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Study of Relation of Blood Sugar Level with Outcome in Acute Myocardial Infarction (Stemi and Nstemi) in Non-Diabetic Patients

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Abstract **Original Research Article**

In recent years, much attention has been given to the evidence that the concomitant occurrence of hyperglycaemia in patients admitted to intensive care units with an acute myocardial infarction (MI) enhances the risk of mortality and morbidity, whether the patient as DM or not. In some cases, the elevation of sugar could simply be a marker of pre-existing, but not yet detected type 2 diabetes or impaired sugar tolerance (IGT). This may mean that besides being causal, elevated sugar also could be a marker of existing insulin resistance and/or beta-cell failure that may contribute to the poor prognosis through other mechanisms. However, a positive association between hyperglycaemia at the time of the event and subsequent mortality from MI has frequently been reported. Consequently, understanding the possible mechanisms through which hyperglycemia worsens the prognosis of a MI and the effectiveness of its control during acute coronary syndrome seems to be of great relevance. ***AIM:*** To assess the relation of increased blood sugar level with outcome in patients of acute coronary syndrome (ST Elevation Myocardial Infarction and Non ST Elevation Myocardial Infarction) in non-diabetic subjects. ***Material and methods*:** The present study type was a prospective observational type of study conducted to study the relation of increased blood sugar level with outcome in patients of acute coronary syndrome (ST Elevation Myocardial Infarction and Non ST Elevation Myocardial Infarction) in non-diabetic subjects among 81 cases in Krishna Hospital and Medical Research Centre, Department of Medicine, KIMS over a period of 18 months (October 2019 to March 2021). ***Results*:** A total of 81 patients with a diagnosis of ACS without diabetes mellitus were included in the present prospective observational descriptive study. Out of the 54.32% who had aged more than 60 years, 33.33% had between 46 to 60 years and 12.35% had between 30 to 45 years. ***Conclusion*:** Our study was a prospective study conducted to study the relation of blood sugar level with outcome in acute coronary syndrome (ST Elevation Myocardial Infarction and Non ST Elevation Myocardial Infarction) in non-diabetic patients. The study was done in 81 patients who included both non-diabetics and prediabetic patients. Of the total patients 37 were pre-diabetic and 44 were non diabetic. The majority 56.8% had adverse outcomes and 43.2% had a better outcome on discharge. The study concluded that no significant association was found between age and outcome of disease (p=0.97). But it was seen that majority of Adverse outcomes were seen in the older age group (>60 years). There were no age preponderance with adverse cardiac events but sex preponderance with adverse cardiac events was seen. Males had more adverse outcomes as compared to females and high statistical significance was seen between gender and outcome of disease (p<0.0001).

Keywords: ST Elevation Myocardial Infarction, Non ST Elevation Myocardial Infarction, non-diabetics, outcome.

INTRODUCTION

The reported prevalence of hyperglycaemia among those with acute coronary syndrome (ACS) varies widely [1, 2]. An early series reported 20% of patients with acute myocardial infarction (AMI) presenting with plasma glucose>200mg/dl [3, 4] Hyperglycaemia remains common even after excluding diabetic individuals [5].

Acute hyperglycemia on admission is common among patients with ST-elevation myocardial infarction (ST Elevation Myocardial Infarction) and is one of the important predictors of in-hospital and long-term Died [6]. Whether long-term glucose dysregulation (assessed by HbA1c) is more important than acute hyperglycaemia is unknown [7].

In nondiabetic patients with ST-segment-elevation myocardial infarction, acute hyperglycemia is

associated with adverse outcomes. Whether this association is due merely to hyperglycemia as an acute stress response or whether longer-term glycometabolic derangements are also involved is uncertain [8].

Unlike acute hyperglycaemia, an elevated HbA1c level was not a risk factor for short-term outcomes in ST-segment elevation myocardial infarction patients without diabetes. Patients with acute hyperglycaemia and non-elevated HbA1c were associated with the worst prognosis. That suggests chronic glycaemic control/HbA1c level may help to recognize stress-induced hyperglycaemia and identify high-risk patients [9].

