European Journal of Clinical Medicine
www.ej-clinicmed.org

Difference of Complete Blood Count (CBC) between Patient with Sudden Deafness and Control at Sanglah General Hospital from January 2018-March 2021

Sylvia and Made Wiranadha

ABSTRACT

***Introduction*: Sudden deafness is sudden sensorineural hearing loss (SSNHL) of at least 30 db or more in three contiguous frequencies, occurring within 72 hours. 10-15% is caused by underlying disease, while the others are idiopathic. Prognosis are difficult to predict. Complete blood count (CBC) is a basic examination that can be done in almost all medical facility. Few researches have shown a significant difference in hematocrit, NLR,PLR, MLR, RDW and MPV between patients and control .**

***Methods*: This study was an analytic study with retrospective case control study design**

***Results*: There are differences in level of hematocrit, NLR, PLR among patients with sudden sensorineural hearing loss and control in Sanglah hospital Denpasar (p<0.05, CI 95%)**

***Conclusion*: There was a difference in hematocrit, NLR and PLR between patients with sudden deafness and control at Sanglah General Hospital, Denpasar.**

Keywords: Complete blood count, hematocrit, MLR, MPV, NLR, PLR, RDW, sudden deafness.

Published Online: June 6, 2022

ISSN: 2736-5476

DOI:10.24018/ejclinicmed.2022.3.3.155

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I. Introduction

SSNHL of at least 30 db or more in three contiguous frequencies, occurring within 72 hours. The prevalence is 5-10 cases/ 100.000 in US and 10 cases /100.000 in Korea. Mostly are in their 40-50s [1].

SSNHL mostly are idiopathic and 10-15% is caused by identified problem. Etiology are multifactorial so respond to therapy and prognosis varied between patients. Only 10-15% etiology are identified, autoimmune, infection, vascular and rupture of cochlear membrane are among the causes while mostly are idiopathic [2], [3].

SSNHL mostly unilateral so many patients do not realized, also 32-65% resolved without therapy so some patients do not seek treatment. Some symptoms that can occured are fullness in ear, vertigo, tinnitus. Diagnosis are based on anamnesis, physical examination, tuning fork, audiometry and supporting examination [4].

Supporting examination such as marker of inflammation, cholesterol serum, and blood glucose, also imaging with Computed Tomography (CT) scan or Magnetic Resonance Imaging (MRI) [4]. CBC is a simple examination that can be done in almost all medical facility, not only the method is easy, but also simple processing.

Few researches shown a significant difference in hematocrit, neutrophil- lymphocyte ratio (NLR), platelet-lymphocyte ratio (PLR), monocyte- lymphocyte ratio (MLR), red cell distribution width (RDW) and mean platelet volume (MPV) between patients with SSNHL and control. Therefore, the purpose of this research is to determine the difference of complete blood count (CBC) between Patient with Sudden Deafness and Control at Sanglah General Hospital, Denpasar.

II. Material and Methods

The design of this study is an analytic study with a retrospective case control approach. The sample including the entire population of SSNHL patients at Sanglah General Hospital from January 2018 until March 2021 which was selected by total sampling and met the inclusion and exclusion criteria.

We included patients who had diagnosed with SSNHL and seek treatment to Sanglah General Hospital who undergone CBC examination. We excluded patient who refused to participate after proper informed consent, patient with incomplete medical records, patient who do not undergone CBC examination and patient with meningitis, chronic illness (diabetes mellitus, hypertension, heart disease and autoimmune), malignancy and other infectious disease when diagnosed with SSNHL.

Inclusion criteria for control are patients who undergone medical check-up with normal audiometry on both ear and undergone CBC. We excluded patient who refused to participate, and patient with chronic illness (diabetes mellitus, hypertension, heart disease and autoimmune), malignancy and other infectious disease.

Patients who met the inclusion and exclusion criteria were

included in the study sample and data were recorded. All data obtained were then analyzed using SPSS 20.0 software. There were 2 types of variables in this study. The independent variables were hematocrit, NLR,PLR, MLR, RDW and MPV, while the dependent variable was SSNHL.

An assessment and statement of the ethical suitability of this study was provided by the Research Ethics Commission of the Faculty of Medicine, Udayana University, Sanglah Hospital Denpasar (958 / UN14.2.2.VII.14 / LT / 2022).

III. Results

Based on the research, it was found that descriptive data analysis was carried out on the characteristics of the research subjects. Characteristic data obtained in the form of numerical data scale as described in Table I.

