# Post-operative Nausea and Vomiting at Mulago Hospital

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**Background: Postoperative nausea and vomiting (PONV) are among the most common adverse events related to surgery and anaesthesia and despite modern anaesthetic and surgical techniques the incidence of PONV remains at 20-30%. The aim of this study was to determine the prevalence and factors associated with postoperative nausea and vomiting.**
**Methods: This was a prospective study. Precoded data were analyzed and for categorical variables data were summarized as proportions and presented using tables, histograms and pie charts. Continuous variables were analyzed by separating means using independent samples T-test. In the univariate analysis, Odds ratio together with 95% confidence interval was calculated to test for the association between the possible risk factors and outcome variables. Multivariate analysis was done using logistic regression model to determine prognostic factors of postoperative nausea and vomiting.**
**Results: One hundred eighty two patients aged 10 years and above met the inclusion criteria. They had fasted 6 hours prior to the operation and undergone both general anaesthesia and surgery. Patients who had medical and surgical conditions that led to nausea and vomiting were excluded. 53% of the patients were males and 43% were females. The prevalence of PONV was 40.7% within 24 hours after surgery. Factors that were statistically significantly (p value < 0.05) associated with PONV following univariate analysis included : age group 20 to 30 years, female gender, history of PONV, intra-operative use of Pethidine, type of operation (orthopaedic surgery) and postoperative use of Pethidine. Independent predictors of PONV include; age group of 20 to 30 years, history of PONV, and the type of operation.**
**Conclusion: Predictors of PONV within 24 hours include age group of 20 to 30 years, history of PONV and the orthopaedic surgery.**

## Introduction

Postoperative nausea and vomiting (PONV) are among the most common adverse events related to surgery and anaesthesia and despite modern anaesthetic and surgical techniques the incidence of PONV remains at 20-30%[1-3]. In a study done in Australia on the most frequently recorded complications in the first 24 hours after surgery, overall 37.7% of patients experienced nausea, vomiting or both. The audit sample comprised of 144 patients[4]. From Africa, a prospective study done in Nigeria found the incidence of nausea and vomiting 24 hours after surgery to be 41.6 % and 19.6% respectively[5]. Some clinicians view PONV as a minor medical problem because it is transient and does not carry mortality implications. Others have described PONV as the 'big little problem' facing practitioners today[6]. However, patients view PONV as a very unpleasant experience and this leads to distress and negative patient attitude towards surgery. PONV can also lead to abrupt hospital admission after day surgery and extended hospital stays[7,8]. No studies had been done in Uganda to describe the prevalence and risk factors associated with postoperative nausea and vomiting. This study was therefore aimed at establishing the prevalence and factors associated with PONV at Mulago Hospital Complex.

## Patients and Methods

This was a prospective study undertaken at Mulago National Referral teaching Hospital between November 2006 and March 2007. The study population consisted of a total of 199 patients from the general adult and paediatric surgical wards. Of these, 17 patients were excluded; 6 patients were discharged before 24 hours elapsed, 5 patients who had been schedule for general anaesthesia were given

spinal anaesthesia, 5 patients had no operation notes and anaesthetic sheet and 2 patients declined to participate in the study after having consented prior to surgery. Therefore the study involved 182 patients.

PONV was defined as having at least one episode of nausea, vomiting or both within 24 hours postoperatively. The final outcome which was postoperative nausea, postoperative vomiting and postoperative nausea and vomiting was considered dependent. A structured and pre-tested questionnaire was used to collect the required information that included social demographic characteristics and pre-anaesthetic assessment. Anaesthetic sheets and post-operative review forms were used. Precoded data was entered into the computer using EPI DATA 3.1 package and analyzed using SPSS version 11. Data was summarized as proportions and presented using tables, histograms and pie charts for categorical variables. Continuous variables were analyzed by separating means using Independent Samples *t*-test. In the univariate analysis, Odds ratio together with 95% confidence interval was calculated to test for the association between the possible risk factors and outcome variables (PONV). Then Pearson Chi-square test was used to test the level of significance. All variables with < 0.2 on univariate analysis were entered into a backward stepwise regression model to determine prognostic factors of PONV.