The present study was conducted with an aim to assess the relation of increased blood sugar level with outcome in patients of acute myocardial infarction (ST Elevation Myocardial Infarction and Non ST Elevation Myocardial Infarction) in non-diabetic subjects.

AIM

To assess the relation of increased blood sugar level with outcome in patients of acute coronary syndrome (ST Elevation Myocardial Infarction and Non ST Elevation Myocardial Infarction) in non-diabetic subjects.

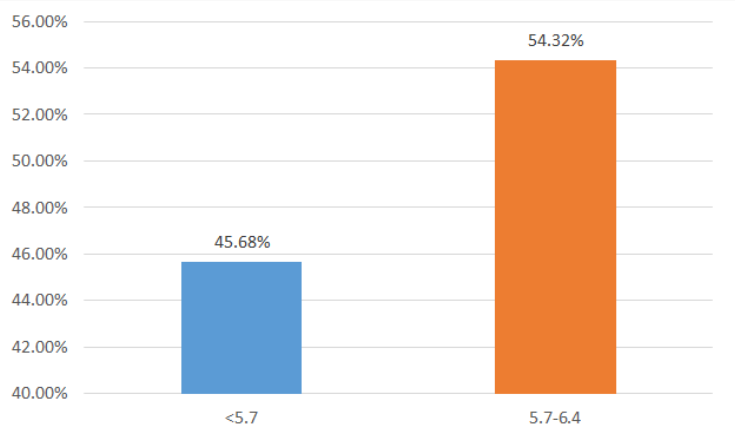
MATERIAL AND METHODS

The present study type was a prospective observational type of study conducted to study the relation of increased blood sugar level with outcome in patients of acute coronary syndrome (ST Elevation Myocardial Infarction and Non ST Elevation Myocardial Infarction) in non-diabetic subjects among 81 cases in Krishna Hospital and Medical Research Centre, Department of Medicine, KIMS over a period of 18 months (October 2019 to March 2021). Inclusion criteria: All non-diabetic patients aged more than 18 years, who were admitted with the acute coronary syndrome (ST Elevation Myocardial Infarction and Non ST Elevation Myocardial Infarction). Participants were told about the study and written informed consent was taken. Study participants admitted to ICU under Medicine department and showing the inclusion criteria were studied. Patients diagnosed with the acute coronary syndrome (ST Elevation Myocardial Infarction and Non ST Elevation Myocardial Infarction) by ECG and cardiac enzyme (CPK-MB, Troponin I) were investigated by random blood sugar level. Patients with e coronary syndrome with elevated random blood sugar levels were included in the study (previously non diabetic). These acute coronary syndrome patients underwent HBA1C to exclude newly detected diabetes mellitus. During the hospital stay 2D-echocardiography was performed and left ventricular function parameters were compared with random blood sugar levels. The outcome was compared with the acute coronary syndrome with elevated blood sugar levels and other parameters.

RESULTS

A total of 81 patients with a diagnosis of ACS without diabetes mellitus were included in the present prospective observational descriptive study. Out of the 54.32% who had aged more than 60 years, 33.33% had between 46 to 60 years and 12.35% had between 30 to 45 years. Majority (60.49%) 49 were males.

Mean HbA1c was 5.57 +0.51. Ranging from 4.2 to 6.4. The majority 54.32% had HbA1c between 5.7-6.4 and 45.68% had <5.7.

