IMPACT OF DIABETES ON LABORATORY MARKERS IN NON-ST ELEVATED ACUTE CORONARY SYNDROME PATIENTS- A CROSS-SECTIONAL STUDY.

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Abstract:

Background:

The diabetic population is known to be at a significantly increased risk of developing cardiovascular complications, particularly in the context of acute coronary syndromes. The present study sought to examine the impact of diabetes on the primary biochemical and haematological indicators in individuals diagnosed with non-ST elevation acute coronary syndromes (NSTE-ACS).

Methods:

A multicenter cross-sectional study collected data from NSTEACS patients who were admitted and diagnosed using a printed form to record age, comorbidities, and investigation results. The patients were divided into diabetics and non-diabetics.

Results:

Ninety-nine patients were enrolled, 39.4% were diabetic, mean age of diabetics was (60.7 ± 11.0) years vs (58.3 ± 13.4) years in non-diabetics; diabetic patients were more to be female 22.9% vs 22.3%, more to have IHD history 59.13% vs 34.8%, more be hypertensive 68.8% vs 54.08%, less to be smokers 32.7% vs 37.7% and hyperlipidaemic 29.2% vs 32.7% when compared to non-diabetic counterparts, however, the differences in baseline characteristics between the two groups did not reach statistical significance apart from the more reported history of IHD in diabetics; p=0.019.

Conclusion:

In the context of non-ST segment elevation acute coronary syndrome (NSTE-ACS), it is noteworthy that diabetes mellitus does not exhibit any significant influence on biochemical and haematological markers, except for elevated blood glucose and serum potassium levels, when compared to individuals without diabetes.

Recommendation:

Further investigations are warranted to substantiate these findings and evaluate the prognostic implications of laboratory indicators in individuals with diabetes experiencing acute coronary syndromes, particularly in resource-limited regions where the utilisation of more advanced markers may not be feasible.

Keywords: Diabetes On Laboratory Markers, In Non-St Elevated Acute Coronary Syndrome, Patients, Submitted: 2023-08-29, Accepted: 2023-09-08

1. Introduction:

Approximately 30% of individuals who present with acute coronary syndrome (ACS) exhibit comorbidity with diabetes mellitus [1, 2]. These individuals exhibit poorer vascular outcomes despite the implementation of modern therapeutic approaches [1, 3]. A state of increased propensity for thrombosis, characterised by unfavourable fibrin clot characteristics and heightened platelet reactivity, has been consistently observed in individuals diagnosed with diabetes. In spite of the modified thrombotic environment in this pathological state, the long-term prophylactic anti-thrombotic therapy following acute coronary syndrome (ACS) remains comparable to that of individuals without diabetes [4]. Providing more comprehensive therapeutic interventions may be a potential strategy to enhance outcomes, although this can pose difficulties in the context of diabetes due to the diverse nature of this ailment, which is distinguished by varying propensities for thrombosis and bleeding [5].

The worldwide incidence of diabetes among individuals aged 25 years and older is estimated to be 10%. Based on data provided by the International Diabetes Foundation, it is estimated that approximately 425 million individuals were affected by diabetes in the year 2017. Furthermore, if this prevailing pattern persists, it is projected that the number of adult individuals diagnosed with diabetes will escalate to approximately 642 million by the year 2040 [4]. It is anticipated that over 50% of individuals will experience mortality due to cardiovascular disease (CVD). Certainly, it is noteworthy that individuals diagnosed with either type 1 or type 2 diabetes exhibit a significantly higher prevalence of cardiovascular events, with a two to fourfold increase compared to those without diabetes [5]. It is worth mentioning that there is a progressive rise in the likelihood of developing type 2 diabetes, coronary heart disease, and/or ischemic stroke as the body mass index (BMI) increases [6–10].

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Multiple previous studies have established a strong correlation between acute coronary syndrome (ACS) and diabetes mellitus (DM), as evidenced by the findings from the Drug Eluting Stents Evaluation: a randomised trial (DESERT) and the Drug Eluting Stenting for Patients with Diabetes Mellitus Trial [9, 10]. These studies demonstrate that in individuals diagnosed with acute coronary syndrome (ACS), diabetes mellitus (DM) is correlated with a higher incidence of stent thrombosis, target lesion revascularization, re-infarction, and major adverse cardiac events. However, there is limited knowledge regarding the impact of diabetes mellitus (DM) on the clinical outcomes of patients with acute coronary syndrome (ACS) in the Indian population.

