ORIGINAL ARTICLE

Assessment of Magnitude and Associated Factors of Emergence Delirium in the Post Anesthesia Care Unit at Tikur Anbesa Specialized Hospital, Ethiopia

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ABSTRACT

BACKGROUND: Emergence delirium (ED) is known as an acute agitation and confusion occurring during or immediately following emergence from general anesthesia, in the Operation Room or post anesthesia care unit (PACU). ED results in significant morbidity and complications resulting in longer hospital stays. We studied the magnitude and risk factors of ED in the general surgical population.

METHODS: An institution-based prospective cross-sectional study was conducted on patients who underwent surgical procedure at Tikur Anbessa Specialized Hospital, Ethiopia, from March 6 - May 1, 2017. Data was collected using patient interview and chart review. Patients with Richmond Agitation Sedation Scale ≥+1 at any time were considered to have emergence delirium/agitation. Categorical data was analyzed using the fishers exact test . Continuous data was analyzed using student t-test. Independent variables were analyzed using binary logistic regression. P-value of <0.05 was considered as cutoff point to test for statistically significance.

RESULT: The overall magnitude of Emergence Delirium in this study was 31.7%. Older age (CI=4.266 – 12.095, P=0.001), substance abuse (OR =4.6, CI=1.962 – 10.863, P=0.001), preoperative anxiety (OR= 2.4, CI=1.140 – 5.244, P=0.02), benzodiazepine premedication (OR= 8, CI=2.788 – 23.21, P=0.001), excessive blood loss (OR=3.38, CI=1.789 – 6.412, P=0.001), postoperative pain (OR=3.37, CI=2.015 – 6.934, P=0.001) and longer PACU stay (CI=18.645 – 26.766, P=0.001) were positively associated with Emergence Delirium.

CONCLUSION: The magnitude of emergence delirium is high and it is associated with older age, substance abuse, premedication with benzodiazepine, excessive blood loss postoperative pain and longer PACU stay.

KEYWORDS: Delirium, Post Anesthesia Care Unit, Magnitude, Risk factors, Ethiopia

INTRODUCTION

Emergence Delirium (ED) is known as acute agitation and confusion occurring during or immediately following emergence from general anesthesia, in the Operationroom (OR) or Post Anesthesia Care Unit (PACU) (1). When patients are delirious, they usually experience disorientation of time, person, and place. Delirium could occur at any time in the perioperative period, but it is more common postoperatively and is said to affect 2 million people every year. Delirium is also commonly underdiagnosed in the postoperative period. A survey of physicians and health professionals found that 78% of them described delirium as underdiagnosed and only 40% of the physicians said they routinely screen for delirium (2).

The incidence of delirium varies significantly depending on the type of procedure performed and the presence of risk factors. Incidence varies from 4% in cataract surgery to 17% in head and neck surgery and to 35-65% after orthopedic/hip fracture surgeries (2-4).

Postoperative delirium is a common complication that is affected by several perioperative factors. Older age is frequently mentioned as a major factor. Others include previous delirium occurrence, preexisting cognitive or functional impairment, preoperative administration of drugs like opioids and benzodiazepines. It is also common among patients who alcohol abuse, patients with low postoperative saturation, untreated pain, electrolyte disturbance and low hemoglobin have all been found to be associated with PACU delirium (5-8).

The occurrence of delirium acutely in the PACU could be very dangerous for the patient and may lead to injury, increased pain, hemorrhage, self-extubation and removal of catheters which may lead the PACU staff to restrain the patient. Studies generally agree that the occurrence of delirium is associated with high morbidity and mortality, prolonged hospital stays and higher costs. The complications of delirium can persist for months or more in some individuals. A study on the occurrence of delirium after orthopedic surgery found that 39% of patients were delirious during discharge, and that the delirium even persisted until 6 months for some patients (6,9).

Data on emergence delirium is relatively scarce. Most studies focus on the development of delirium after discharge from PACU to either intensive care unit (ICU) or outpatient. There are few studies that show the magnitude of delirium in the general surgical population at the emergence phase which is right after admission to PACU. This study aims to assess the incidence and possible risk factors of emergence delirium after anesthesia in Tikur Anbessa Specialized Hospital, Ethiopia.

MATERIALS AND METHODS

After being approved from the Ethical Board in Addis Ababa University, the study was conducted in Tikur Anbessa University Hospital (Black Lion Hospital) between March 6 and may 12, 2017. A total of 1223 patients underwent surgery at the hospital. The sample size was calculated by single proportion formula using 50% proportion, 95% confidence interval and margin of error of 5%. After using correction formula and considering a 10% non-response rate, a sample size of 306 was obtained. Each morning after obtaining the daily schedule list, patients were selected using systematic random sampling. Every patient who was sampled and admitted to PACU in the study period was included. This 6-bed PACU is located right after the operating theatres. There were 3 full-time nurses, each for two tables. Patients younger than 18 years, patients with dementia and those who underwent psychiatric surgrywere excluded from the study.

