Original Research Article

A Study of Three Different Scoring Systems for Prediction of Postoperative Nausea Vomiting

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Abstract

Introduction: Post-operative nausea and vomiting (PONV) is one of common side effect that occurs after the surgery. Although it is not fatal, there are several physiological changes which lead to uncomforted for the patients. For the avoidance, prophylactic anti-emetic management is provided empirically to all patients who are receiving aneasthesia but there is a need to assess patients before the surgery as all patients are not prone to PONV. For this purpose, there are various scoring systems of PONV and this study has considered Apfel, Koivuranta and Ulleval scoring system for its effective evaluation.

Aims and Objectives: To statistically compare the efficacy of PONV scoring systems to predict risk of PONV in patients undergoing surgery

Materials and Methods: Total 200 number of patients enrolled in study which were posted for different type of surgeries. All patients were assessed for risk factors of all three mentioned scoring systems in pre-anaesthetic checkup. The scores obtained by the scoring systems were statistically analyzed.

Result: Although all the scoring systems are effective in prediction of PONV, the study found that percentage of prediction of Ullveal scoring system is higher (80%) compare to other scoring systems but not only this sensitivity and specificity score of Ullveal scoring system is higher compare to other systems.

Conclusion: The study has concluded that all the three scoring systems are effective to predict PONV but Ulleval scoring system is the most effective compared to other two scoring system for prediction of PONV

Keywords: PONV, Ullveal, Apfel, Koivuranta.

Background

In today's era life threatening post-operative complications have become very rare but still patients have to face few post-operative side effects. Of these side effects PONV (Post-operative nausea and vomiting) is the most frequent side effect in post operative period. In a preoperative survey, patients ranked emesis as the most

undesirable and nausea as the fourth most undesirable outcome among ten negative postoperative outcomes; post-operative pain ranked third in this study [1]. Though PONV is not very fatal complication but it causes lot of physiological changes in body like forceful contraction of glottis, diaphragm, abdominal muscles, excessive salivation, tachycardia, which are very uncomfortable for patients [2] Sometime PONV it can cause significant morbidity, including dehydration, electrolyte imbalance, suture tension and dehiscence, venous hypertension and bleeding, oesophageal rupture and life-threatening airway compromise [1,3] However, interventions to prevent PONV using prophylaxis are not needed in the majority of the general patient population. In addition, emperical interventions with anti-emetic drugs may cause side effects (allergy, dryness of mouth, prolong QT) and entail substantial expense. To avoid the side effects and expenses due to intervention of antiemetic drugs in unindicated patients and to give proper prophylactic anti-emetic management in

indicated patient we need to use good PONV predictor scoring systems. There are lot of PONV predictor scoring systems which helps to detect patients which are at risk of PONV but present study is carried out to find the most efficient scoring system among Apfel, Koivuranta and Ulleval scoring system.

Apfel Simplified score consisted of four predictors [4] Koivuranta system has 5 predictors [5] and Ullveal system has 10 predictors [6].

Materials and Methods

Primary aim was to compare the efficacy of above mentioned three PONV scoring systems to predict risk of PONV in patients undergoing surgery. Secondary aims were to evaluate the most predictable risk factors for the PONV and to detect patients who were actually needs prophylactic anti-emetic treatment with help of these scoring system. Study was conducted in total 200 patients (n = 200) admitted in different surgical department were posted for elective surgery.

Table 1

Department	No. of patients
Surgery	47
wynaec	50
Ortho	41
ENT	62

In this study we included patients with ASA grade I and II, of both genders, age ranging between 18- 75 years, willing to give consent and scheduled for any type of elective surgery under all type of anaesthesia except local. Patients with age less than 18 and more than 75 years, ASA grade III and IV were exluded from study. All patients were undergone for pre-anaesthestic checkup.

Before surgery we were assessed each patient under study for the risk factors mentioned in all three-scoring system of PONV under study. After assessment

according to total score each patients was classified as high risk and low risk for PONV.

In Apfel scoring system [4] (A score) patients were assessed for 4 risk factors–1)Is patient is female? 2)Is patient has history of motion sickness or PONV? 3) Is there need to use postoperative opoids? 4) Is patient smoker? This score (A score) ranges from 0-4 (Point for answer no is 0 and for yes 1). If total score was more than 3 considered as high risk for PONV and if less than 3 considered as low risk for PONV.