## Results

A total of 182 patients were enrolled in the study. Females accounted for 53.3% of the patients while 46.7% were males. The male to female sex ratio was 1: 1.14. The ages ranged from 11 to 84 years. The mean age of the study population was 35.4 years with standard deviation of 15.71. Most of the patients (63.7%) were aged between 16 and 45 years. The body mass index (BMI) was obtained by dividing weight (in kilograms) over square of the height (in metres).

**Table 1.** Summary of Some of Frequencies of Pre-Operative Factors

| Factors | | Frequency | Percentages |
|---|---|---|---|
| **Gender** | **Male** | **85** | **46.7** |
| | **Female** | **97** | **53.3** |
| **Smoking** | **Smoker** | **21** | **11.5** |
| | **Non-smoker** | **161** | **88.5** |
| **Alcohol Intake** | **Yes** | **65** | **35.7** |
| | **No** | **117** | **64.3** |
| **Motion sickness** | **Present** | **42** | **23.1** |
| | **Absent** | **140** | **76.9** |
| **Migraine headaches** | **Present** | **27** | **14.8** |
| | **Absent** | **155** | **85.2** |
| **Prior Anaesthesia** | **Yes** | **43** | **23.6** |
| | **No** | **139** | **76.4** |
| **History of PONV** | **Yes** | **11** | **6** |
| | **No** | **171** | **94** |
| **Morning sickness** [#] | **Yes** | **43** | **23.6** |
| | **No** | **36** | **19.8** |
| | **NA** | **103** | **56.6** |

[#] Only applicable to women who had been pregnant before

**Table 2.** Frequency of the outcome variables (PONV)

| Outcome | Frequency | Percent |
|---|---|---|
| Nausea | 37 | 20.3 |
| Nausea and Vomiting | 33 | 18.1 |
| Vomiting | 4 | 2.2 |
| None | 108 | 59.3 |
| Total | 182 | 100 |

**Table 3.** Pre-operative factors associated with PONV: result of univariate analysis* Reference category, OR Odds ratio, CI Confidence interval, +ve PONV present, -ve PONV absent

| Variable | | PONV (+ve) (%) | PONV (-ve) (%) | OR | 95%CI | P value |
|---|---|---|---|---|---|---|
| Age (years) | | | | | | |
| <20* | | 11(40.7) | 16(59.3) | | | |
| 20-30 | | 16(28.6) | 40(71.4) | 2.500 | 1.400-4.464 | 0.002 |
| 31-40 | | 15(38.5) | 24(61.5) | 1.600 | 0.839-3.050 | 0.153 |
| 41-50 | | 20(64.5) | 11(35.5) | 0.550 | 0.264-1.148 | 0.111 |
| >50 | | 12(41.4) | 17(58.6) | 1.417 | 0.677-2.966 | 0.356 |
| Sex | Female | 50(51.5) | 47(48.5) | 2.704 | 1.458-5.015 | 0.001 |
| | Male | 24(28.2) | 61(71.8) | | | |
| BMI | | | | | | |
| <20 | | 30(44.1) | 38(55.9) | 0.985 | 0.329-2.953 | 0.979 |
| 20-25 | | 30(36.6) | 52(63.4) | 1.348 | 0.455-3.990 | 0.590 |
| >25-30 | | 7 (43.8) | 9 (56.3) | 1.000 | 0.247-4.042 | 1.000 |
| >30* | | 7 (43.8) | 9 (56.3) | | | |
| History of PONV | Yes | 9 (81.8) | 2 (18.2) | 7.338 | 1.537-35.027 | 0.004 |
| | No | 65 (38.0) | 106(62.0) | | | |
| Smoker | Yes | 6 (28.6) | 15 (71.4) | | | |
| | No | 68 (42.2) | 93 (57.8) | 1.828 | 0.674-4.954 | 0.231 |
| Alcohol | Yes | 20 (30.8) | 45 (69.2) | 0.519 | 0.273-0.983 | 0.043 |
| | No | 54 (46.2) | 63 (53.8) | | | |
| Motion sickness | Yes | 22 (52.4) | 20 (47.6) | 1.862 | 0.928-3.733 | 0.078 |
| | No | 52 (37.1) | 88 (62.9) | | | |
| Migraine headache | Yes | 11 (40.7) | 16 (59.3) | 1.004 | 0.437-2.307 | 0.993 |
| | No | 63 (40.6) | 92 (59.4) | | | |
| Morning Sickness | Yes | 25 (58.1) | 18 (41.9) | 1.552 | 0.636-3.787 | 0.333 |
| (Females only) | No | 17 (47.2) | 19 (52.8) | | | |