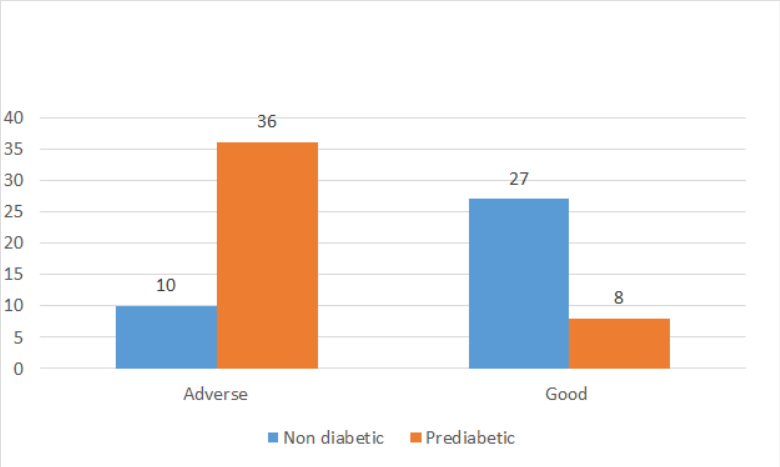


Grpah-1: HbA1C

The majority 56.8% had adverse outcomes and 43.2% had a good outcome.

Table-1: Outcome of the disease

Outcome	Number of subjects (n=81)	Percent
Adverse	46	56.8
Good	35	43.2
Total	81	100



Graph-2: Association between non diabetic and prediabetic and outcome of disease

Out of 46 patients with adverse outcomes (EF<40%) 36 were prediabetics and 10 were non-diabetics whereas out of 35 patients with good outcomes (EF>40) 27 were non-diabetics and 8 were prediabetics (5.7-6.4). X^2=24.59, df=1, 'p'<0.0001, significant.

Table-2: Association between duration of stay and outcome of disease

Duration of stay	Adverse (EF<40%)	Good (EF>40%)	Total
>1 week	34(73.91%)	32(91.42%)	66
<1 week	12(26.09%)	3(8.58%)	15
Total	46(100%)	35(100%)	81

Among 46 patients with adverse events, duration of stay >1week, 12 had < 1week. Among 35 patients having good events 32 had duration of stay >1week and 3 had < 1week. Applying chi-square test p value=0.02, as p-value is <0.05, shows statistical significance.

DISCUSSION

A total of 81 patients with a diagnosis of ACS without diabetes mellitus were included in the present prospective observational descriptive study. Out of the 54.32% who had aged more than 60 years, 33.33% had between 46 to 60 years and 12.35% had between 30 to 45 years. Majority (60.49%) 49 were males. Ullah M *et al.* [5] showed that mean age 72+5.2 years and majority were males (57.7%) similar findings were seen in the present study. A study by Novakovic *et al*. [10] showed a mean age of 62.8±13.8 years and 77.5% were males. A study by Sameh Samir *et al*. [11] showed that the Mean age was 55.9 ± 7.12 years.

In present study mean HbA1c was 5.57 +0.51. Ranging from 4.2 to 6.4. The majority 54.32% had HbA1c between 5.7-6.4 and 45.68% had <5.7. A study by Rasoul S *et al*. [7] showed that patients with hyperglycaemia on admission were comparable with those with normoglycaemia. However, patients with HbA1c >or=6.0%, as compared with those with HbA1c <6%, were older.

The majority 56.8% had adverse outcomes and 43.2% had a good outcome. Ullah M *et al*. [5] showed that 18% had died.

Out of 46 patients with adverse outcomes (EF<40%) 36 were prediabetics and 10 were non-diabetics whereas out of 35 patients with good outcomes (EF>40) 27 were non-diabetics and 8 were prediabetics (5.7-6.4). X^2=24.59, df=1, 'p'<0.0001, significant. Among 46 patients with adverse events, duration of stay >1week, 12 had < 1week. Among 35 patients having good events 32 had duration of stay >1week and 3 had < 1week. Ullah M *et al.* [5] conducted a study and found that the frequency of individual complications had no significant relation with the blood sugar level. n the study by Mak *et al*.,

[12] it has been shown that subjects without DM having elevated admission blood glucose value after the first AMI suffered poor immediate outcomes. Among 37 non-diabetic cases 30 had duration of stay &> 1week and 7 had &<1 week and among 44 prediabetic cases 36 had duration of stay &>1 week, 8 had &<1 week. No statistical significance was seen between duration of stay and non-Diabetic and prediabetic.

