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Value of Immature Granulocyte in Prediction of Severity of Coronary Artery Disease and Short Term Outcome in Patients with Ischemic Heart Disease

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Abstract

Background: Ischemic Ischemic heart disease [IHD] is a leading cause of hospitalizations and visits to the emergency room. Rupture of atherosclerotic plaques and coronary artery thrombosis, either whole or partial, are typical symptoms of IHD. This research set out to compare the SYNTAX score [SX score] with the value of immature granulocyte in predicting the severity of coronary artery disease in ischemic heart disease patients having coronary angiography at Benha University. Included were 200 individuals who had coronary artery disease. Patients with cancer, inflammatory bowel disease, chronic renal failure, chronic liver failure, heart failure, being under the age of 18, pregnant, or using steroids or immunosuppressive drugs were excluded. The results showed that hypertension, heart rate, LDL and triglyceride levels, and HDL levels were all lower in patients with high granulocytes. The amount of granulocytes was significantly correlated with other inflammatory indicators [p value < 0.05]. Complex coronary vasculature and a high syntax score were both linked to a high granulocyte level.

Keywords: CCS., EF%., IG%., MHR.

Introduction

Ischeamic Ischemic heart disease [IHD] is a leading cause of hospitalizations and visits to the emergency room. Atherosclerotic plaque rupture and coronary artery thrombosis, either whole or partial, are hallmarks of atherosclerotic coronary syndrome [ACS], a leading cause of death and disability [1]. Inflammation is one of the pathophysiological variables that impact this atherosclerotic process. The development and advancement of atherosclerosis are both aided by inflammation [2].

Researchers have looked at inflammatory indicators such white blood cell [WBC], C-reactive protein [CRP], neutrophil-lymphocyte ratio [NLR], and platelet-lymphocyte ratio [PLR] to show that cardiovascular events are bad [3]. One metric that many doctors fail to properly understand is the percentage of immature granulocytes in the blood that circulates in the body's periphery [4].

Numerous factors influence the choice of treatment for patients suffering from coronary artery disease [CAD], including the severity of the condition, the degree of myocardial ischemia, the preferences of both the patient and their physician, and any additional medical conditions that the patient may have [6].

The location of the lesions, their impact on blood flow, the degree of vessel stenosis, the classification of the lesions, and the diameter and calcification of each vessel are some of the specific complications that can affect the preferred revascularization strategy and the severity of multi-vessel disease [7].

The angiographic score known as SYNTAX stands for "Synergy between PCI with TAXUS and Cardiac Surgery," and it is used to measure the degree of heart attack complexity [8].

In light of the importance of SYNTAX score and short-term outcomes in predicting the severity of coronary artery disease in ischemic heart disease patients undergoing coronary angiography, this research aims to assess the relevance of immature granulocyte.Ischemic heart disease [IHD] is a leading cause of hospitalizations and visits to the emergency room. Atherosclerotic plaque rupture and coronary artery thrombosis, either whole or partial, are hallmarks of atherosclerotic coronary syndrome [ACS], a leading cause of death and disability [1]. Inflammation is one of the pathophysiological variables that impact this atherosclerotic process. The development and advancement of atherosclerosis are both aided by inflammation [2].

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Patients and Methods

Study population:- A compartative subjects were enrolled in the research at Benha University Hospital.

Following approval of the study design and informed consent from the Research Ethical Committee at the Benha Faculty of Medicine, subjects were recruited.

A hundred individuals with coronary artery disease.

Group I consisted of 122 patients with a low granulocytes level and was one of two groups who participated in the investigation.

Section II: 78 individuals with a high granulocyte

Excluded from the study were patients who were under the age of 18, pregnant, had inflammatory bowel illness, used steroids or immunosuppressants, had a history of cancer, or suffered from acute or chronic inflammatory disorders of the liver, kidneys, or chest.

Methods:

The following diagnostic procedures were performed on each patient: History taking includes - Risk factors for CAD including HTN, DM, Smoking.

Comprehensive medical evaluation: vital signs [pulse, systolic and diastolic blood pressure].

At the time of admission, all patients underwent a standard 12-lead ECG.

Transthoracic To evaluate abnormalities in the heart's resting wall motion, an echocardiogram is performed.

laboratory test: Patients were given peripheral venous blood samples when they were admitted to the hospital. The lipd profile and immature granulocyte levels were measured using it.

Both the femoral and the radial arteries were used to get access to the circulation during the angiography procedure. To see where the catheter was, doctors employed real-time X-ray fluoroscopy.

The anatomy is delineated by injecting intravenous contrast into the coronary artery.