For Koivuranta scoring system [4] (K-score) patients were assessed for 5 risk factors - 1) Is patient female? 2)History of previous PONV? 3) Is duration of suergery over 60 min? 4)history of motion sickness? 5) is patient smoker? This score ranges from 0-5, (Point for answer no is 0 and for yes 1). If total score was more than 3 considered as high risk for PONV and if less than 3 considred as low risk for PONV.

In Ullveal scoring system [6] (U score) patients were assessed for 10 predictors of PONV. Risk factors – 1) Is the patient younger than 60 year of age? 2) Is the patient a female between 15 and 50 years? 3) Have the patient experienced PONV previously? 4) Does the patient suffer medium or much from travel sickness? 5) Is the patient usually a non-smoker? 6) Will the patient receive general anaesthesia? 7) Will the patient be in general anaesthesia based on something else than Propofol infusion? 8) Will the patient receive local/regional anaesthesia with opoid supplement intravenously? 9) Is the patient expected to need intravenous opioid postoperatively? 10) Is the patient scheduled for either strabismus surgery, laparoscopy, gynecological, laparotomy, inner ear surgery or thyroid surgery? For each question point 1 was given for yes answer. Except for question 4 – answer much gives point 2, question 6- if answer is yes 3 points are given and for question 7 patient received something else than Propofol infusion for a) between 30 -90 minutes= 1 points b) more than 90 minutes = 2 points. Total score ranges from 0-14. If score ≥ 7 consider as high risk for PONV and if score ≤ 7 consider as low risk for PONV.

Anti- emetic prophalyxis was not given to any patient in pre-operative and intra-operative period. Postoperatively they were observed for nausea and vomiting for 24 hours. Anti-emetic medication injection Ondensetron 4 mg intravenously was given immediately to patients who experienced nausea ≥ 10 minutes or one episode of vomiting. Iinjection Metoclopromide 10 mg IV was given after 15 minutes if still nausea and vomiting was persist.

Stastical Analysis

For each patient total score of the risk factors of each scoring system was done andthen patients were classified into two groups- high risk and low risk for PONV and then will analyzed for its positive and negative outcome in the form of PONV present or not.

For comparision of three scoring systems (Ulleval, Apfel and Koivuranta) we were applied the exact Fischer test to find whether it is statically significant or not. The Fisher's exact test is a statistical significance test used in the analysis of contingency tables where sample sizes are small. Test is useful for categorical data that result from classifying objects in two different ways and to examine the significance of the association (contingency) between the two kinds of classification. The p value ≤ 0.05 consider as significant.

Relative risk, odds ratio, *specificity and* sensitivity was calculated of all three-scoring system.

Results

In our study after applying all three scoring system for each patient we divided all patients in two groups as high risk and low risk for PONV. Then these patients were observed postoperatively for nausea and vomiting and they are again grouped as positive and negative for PONV.

