg/dl) to extremely moderate hypoglycemia with few or no symptoms (60–70 mg/dl) [4]. Prompt recognition and treatment are crucial to prevent potential complications, including neurological damage and, in severe cases, death [2, 5]. This study was therefore undertaken to analyze the common causes of hypoglycemia in

diabetic and non-diabetic patients presenting to a tertiary care center in Western Rajasthan.

Material and Methods

This was an observational study done at department of Medicine, Mahatma Gandhi Hospital attached to Dr. S. N. Medical College, Jodhpur, Rajasthan, India.

Inclusion Criteria:

1. Individuals with age between 18 to 90 years of both sexes. 2.Diabetic and non-diabetic individuals presenting with symptom suggestive of hypoglycaemia and confirmed with blood glucose testing.
2. Patients with documented episodes of hypoglycaemia (blood glucose < 70 mg/dL).

Exclusion Criteria:

1. Patients with known psychiatric illnesses affecting behavior or dietary pattern.
2. Pregnant or lactating women.

Data Collection: Demographic details, clinical symptoms, comorbidities, and history of medication or alcohol use were recorded.

Biochemical investigations included: Random blood sugar (RBS), Serum creatinine, Liver function tests (AST, ALT, bilirubin) & Beta-hydroxybutyrate (BHB)levels.

Statistical analysis: Data were analyzed using SPSS software. Mean ± SD was calculated for continuous variables. Chi-square and t-tests were applied for categorical and continuous variables respectively. Level of statistical significance was set at p-value less than or equal to 0.05.

Results

Factors Associated with Hypoglycaemia in Non-Diabetic Patients: Among non-diabetic patients, several biochemical parameters showed statistically significant differences between those who experienced hypoglycaemia and those who did not. The random blood sugar (RBS) level was significantly lower in the hypoglycaemic group (48.96±10.8 mg/dL) compared to the non-hypoglycaemic group (117.16±16.96 mg/dL, $p < 0.001$). Similarly, fasting blood sugar (FBS) values were reduced in the hypoglycaemic group (105.88±29.58 mg/dL) relative to those without hypoglycaemia (88.80±8.25 mg/dL, $p = 0.008$), while postprandial blood sugar (PPBS) was markedly elevated among hypoglycaemic individuals (154.16±41.16 mg/dL) compared to the control group (128.40±14.81 mg/dL, $p = 0.005$). Direct bilirubin was significantly higher in patients with hypoglycaemia (0.51±.47 mg/dL) versus those without (0.27±0.18 mg/dL, $p = 0.023$). Likewise, AST levels were elevated in the hypoglycaemic group (71.88±13.96 U/L) compared to the non-hypoglycaemic group (31.96±17.52 U/L, $p = 0.009$). Notably, beta-hydroxybutyrate, a ketone body indicating altered metabolic state, was significantly raised in the hypoglycaemic patients (0.052±0.031 mmol/L) compared to those without hypoglycaemia (0.008±0.002 mmol/L, $p < 0.001$), suggesting a possible shift toward ketogenesis. (Table 01)

Table 1: Factors Associated with Hypoglycaemia in Non-Diabetic Patients

Variables	Hypoglycaemia		p-value
	Present	Absent	
Age	61.24 ± 16.17	55.24 ± 20.89	0.262
Male	14 (56)	12 (48)	0.571
Female	11 (44)	13 (52)	
RBS	48.96 ± 10.08	117.16 ± 16.96	<0.001
FBS	105.88 ± 29.58	88.80 ± 8.25	0.008
PPBS	154.16 ± 41.16	128.40 ± 14.81	0.005
Haemoglobin	10.98 ± 1.56	10.31 ± 2.21	0.221
TLC	13.66 ± 6.15	10.62 ± 5.41	0.071
Platelet	264.2 ± 69.4	260.36 ± 105.7	0.880
Total Bilirubin	0.97 ± 0.12	0.64 ± 0.35	0.124
Direct Bilirubin	0.51 ± 0.47	0.27 ± 0.18	0.023
AST	71.88 ± 13.96	31.96 ± 17.52	0.090
ALT	40.52 ± 13.7	28.40 ± 23.81	0.438
Urea	32.48 ± 17.0	41.0 ± 35.0	0.277
Creatinine	1.24 ± 0.90	1.33 ± 0.93	0.734
Beta Hydroxybutyrate	0.052 ± 0.031	0.008 ± 0.002	<0.001
HbA1c	5.78 ± 0.25	5.74 ± 0.21	0.213