Analyzing statistical data:

-SPSS [Inc. Released, 2018] versions 26 was used for statistical testing. Numerical data was described using the mean and standard deviation. The distribution of frequencies and percentages was used to display the qualitative data. If the data in two groups follows a normal distribution, the quantitative variables may be compared using Student's t-test [t], and if the data does not, the quantitative variables can be compared using Mann-test Whitney's [U]. Using either Fisher's exact or a chi-square test, we looked at the connection between the qualitative variables.

Results:-

Patients separated into two groups based on granulocyte level; 122 patients were found to have low granulocyte level and 78 patients were found to have high granulocyte level.

Table (1) demonstrated that there was no statistically significant difference in age or gender between patients with high and low levels of immature granulocytes. With a p-value greater than 0.05,

Demographic data		**Low granulocytes [n=122] [IG%]**		**High granulocytes [[n=78] [IG%]**		**Test of sig.**	**P value**
		No.	**%**	**No.**	**%**		
Gender	**Male**	97	79.5	64	82.1	**χ2=**0.048	0.827
	Female	25	20.5	14	19.7		
Age	**Mean ± SD**	57.35±10.47		54.8±8.12		t =1.941	0.054
[years]	**Range**	30 – 75		40-70			

Table (2) demonstrated that patients with high granulocytes had significantly higher SBP and DBP compared to those with low granulocytes, but there was a highly significant difference in HR and Syntax score, with a p value of less than 0.05, indicating that patients with high granulocytes were significantly better.

Variable		**Low granulocytes [n=122]**	**High granulocytes [[n=78]**	**t=Test**	**P value**
SBP	**Mean ± SD**	127.5±13	129.71±14.7	1.115	0.266
	Range	100-155	100 -154		
DBP	**Mean ± SD**	76.79±6	76.81±7.97	0.021	0.983
	Range	60 – 90	60 – 100		
HR	**Mean ± SD**	79.5±9.13	91.1±9.7	8.434	<0.001**
	Range	65 -100	66 – 110		
Syntax	**Mean ± SD**	10.68±**6.79**	31.19±**5.39**	U=10.955	<0.001**
score	**Range**	1 – 35	5 -37		

According to Table (3), there was no significant difference in DM and smoking rates between patients with high and low granulocytes [p > 0.05]. However, there was a very significant difference in hypertension rates, with high granulocytes patients more likely to have hypertension [p < 0.05].

Clinical data		Low granulocytes [n=122]		High granulocytes [[n=78]		Test of sig. $\chi 2$	P value
		No.	%	No.	%		
DM	**Yes**	70	57.4	55	70.5	3.200	0.074
	No	52	42.6	23	29.5		
HTN	**Yes**	70	57.4	58	74.4	5.501	0.019*
	No	52	42.6	20	25.6		
Smoking	**Yes**	70	57.4	49	62.8	0.498	0.480
	No	52	42.6	29	37.2		

Table (4) shows that there was no statistically significant difference in EF percentage or creatinine level between the two groups [p>0.05].

Variable		Low granulocytes [n=122]	High granulocytes [[n=78]	t Test	P value
EF%	**Mean ± SD**	58.7±5.77	57.3±5.11	1.809	0.065
	Range	50 – 70	50 – 69		
Creatinine	**Mean ± SD**	0.88±0.19	0.86±0.23	0.733	0.465
	Range	0.4 – 1.3	0.4 – 1.2		

High granulocytes patients had significantly higher TG and LDL levels, while low granulocytes patients had significantly higher HDL levels, as seen in Table 5. When it came to cholesterol, neither group differed much from the other.

Variable		Low granulocytes [n=122]	High granulocytes [[n=78]	t Test	P value
Cholesterol	**Mean ± SD**	244.79±48	243.5±44.57	0.194	0.847
	Range	167- 335	160 – 322		
TG	**Mean ± SD**	176.93±39.3	191.5±37.89	2.609	0.01*
	Range	110-300	130 – 300		
LDL	**Mean ± SD**	132.6±27.96	155.59±24.13	6.011	<0.001**
	Range	75 -181	110-191		
HDL	**Mean ± SD**	45.57±9.39	41±8.28	3.531	0.001**
	Range	25 – 65	25 – 55		

Patients with high granulocytes had considerably higher levels of the following laboratory markers Table (6), although there was no statistically significant difference between the two groups with respect to HB: TLC, Neutrophil, lymphocyte, NLR, platelet, PLR, MPV, monocyte, MHR, and CRP.

