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Impact of Platelet Count on Non-ST Elevation Myocardial Infarction: In-Hospital Outcome

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Abstract

Introduction: *Incidence of ACS is increasing in developing countries like Bangladesh. Many factors can influence in hospital outcome of NSTEMI Patient. Platelet count is one of them. The aim of present study was by measuring platelet count to detect the severity of NSTEMI patients and their in hospital outcome.* ***Objective:*** *The aim of present study was to observe the impact of platelet counts on in hospital outcome of NSTEMI.* ***Materials and Methods:*** *The study was conducted in Shahid Sheikh Abu Naser Specialized Hospital, Khulna from January 2021 to November-2021. NSTEMI Patient Presented within 24 hours of chest pain was included in this study. Data were collected by direct interview from Patient and venous blood was drawn for platelet count. Continuous data were expressed as mean ±SD. Categorical data were analyzed with x^2 test. Student's 't' test was used for analysis of Continuous variables. Comparision between groups was done by unpaired t-test. Multiple logistic regression analysis was done to determine the association between lower platelet counts and adverse hospital events in NSTEMI patients. P-values <0.05 were be considered statistically significant.* ***Results:*** *100 Patients are included in this study. They are devided into two groups. Group-1 having platelet count <200000/cmm) and Group-II having platelet count > 200000/cmm. Bleeding, Q-wave MI, arrythmia and heart failure were significantly (P<0.05) higher in group-I but stroke and death were similar in both groups.* ***Conclusion:*** *Lower platelet count in NSTEMI patient is associated with adverse in-hospital outcome.*

Key words: *Platelet count, Non-ST-Elevation Myocardial infarction, outcome.*

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Introduction:

Incidence of ACS is increasing in developing countries including Bangladesh. With socioeconomic improvement, changes in the life style and dietary habit, smoking, decrease physical activity, increasing body weight and consequently increasing rate of diabetes mellitus, hypertension, dyslipidemia which contribute to increase coronary heart disease[1]. The significance of thrombocytopenia in patients experiencing during non-ST Elevation myocardial infarction has not been examined systematically[2]. Patient with ACS present with increased mean platelet volume, lower platelet count and decreased eosinophil counts[3, 4]. These cells become targets for new drugs and these changes may also acts as markers of myocardial damage or prognosis[4].

As ACS is increasing in Bangladesh, platelet count has become an important health care issue to detect the severity of NSTEMI patient. By measuring platelet count we can reduce the morbidity and mortality in our population. Initial platelet count can be used as prognostic marker. It might be useful adjunct for identifying those patients who may benefit from a more intensified therapy (e.g. higher dose or prolong dual anti-platelet therapy)[5].

Materials and Methods:

This is a prospective study of 100 NSTEMI patients presented within 24 hours of chest pain. The study was conducted in Shahid Sheikh Abu Naser Specialized Hospital, Khulna from January 2021 to November-2021.

Inclusion Criteria were Non-ST-Elevation Myocardial Infarction presented within 24 hours of chest pain.

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Exclusion Criteria were: Previous documented thrombocytopenia (<1,50,000/cmm), Heparin therapy before admission, Patient on antiplatelet drug before admission, Patients on lipid lowering agent (statin) before admission, History of previous or current haemostatic disorder, Long-term daily need for nonsteroidal anti-inflammatory drugs, Renal insufficiency (creatinine level > 1.6mg/dl), History of PCI, History of CABG and Acute and chronic inflammatory conditions like-Rheumatoid arthritis, SLE.

The study was conducted after informed written consent from all participants. Date were collected with all aseptic precaution. Venous blood was drawn by dry plastic syringe. The needle was detached from the syringe and the requisite amount of blood was delivered into a vessel containing EDTA (Etheline dyamine tetraacetic acid). Dilution (1 in 20) were done by adding 0.1 ml of blood to 1.9 ml of the diluents. After mixing of suspension for 10-15 minutes the Neubauer counting chamber was filled with suspension, using a stout glass capillary pipette. The counting chamber was placed in a moist Petridish and leave untouched for at least 20 minutes to give time for the platelets to settle. The preparation was examined with the x40 objective and x6 or x10 eyepieces. The number of platelets in one or more areas of $1mm^2$ was counted. Continuous data were expressed as mean ±SD. Categorical data were analyzed with χ^2 test. Student's 't' test was used for analysis of continuous variables. Comparison between groups was done by unpaired t-test. Multivariate logistic regression analysis was done to determine the association between lower platelet counts and adverse hospital events in patients with NSTEMI. P values <0.05 were be considered statistically significant.

