Comparison of Sinclair and APFEL Score in The Incidence of Post Operational Nausea and Vomiting (PONV) With General Anesthesia at H. Adam Malik Hospital, Medan

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Abstract- **Background:** PONV (postoperative nausea and vomiting) is a complication that often occurs in operations with general anesthesia. Non-pharmacological and pharmacological prophylaxis provide an advantage against this complication. The risk score for PONV prediction had been used as a means of classifying patients according to risk prediction and providing prophylaxis such as the Sinclair and Apfel scores.
Objective: To compare the sensitivity and specificity between the Sinclair score and Apfel score in the incidence of PONV in postoperative patients with general anesthesia at H. Adam Malik Central General Hospital Medan.
Methods: This study used an analytic cohort design with a sampling technique using consecutive sampling. Analysis of the difference in Siclair and Apfel scores using the Mann-Whitney test.
Results: The characteristics of the sample had the most gender was 35 women (59.3%) and 24 men (40.7%), p = 0.01. The most type of surgery was gynecological surgery 15 people (25.4%) and the lowest was eye surgery 1 person (1.7%), p=0.6. The mean systolic blood pressure was 122.71 ± 9.61, p=0.53 while the mean diastolic blood pressure was 80.67 ± 7.84, p=0.36. In this study, 18.6% (11 people) had nausea, and 81.4% (48 people) did not had nausea. The Scinclair score using the diagnostic test had sensitivity 69%, specificity 64%, and accuracy 0.61%, while the Apfel score had sensitivity 63%, specificity 77%, and accuracy 57%.
Conclusion: There is a significant difference between the Sinclair score and the Apfel score.

Index Terms- PONV, Sinclair score, Apfel score, General Anesthesia

I. Introduction

Postoperative nausea and vomiting, or what is often known as PONV (postoperative nausea and vomiting) is a complication that often occurs in operations undergoing general anesthesia. The incidence of PONV is approximately 30% of all patients undergoing general anesthesia. Although PONV almost always goes away on its own, patient discomfort after surgery can occur, and in severe cases it can lead to serious complications [1]
PONV is a co-occurrence that has been found for a long time. Several studies have described the mechanism of opioid-induced emesis as a cause of PONV [2] . Opioids can stimulate opioid receptors on the CTZ and induce emesis [3].

Risk factors for PONV were categorized into patient, anesthetic, and surgical risk factors. Patient risk factors include obesity [1,4], child age [5–7], and female gender [1,8]. The increased risk of PONV is also influenced by the type of surgery and the length of surgery [9,10].

Recently, risk scores for predicting PONV have been used to classify patients according to the predicted risk for prophylactic administration according to that classification [9].

To date, scoring systems for PONV vary widely. There is a Sinclair score which has seven risk factors that are categorized as having moderate power in predicting PONV and more accurate in predicting PONV in children than adult[9,11]. Another study comparing the sensitivity and specificity of the Apfel, Koivuranta, and Sinclair scores found that the Koivuranta score was the most sensitive and the Sinclair score the most specific in predicting PONV. However, based on the AUC showing accuracy, the Apfel score was the most accurate predictor of PONV. The Apfel score is recommended because it is considered more accurate and has simpler variables [12].

In order to identify high-risk patients who would benefit from antiemetic treatment, several scores such as the Apfel and Sinclair scores have been proposed. However, there is no scoring system that has been used as a standard based on its accuracy for PONV risk assessment, especially in Indonesia. So researchers are interested in determining the comparison of Apfel and Sinclair scores in predicting the incidence of postoperative nausea and vomiting (PONV) under general anesthesia at Haji Adam Malik Hospital, Medan.

II. RESEARCH METHODOLOGY

Study Design

This study is an analytic observational study with a cohort design to compare Apfel score and Sinclair score in predicting the incidence of postoperative nausea and vomiting under general anesthesia at Haji Adam Malik General Hospital, Medan.

This research was conducted in the treatment room, central operating room, and postoperative recovery room at Haji Adam Malik General Hospital Medan.

This research has received approval from the Ethics Commission of the Faculty of Medicine, University of North Sumatra and a research permit from the Haji Adam Malik General Hospital Medan

Population and Research Sample

The study population was all patients who underwent elective surgery under general anesthesia at the Haji Adam Malik General Hospital Medan.

The research sample was patients who underwent elective surgery at Haji Adam Malik General Hospital Medan who met the inclusion and exclusion criteria of the study. The technique of obtaining samples was by consecutive sampling, namely looking for patients who met the inclusion and exclusion criteria until the required number of samples was met.

