

# Comparison of Richmond Agitation Sedation Scale (RASS) And Ramsay Sedation Scale (RSS) With Bispectral Index to Evaluate Depth of Sedation in Patients at The Intensive Care Unit in Adam Malik General Hospital Medan

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DOI: 10.29322/IJSRP.10.01.2020.p9788

<http://dx.doi.org/10.29322/IJSRP.10.01.2020.p9788>

**Abstract- Background:** Management of sedation and analgesia in the Intensive Care Unit requires parameters to evaluate the sedation that can be done by objective or subjective methods. Objectively, we can use the Bispectral Index (BIS), while subjectively we can use thesedation scale, such as Richmond Agitation Sedation Scale (RASS) and Ramsay Sedation Scale (RSS).

**Objective:** This study aims to compare the correlation between BIS with RASS and RSS.

**Method:** Thirty-four patients who was treated in the Intensive Care Unit, mechanically ventilated and receiving Midazolam sedation with a cross-sectional analytic design were observed with BIS (target 65-85), then observed with RSS and RASS sedation scales. Patients with muscle relaxation treatment, central nervous system disorder, GCS <8, and unstable hemodynamics were included the exclusion criteria in this study.

**Results:** The average value of Richmond Agitation Sedation Scale (RASS) was -0.88 and Ramsay Sedation Score (RSS) was 3.55 after the administration of sedation. The correlation of Bispectral Index when evaluating the depth of sedation in patients at Intensive Care Unit with the Richmond Agitation Sedation Scale (RASS) sedation scale showed a non-significant weak correlation ( $r = -0.232$   $p > 0.05$ ) compared to the correlation of Ramsay Sedation Score (RSS) sedation scale to Bispectral Index ( $r = 0.350$   $p < 0.05$ ).

**Conclusion:** RSS and RASS scoring systems had weak correlation to BIS but can be used to evaluate the depth of sedation in the Intensive Care Unit where RSS showed a better correlation than RASS.

**Index Terms-** Bispectral Index (BIS), Richmond Agitation Sedation Scale (RASS), Ramsay Sedation Scale (RSS).

## I. INTRODUCTION

Most patients in the Intensive Care Unit experience pain, agitation, or anxiety during treatment and include indications for administration of sedation and analgesia.1 Sedation

should be given to patients with critical illness who are treated in the Intensive Care Unit to reduce anxiety in patients.2 The main principle of care in the Intensive Care Unit is to provide comfort so that patients can tolerate to an unfriendly environment in the Intensive Care Unit.3 Management of analgesia and sedation in the Intensive Care Unit requires evaluation and also monitoring parameters to detect and measure the degree of pain, agitation, and sedation.4

Several sedation scales have been applied to evaluate sedation. Sedation levels on these scales are assessed and monitored using a number of different methods. In clinical practice, several assessments have been used that are objective methods (measuring plasma concentrations of sedation drugs, frontal electromyogram, lower oesophageal contraction, electroencephalogram, Bispectral Index monitoring (BIS), auditory evoked potentials) and subjective methods such as Ramsay Sedation Scale (RSS), Motor activity scale, Richmond Agitation Sedation Scale (RASS), Riker Sedation-Agitation Scale (RSAS).5

In 1974, Ramsay published the well-known Ramsay Sedation Scale (RSS) by evaluating the effects of dalphaxolone or alphasolone sedation in 30 patients at the Intensive Care Unit using 6 point anxious or agitation scale to patients who did not have a response to stimulation. Since being published, the Ramsay scale has been used by many researchers and has also been used in 20 of 31 randomized controlled trials (RCTs) to compare sedation drugs with sedation quality or duration of mechanical ventilation. In 2002 the Richmond Agitation Sedation Scale (RASS) was introduced. The RASS scale was designed to have precise, unambiguous definitions for the level of sedation in the assessment of wakefulness, awareness, and general response resistance (open eyes, eye contact, physical movements) to sound and physical stimuli that are present in logical development.6

Bispectral Index (BIS) is a new electroencephalogram parameter specifically developed to measure the effects of sedation and hypnotics that are produced by anesthetic drugs. The main role of BIS is to measure the depth of anesthesia and it is useful for adjusting the dose of sedative drugs. The BIS index is a

number between 0 and 100 on a scale that correlates between a good clinical outcome and the state of the EEG during anesthetic administration. BIS value close to 100 represents a clinical state of "awake / fully conscious". while BIS value of 0 has the meaning that there is no EEG activity.<sup>7</sup>

There was a correlation between BIS and RASS to evaluate the depth of sedation at the Intensive Care Unit in patients undergoing Flexible Fiberoptic Bronchoscopy (FFB) ( $p < 0.05$ ). The study results show that BIS monitoring is a meaningful tool that can be applied as an additional and alternative method for assessing sedation, especially for high-risk patients who are susceptible to sedation or over-sedation.<sup>8</sup>

At present, the use of BIS has limitations where not all hospitals have these facilities so that subjective modalities are used more often. Sedation scales that are often used are the Ramsay sedation scale (RSS) and the Richmond agitation sedation scale (RASS). Several studies had shown results that the BIS value is significantly correlated with the RASS score for evaluating sedation in patients at the Intensive Care Unit. However, studies supporting the correlation of BIS with other sedation scales such as the Ramsay Sedation Scale (RSS) are still lacking. Thus, the current study aims to assess the comparison of BIS correlation with RASS and BIS correlation with RSS in patients at the Intensive Care Unit, so that a sedation scale that is correlated well with BIS can be used to evaluate a better depth of sedation.