Results:

The study was conducted to see the impact of platelet count on NSTEMI.

Table-I: Age distribution of the study population (N-100).

Age group (years)	Group I (n=50)		Group II (n=50)		P value
	n	%	n	%	
≤ 40	7	14.0	4	8.0	
41-50	11	22.0	9	18.0	
51-60	18	36.0	19	38.0	
61-70	10	20.0	13	26.0	
> 70	4	8.0	5	10.0	
Mean ±SD	56.8±12.5		55.9±10.7		0.720^{ns}
Range (min-max)	(38-100)		(36-78)		

Group I : Platelet count (PC) ≤ 200000/cmm

Group II : Platelet count (PC) > 200000/cmm

Not significant (p > 0.05 with unpaired t-test)

The study included 100 subjects and they were divided into five age groups. In group I, the men age was 56.8± 12.5 years ranging from 38 to 100 years. In group II, the mean age was 55.9±10.7 years ranging from 36 to 78 years. Maximum number found in the age group of 51-60 years in both groups. The mean age difference was not statistically significant (p>0.05) between the two groups in unpaired t-test. Results are depicted in the above table.

Table-II: Distribution of risk factors of the study population (n=100).

Risk Factors	Group I (n=50)		Group II (n=50)		P value
	n	%	n	%	
Smoking	32	64.0	29	58.0	0.538^{ns}
HTN	22	44.0	18	36.0	0.414^{ns}
DM	15	30.0	12	24.0	0.499^{ns}
Dyslipidaemia	15	30.0	13	26.0	0.655^{ns}
Obesity	13	26.0	11	22.6	0.639^{ns}
Family history of CAD	10	20.0	8	16.0	0.602^{ns}

NS=Not significant

P value reached from Chi square test

Smoking (64.0% Vs 58.0%) and HTN (44.0% Vs 36.0%) were the most common risk factor for Non-ST-Elevation Myocardial infarction in both groups, followed by diabetes mellitus, dyslipidaemia, obesity and family history of CAD. No statistically significant difference of risk factors for Non-ST-Elevation Myocardial infarction was observed between two groups of patients (p>0.05)

Table-III: Platelet count of the study population (n=100).

Platelet count (cmm/L)	Group I (n=50)	Group II (n=50)	P value
Mean ±SD	165696.6±28396.3	293660±69896.9	0.001^{S}
Range (min-max)	(86000-199000)	(202000-420000)	

Significant (p<0.05) with unpaired t-test

The mean Platelet count was 165696.6±28396.29 cmm/L range from 86000-199000 cmm/L in group I and 293660±69896.9 cmm/L range from 202000-42000 cmm/L in group II. The mean platelet count difference was statistically significant (p<0.05).

Table-IV: In-hospital outcome of the study population (n=100).

Outcome	Group I (n=50)		Group II (n=50)		P value
	n	%	n	%	
Bleeding	7	14.0	1	2.0	0.026^{S}
Q-wave MI	8	16.0	2	4.0	0.045^{S}
Arrhythmia	11	22.0	4	8.0	0.049^{S}
HF	13	26.0	5	10.0	0.037^{S}
Stroke	5	10.0	4	8.0	0.726^{ns}
Death	4	8.0	3	6.0	0.695^{ns}

S= Significant

NS= Not Significant

P value reached from Chi square test

Table IV shows in-hospital outcome of the study population and found bleeding 7(14.0%) and 1(2.0%) in group I and group II respectively. Q-wave MI was 8(16.0%) in group I and 2(4.0%) in group II, arrhythmia was 11(22.0%) in group I and 4(8.0%) in group II. Heart failure was 13(26.0%) and 5(10.0% in group I and group II respectively. Stroke was 5(10.0%) in group I and 4(8.0%) in group II. Death was 4(8.0%) in group I and 3(6.0%) in group II. Bleeding, Q-wave MI, arrhythmia and HF were statistically significant ($p<0.05$), but stroke and death were not statistically significant ($p>0.05$) between two groups.