TABLE I: THE CHARACTERISTIC OF SUBJECT

Variable	SSNHL (n=46)	Control (n=46)
	Age (year old)	
Mean±SD	49,84±7,16	48,17±5.93
	Gender	
Male	32 (69,5%)	32 (69,5%)
Female	14 (30,5%)	14 (30,5%)

Based on the table above, in this study, the average age of patients with SSNHL was 49,84 years and control was 48,17 years. Based on gender, in SSNHL group was 32 men (69,5%) and 14 women (30,5%). We did matching so the control group are also the same.

Comparison of CBC in SSNHL patient and control can be seen in Table II.

Based on Table II, there was differences of hematocrit, NLR and PLR between SSNHL group and control. Mean hematocrit in SSNHL group is 47.19 and mean hematocrit in control is 43.45 ($p<0.05$ 95% Confidence Interval). Mean NLR in SSNHL group is 4.05 and mean NLR in control is 1.66 ($p<0.05$ 95% Confidence Interval). Mean PLR in SSNHL group is 148.87 and mean PLR in control is 113.38 ($p<0.05$ 95% Confidence Interval).

There was no differences of MLR, RDW and MPV between SSNHL group and control. Mean MLR in SSNHL group is 0.26 and mean MLR in control is 0.19 ($p>0.05$ 95% Confidence Interval). Mean RDW in SSNHL group is 12.0 and mean RDW in control is 11.68 ($p>0.05$ 95% Confidence Interval). Mean MPV in SSNHL group is 7.01 and mean MPV in control is 6.7 ($p>0.05$ 95% Confidence Interval).

IV. Discussion

This study was conducted to determine and assess the difference of hematocrit, neutrophil- lymphocyte ratio (NLR), platelet- lymphocyte ratio (PLR), monocyte-lymphocyte ratio (MLR), red cell distribution width (RDW) and mean platelet volume (MPV) between patients with SSNHL and control. This research is an an analytic study with a retrospective case control approach. The study was conducted at the ENT clinic of Sanglah Hospital Denpasar with the affordable population being patients with SSNHL at the ENT clinic of Sanglah Hospital. A total of 46 patients with SSNHL were taken in this study using a total sampling method.

Sudden sensorineural hearing loss (SSNHL) is a sensorineural hearing loss of at least 30 db or more in three contiguous frequencies, occurring within 72 hours [1]. Etiology are multifactorial so respond to therapy and prognosis varied between patients. Only 10-15% etiology are identified, autoimmune, infection, vascular and rupture of cochlear membrane are among the causes while mostly are idiopathic [2], [3].

Some symptoms that can occured are fullness in ear, vertigo, tinnitus. Diagnosis are based on anamnesis, physical examination, tuning fork, audiometry and supporting examination [4].

Supporting examination such as marker of inflammation, cholesterol serum, and blood glucose, also imaging with CT scan or MRI [4]. CBC is a simple examination that can be done in almost all medical facility, not only the method is easy, but also simple processing.

A. Characteristics of Research Subjects

In this study, the proportion of men who experienced sudden deafness was more than women with the percentage of men 69.5% and women 30.5%. According to [5] the ratio of the prevalence of men and women with sudden deafness is 1.07: 1, where men experience sudden deafness more often than women. In addition, according to [6] the estimated incidence of sudden deafness is 8.85 in men and 7.79 in women per 100,000 people.

The mean age of patients with sudden deafness in this study was 49.8 ± 7.16 years. According to [7]. the most sufferers are in the 40-60 year age group, as many as 57.69%. In addition, according to [8] the most sudden deafness sufferers are in the 40-60 year age group as much as 40.51%.

B. Differences in Hematocrit between SSNHL and Control

From the results of this study, there were differences in the hematocrit value in the case and control groups, with $p = 0.01$, according to [9], which stated that the value of blood viscosity in cases was higher than controls. This is in accordance with the study of [10] which states that a decrease in hematocrit can reduce blood viscosity and reduce venous return resistance, thereby increasing cardiac output. At the microcirculation level, a decrease in the hematocrit improves perfusion and oxygenation. Optimum oxygenation at a hematocrit level of 30%. From a study by [11] hemoconcentration due to a high hematocrit is not a prognostic factor for sudden deafness.

TABLE II: COMPARISON OF CBC IN SSNHL PATIENT AND CONTROL

Variable	Mean in cases	Min-Max	Mean in control	Min-Max	P
Hematocrit	47.19	39.57 - 79.08	43.45	27.90 - 54.48	0.000
NLR	4.05	0.67 - 16.63	1.66	1 - 2.69	0.000
PLR	148.87	84.78 - 415	113.38	91.93 - 195.88	0.01
MLR	0.26	0.04 - 1.08	0.19	0.12 - 0.38	0.064
RDW	12.01	10.62- 18.27	11.68	10.64 - 13.29	0.214
MPV	7.01	5.55 – 8.2	6.7	5.02 - 8.6	0.114