**Table 4.** Intra-operative factors associated with PONV: Result of Univariate Analysis

| Variable | | PONV (+ve) (%) | PONV (-ve) (%) | OR | 95% CI | P value |
|---|---|---|---|---|---|---|
| Induction Agent | Ketamine | 36 (36.7) | 62 (63.3) | 0.626 | 0.343-1.145 | 0.127 |
| | Thiopentone | 38 (48.1) | 41 (51.9) | | | |
| Pethidine | Used | 18 (64.3) | 10 (35.7) | 3.150 | 1.360-7.295 | 0.006 |
| | Not used | 56 (36.4) | 98 (63.6) | | | |
| Type of operation | Abdominal* | 45 (50.0) | 45 (50.0) | | | |
| | *Orthopaedic* | 4 (10.8) | 33 (89.2) | 8.250 | 2.923-23.287 | 0.000 |
| | Thyroid | 19 (59.4) | 13 (40.6) | 0.684 | 0.338-1.385 | 0.292 |
| | Breast | 3 (25.0) | 9 (75.0) | 3.000 | 0.812-11.081 | 0.099 |
| | Others | 3 (27.3) | 8 (72.7) | 2.667 | 0.707-10.052 | 0.147 |
| Duration of operation (minutes) | < 60 | 28 (36.4) | 49 (63.6) | 1.364 | 0.746-2.495 | 0.312 |
| | >=60 | 46 (43.8) | 59 (56.2) | | | |
| Lowest systolic pressure (mmHg) | 0-90 | 15 (45.5) | 18 (54.5) | 1.271 | 0.595-2.718 | 0.535 |
| | Over 90 | 59 (39.6) | 90 (60.4) | | | |
| IV fluids used (mls) | 500-1000* | 20 (32.3) | 42 (67.7) | | | |
| | 1001-2000 | 43 (44.8) | 53 (55.2) | 1.233 | 0.824-1.843 | 0.308 |
| | 0ver 2000 | 11 (45.8) | 13 (54.2) | 1.182 | 0.529-2.638 | 0.683 |

* Reference category, OR Odds ratio, CI Confidence interval, +ve PONV present, -ve PONV absent

Thirty seven percent (37.4%) of the study patients had a BMI of less than 20, which indicates they were underweight. Those with normal weight (BMI 20-25) were 45.1% and 8.8% were overweight (BMI 25-30). Sixteen of the study patients were of obese with a BMI of over 30. Of the 182 study patients 74 (40.7%) had PONV. Females comprised 53% of patients with PONV. The majority of the study patients (92.9%) scored ASA 1 and ASA 11. The rest of the patients scored ASA 111. Patients with ASA score 1 and 11 who had PONV were 46% and 41% respectively. Out of 13 patients with ASA 111 score, only one patient had PONV. ASA score was not associated with PONV.