Table-V: Association between platelet count with bleeding, Q-wave MI, arrhythmia, HF, Stroke and Death.

Variable	β	Odds ration (OR)	95% CI	P value
Bleeding	2.08	8.03	1.11-79.93	0.060^{ns}
Q-wave MI	1.86	6.43	1.27-32.58	0.024^{S}
Arrhythmia	1.23	3.43	0.96-13.19	0.057^{ns}
HF	1.10	0.86	0.19-7.25	0.288^{ns}
Stroke	0.78	0.84	0.99-3.49	0.860^{ns}
Death	0.81	0.98	1.09-4.37	0.672^{ns}
Constant	-0.48	0.62		0.052^{ns}

NS= Not Significant, S= Significant

Q-wave MI was significantly associated only with platelet count where OR 6.43 and 95% CI 1.27-32.58 and other factors were not associated in multivariate logistic regression model.

Discussion:

This prospective study was carried out with an aim to observe the impact of platelet counts on in-hospital outcome of NSTEMI.

A total of 100 patients of NSTEMI presented within 24 hours of chest pain age ranging from 36 to 100 years were included in the study.

In this present study it was observed that the mean age was 56.8±12.5 years ranging from 38 to 100 years, 55.9±10.7 years ranging from 36 to 78 years group I and group II respectively. Majority of the patients found in the age group of 51-60 years in both groups. The mean age was almost similar between two groups. Mueller et al.[5] (2006) has observed higher mean age in their study, which was 64.2±11.8 years. Similarly McClure et al.[2] (1999) observed that the median age was 67 years and 64 years in low platelet count group & high platelet count group respectively. Jeong et al.[8] (2007) carried out a study on 2762 acute NSTEMI patients and found that mean age was 64.6±12.8 years. All the above findings are higher with the present study, which may be due to increased life expectancy in their study patients.

Regarding the risk factors smoking 64.0% and 58.0% in group I and group II respectively. HTN observed 44.0% in group I and 36.0% in group II. Smoking and HTN were the most common risk factor for Non-ST-Elevation Myocardial Infarction in both groups, however diabetes mellitus, dyslipidaemia, obesity and family history of premature CAD were also observed in this study patients. No significant difference of risk factors for Non-ST-Elevation Myocardial Infarction was observed between two groups of patients in the present study patients. McClure et al.[2] (1999) found HTN 57.8% vs 55.1% in low platelet count group & high platelet count group. DM was observed 26.7% and 22.7% in low platelet count group & high platelet count group respectively. However regarding the tobacco use, 21.4% low platelet count group and 28.8 high platelet count group were current smoker. Family history of CAD was 36.3% vs 35.2% in low platelet count group & high platelet count group. Patients with low platelet count group were older. weighed less. Mueller et al[5] (2006) found smoker was 23.2%, HTN 61.7% Avremakis et al.[4] (2007) demonstrated a significant lower platelet count in non-DM non-smokers with UA or AMI when compared with non-DM non-smoker controls.

In this present study regarding the hospital outcome, it was found bleeding 14.0% and 2.0% in group I and in group II respectively. Q-wave MI was 16.% in group I and 4.0% in group II, arrhythmia was 22.0% in group I and 8.0% in group II. Heart failure 26.0% and 10.0% in group I and group II respectively. Stroke was 10.0% in group I and 8.0% in group II. Death was 8.0% in group I and 6.0% in group II. Bleeding, Q-wave MI, arrhythmia and HF were significantly ($p<0.05$) higher in group I patients but stroke and death were not statistically significant ($p>0.05$)

between two groups.

In-hospital bleeding, one of the outcomes of this study, was significantly higher in group-I (14%) than group-II (2%) (p-value <0.05). In group-I, echymosis other than paraumblical area, epistaxis, intracranial haemorrhage were 8%, 4%, 2% respectively. In group-II, only echymosis other than paraumbilical area was 2%. McClure et al.[2] (1999) observed in their study that the incidence of bleeding was 75.4% in low platelet count group and 27.8% in high platelet count group. This result is higher than present study, possibly due to different invasive procedure like CAG, PCI with or without stenting, IABP insersion & CABG in their management protocol.