A preliminary feasibility pilot study was conducted on 30 patients on the PACU using the Richmond Agitation and Sedation Scale (RASS). The RASS scale was developed to assess the level of agitation and sedation for ICU patients. We felt that it could also be applicable in the PACU. The scale ranges from 4 (combative) to negative 5 (unarousable), with 0 being alert and calm. Initially, patients were classified into non-agitated (o to negative 5) and agitated (1-4). After that, they were classified into 0 (calm and alert) and 1 (restless), 2 (agitated), 3 (very agitated) and 4 (combative) right after being admitted into PACU. Each classification has its own description. A

patient with RASS score of greater than one was also considered agitated**.** The scale is user-friendly. Recovery room nurses were responsible for identifying patients and collecting data.

Data was collected using structured questionnaire. Preoperatively, patients' sociodemographic variables including ASA (American Society of Anesthesiologist's Physical Status), history of substance abuse, any preexisting comorbidity, and anxiety were recorded. The intra and postoperative data included premedication, surgery type and duration, type of anesthesia, type of induction and maintenance agent, usage of analgesics, presence of tracheal tube and urinary catheter, blood loss defined ass intraoperative loss of>400ml, postoperative pain using numeric rating score (NRS) and PACU stay time. For patients with emergence delirium, the score was recorded, and the patients were given the necessary treatments including analgesics antiemetics and anxiolytics.

Data were analyzed using SPSS® (Statistical Package for Social Sciences) version 20 software. Categorical data were analyzed using the fishers exact test where appropriate. Continuous data were analyzed using student t-test. All Independent variables were analyzed using binary logistic regression. Odds ratio, 95% confidence interval and p-value were computed to identify associated factors and to determine the strength of the association. Variables with a p-value of less than 0.1 in the univariate analysis were taken to multivariate analysis, and p-value of <0.05 was considered as a cutoff point to test for statistically significance.

RESULTS

Sociodemographic and preoperative variables: There were 306 study participants: 145 males and 161 females. The participants had a mean age of 44.53 ± 16.61 with a range of 18-82. The demographic and perioperative data of the agitated and non-agitated patients are shown in Tables 1 and 2. Patients with delirium were much older than non-delirious patients. Of the preoperative data, age, substance abuse preoperative anxiety and premedication with benzodiazepine were found to be statistically significant. No major differences observed in the other variables.

Table 1: Logistic regression, preoperative risk factors of emergence delirium-comparison between agitatedand non-agitated patients

Variable		All patients	Agitated(%)	Non Agitated (%)	P value
Total		306	97 (31.7)	209 (68.3)	
Age		$44.53\pm16.61^{\S}$ yr.	$50.11\pm17.45^{\S}$yr.	$41.93^{\S}\pm15.574^{\S}$ yr.	$0.001^{\dagger}$
Sex	Male	145	48 (33.1)	97 (66.9)	0.616*
	Female	161	49 (30.4)	112 (33.1)	
ASA physical status	ASA I	196	66 (33.7)	130 (66.3)	0.126*
	ASA II	102	31 (30.4)	71 (69.6)	
	ASA III	8	0	8 (100)	
Co-existing disease	Yes	75	24 (32)	51 (68)	0.94*
	No	231	73 (31.6)	158 (68.4)	
Substance abuse	Yes	40	22 (55)	18 (45)	0.001*
	No	266	75 (28.2)	191 (71.8)	
Preoperative anxiety	Yes	53	23 (43.4)	30 (56.6)	0.044*
	No	253	74 (29.2)	179 (70.8)	
Premedication with benzodiazepine	Yes	26	18 (69.2)	8 (30.8)	0.001*
	No	280	79 (28.2)	201 (71.8)	

ASA American society of Anesthesiologist's physical status, *Pearson chi square, †two sample t-test, §mean (range or SD)

Table 2: Logistic regression: Intra and post-operative risk factors of emergence delirium. Comparison between Agitatedand Non Agitated patients