The majority of the study patients received pre-induction oxygen (96.7%), Atropine (95.1%), muscle relaxant (suxamethonium) (88.5%) and halothane (95.6%). Endotracheal intubation was done in 95.6% of the study patients and the rest had oropharyngeal airway used. Anaesthetic drugs given included Ketamine (53.8%), thiopentone (43.4%) and 1.6% Propofol. Twenty eight (15.4%) of cases received intra-operative Pethidine; Morphine and Tramadol were used in one patient each. No antiemetics were used intra-operatively on the study patients.

Most of the study patients (96.7%) had their first oral intake after 18 hours postoperatively. Only three percent (3.3%) took orally in the first 6-hours. The analgesia given in the majority of study patients was

Pethidine (64.8%) and only one patient got morphine. The rest of the study patients got diclofenac and paracetamol.

**Table 5.** Postoperative Factors Associated with PONV: Result of Univariate Analysis.

| Variable | | PONV (+ve) (%) | PONV (-ve) (%) | OR | 95% CI | P value |
|---|---|---|---|---|---|---|
| *Pethidine* | *Used* | 55 (46.6) | 63 (53.4) | 2.068 | 1.083-3.948 | 0.026 |
| | Not used | 19 (29.7) | 45 (70.3) | | | |
| Pain | Less pain | 30 (33.7) | 59 (66.3) | | | |
| | More Pain | 44 (47.3) | 49 (52.7) | 1.766 | 0.970-3.215 | 0.062 |
| Time of first oral intake (hrs) | 0-12* | 20 (27.0) | 54 (73.0) | | | |
| | 13-18 | 15 (46.9) | 17 (53.1) | 1.133 | 0.566-2.269 | 0.724 |
| | 19-24 | 39 (51.3) | 37 (48.7) | 0.949 | 0.605-1.488 | 0.819 |

* Reference category, OR Odds ratio, CI Confidence interval, +ve Had PONV, -ve No PONV

**Table 6.** Factors associated with PONV: Results of logistic regression analysis.

| Variable | OR | 95% CI | P value |
|---|---|---|---|
| History of PONV | 5.394 | 1.054-27.589 | 0.043 |
| Alcohol | 0.426 | 0.205-0.884 | 0.022 |
| Intra-operative pethidine | 4.622 | 1.477-14.469 | 0.009 |
| Type of operation | | | |
| Abdominal surgery* | 8.632 | 2.716-27.432 | 0.000 |
| Orthopaedic surgery | | | |
| Thyroid surgery | 1.338 | 0.517-3.461 | 0.548 |
| Breast surgery | 9.876 | 1.750-55.735 | 0.009 |
| Others | 1.596 | 0.305-8.356 | 0.580 |

- Reference category, OR Odds ratio, CI Confidence interval

The pre-operative factors that were significantly associated with PONV in the first 24 hours *(p value <0.05)* included 20-30 years age group, female gender, previous history of PONV, use of intra-operative pethidine (p value=0.006) and post-operative pethidine (p value=0.026) and orthopaedic surgery (OR 8.250, 95% CI 2.923-23.287) (p value=0.000). By contrast, alcohol consumption was strongly protective against PONV (odds ratio 0.519, 95% CI 0.273-0.983) with a p value of 0.043 (Tables 2 – 6)). Other postoperative factors such as duration of surgery were not associated with PONV. Risk factors associated with PONV were analyzed further. All factors that turned out with a significant level of less or equal to 20% (p value = 0.20) were put together and analyzed using logistic regression, with PONV as the dependent variable.

## Discussion

This study has shown that the prevalence of PONV is 40.7% at Mulago Hospital. This does not differ much from what studies done elsewhere found[1-3,5,9].

The preoperative factors that were statistically significant following univariate analysis included age, female gender, history of PONV and alcohol consumption. Age of 20-30 years was significantly (p=0.002) associated with PONV. Patients in this age bracket were 3 times more likely to have PONV than those in other age groups. These findings are in line with studies done in other centres.[10,11] Sinclair *et al* in Canada found that age decreased the likelihood of PONV by 13% for each 10-year increase[11].