Despite numerous previous studies that have primarily focused on the characteristics and outcomes of patients with diabetes who have acute coronary syndrome (ACS) [5-8], there is a scarcity of literature that specifically addresses the influence of diabetes on laboratory investigations in this particular population, as well as the prognostic importance of these markers in this population. The objective of this study was to investigate the potential impact of diabetes on the biochemical and haematological markers in individuals diagnosed with non-ST elevation acute coronary syndromes (NSTEACS).

2. Methods:

Study Design and Setting: A multi-centre cross-sectional study was conducted on patients who were diagnosed with and admitted for non-ST segment elevation acute coronary syndrome (NSTE-ACS) at a tertiary care centre over a one-year period. The study population was stratified into individuals with diabetes and those without diabetes. Fundamental criteria and experimental indicators: Data were gathered from individuals through the utilisation of a meticulously designed printed questionnaire that documented pertinent information such as the patients' age, presence of any concurrent medical conditions, and the outcomes of various diagnostic tests.

2.1. ***Statistical Analysis:***

The data underwent coding and were subsequently entered into a computer system utilising SPSS version 24. The numerical variables were presented as the mean ± standard deviation, while the categorical variables were expressed as percentages. The numerical variables were subjected to statistical analysis using the t-test, while the categorical variables underwent comparison using the Chi-Square test.

3. Results:

A total of 99 participants were included in the research study. At the initial stage a number of 200 patients were examined for eligibility, however 101 patients were excluded from this study due to not being eligible. Among them, 39.4% were diagnosed with diabetes. The average age of diabetic patients was (60.7 ± 11.0) years, while non-diabetic patients had an average age of (58.3 ± 13.4) years. Female patients accounted for 22.9% of the diabetic group, compared to 22.3% in the non-diabetic group. Additionally, 59.13% of diabetic patients had a history of ischemic heart disease (IHD), whereas only 34.8% of non-diabetic patients had such a history. Furthermore, 68.8% of diabetic patients were hypertensive, while 54.08% of non-diabetic patients had hypertension. Diabetic patients were less likely to be smokers, with a prevalence of 32.7% compared to 37.7% in non-diabetic patients. Similarly, diabetic patients had a lower prevalence of hyperlipidemia (29.2% vs 32.7%) compared to their non-diabetic counterparts. However, apart from the higher reported history of IHD in diabetic patients, the differences in baseline characteristics between the two groups were not statistically significant.

Diabetic patients tend to be presented more with dyspnoea compared to non-diabetics 40.9% vs 27.3%. Positive troponin was more to be positive in diabetics (49.3% vs 39.2%), diabetic patients tend to have higher urea (45.8 ± 18.8 vs 40.4 ± 24.4) and higher creatinine (2.03 ± 0.43 vs 1.05 ± 0.43), random blood sugar (267.7 ± 114.9 vs 126.0 ± 49.8) and serum potassium (4.5 ± 1.47 vs 3.98 ± 0.58) were significantly higher in diabetic patients (Table 1).

4. Discussion:

The findings of this study revealed that diabetic patients exhibit elevated levels of potassium, as well as higher random blood sugar (RBS) levels. However, no statistically significant differences were observed between the two groups in terms of other biochemical and haematological markers. The findings of this study indicate that individuals diagnosed with diabetes exhibited advanced age and a higher proportion of female participants compared to those without diabetes. Additionally, a greater prevalence of ischaemic heart disease (IHD) was observed among diabetic individuals. These findings align with previous research [9, 10], which suggests that diabetes is linked to significant proinflammatory and prothrombotic conditions, ultimately resulting in an increased risk of IHD [9, 11-13].

There were no statistically significant disparities noted in the prevalence of additional cardiovascular risk factors, such as hypertension, smoking, and hyperlipidemia, within the diabetic cohort. This observation aligns with previous investigations [14], although conflicting findings have been reported by other researchers [8].

The existing literature provides limited information regarding the influence of diabetes on laboratory parameters in the context of non-ST segment elevation acute coronary syndrome (NSTE-ACS). Therefore, this study aims to examine the potential impact of diabetes on laboratory markers in patients with NSTE-ACS.