Factors Associated with Hypoglycaemia in Diabetic Patients: Among diabetic patients, RBS, PPBS, and serum creatinine levels were significantly associated with hypoglycaemia. Patients with hypoglycaemia had a mean RBS of 46.40±11.42 mg/dL, significantly lower than those

without hypoglycaemia (175.4±75.62 mg/dL). Similarly, mean PPBS was lower in the hypoglycaemic group (235.44±32.40 mg/dL) compared to the non-hypoglycaemic group (209.64±43.80 mg/dL). Elevated serum creatinine was also observed in hypoglycaemic individuals (1.46±0.78 mg/dL) relative to those without hypoglycaemia (0.97±0.35 mg/dL). (Table 02)

Table 2: Factors Associated with Hypoglycaemia in Diabetic Patients

Variables	Hypoglycaemia		p-value
	Present	Absent	
Age	60.56±19.53	56.24±11.61	0.347
Gender **Male** **Female**	 9 (36) 16 (64)	 12 (48) 13 (52)	0.571
RBS	46.40±11.42	175.4±75.62	<0.001
FBS	141.24±31.80	134.96±31.31	0.485
PPBS	235.44±32.40	209.64±43.80	0.022
Haemoglobin	10.14±2.01	10.75±2.49	0.352
TLC	10.70±4.58	10.43±4.67	0.838
Platelet	298.7±99.78	271.7±105.0	0.357
Total Bilirubin	1.46±5.19	0.55±0.35	0.389
Direct Bilirubin	0.83±0.12	0.97±0.31	0.874
AST	46.48±8.34	34.60±6.09	0.475
ALT	38.76±6.68	32.16±9.23	0.591
Urea	50.40±36.23	29.36±19.73	0.015
Creatinine	1.46±0.78	0.97±0.35	0.007
Beta Hydroxybutyrate	0.072±0.06	0.112±0.045	0.667
HbA1c	7.71±1.59	8.39±2.02	0.196

Co-Morbidities Associated with Hypoglycaemia Among Non-Diabetic patients: Among the various co-morbidities evaluated in non-diabetic patients, chronic liver disease showed a statistically significant association with hypoglycaemia ($p = 0.037$). All four patients (100%) with chronic liver disease experienced hypoglycaemia, in contrast to only 21 out of 46 patients (45.7%) without liver disease. (Table 03)

Table 3: Co-Morbidities Associated with Hypoglycaemia Among Non-Diabetic patients

Variables	Hypoglycaemia		p-value
	Absent	Present	
Chronic Kidney Disease (49:1)	24 (96)	1 (100)	0.312
Acute Kidney Injury (40:10)	20 (50)	5 (50)	1.000
Chronic Liver Disease (46:4)	21 (45.7)	4 (100)	0.037
CVA (45:5)	21 (46.7)	4 (80)	0.157
COPD (49:1)	24 (49)	1 (100)	0.312
IHD (47:3)	23 (48.9)	2 (66.7)	0.552
HTN (40:10)	22 (55)	3 (30)	0.157

Co-Morbidities Associated with Hypoglycaemia Among Diabetic patients: Among the diabetic individuals only chronic kidney disease (CKD) shows statistically significant association with hypoglycaemia. CKD was present in 4 patients (100%) with hypoglycaemia compared to 21 patients (84%) in the non-hypoglycaemic group. Other co-morbidities, including acute kidney injury, chronic liver disease, cerebrovascular accidents (CVA), COPD, ischemic heart disease (IHD), and hypertension (HTN), not demonstrate any significant associations with hypoglycaemia ($p > 0.05$). (Table 04)