The inclusion criteria for our study were patients aged 18-50 years, undergoing elective surgery under general anesthesia, PS ASA 1-2, and undergoing surgery (ENT, ophthalmology, plastic, abdominal, gynecological, and orthopedic especially shoulder and knee). While the exclusion criteria were patients who refused to participate in the study, pregnancy, increased intracranial pressure, history of taking antiemetic drugs, and Sinclair score >4. The dropout criteria in this study were patients who experienced respiratory and cardiac arrest during surgery, and patients admitted to the ICU after surgery.

Thus, a total of 59 research samples that have met the inclusion and exclusion criteria have been obtained and included in the analysis.

Method

All patients taken by consecutive sampling were included in the study sample to assess the predictive score of PONV with Apfel and Sinclair scores. At the time of the patient's surgery schedule the next day, patients who met the inclusion and exclusion criteria was determined. All patients in the study sample were fasted 8 hours before surgery.

Upon arrival in the operating room, standard monitoring equipment was installed, oxygenation with a nasal cannule 3 liters/minute and an intravenous line was ensured. Hemodynamic recording in the form of blood pressure, pulse, respiratory rate, and oxygen saturation.

To start the general anesthetic process, midazolam 0.1 mg/kgBW intravenously was given, and fentanyl 2 mcg/kgBW intravenously was given. Induction was done by administering propofol 2 mg/kgBW intravenously.
Furthermore, relaxation was carried out by giving rocurronium 1 mg/kgBW intravenously.

Airway patency is maintained by insertion of an endotracheal tube (ETT). The patient's hemodynamics was maintained in a stable condition. Anesthesia was maintained until the end of surgery with MAC isoflurane 1.0 volume%. For maintenance of intraoperative analgesia, fentanyl injection of 0.5-1.5 mcg/kgBW intravenously (bolus) was administered.

After the surgery was completed, the patient was transferred to the recovery room, and given oxygen using a nasal cannula.

Post-anesthesia monitoring consists of hemodynamic monitoring (blood pressure, pulse, respiratory rate, oxygen saturation), and electrocardiography.

After the operation was completed and the patient was fully conscious with an alderete score >9, then the PONV incident was recorded up to 24 hours postoperatively starting from 2 hours, 6 hours, and 24 hours.

The collected data was processed and analyzed statistically using the SPSS Windows program. Numerical data is presented in the mean ± standard deviation and statistical tests to compare between statistically significant or significant.

III. RESULT

Patient Characteristics

A total of 59 samples of patients who met the inclusion and exclusion criteria were included in the study and an analysis of the basic characteristics of the research subjects was carried out, the results of which are summarized in table 1.

Patients in our study had a mean age of 45 ± 14.26 years. Our sample is mostly female as many as 35 people (59.3%) while the male sample is 24 people (40.7%). Based on the type of surgery the patient underwent, the most was gynecological surgery as many as 15 people (25.4%) and the least was eye surgery as many as 1 person (1.7%). The mean systolic blood pressure was 122.71 ± 9.61 mmHg, while the mean diastolic blood pressure was 80.67 ± 7.84 mmHg. The mean BMI in our study sample was 24.97 ± 3.72. Data on age, type of surgery, systolic, diastolic blood pressure, and BMI have p>0.05, so the sample can be said to be normally distributed.

Of the 59 samples of our study, 11 patients experienced PONV or postoperative nausea and vomiting. A total of 2 (18.2%) male patients and 9 (81.8%) female patients had PONV. There were 5 (45.5%) patients who underwent gynecological surgery experienced PONV, and each of 2 (18.2%) patients who underwent digestive, orthopedic, and plastic surgery experienced PONV.

Table 1. Patients Characteristic

Characteristic	n(%) = 59	n Nausea(%) = 11
Age (years)	45 ± 14,26	
Gender		
Man	24 (0,7)	2 (18,2)
Woman	35 (59,3)	9 (81,8)
Operation Type		
Digestive	11 (18,6)	2 (18,2)
Gynecology	15 (25,4)	5 (45,5)
Cardiovascular	2 (3,4)	-

Eye	1 (1,7)	-
Oncology	6 (10.2)	-
Orthopedics	9 (15,3)	2 (18,2)
Plastic	5 (8,5)	2 (18,2)
ENT	2 (3,4)	-
Urology	8 (13,6)	-
Systolic BP (mmHg)	122,71 ± 9,61	
Diastolic BP (mmHg)	80,67 ± 7,84	
BMI	24,97 ± 3,72	

Characteristics of the Apfel Score and the Sinclair Score

In table 2 which contains the characteristics of the patient's Apfel and Sinclair scores, it was found that the patients who had mild risk based on the Apfel score were 42 people (71.2%) and 17 people with moderate risk (28.8%). Based on the Sinclair score, there were 13 people (22%) included mild risk and 46 people (78%) having moderate risk.