C. Differences in NLR between SSNHL and Control

From the results of this study, there was a difference between NLR in cases and controls ($p<0.05$). According to [12] the mean NLR in cases was significantly higher than in controls ($p<0.05$). According to [1] neutrophils are a thrombogenic marker, and a risk factor for stroke and myocardial infarction. Neutrophils in patients with sudden deafness were positively correlated with hearing loss before treatment, and negatively correlated with hearing improvement after 1 week and final improvement. These findings indicate that a high neutrophil count may be a clinical indicator of the severity and prognosis of sudden deafness. Inflammation can induce sudden deafness. NLR was the most studied factor and it was found that patients with sudden deafness had a higher NLR than control subjects ($p < 0.001$). In addition, the NLR was higher in patients with no improvement in symptoms than in those with symptom improvement. With these findings, NLR can be a marker of sudden onset and prognostic deafness. There are no studies that state the exact NLR limit, but there are recent studies that suggest an NLR limit of 0.78–3.53 [1].

D. Differences in PLR between SSNHL and Control

From the results of this study, there was a difference between PLR in cases and controls ($p<0.05$). According to [1] PLR was found to be higher in the case group than in the control group. Platelets are part of the pathophysiology of inflammation, coagulation, thrombosis and atherosclerosis of blood vessels. PLR can be used to evaluate the degree of systemic inflammation and endothelial damage of the peripheral vascular system, with an increase in PLR associated with increased platelet adhesion to the damaged vessels [1].

E. Differences in MLR between SSNHL and Control

From the results of this study, there was no difference between MLR in cases and controls. According to [13] there was no difference in MLR values in controls and cases, in addition, there was no difference in MLR between groups that improved after treatment and those who did not improve after treatment. According to [14], MLR is influenced by age and gender so it is not reliable as an indicator.

F. Differences in RDW between SSNHL and control

From the results of this study, the RDW values between the case and control groups were not significantly different ($p > 0.05$). According to the literature, the pathophysiology of the relationship between RDW and sudden deafness itself is not clear, where research by [15] stated that there was no difference in RDW of control patients and sudden deafness. Meanwhile, according to [1], RDW was associated with inflammation and microcirculation disorders, such as in coronary disease and rheumatoid arthritis. It was found that increased RDW was associated with worse disease outcome, particularly in inflammation and thrombosis [1].

G. Differences in MPV between SSNHL and control

From the results of this study, there was no difference in MPV values in the case and control groups. MPV is the smallest cell of the peripheral blood component, and functions in hemostasis and the processes of coagulation, inflammation, thrombosis and atherosclerosis. MPV is also a parameter of platelet volume, function and activity. MPV levels are elevated in vascular events such as atherosclerosis, thrombosis or thromboembolism. Several studies have been conducted on the relationship between MPV and sudden deafness, but there are no consistent and conclusive results. According to [12], there was no significant difference between the MPV values of cases and controls.

H. Significance of Differences in Hematocrit, NLR, PLR between SSNHL andControl

There was a difference between NLR, PLR and hematocrit in patients with sudden deafness compared to controls, which was indicated by the significance of the p value <0.05 at the 95% confidence interval. This is in accordance with the study of [3] which states that a decrease in hematocrit can reduce blood viscosity and reduce venous return resistance, thereby increasing cardiac output. At the microcirculation level, a decrease in the hematocrit improves perfusion and oxygenation.

This is also in accordance with a study conducted by to [1], neutrophils are a thrombogenic marker, and a risk factor for stroke and myocardial infarction. Neutrophils in patients with sudden deafness were positively correlated with hearing loss before treatment, and negatively correlated with hearing improvement after 1 week and final improvement [1].

According to [1], PLR was found to be higher in the case group than in the control group. Platelets are part of the pathophysiology of inflammation, coagulation, thrombosis and atherosclerosis of blood vessels. PLR can be used to evaluate the degree of systemic inflammation and endothelial damage of the peripheral vascular system, with an increase in PLR associated with increased platelet adhesion to the damaged vessels.

V. Conclusion

Most of the research subjects with SSNHL were male with an average age of 49 years. There was a difference between NLR, PLR and hematocrit in patients with sudden deafness compared to controls, which was indicated by the significance of the p value <0.05 at the 95% confidence interval. There was no significant difference between MPV, RDW and MLR in patients with sudden deafness compared to controls in this study.

It is necessary to do further research with a larger sample size to find out whether there are other indicators that are risk factors for sudden deafness. It is also necessary to develop similar research with multi-variable analysis by controlling for the existing confounding variables and conduct research that examines the relationship of other risk factors to the incidence of sudden deafness in order to prevent the occurrence of sudden deafness from increasing.

Conflict of Interest

There is no conflict of interest in this research.

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