Table 4: Co-Morbidities Associated with Hypoglycaemia Among Diabetic patients

Variables	Hypoglycaemia		p-value
	Absent	Present	
Chronic Kidney Disease (46:4)	21 (84)	4 (100)	0.037
Acute Kidney Injury (49:1)	24 (49)	1 (100)	0.312
Chronic Liver Disease (46:4)	25 (50)	0 (0)	0.126
CVA (48:2)	56 (92)	2 (100)	0.149
COPD (49:1)	24 (49)	1 (100)	0.312
IHD (40:10)	20 (50)	5 (50)	1.000
HTN (25:25)	10 (40)	15 (60)	0.157

Discussion

Hypoglycemia is a critical condition that can affect both diabetic and non-diabetic individuals and the commonest diabetic emergency which is associated with considerable morbidity and mortality. The present study of 50 diabetic patients and 50 non-diabetic patients with symptoms of hypoglycemia were analyzed with special emphasis to find out common causes of hypoglycemia. Study was done in patients with age group between 18 to 90 years among which majority of patients were of age group between 51-60 (24%). Among male & female relatively balanced distribution with Male female ratio 1.12. Most of patients of hypoglycemia present with complaint of altered sensorium (31%) followed by dizziness (21%), confusion (15%), and sweating (11%). Altered sensorium was present in all hypoglycaemic cases 15/15 (100%) and only 10/35 (28.6%) of the non-hypoglycaemic patients, indicating a highly significant association ($p < 0.001$).

Sweating was significantly more frequent among those with hypoglycaemia (7/7; 100%) versus 18/43 (41.9%) in the control group ($p = 0.004$). Physical activity revealed a moderate activity level in the majority (63 participants, 63%), followed by a sedentary lifestyle in 32 individuals (32%).

In non-diabetic patients, random blood sugar (RBS) level was significantly lower in the hypoglycaemic group (48.96±10.8 mg/dL) compared to the non-hypoglycaemic group (117.16±16.96 mg/dL, $p < 0.001$). In non-diabetic patients, fasting blood sugar (FBS) values were reduced in the hypoglycaemic group (105.88±29.58 mg/dL) relative to those without hypoglycaemia (88.80±8.25 mg/dL, $p = 0.008$), while postprandial blood sugar (PPBS) was markedly elevated among hypoglycaemic individuals (154.16±41.16 mg/dL) compared to the control group (128.40±14.81 mg/dL, $p = 0.005$).

Ketone body indicating altered metabolic state, was significantly raised in the hypoglycaemic patients (0.052±0.031 mmol/L) compared to those without hypoglycaemia (0.008±0.002 mmol/L, $p < 0.001$), suggesting a possible shift toward ketogenesis.

Among the various co-morbidities evaluated in non-diabetic patients, chronic liver disease (4/4,100%), showed a statistically significant association with hypoglycaemia ($p = 0.037$). In diabetic patients, random blood sugar (RBS), postprandial blood sugar (PPBS), and serum creatinine levels were significantly associated with hypoglycaemia. Patients with hypoglycaemia had a mean RBS of 46.40±11.42 mg/dL, significantly lower than those without hypoglycaemia (175.4±75.62 mg/dL, $p < 0.001$). Similarly, mean PPBS was lower in the hypoglycaemic group (235.44±32.40 mg/dL) compared to the non-hypoglycaemic group (209.64±43.80 mg/dL, $p = 0.022$). Elevated serum creatinine was also observed in hypoglycaemic individuals (1.46±0.78 mg/dL) relative to those without hypoglycaemia (0.97±0.35 mg/dL, $p = 0.007$).In diabetic patients, chronic kidney disease (CKD) showed a statistically significant association with hypoglycaemia. CKD was present in 4 patients (100%) with hypoglycaemia compared to 21 patients (84%) in the non-hypoglycaemic group ($p = 0.037$).

There was no statistically significant association between the number of anti-diabetic medications and the occurrence of hypoglycaemia in diabetic patients ($p = 0.158$).

Summary and Conclusion

Patients with diabetes and non-diabetes require emergency intervention for hypoglycemia were approximately equally. Our study is to investigate, the main characteristics of patients with diabetes and non-diabetes who develop hypoglycemia in the community requiring emergency services intervention to prevent significant complication in diabetes, hypoglycemia is a barrier to glycemic management and is linked to higher morbidity. Preventing hypoglycemia requires a lot of work, which includes patient education, adequate diet and activity plans, treatment regimen modifications, and the use of glucose monitoring devices as necessary.

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