Table 2: Apfel scoring system results

| Apfel score	PONV Positive	PONV Negative	Total
≥ 3	85	15	100
≤ 3	30	70	100
	115	85	
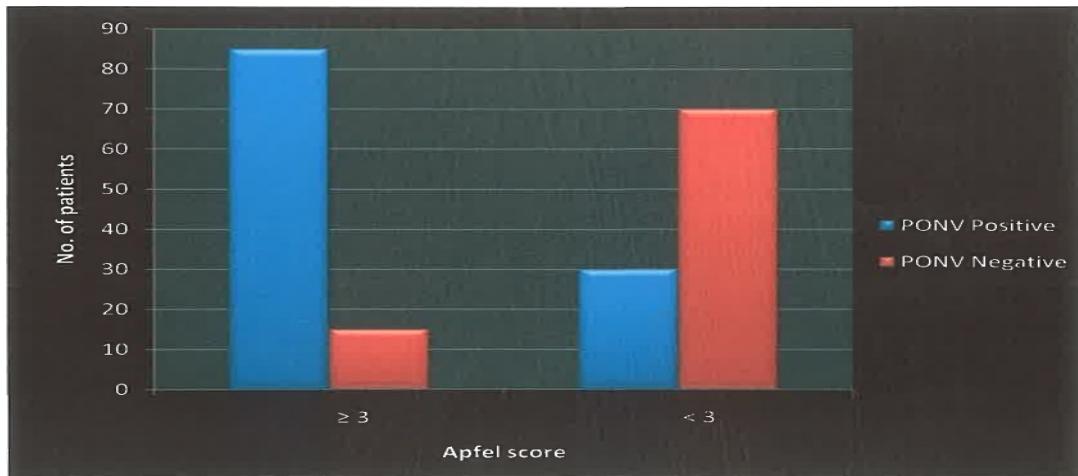
**Figure 1: Results of Apfel scoring system.**
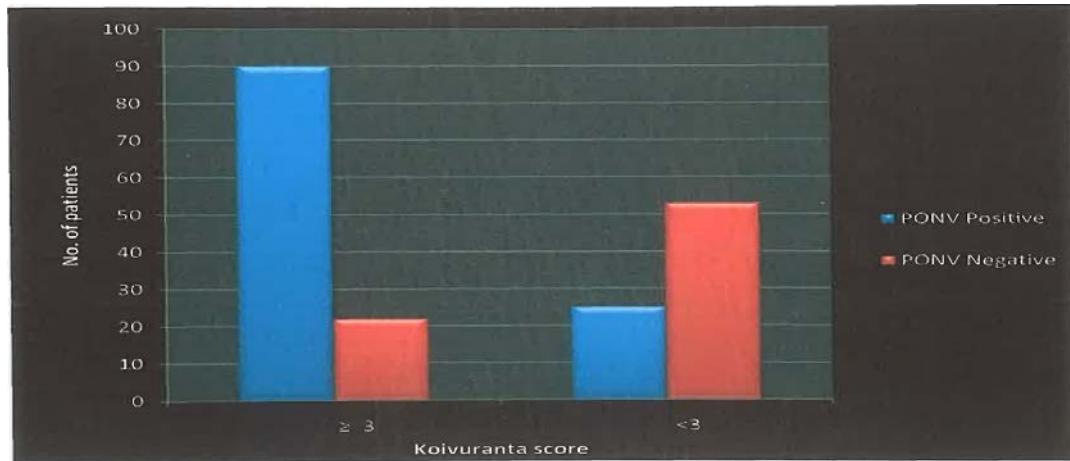
Figure 2: Results of Koivurantu scoring system

By applying the Exact — Fischer's test to the association of Apfel score (≥ 3 or <3) with PONV , it was shown to be highly statistically significant (P<0.001),with RR—2.83, OR—13.22,sensitivity— 0.73 and specificity — 0.

We found following results for Koivuranta system

Table 3: Koivuranta scoring system

Koivuranta score	PONV Positive	PONV Negative	Total
≥3	90	22	112
≤3	25	53	78
	115	85	200

By applying the Exact -Fischer's test to the association of Koivurantascore (*3 or <3) with PONV (as given in the table 3), it was shown to be highly statistically significant (P<0.001), With RR—2.50, OR—8.67,sensitivity-0.78 and specificity-0.70.

For Ullveal scoring system we found following results (Table 4).

Table 4: Ullveal scoring system results.

Score	PONV positive	PONV negative	Total
≥ 7	92	13	105
≤ 7	23	72	95
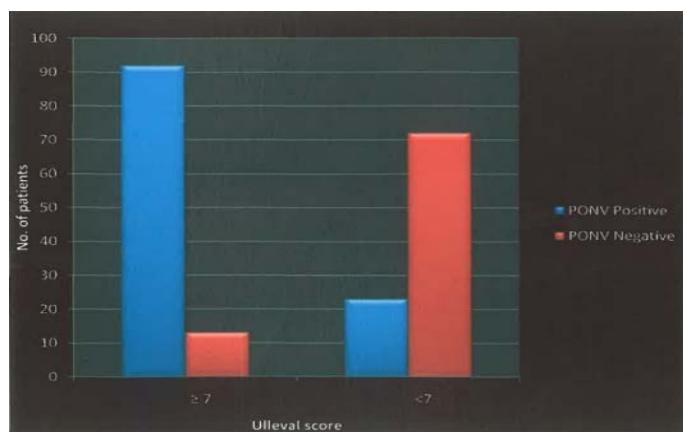
Figure 3: Results of Ulleval scoring system.

By applying the Exact — Fischer's test to the association of Ulleveal score (≥ 7 or ≤ 7) with PONV (as given in the table 12), it was shown to be statistically highly significant (P < 0.001), with RR — 3.61, OR —22.15,sensitivity—0.80 and specificity—0.84.