Variable		Low granulocytes [n=122]	High granulocytes [[n=78]	Test of sig.	P value
TLC	**Mean ± SD**	6733.3±2006	12898.8±2289.4	U=10.992	<0.001**
	Range	4200 - 13000	6300 – 18000		
Neutrophil	**Mean ± SD**	4084.2±1665	9345±2218.6	U=10.989	<0.001**
	Range	2200-9500	3500 – 14800		
Lymphocyte	**Mean ± SD**	2231.7±548.56	2836.3±736.78	t=6.644	<0.001**
	Range	1300 - 3400	1500-5000		
	Range	0.7 – 4.5	1.3 – 6.5		
Platelet	**Mean ± SD**	235.13±64.2	398.3±79.4	t=15.992	<0.001**
	Range	120 – 450	180 – 500		
PLR	**Mean ± SD**	109.65±35.56	148.67±35.4	t=7.671	<0.001**
	Range	52 – 194	46 – 220		
MPV	**Mean ± SD**	8.9±1.5	13.2±1.2	t=20.989	<0.001**
	Range	6.5 – 15	7 -16		
Monocyte	**Mean ± SD**	380.6±155.6	616.6±157.1	U=8.604	<0.001**
	Range	150 – 852	300-900		
	Range	3.07 – 34	6 – 31		
HB	**Mean ± SD**	13.5±1.8	13.7±1.2	t=1.051	0.255
	Range	10 – 17	10 – 16		
CRP	**Mean ± SD**	2.37±1.8	8.19±2.1	U=10.995	<0.001**
	Range	0 -11	0-11		

Discussion

Early It is crucial to prioritise evaluation and therapy for individuals suffering from cardiovascular disease, which is linked to a high death rate [9]. Past research has used clinical score and a number of biomarkers as indications of prognosis, such as troponin, C-reactive protein, N-terminal pro-brain natriuretic peptide [NT-proBNP], and NLR. All doctors can readily interpret haemograms, hence they are sought for almost all patients brought to the emergency room or critical care unit. Although it is a straightforward haemogram metric, the IG count is not as well-known among doctors. Recent research has shown that the IG count may be a useful predictor of both the immediate and long-term death rates linked to a wide range of illnesses [10,11].

For a long time, people have understood that inflammation may lead to coronary artery disease [CAD]. The prognosis and potential consequences in individuals with IHD are intimately linked to inflammation [12]. Atherosclerotic plaques may cause myocardial infarction [MI] if inflammation is severe enough [13]. Haemogram measures [such as white blood cell and neutrophil counts] and their ratios have been shown to have predictive significance in patients with coronary artery disease and STEMI in several prior studies[14–17]. A poor prognosis in STEMI patients was associated with the IG count, a basic haemogram metric, according to the current research. An anatomical grading system based on coronary angiography, the [SYNTAX] score [SS] may aid in determining the degree of coronary artery disease and making judgments about revascularization.

With the use of automated blood cell analyzers, one may determine the IG count, which reveals the quantity of serial myelocytic cells in the peripheral blood [20]. There are known cases of immature cells circulating in the peripheral circulation as a result of inflammation and damage. Consequently, several research have addressed the diagnostic and prognostic significance of circulating immature cells in sepsis, trauma, and gastrointestinal system illnesses [18,19]. In this research, we split the patients into two groups based on their granulogytes level. The first group, comprising 61% of the total, had a low granulocytes level . Group II: A granulocyte count is 39%. Consistent with the research by Bedel et al., the study group had a mean age of 55.17 + 10.8 and 80 percent of the patients were male [2020]. In their study, AbdelHamid et al., 2023 found a strong association between syntactic score, an indicator of coronary lesion complexity, and immature neutrophils or the NLR. In a study conducted by Park et al. in 2017, it was found that individuals in good health in Korea had a greater degree of subclinical inflammation and more immature granulocytes when their resting heart rates were higher. Granuolocytes, hypertension, and cardiovascular outcomes were all shown to be significantly related in a study by Wenstedt et al., 2022.

Immature granulocyte counts are a dependable indicator for assessing ischemia, as shown by Durak et al [mesenteric].

Conclusions

- Patients People with a high granulocyte count were more likely to have hypertension, a racing heart, elevated levels of bad cholesterol and triglycerides, and subpar HDL cholesterol. The amount of granulocytes was significantly correlated with other inflammatory indicators [p value < 0.05]. Complex coronary vasculature and a high syntax score were both linked to a high granulocyte level.
- MACES may be predicted by other inflammatory indicators that indicate a high amount of granulocytes [TLC, PLR, platelets, neutrophils, lymphocyte, and MPV].

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