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Comparison between the Apfel score and the Koivuranta score in predicting the occurrence of postoperative nausea and vomiting during general anesthesia

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ABSTRACT

Background: PONV is one of the side effects that often occur after general anesthesia, occurs in the first 24 hours post surgery and occurs in as many as 30-70% of hospitalized patients. PONV greatly avoided by most patients and anesthesiologists. Recent risk score for prediction of PONV has been used as a way to classify patients according to risk prediction and provide prophylaxis in accordance with this classification. For everyday clinical purposes, a simple risk score in easy to do and shows the correlation between the predicted incidence of PONV in patients hospitalized. In the clinical practice known various risk score for prediction of PONV as Apfel scores, Koivuranta scores, Sinclair scores, Palazzo scores, Gan scores, and Scholz scores varying accuracy. **Methods:** The research design was a cohort study with the total of 80 patients recruited. Ordinal and nominal data was analyzed using chi-square test. P value < 0,05 was declared significant with 95% confidence level. Measurements taken are incidence of PONV between Apfel scores to Koivuranta scores with PONV scores. **Results:** Incidence of PONV in patients who carried the scoring with Apfel scores higher (80%) than Koivuranta scores, and statistically highly significant differences (p < 0,01). The results said that Apfel scores are more accurate than the Koivuranta scores, indicated by results of PONV scores positive (>1) on the Apfel scores 32 people (80%) and on the Koivuranta scores 12 people (30%), whereas PONV scores negative (≤ 1) on the Apfel scores 8 people (20%) and on the Koivuranta scores 28 people (70%). **Conclusions:** Apfel scores are more accurate than the Koivuranta scores in predicting the occurrence of PONV in patients with general anesthesia.

Kata kunci: PONV, Apfel scores, Koivuranta scores, nausea, vomiting

Introduction

Postoperative Nausea and Vomiting (PONV) is one of the side effects that often occurs after general anesthesia, occurring in the first 24 hours after surgery and occurring in 30-70% of inpatients (Gan, 2006; Gan, 2003). Although PONV almost always goes away on its own and is not fatal, it shows significant morbidity rates, where dehydration, electrolyte imbalances and sutures can become strained and open. Every incident of vomiting will delay the patient's exit from the recovery room (Gan, 2006).

PONV is largely avoided by most patients and anesthesiologists. However, nonselective antiemetic prophylaxis does not improve outcomes except in high-risk patients. Recently risk scores for PONV prediction have been used as a way to classify patients according to the predicted risk and provide prophylaxis according to that classification. For everyday clinical purposes, a simple risk score is easy to perform and shows a correlation between predictions and the incidence of PONV in hospitalized patients (Pierre et al, 2004).

There is no scoring system that is used as the gold standard based on its accuracy. The main developments in scoring systems focus on simplifying the scoring system for ease of assessment. For adults, Apfel and Koivuranta have created a simple scoring system with 4 and 5 risk factors (Apfel et al, 1999; Koivuranta et al, 1997). In adults, the Apfel and Koivuranta scores showed statistically higher predictive value than the Palazzo and Evans scoring system. In this study, it was also found that the strength of the Apfel score on the ROC curve was higher than Koivuranta (0.68 and 0.66) (Apfel et al, 2002). In other research, numerically the ROC curve Koivuranta score was greater than the Apfel score, namely (0.66 and 0.63) (Rusch et al, 2005). However, research conducted by Pierre et al showed that the Apfel score was significantly more accurate than the Sinclair score in research on adult patients (Pierre et al, 2002).

In ASPAN's (American Society of Perianesthesia Nurse) guideline for prevention and/or management of PONV/PDNV the Apfel score and Koivuranta score are used to assess patient groups based on their risk of PONV (ASPAN, 2006). This shows that these two scoring systems can be used to assess PONV predictions and find out which score is more accurate between the Apfel score and the Koivuranta score using diagnostic tests.

The main purpose of this study is to determine whether the scores Apfel more accurate than Koivuranta scores in predicting the occurrence of PONV in patients with general anesthesia.

Methods

The research design used was a cohort study with a prospective analytical observational approach. The research sample was 80 patients who were divided into two groups, namely the Apfel score group and the Koivuranta score group with 40 patients in each group. The research was carried out in the central surgery building at GBST RSUP DR Sardjito Yogyakarta after obtaining approval from the Ethics Committee of the Faculty of Medicine UGM. Before the research is carried out, the patient must agree and sign a letter of consent to take part in the research, after the patient has previously received an explanation regarding matters related to the research both verbally and in writing. All patients taken by consecutive sampling were included as research samples to assess PONV prediction scores using the Apfel score and Koivuranta score.