Author	Sample size	Observation	Interpretation
Ullah M *et al.* [5]	50	On admission blood sugar level was also significantly higher in patients with Non ST Elevation Myocardial Infarction with complications (10.6 vs 8.6 mg/dl).	Higher level of admission blood glucose is related to poor in hospital outcomes in both ST Elevation Myocardial Infarction & Non ST Elevation Myocardial Infarction even in nondiabetic patients. It may be used as a predictor of poor outcomes of patients with myocardial infarction.
Ekmekci A *et al.* [6]	100	Long term mortality and in-hospital major adverse cardiac events were higher in the high admission blood glucose group (P < 0.001).	Admission hyperglycemia in elderly patients presenting with ST elevation myocardial infarction is an independent predictor of in-hospital major adverse cardiac events and is associated with in-hospital and long term mortality.
Rasoul S *et al.* [7]	100	Thirty-day mortality in the subsequent glucose categories (<11.1 mg/dl and >or=11.1 mg/dl) was 4% and 19% (p<0.001) and in the subsequent HbA1c categories (<6% and >or=6%) was 5% and 12% (p=0.03).	Among 30-day survivors, neither admission blood glucose nor HbA1c was a predictor of long-term outcome.
Timmer JR *et al.* [8]		One-year mortality was 4.7%, and mortality after total follow-up (3.3 ± 1.5 years) was 10%. Both elevated HbA(1c) levels (P<0.001) and elevated admission glucose (P<0.001) were associated with 1-year and long-term mortality.	Both of these parameters reflect different patient populations, and their association with the outcome is probably due to different mechanisms. Measurement of both parameters enables the identification of these high-risk groups for aggressive secondary risk prevention.
Liu Y *et al.* [9]	4793	A total of 373 deaths (7.8%) occurred at 7 days, and 486 deaths (10.1%) occurred at 30 days.	Patients with acute hyperglycaemia and non-elevated HbA(1c) were associated with the worst prognosis. That suggests chronic glycaemic control/HbA(1c) level may help to recognize stress-induced hyperglycaemia and identify high-risk patients.
Novakovic A *et al.* [10]	80	As risk factors we set hypertension and current smoking. There were no statistically significant associations between active smoking and hypertension as a risk factor for the occurrence of stress diabetes.	As risk factors we set hypertension and current smoking. There were no statistically significant associations between active smoking and hypertension as a risk factor for the occurrence of stress diabetes.

CONCLUSION

Our study was a prospective study conducted to study the relation of blood sugar level with outcome in acute coronary syndrome (ST Elevation Myocardial Infarction and Non ST Elevation Myocardial Infarction) in non-diabetic patients. The study was done in 81 patients who included both non-diabetics and prediabetic patients. Of the total patients 37 were pre-diabetic and 44 were non diabetic. The majority 56.8% had adverse outcomes and 43.2% had a better outcome on discharge. The study concluded that no significant association was found between age and outcome of disease (p=0.97). But it was seen that majority of Adverse outcomes were seen in the older age group (>60 years). There were no age preponderance with adverse cardiac events but sex preponderance with adverse cardiac events was seen. Males had more adverse outcomes as compared to females and high statistical significance was seen between gender and

outcome of disease (p<0.0001). The majority of Adverse outcomes were seen among prediabetic as compared to non-diabetic patients and high statistical significance was seen between prediabetic and outcome of disease (p<0.001). The majority of Adverse outcomes were seen among patients having HbA1C between 5.7 – 6.4 as compared to patients having Hb1AC <5.7 and high statistical significance was seen between prediabetic and outcome of disease (p<0.001) Even duration of stay and outcome of disease showed statistical significance. (p=0.02). Patients with acute hyperglycaemia and non-elevated HbA(1c) (prediabetic) were associated with the worst prognosis. That suggests chronic glycaemic control/HbA (1c) level may help to recognize stress-induced hyperglycaemia and identify high-risk patients. It remains clear and undisputed that there is an association between hyperglycaemia and increased mortality following acute myocardial infarction. However, the optimal admission glucose cut-off values for predicting prognosis differ for patient's non diabetic and prediabetic.

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