Table 2. Characteristics of the Apfel Score and the Sinclair Score

Characteristic	n(%) = 59	p-*value*
Apfel		0,067
Mild Risk	42 (71,2)	
Moderate Risk	17 (28,8)	
Sinclair		0,45
Mild Risk	13 (22)	
Moderate Risk	46 (78)	

Sensitivity, Specificity, and AUC Apfel Score and Sinclair Score

In our diagnostic test, as shown in Table 3, it was found that the Sinclair score had a sensitivity of 69%, specificity 64%, and accuracy 61%, while the Apfel score had a sensitivity of 63%, specificity 77%, and accuracy 57%.

Table 3. Sensitivity, Specificity, and AUC Apfel Score and Sinclair Score

	Sensitivity	Specificity	AUC	p- *value*
Sinclair	69%	64%	0,61	0,03
Apfel	63%	77%	0,57	

IV. DISCUSSION

In our study, it was found that the Sinclair score had a sensitivity of 69%, specificity 64%, and an accuracy of 0.61%, while the Apfel score had a sensitivity of 63%, specificity of 77%, and accuracy of 0.57%. With a p value <0.05 which indicates a significant difference between the sensitivity and specificity of the Sinclair score compared to the Apfel score on the incidence of PONV in patients under general anesthesia.

Based on previous studies, the Apfel score had higher sensitivity and specificity than the Sinclair score, with the sensitivity and specificity of the Apfel score of 87.5% and 50.0%, while the Sinclair score was 70.8% and 22.7%[13]. Based on another study, the Apfel score was found to have better discriminatory and calibration properties for predicting PONV than the Sinclair score. In addition, the simplified Apfel score is also useful as a tool for risk assessment of PONV in clinical practice and for research purposes [14]

A study conducted at Hasan Sadikin Hospital, Bandung, stated that the sensitivity and specificity of Apfel scores were 61.9% and 81% and the incidence of PONV in patients under general anesthesia was in accordance with the predicted Apfel scores. In this study, the Apfel score was considered to have good validity as a predictor of the incidence of PONV seen from the AUC value of 0.777 [15]. In patients with high Apfel scores and undergoing head and neck surgery, anesthesiologists can predict an increased risk of severe PONV associated with opioid-based intravenous patient-controlled analgesia (PCA IV) [16].

Another literature comparing the sensitivity and specificity of the Apfel and Sinclair scores stated that the Apfel score had a higher sensitivity than the Sinclair score, namely 79.5% vs. 73.1% (Apfel vs Sinclair). However, the specificity of Sinclair's score was higher than Apfel's score, which was 45.9% vs. 48.6% (Apfel vs Sinclair). Both scores were considered to have moderate confidence as predictors of PONV with AUC < 0.8 [12].

In this study, 18.6% (11 people) experienced nausea. This is in line with previous studies[14] which described the incidence of PONV as ranging from 20 – 30% after general anesthesia, much more than the 9% reported by Sinclair, Chung, and Mezei. Interestingly, this latter study was very close to the incidence of severe nausea (8%) seen in the same population by Koivuranta et al [9].

The incidence of PONV is known to increase with increasing Apfel scores. The addition of 1 Apfel score increases the incidence of PONV by about 20%. The percentage incidence of PONV in each Apfel score group in our study was similar to the predicted Apfel score [15,17].

The Apfel score can also differentiate groups of patients at high risk and low risk for PONV. In one study, the cut-off value of Apfel score was 3. The value ≥3 had a higher incidence of PONV than Apfel score <3, with a statistically significant difference. The Apfel score value of 3 has a sensitivity of 61.9% and a specificity of 81.0%. This means that 61.9% of patients with Apfel 3 were predicted to have PONV [15].

Apfel and Sinclair scores have significantly higher discriminating power than Palazzo, Gan, and Scholz scores. The adoption of such a significant score is recommended and a prophylactic antiemetic strategy should also be considered [18].

V. CONCLUSION

There is a significant difference between the Sinclair score and the Apfel score, where the Apfel score had a sensitivity of 63%, specificity of 77%, and accuracy of 57%. The Sinclair score obtained a sensitivity value of 69%, specificity of 64%, and accuracy of 61%,

The incidence of PONV was found in the Sinclair and Apfel scores, namely 18.6% (11 people) of patients experienced nausea and 81.4% (48 people) did not experience nausea.

VI. SUGGESTION

The predictive PONV score can be used in everyday clinical practice to determine which patients are at high risk of developing PONV. In addition, future studies can compare Sinclair and Apfel's PONV prediction scores in different sample groups for more significant results.

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