In-hospital Q-wave MI, another outcome of this study was significantly higher in group-I (16%) than group-II (4%) (p-value<0.05). McClure et al[2] ,(1999) observed in their study that MI was 27.2% in low platelet count group & 12.2% in high platelet count group. Their result is higher than current study result but the result comparing between two groups is almost similar. Anderson et al.[6], (2010) observed that, upto 25% of patient wsith NSTEMI and elevated CK-MB go on to develop Q wave MI during their hospital stay. On considering total events, their result is consistent with current study.

Heart failure was significantly higher in group-I (26%) than group-II (10%) in the present study (p-value <0.05). In group-I, Killip class-I, II, III, IV were 74%, 14%, 8%, 4% respectively. In group-II, Killip class-I, II, III, IV were 90%, 6%, 2% & 2% respectively. Hung et al.[7] (2006) observed in their study that heart failure was 8.4% in low platelet count (<2 lacs) group and 11.5% in higher platelet count group (>2 lacs). In comparison between low & high platelet count group, current study is contradictory to Hung et al.[7] (2006) study. As because Hung et al.[7] (2006) carried out their study on STEMI patient.

Arrythmia was significantly higher in group I (22%) than group II (8%) in this study (P-value <0.05). In group I, AF, AV block, VT & VF were 8%, 8%, 4%, 2% respectively. However, in group II, AF was 2%, AV block was 2% and VT was 4%.

Stroke was 10% in group I and 8% in group II but the difference was not significant in present study. McClure et al.[2] (1999) observed in their study that the incidence of stroke was 3% in low platelet count group and 0.6% in high platelet count group. In comparison between two groups, the result is consistent with current study.

Another in hospital outcome was death which was 8% in group I and 6% in group II and the difference was not statistically significant. MeClure et al.[2] (1999) observed that death was 7.4% in low platelet count group & 3.3% in high platelet count Group. This result is also similar to current study.

Kaplar-Meier Survival analysis showed cumulative 4-year mortality rates of 12.5%, those who have platelet count less than `181000 per cmm. This mortality rate was higher than other groups having platelet count >181000 per cmm. Low platelet count and adverse outcome might be explained by mainly 3 mechanisms: First, Recent studies point to a possible correlation of platelet count and blood levels of certain inflammatory markers. This could be well demonstrated for soluble CD40 ligand, an independent predictor of adverse outcome in UA/NSTEMI[5]. Second, more extensive coronary artery disease may be an important mediator responsible for the higher mortality in patients with very low platelet count[5]. Third, low platelet count in the first platelet count quintile can be caused by comorbidity with a hidden prothrombotic state which can be associated with increased risk of death[5]. A significant association of low platelet count and adverse clinical outcome in patients with high risk PCI and UA/NSTEMI has also been demonstrated[8].

In this current study it was observed that Q-wave was significantly associated only with platelet count where OR 6.73 and 95% CI 1.27-32.58 and other factors regarding hospital outcome not associated in multivariate logistic regression model.

Conclusion:

This prospective study was carried out to observe the impact of platelet counts on in-hospital outcome of NSTEMI. Most of the patients were found 51-60 years age in both groups and male was predominant in both groups. Smoking, HTN, diabetes mellitus, dyslipidaemia, obesity and family history of CAD were most common risk factor for Non-ST-Elevation Myocardial Infarction in both groups (p>0.05). The RBS and S. Creatinine were almost similar between two groups.

The Troponin-I level was significantly (p<0.05) higher in group I patients. The TC and LDL were higher in group I, however TG was higher in group II but the difference was not significant (p>0.05). HDL was almost parallel between two groups. Bleeding, Q-wave MI, arrhythmia and HF were significantly (p<0.05) higher in group I, but stroke and death were similar in both groups. In multivariate logistic regression model, Q-wave MI was significantly associated only with platelet count and other factors were not associated.

Conflict of Interest : None

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