Table 1. Apfel Score (Ebell, 2007; ASPAN, 2006)

Apfel Score	
Risk Factor	**Points**
Woman	1
Do not smoke	1
History of PONV/ motion sickness	1
Postoperative Opioids	1
Amount	0....4

Table 2. Koivuranta Score (Ebell, 2007; ASPAN, 2006)

Koivuranta Score	
Risk Factor	**Points**
Woman	1
Do not smoke	1
History of PONV	1
History of motion sickness	1
Surgery time > 60 minutes	1
Amount	0....5

In the ward, an IV has been installed since the start of fasting, with a maintenance drip of 2 ml/kgBW/hour. After the patient enters the operating room, an ECG, NIBP and oxygen saturation monitor is installed. With premedication midazolam 0.05 mg/kgBW IV, fentanyl 1-2 mcg/kgBW IV, propofol induction 2-2.5 mg/kgBW IV, intubation facilities using rocuronium 0.6 mg/kgBW IV or atracurium 0.5 mg/ kgBB iv. Maintenance of anesthesia using O_2 : N_2O = 50% : 50% and isoflurane. Ventilation is controlled manually.

After extubation, the patient is transferred to the recovery room. After the patient is fully conscious, with an Aldrete score above 9, PONV is assessed within 24 hours starting from 2 hours postoperatively. Patients were assessed for postoperative PONV with the PONV scale.

The PONV scale (Northclife et al, 2003) is expressed by numbers:

Score 1: no nausea/vomiting

Score 2: nausea only

Score 3: vomited once

Score 4: vomiting more than once

Score 5: vomiting to the point of requiring additional anti-emetic medication.

Ordinal and nominal data was analyzed using chi-square test. P value < 0,05 was declared significant with 95% confidence level. Measurements taken are incidence of PONV between Apfel scores to Koivuranta scores with PONV scores.

Results

Demographic Data

Demographic data of research subjects includes: age, gender, body mass index (BMI), education, type of surgery, and physical status which are thought to have bias in measuring PONV scores.

Table 3. Demographic data of research subjects

Variable	Group Apfel Score	Group Koivuranta Score	p value

Age (year)			
18-32	21 (52.5%)	12 (30.0%)	
33-46	12 (30.0%)	15 (37.5%)	0.101
47-60	7 (17.5%)	13 (32.5%)	
Gender			
Male	8 (20.0%)	14 (35.0%)	0.133
Female	32 (80.0%)	26 (65.0%)	
BMI (kg/m²)			
18.00-21.99	24 (60.0%)	18 (45.0%)	0.179
22.00-25.00	16 (40.0%)	22 (55.0%)	
Education			
Elementary School	9 (22.5%)	8 (20.0%)	
Junior/Senior High School	16 (40.0%)	25 (62.5%)	0.084
Bachelor	15 (37.5%)	7 (17.5%)	
Type of Surgery			
Gynecologic	1 (2.5%)	6 (15.0%)	
Digestive	2 (5.0%)	4 (10.0%)	
Onkology	2 (5.0%)	2 (5.0%)	
Laparascopy	15 (37.5%)	8 (20.0%)	0.272
Ear Nose Throat	8 (20.0%)	8 (20.0%)	
Eye	12 (30.0%)	12 (30.0%)	
Physical status ASA			
1	26 (65.0%)	18 (45.0%)	0.072
2	14 (35.0%)	22 (55.0%)	

*p< 0.05 = statistically significant difference

Based on table 3, the demographic data of the research subjects shows equality with p value > 0.05, it can be said that the research subjects have homogeneous demographic data, so they can be compared and do not influence the results of further research.

PONV Incidence with PONV Score between Apfel Score and Koivuranta Score

Table 4. PONV Incidence with PONV Score between Apfel Score and Koivuranta Score

Variable	Group Apfel Score	Group Koivuranta Score	p value
PONV Score			
Positive (>1)	32 (80.0%)	12 (30.0%)	0.000*
Negative (≤ 1)	8 (20.0%)	28 (70.0%)	

*p< 0.05 = statistically significant difference

*p< 0.01 = very different and statistically significant

In table 4, it was found that there was a very significant difference (p<0.01) for the PONV Score between the Apfel Score and the Koivuranta Score in subjects undergoing elective surgery under general anesthesia. PONV scores were positive (>1) in subjects assessed by the Apfel Score in 32 patients (80.0%), and in subjects assessed by the Koivuranta Score in 12 patients (30.0%). Meanwhile, the PONV score was negative (≤ 1) in subjects assessed with the Apfel Score as many as 8 patients (20.0%), and in subjects assessed with the Koivuranta Score as many as 28 patients (70.0%).

PONV Incidence with PONV Score between Male and Female Gender

Table 5. PONV Incidence with PONV Score between Male and Female Gender

Variable	PONV Score Positive (>1)	PONV Score Negative (≤ 1)	p value
Gender			
Male	8 (18.2%)	14 (38.9%)	0.039*
Female	36 (81.8%)	22 (61.1%)	

*p< 0.05 = statistically significant difference

Table 5 shows a significant difference (p<0.05) in PONV scores with the gender of research subjects who underwent elective surgery under general anesthesia. The PONV score was positive (>1) in research subjects with male gender as many as 8 patients (18.2%), and in research subjects with female gender as many as 36 patients (81.8%). Meanwhile, the PONV score was negative (≤ 1) in research subjects with male gender as many as 14 patients (38.9%), and in research subjects with female gender as many as 22 patients (61.1%).