Variable		All patients	Agitated(%)	Non Agitated (%)	P value
Total		306	97 (31.7)	209 (68.3)	
Type of surgery	General surgery	74	25 (33.5)	49 (66.2)	0.045*
	Urology	40	15 (37.5)	25 (62.5)	
	Neuro surgery	39	22 (56.4)	17 (43.6)	
	ENT	41	6 (14.6)	35 (85.4)	
	Cardiothoracic	56	17 (30.4)	39 (69.6)	
	Gynecology	4	3 (75)	1 (25)	
	Orthopedics	52	14 (26.9)	38 (73.1)	
Induction type	Thiopental	152	35 (23)	117 (117)	0.001*
	Propofol	110	38 (34.5)	72 (62.5)	
	Ketamine	19	5 (26.3)	14 (73.7)	
	Ketofol	21	6 (28.6)	15 (71.4)	
	Inhalational	4	4	0	
Duration of surgery		$65.52\pm19.82^{\S}$min.	(97) $81.03\pm16.088^{\S}$ min.	(209) $58.33\pm17.113^{\S}$ min.	$0.001^{\dagger}$
Excessive blood loss[a]	Yes	78	42 (53.8)	36 (46.2)	0.001*
	No	228	55 (24.1)	173 (75.9)	
Presence of tracheal tube	Yes	1	0	1	0.495*
	No	305	97 (31.8)	208 (68.2)	
Presence of urinary catheter	Yes	185	66 (35.7)	119 (64.3)	0.065*
	No	121	31 (25.6)	90 (74.4)	
PACU stay time		$65.2\pm19.8^{\S}$ min.	(97) $81.03\pm16.08^{\S}$ min.	(209) $58.33\pm17.11^{\S}$min.	$0.001^{\dagger}$
NRS for postoperative pain	NRS$\geq$4	92	47 (51.1)	45 (48.9)	0.001*
	NRS<4	214	50 (23.4)	164 (76.6)	

ENT ear nose and throat surgery, PACU post anesthesia care unit, NRS numeric rating scale

aExcessive bleeding was defined as intraoperative blood loss of>400ml

*Pearson chi square, †two sample t-test, §mean (range or SD)

Intra and postoperative variables: Surgeries in the General surgery category were most routinely performed. Thiopental is the most regularly used induction agent. The mean surgical time was 65.52±19.82 with the range being 20-420 minutes. Patients stayed in the PACU from 20-120 minutes (mean time = 65.2±19.8 minutes). Type of surgery, induction type, excessive blood loss, PACU stay time and postoperative pain were found to be clinically significant variables.

Magnitude of delirium: Among the 306 patients included in this study, the magnitude of confirmed emergence delirium in the PACU was 97 (31.7%). Out of this, nearly half (47%) of the patients were combative and 28% very agitated (Figure 1).
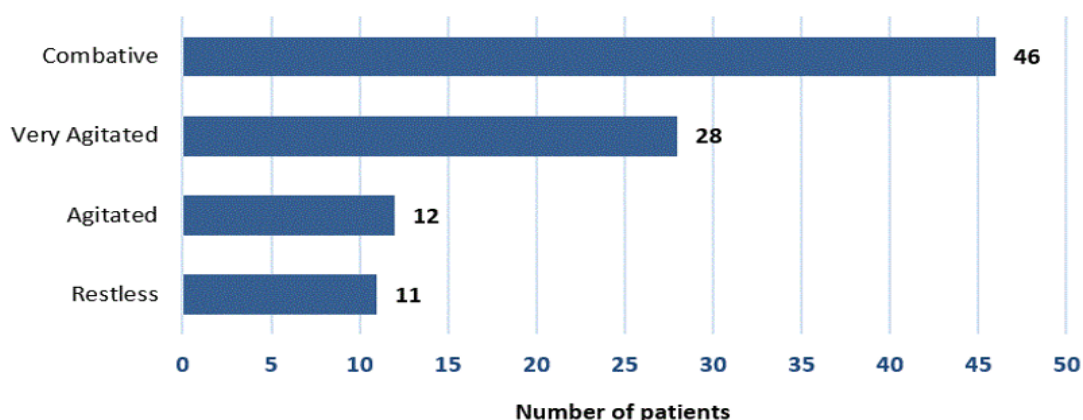
Fig 1 Occurrence and Degree of Delirium

Univariate and multivariate analysis of risk factors for emergence delirium: Univariate analysis found that the occurrence of delirium correlated positively with the following variables. ASA physical status, age, premedication with benzodiazepine, social history of substance abuse, preoperative anxiety, premedication with benzodiazepine, induction agent used, excessive blood loss, PACU stay and postoperative pain.

Multivariate logistic regression analysis was conducted using the risk factors that were established by the univariate analysis. It demonstrated that older age, substance abuse, premedication with benzodiazepine, preoperative anxiety, excessive blood loss, postoperative numeric rating scale of ≥ 4 and longer PACU stay were found to be significant determinants for emergence delirium (Table 3).