## II. METHODS

This study is an analytic study with a cross-sectional design carried out in the Intensive Care Unit at Haji Adam Malik General Hospital Medan. Consecutive sampling is a sample selection technique by which all subjects who come and meet the selection criteria are included in the study until the number of subjects is met. After obtaining approval from the Ethics Committee, Faculty of Medicine, University of North Sumatra, based on inclusion and exclusion criteria 34 research samples were collected. All samples were given sedation drugs (Midazolam) and BIS values were measured. After the BIS value reached 65-85, the patient was observed and we recorded the level of sedation using RASS sedation score and RSS sedation score and then compared statistically. In analyzing the data of this study, we used inferential analysis to see the correlation. Previously, a normality test will be conducted, namely Kolmogorov Smirnov test, if the data is normally distributed then the Pearson correlation test will be used, whereas if the data is not normally distributed the Spearman correlation test will be used. Correlation was considered significant if the  $p$  value  $< 0.05$ .

## III. RESULTS

This study was attended by 34 subjects who met the inclusion criteria. The characteristics of this study were displayed based on gender, age group, job, body weight and Critical-Care Pain Observational Tool (CPOT).

### 4.1 Demographic Data Table

Gender	N	%	p-value*
Male	18	52.9	0.200
Female	16	47.1	
Age Group	n	%	
18-37	7	20.6	0.083
38-57	20	58.8	
>58	7	20.6	
Job	n	%	
Entrepreneur	16	47.1	0.535
Housewife	8	23.5	
Farmer	8	23.5	
Civil Servant	2	5.9	
CPOT	n	%	
0	20	58.8	0.348
1	14	41.2	
Total	34	100	

\*Kolmogorov Smirnov test

The last characteristics of this study was body weight with the mean Predicted Body Weight (PBW) of  $55.94 \pm 7.4$ .

Based on table 4.1, 34 samples were found, including 18 male (52.9%), and 16 female (47.1%). From the statistical test result, distribution of demographic data based on gender was found normal with  $p$  value  $> 0.05$ .

Also from table 4.1, age group obtained by this study was 7 (20.6%) with an age range of 18-37 years, 20 (58.8%) samples with an age range of 38-57 years and 7 (20.6%) samples with age above 57 years. Based on statistical tests, it was found that distribution of demographics data based on age group was normal with  $p > 0.05$  with mean (mean  $\pm$  SB) of  $49.7 \pm 1.0$ .

Based on table 4.1 in this study, based on job followed by 16 (47.1%) samples with job as an entrepreneur, 8 (23.5%) samples with job as a housewife, 8 (23.5%) samples with job as a farmer and 2 (5.9%) samples with job as a civil servant. Based on statistical test, it was found that distribution of demographic data based on job was normal with  $p$  value  $> 0.05$ .

Based on table 4.1, in this study samples obtained based on Critical-Care Pain Observational Tool (CPOT) were 20 (58.8%) samples with CPOT values of 0 and 14 (41.2%) samples with CPOT values of 1. Based on statistical test, it was found that distribution of demographic data based on CPOT was normal with  $p$  value  $> 0.05$ .

### 4.2 Overview of Correlation Between Bispectral Index (BIS) and Ramsay Sedation Scale (RSS)

Depth of Sedation	BIS		RSS		Pearson Correlation	p-value*
	N	%	N	%		
Mild sedation	0	0	5	14,7	0,350	0,042
Moderate sedation	34	100	24	70,6		
Deep sedation	0	0	5	14,7		
Total	34	100	34	100		

\*Pearson test

In this study based on table 4.2, we found a moderate positive correlation (0.350) between BIS and RSS using Pearson correlation and statistically it was significant with  $p$  value < 0.05.

### 4.3 Overview of Correlation Between Bispectral Index (BIS) and Richmond Agitation Sedation Scale (RASS)

Depth of sedation	BIS		RASS		Pearson correlation	p-value*
	N	%	N	%		
Mild sedation	0	0	2	5,9	-0,232	0,187
Moderate sedation	34	100	30	88,2		
Deep sedation	0	0	2	5,9		
Total	34	100	34	100		

\*Pearson test

In this study based on table 4.3, we found that there is a weak negative correlation (-0.232) between BIS and RASS using Pearson correlation and statistically it was insignificant with a  $p$  value > 0.05.

## IV. CONCLUSIONS

From the results of this research conducted to see the comparison of Richmond Agitation Sedation Scale (RASS) and Ramsay Sedation Scale (RSS) with Bispectral Index (BIS) to evaluate the depth of sedation in patients at the Intensive Care Unit, it can be concluded that:

1. The average value of Richmond Agitation Sedation Scale (RASS) was -0.88 and Ramsay Sedation Scale (RSS) was 3.55 after the administration of sedation.

2. Bispectral Index Correlation when evaluating the depth of sedation in patients at the Intensive Care Unit with the Richmond Agitation Sedation Scale (RASS) showed a non-significant weak negative correlation ( $r = -0.232$ ,  $p > 0.05$ ) compared to the correlation of the Ramsay Sedation Scale (RSS) using Bispectral Index ( $r = 0.350$ ,  $p < 0.05$ ).

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