Ulleval, Apfel and Koivuranta scoring system was applied to all the 200 patients. Following table shows difference between results of these three scoring system.

Table 5: Difference between Results of 3 scoring system.

	U — Score (Score W)	K — Score (Scorea3)	A — Score (Scorea3)
No. of Patients with PONV	92	90	85
Percentage of prediction for PONV	80%	78.26%	73.91%
P Value	<0.0001	<0.0001	<0.0001
Relative risk	3.619	2.507	2.833
Odds ratio	22.15	8.673	13.22
Sensitivity	0.8000	0.7826	0.7391
Specificity	0.8471	0.7067	0.8235
Positive Predictive Value	0.8762	0.8036	0.8500
Negative PredictiveValue	0.7579	0.6795	0.7000

From this table we came to know that Ullveal scoring system has more sensitivity and specificity. Positive predictive and negative predictive value for PONV of Ullveal scoring system was more significant (percentage of prediction of PONV is 80%) than other scoring systems. This results shows that Ulveal scoring system is best to predict PONV among all three scoring system.

Summary of results

1. All the three scoring systems under study are found to be statically significant and can be used in prediction of Postoperative nausea and vomiting.

2. Among the three scoring systems Ulleval scoring system was found to be better in prediction of PONV with the 80%, followed by Koivuranta, Apfel with 78.26% and 73.91% respectively.

3. The relative risk and odds ratio was highest with Ulleval scoring system followed Apfel and Koivuranta.

4. The sensitivity among three scoring systems is highest with Ullevalfollowed by Koivuranta and Apfel.

5. The specificity was highest with Ulleval followed by Apfel and Koivurant

Discussion

In this study we comparing three scoring system to predict post- operative nausea

vomiting . With the help of best scoring system we can avoid unnecessary admistration of antiemetic drugs in low risk patients posted for surgery. Actually different factors are responsible for prediction of PONV like age, gender, type of surgery and anaesthesia, drugs used for anaesthesia, history of motion sickness, addiction of smoking and many more[1,7] R. Ssebuufu et al, in his study of PONV at Mulago hospital observed that among the females, 52% have PONV as compared to males (28%). Female gender increase likehood of PONV by three times [8]. Ashraf S. Habib, Tong J. Gan et al, found in their study that most reliable independent predictors of PONV were female gender, history of PONV or motion sickness, non-smoker, younger age, duration of anaesthesia with volatile anaesthetics, and postoperative opioids [9] Trope A et al found that patient receiving General anaesthesia has increased incidence of PONV than patient receiving regional anaesthesia [10]

L H Eberhart et al. evaluated three scoring system of PONV – Apfel, Koivarantu and Palazzo and they found all the three scoring system has moderate accuracy to predict PONV but Apfel and Koivuranta score predictability was better than Palazzo [11]

C. C. Apfel et al compared the predictability of six PONV scoring Apfel scoring system was found to be best systems in which discriminating power of (0.68) and then of Koivaranta system (0.66). In our study we found that percentage of predictability of PONV of Koivuranta scoring system is greater than Apfel scoring system but specificity of Apfel system was better than Koivuranta system [12]

C. C. Apfel and et al. did evidence-based analysis of individual risk factors for postoperative nausea and vomiting in 500 patients and they found female gender, previous history of postoperative nausea vomiting or motion sickness, non-smoker, duration of exposure to volatile agents

under anaesthesia and intraoperative use of opiods are strong risk factors for PONV. In Apfel and Koivuranta scoring system out of these strong predictors only four were included but in Ullval scoring system all these strong predictors were included so Ullveal scoring system can gives better predictability for PONV. In our study also we found Ulleval scoring system has highest percentage of prediction, sensitivity and specificity compared to Apfel and Koivuranta scoring system [13]

Conclusion

This current study has analyzed scoring systems that are used for the assessment of Post-Operative Nausea and Vomiting (PONV). The study found that all the three systems are effective for pre-determining PONV but the most efficient one is Ulleval scoring system. However, Ulleval scoring system showed highest relative risk although the sensitivity and specificity was the highest among the three systems. The study, although, had some limitations. There is a need to conduct more studies with larger varied populations and in more variety of surgeries. This current study evaluated scoring systems which can pre-determine PONV.

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