Table 3: Multivariate analysis for risk factors of emergence delirium

Variable	Odds ratio	P value <0.05	CI (95%)
Age	_	0.001 [†]	4.266 – 12.095
Substance abuse	4.6	0.001	1.962 – 10.863
Premedication with BZD	8	0.001	2.788 – 23.21
Preoperative anxiety	2.44	0.02	1.140 – 5.244
Excessive blood loss	3.38	0.001	1.789 – 6.412
NRS ≥4	3.73	0.001	2.015 – 6.934
PACU stay time	_	0.001[†]	18.645 – 26.766

[†]two sample t-test

DISCUSSION

In our study, the magnitude of emergence delirium in the general surgical population was 31.7%. this is a relatively larger finding. The occurrence of delirium varies widely among different fields and surgical specialties, from 4% to 65% (2-3). Moreover, it was found that of all agitated patients, the majority were either combative (46%) or very agitated (28%). Emergence delirium was

diagnosed using the RASS (Richmond Agitation and Sedation Score) scale. There are several scales for assessing emergence agitation like the Riker Agitation Sedation Score and Motor Activity Assessment Scale. Studies have shown that the RASS scale has an excellent inter-rater consistency and ease of use (10,11). Although the scales are primarily made for assessing ICU patients, we felt that such scales can also be used in the PACU. Based on the analysis, it was also

found that older age, substance abuse, premedication with benzodiazepine, excessive blood loss, postoperative pain and longer PACU stay were found to be significantly associated with emergence delirium.

Advanced age is a well-known risk factor for delirium. Several studies have consistently shown that in different surgical specialties, the most constant predicting variable for delirium is advanced age (12-14). In advanced age, there is a significant pharmacodynamic and pharmacokinetic change which will result in substantial side effect of the drug used perioperatively. Furthermore, older patients have reduced ability for surgical and anesthesia-related stress regulation (15).

Patients who were consuming alcohol regularly, smoking cigarette or chewing Khat (a mildly stimulant substance chewed for a recreational purpose), were considered at risk for ED. Patients who either took one or a multitude of those agents were highly susceptible to ED. Studies have shown an association between substance abuse and delirium occurrence (16). Although the cutoff points to define levels of abuse were different (17), in our study, levels of alcohol and cigarette and Khat consumption were not quantified. Patients were asked if they uses the substances regularly or not at all.

Preoperative anxiety and emergence delirium are closely interrelated problems. This is especially true in children (18). Although our study did not use any structured questionnaire to diagnose anxiety, the use of such tools have also been shown to increase the anxiety level (19). In our study, patients who were premedicated with benzodiazepine were 8 times more likely to be delirious than patients who were not. This might be surprising given that such drugs are prescribed to alleviate apprehension. Various reports have conflicting information: some report that BZD hasprotective effects (18-20), while others report a higher rate of delirium especially in older patients (19-21). The effects could be attributed to the paradoxical effects of BZDs, effects such as irritability, aggressiveness, and confusion that especially result with repeated doses. Because of the study design, it is difficult to ascertain the exact role of BZDs.

An Excessive blood loss intraoperatively was associated with emergence delirium. Studies show similar results (18-20). The resulting hypotension with a drop in cerebral blood flow is implicated to be behind the ED. Extreme hypotension that is either deliberate or resulting from bleeding should be short-lived to prevent ED (22). Patients who were in pain in PACU were more likely to be in ED. Although patients were administered the standard analgesics in our PACU, which includes diclofenac, tramadol and sometimes meperidine. the findings still show that pain management is not well addressed. Untreated pain can result in a multitude of problems which include apprehension, confusion and aggressiveness (23).

Emergence delirium can result in significant mortality and morbidity with longer hospital stays. It requires more staff as well as resources and results in dangerous complications like sudden self-extubation and removal of catheters. In our study, delirious patients stayed longer in the PACU than non-delirious ones.

In conclusion we investigated the magnitude of emergence delirium in PACU in the general surgical population. The result showed that ED occurs frequently and is undermanaged. Few studies have given attention to ED that occurs in PACU. The following risk factors were associated with ED: older age, substance abuse, premedication with a benzodiazepine, excessive blood loss, postoperative pain and longer PACU stay. Emergence delirium is associated with high postoperative complications which lead to longer PACU stays. The significant mortality and morbidity imposed by ED could be reduced by developing a prevention strategy to deal with the predisposing risk factors beginning from the preoperative period until patient discharge.

Our study had some limitations primarily the relatively larger confidence intervals which is a result of our smaller sample size. Assessing ED after PACU discharge might not have given us the complete picture of the severity and risk factors of ED.

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