In this study, it was observed that individuals with diabetes mellitus exhibited a higher prevalence of dyspnea. This finding is consistent with previous research conducted by other scholars. The increased occurrence of atypical presentation, which is more frequently reported in the diabetic population, may account for this observation. Additionally, the incidence of heart failure in individuals with diabetes experiencing acute coronary syndrome is higher compared to those without diabetes, which could also contribute to the higher

Table 1: **Laboratory Markers**

Laboratory Marker	**Diabetics**	**Non-diabetics**
	Mean ± SD	
WBC Count	(8.9 ± 4.2) $\times 10^3$ mcL	(10.0 ± 3.0) $\times 10^3$ mcL
Haemoglobin	12.8 ± 1.8	14.4 ± 1.9
Urea	45.8 ± 18.8	40.2 ± 24.4
Sodium	136.0 ± 5.0	136.8 ± 3.7
Potassium	3.6 ± 1.1	4.0 ± 1.5
RBS	269.7 ± 114	126.0 ± 49.8
Creatinine	0.93 ± 0.36	0.85 ± 0.36
Ejection fraction	50.1 ± 11.8	53.6 ± 12.4
Platelet Count	(222.4 ± 63.6) $\times 10^3$ mcL	(225.3 ± 68.4) $\times 10^3$ mcL

prevalence of dyspnea in this patient group [15-17]. It is important to highlight that the atypical manifestation of acute coronary syndrome (ACS) in individuals with diabetes mellitus may arise from autonomic neuropathy and a modified pain sensitivity threshold [17-19].

The present study observed elevated renal indices in individuals with diabetes, although statistical significance was not achieved. These findings align with previous research, indicating poorer outcomes in patients with diabetes and those with impaired renal function [12, 20]. Moreover, it has been reported that diabetes, even in the absence of renal impairment, is a prognostic factor for increased mortality in ST-elevation myocardial infarction (STEMI), but not in non-ST-elevation acute coronary syndrome (NSTE-ACS). Additionally, renal failure, regardless of the presence of diabetes, is a stronger predictor of mortality in all types of acute coronary syndrome (ACS) compared to diabetes alone [20].

The research findings have demonstrated a significantly elevated concentration of potassium in the group of individuals with diabetes who experienced acute coronary syndrome (ACS). This increase in serum potassium levels can be attributed to the leakage of intracellular components, including potassium, from damaged cardiomyocytes caused by ischemia. Interestingly, another study has revealed a notable decrease in potassium levels during ACS, particularly in individuals with diabetes. This decrease has been associated with worse cardiovascular outcomes and has shown a strong correlation with glucose levels. Furthermore, this study found no correlation between changes in potassium levels and creatinine kinase (CK) levels during ACS, suggesting that alterations in potassium levels primarily reflect the severity of ischemic stress rather than the extent of cellular injury. Conversely, other studies have indicated that potassium levels in ACS tend to be higher in individuals with diabetes who do not exhibit the early decrease observed in those without diabetes. This phenomenon may be attributed to the common occurrence of sympathetic nerve dysfunction in individuals with diabetes.

The haematological parameters exhibited no significant differences between the two study groups. However, previous research has indicated lower levels of haemoglobin in individuals with diabetes and acute coronary syndrome (ACS). This observation can be attributed to subclinical renal impairment, which impacts the erythropoietin-mediated hematopoietic response [4, 12, 16]. It is worth noting that there have been reports indicating that the simultaneous presence of diabetes and anaemia in acute coronary syndrome (ACS) patients is associated with a higher mortality rate compared to the presence of either predictor alone [17]. Although there were no significant variations in white blood cell (WBC) counts among the study cohorts, it is noteworthy to highlight the pivotal role of WBCs in the progression and vulnerability of atherosclerotic plaque. WBCs have

been implicated in the initiation of microvascular formation within the tunica intima, leading to the development of plaques that are prone to rupture. Additionally, the WBC count serves as a valuable prognostic marker for adverse cardiovascular outcomes [8].

5. Conclusion:

In the context of non-ST-segment elevation acute coronary syndrome (NSTE-ACS), it is noteworthy that diabetes mellitus does not exhibit any significant influence on biochemical and haematological markers, except for elevated levels of blood glucose and serum potassium. This observation holds true when comparing individuals with diabetes to those without diabetes.

6. Limitations:

The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

7. Recommendation:

Further research is warranted to substantiate these findings and evaluate the prognostic implications of laboratory markers in individuals with diabetes who have acute coronary syndromes, particularly in low-resource settings where the use of more advanced markers may not be feasible.

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9. List of abbreviations:

NSTE-ACS- non-ST elevation acute coronary syndromes
IHD- ischemic heart disease
ACS- acute coronary syndrome
CVD- cardiovascular disease
BMI- body mass index
DM- diabetes mellitus
DESERT- Drug Eluting Stents Evaluation: a randomised trial
WBC- white blood count
RBS- Random blood sugar
CK- creatinine kinase

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