PONV Incidence with PONV Score by Type of Surgery

Table 6. PONV Incidence with PONV Score by Type of Surgery

Variable	PONV Score Positive (>1)	PONV Score Negative (≤1)	p value
Type of Surgery			
Gynecologic	1 (2.3%)	6 (16.7%)	
Digestive	2 (4.5%)	4 (11.1%)	
Oncology	1 (2.3%)	3 (8.3%)	0.080
Laparascopy	13 (29.5%)	10 (27.8%)	
Ear Nose	11 (25.0%)	5 (13.9%)	
Throat	16 (36.4%)	8 (22.2%)	
Eye			

*p< 0.05 = statistically significant difference

Table 6 shows that there is no significant difference (p> 0.05) in PONV scores with the type of surgery in research subjects who underwent elective surgery under general anesthesia. PONV score was positive (> 1) in research subjects with gynecologic surgery in

1 patient (2.3%), digestive surgery in 2 patients (4.5%), oncology in 1 patient (2.3%), type of surgery laparoscopy in 13 patients (29.5%), ear nose throat surgery in 11 patients (25.0%), and 16 patients in eye surgery (36.4%). Meanwhile, the PONV score was negative (≤ 1) in research subjects with gynecologic surgery in 6 patients (16.7%), digestive surgery in 4 patients (11.1%), oncology surgery in 3 patients (8.3%), laparoscopic surgery was 10 patients (27.8%), ear nose throat surgery was 5 patients (13.9%), and eye surgery was 8 patients (22.2%).

Discussion

Based on the demographic data of the research subjects (table 3) which was tested using the chi-square test for categorical data, the prerequisite tests for comparative research have been fulfilled. The results of the research for the demographic data of the research subjects which were scored using the Apfel score and the Koivuranta score, there were no significant differences ($p>0.05$), so the data was said to be homogeneous or equal and would not be biased or influence the results in this study.

Based on table 4, it shows that there is a very significant difference ($p<0.01$) between the Apfel score and the Koivuranta score on the incidence of PONV. This means that the results of this study show that the Apfel score is more accurate in predicting PONV than the Koivuranta score, so the hypothesis in this study is accepted. The results of this research are supported by previous research conducted by Apfel et al (2002).

Research conducted by ASPAN (2006) states that the Apfel score can be used to assess PONV predictions. This score is used to assess patient groups based on their risk of PONV. When handling PONV according to ASPAN, the Apfel score with a score of 0-1 is considered low risk while a score above 1 is considered moderate to high risk. And according to ASPAN prophylaxis is given at a score above 1. Research by Pierre et al (2004) conducted on a population of adults undergoing general anesthesia stated that the incidence of PONV decreased within 24 hours after surgery from 49.5% to 14.3% ($p<0.001$) after administering prophylaxis according to the risk classified using a scoring system.

Apfel et al (1999) stated that an Apfel score with a score above 1 should be given PONV prophylaxis medication. A similar study was also conducted by Biedler et al (2004) which stated that giving PONV prophylaxis to patients at high risk significantly reduced the incidence of PONV from 47% to 39%.

Based on table 5, it shows that there is a significant difference ($p<0.05$) between the gender of research subjects who underwent elective surgery under general anesthesia and the incidence of PONV. This means that the results of this study show that female gender is a strong predictor of the incidence of PONV. The results of this study are supported by previous research conducted by Apfel et al (1999) where Apfel et al stated that female gender is a strong predictor of the incidence of PONV at 57%. Likewise, research conducted by Pierre et al in 2002 and 2004 stated that female gender was a strong predictor of PONV incidence of 90%. Similar research was also conducted by Koivuranta et al (1997) where Koivuranta et al stated that female gender was a strong predictor of PONV incidence of 66%.

Based on table 6, it shows that there is no significant difference ($p> 0.05$) between the type of surgery of research subjects who underwent elective surgery under general anesthesia and the incidence of PONV. This means that the results of this study indicate that the type of operation is not a strong predictor of the incidence of PONV. In this study, the highest frequency of PONV was

found in patients undergoing eye surgery, namely 16 patients (36.4%). However, previous research conducted by Choi et al (2005) stated that the highest frequency of PONV was found in patients undergoing gynecological surgery, namely 50%. In 1999 Apfel et al conducted a similar study with results stating that the highest frequency of PONV was found in patients undergoing laparotomy surgery at 75%. Likewise, research conducted by Koivuranta et al (1997) stated that the highest frequency of PONV was found in patients undergoing gynecological surgery at 52%.

Conclusions

From the results of the research and discussion it can be concluded that the Apfel score is more accurate than the Koivuranta score in predicting the occurrence of PONV in patients under general anesthesia. The Apfel score as a PONV prediction score can be used in everyday applications to determine patients who are at high risk of experiencing PONV, so that PONV prophylaxis should be given to reduce the incidence of PONV.

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