Among the females, 52% had PONV compared to 28% in males. The female gender increased the likelihood of PONV by three times (p=0.001). This finding was in agreement with what has previously been reported from studies done elsewhere[10-13]. Soyannwo et al[5] in Nigeria found that women had significantly more emetic symptoms than men and suggested that Nigerian women be considered for prophylactic anti-emetic therapy, especially when given narcotic analgesia. A previous history of PONV was also strongly associated with PONV. Among the eleven study patients who had had PONV previously, 82% had PONV compared to 38% of those who had no previous history of PONV. This group of patients was seven times more likely to have PONV (p=0.004). Similar findings have been noted in other studies[5,11,14].

Although cigarette smoking is a risk to our health, causing cardiovascular and pulmonary complications, smokers are protected against PONV[15,16]. In this study, non-smokers were 2 times more likely to have PONV than smokers, though this was not statistically significant (p>0.231). The mechanism by which cigarette smoke protects from PONV is not known. Use of alcohol was also a protective factor against PONV. Among the 65% study patients who were taking alcohol 31% had PONV compared to 46% of patients who were not taking alcohol. Alcohol use showed a reduced risk for PONV (OR=0.519, 95% CI; 0.273-0.983) and this was statistically significant (P=0.043).

Patients who had a history of motion sickness were 2 times more likely to have PONV than their counter parts who did not have a history of motion sickness, though this was not statistically significant (p=0.078). This finding is similar to the study done by Busone et al[17]. Sixteen (9%) of the study patients were obese. That is, the obese patients were considered as having a BMI of above 30. Although we found that 44% of our obese patient had PONV, in this study, BMI was not associated with PONV. Obese patients have been reported as more likely to experience PONV[2,18]. Kranke et al[19] found no evidence of increased BMI as a risk factor for PONV.

According to results of univariate analysis, intra-operative use of Pethidine was statistically significantly associated with PONV (p<0.006). This finding is similar to studies done elsewhere.[10] The reason for this is due to the fact that Pethidine which is an opioid directly stimulates the CTZ and vestibular apparatus, and also decreases motility of the gut[20]. Orthopaedic surgery (external fixation of compound fractures) was significantly associated with PONV (p=0.000). This is supported by a study done by Sinclair *et al* in 1999, were they found orthopaedic surgery to be among the independent predictors of PONV[11]. Other intra-operative factors were not significantly associated with PONV.

Postoperative use of Pethidine was the only postoperative factor that was significantly associated with PONV (p=0.026). This was in agreement with findings of studies done elsewhere[5,21,22]. Roberts et al[22] in Australia found postoperative opioid use to significantly (p=0.025) influence PONV. In a study done by Andersen et al[23] in Norway, it was shown that treatment of pain reduces the effect of nausea. In our study, pain was associated with PONV no statistical significance (p=0.062). However we found that patients who were feeling more pain were two times more likely to have PONV than patients who were feeling less pain.

Logistic regression analysis was used to determine the association of independent patient factors with the prevalence of PONV. Patient factors such as history of PONV, use of alcohol, type of operation and intra-operative Pethidine were identified as significant independent variables. Apart from history of PONV, these factors somehow differ from what has been found by other researchers, probably because of a small sample size[24]. Apfel *et al* designed a simplified risk score for predicting PONV and their final

score consisted of four predictors; female gender, history of motion sickness or PONV, non-smoking and use of postoperative opioids[14].

## Conclusion and Recommendations

The prevalence of postoperative nausea and vomiting among surgical patients aged10 years and above admitted at Mulago Hospital Complex is high up to 40.7%. The independent predictors of postoperative nausea and vomiting within 24 hours after surgery, following a multivariate analysis include history of PONV, use of alcohol, intra-operative Pethidine and orthopaedic surgery. It is recommended that patients with increased likelihood of developing postoperative nausea and vomiting should be given anti-emetic prophylaxis.

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