Prevalence of emergence delirium and associated factors among old-age patients who underwent elective surgery in the Teaching Hospitals of Ethiopia, Ethiopia, 2021. A multicenter prospective observational study

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Research Article

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Abstract

Background

Emergence Delirium is a common and serious post-operative complication in surgical patients, especially in the old-age. It occurs at any time in the perioperative period, during or immediately following emergence from general anesthesia. Unfortunately, it is highly associated with post-operative complications such as decrease in functional capacity, prolonged hospital stay, an increase in health care costs and morbidity and mortality. The goal of this study was to determine the prevalence of emergence delirium and associated factors among old-age patients who underwent elective surgery in the Teaching Hospitals of Ethiopia at post anesthesia care unit, 2021.

Methods

A multi-center prospective observational study was conducted at the post-anesthetic care unit of four teaching hospitals in Ethiopia. Old-age surgical patients admitted to Post-anesthesia Care Unit who underwent elective surgery in the four Teaching Hospitals of Ethiopia were selected by using simple random sampling. Pretested structured questionnaire was used to collect data. Data were entered in to Epidata (version 4.6) and exported to the SPSS (version 25.0). Binary logistic regression was used to identify factors independently associated with emergence delirium.

Results

Out of 384 old-age patients included in the study with 100% response rate, the Prevalence of emergence delirium was 27.6%. Preoperative low hemoglobin levels (AOR: 2.0, 95%CI; 1.77–3.46), opioids (AOR: 8.0, 95%CI; 3.22–27.8) and anti-cholinergic premedications (AOR: 8.5, 95%CI; 6.85–17.35), and post-operative pain (AOR: 3.10, 95CI; 2.07–9.84) at PACU were independently associated with emergence delirium.

Conclusion

The Prevalence of emergence delirium was high. Old-age patients who were premedicated with anti-cholinergic and opioids, those patients who had low pre-operative hemoglobin and post-operative pain were independently associated with emergence delirium. Adequate pre-operative optimization and post-operative analgesia may reduce the Prevalence of emergence delirium.

Introduction

Emergence delirium is a state of acute restlessness and confusion manifested by changes in the mental state, loss of attention, and disorganized thinking (1, 2).

Emergence delirium is manifested by acute deterioration in attention and cognition, which may include changes in levels of consciousness and thinking (3, 4). It could occur in the Operation room or PACU at any time in the perioperative period, during or immediately following emergence from general anesthesia (1–3).

It remains a common complication in surgical patients during early post-operative period, complicating up to 87% of critically ill patients; 10–24% of general adult medical patients; 37–46% of general surgical patients receiving anesthesia, and in up to 50% of old-age surgical patients during early emergence at PACU(4–6). Hence, the prevalence of delirium varies significantly depending on the type of procedure and age of the patients; being old-age is the most susceptible age groups (2, 5, 6).

It varies according to the patient population, the type and urgency of surgery, and the type and sensitivity of assessment tools. Hence, it has been increasingly recognized as a major adverse event occurring post-operative in old-age surgical patients as it causes considerable distress to patients, families, and health professionals (4, 8–11).

This distressing and serious complication possess a serious risk for the patient and PACU staff like violent behavior leading injury, disrupting wound dressing, increased pain, hemorrhage, self-removal medical devices (like endotracheal tubes, catheters, and drainage tubes) with increased health care expenditure, and post-operative mortality placing difficulties in giving patient care(5, 7, 11).

The use of certain pre-operative medications like anticholinergics and benzodiazepines, and history of chronic smoking and alcohol abuse has been independently associated with the occurrence of emergence delirium (12–14).

It is a common perioperative problem in old-age patient that we encounter after anesthesia and surgery post-operatively in the PACU, particularly surgical teams, including anesthetists, surgeon, nurses, residents, interns and PACU nurses were encountering delirium in old-age patients. As long as additional burden on man power is considered, there exist the needs of increasing health professional's numbers caring delirious patient. Specially, PACU staffs must always stay patient side. However, while nurses, medical interns or other professionals are attending delirious patients, non-delirious patients might be less closely monitored, thereby reducing their care and perhaps increasing their anxiety. Therefore, noticing the Prevalence of emergence delirium and identifying associated factors to avoid these challenges discussed is vital to the anesthetist. Thus, we sought to determine the prevalence of emergence delirium and associated factors in old-age patients who underwent elective surgery in teaching hospitals in Ethiopia at PACU.

Methods And Materials

Study Area, Study design, Study Period and Population

A multi-center prospective observational study design was conducted in the four Teaching Hospitals of Ethiopia from February 05 to March 30,2021 at Post Anesthesia Care Unit. These teaching hospitals were

a center of teaching for medical students and bears different clinical care delivery and also serving as an academic upgrading or specialty. Patients aged 60 years and above who underwent operation on elective setting during the study period were included in the study. However, patients with pre-existing complicated co-morbid diseases and or psychiatric problems like dementia, and Unconscious patient at PACU were excluded from the study.

Operational definition

With the Confusion Assessment Method – Intensive Care Unit (CAM - ICU) both feature 1 (acute onset and fluctuating course) and feature 2 (inattention) and either of feature 3 (disorganized thinking) or feature 4 (altered level of consciousness) within the first one hour was considered as emergence delirium. Because it is easy to administer, quick with good specificity and sensitivity for diagnosis of emergence delirium in old-age patients who were awake, not critically ill and mechanically ventilated, as well it enables assessment of the cognitive function (15–19).

Postoperative sedation (consciousness) and agitation were assessed by the Richmond Agitation Sedation Scale (RASS), a 10-point scale between +4 and -5 (18.20, 21).

Patients were evaluated for delirium by CAM if they are responsive to verbal commands (RAAS score of other than -4 or -5 as described below. 4 - combative (violent, immediate danger to his/her self or staff), 3 – very agitated (pulls or removes tube or catheters, aggressive), 2 – agitated (frequent non-purposeful movements, fight), 1- restless (anxious, but no aggressive movements), 0- alert and calm, -1 - drowsy (sustained awakening to voice (>10sec)), -2 – light sedation (briefly awakens with eye contact to voice (<10sec)), -3 – moderate sedation (movement or eye-opening to voice, but no eye contact), -4 – deep sedation (no response to voice, but movement or eye-opening to physical stimulation), -5 – unarousable (no response to voice or physical stimulation).

Postoperative patient pain was assessed by using numeric rating score, which had a score of 0-10, with 0 - 3= no pain - mild pain, 4 - 6= moderate pain, and 7 – 10 = severe pain.

Anemia was defined as a clinical syndrome outlined with low hemoglobin level. Hemoglobin levels <12.0 g/dL in women and hemoglobin levels < 12 g/dL in men (22).

Old-age patients were the patient population who were 60 and over years old (21).

Sample size determination and sampling techniques

Sample size determination

Sample size was calculated by single population proportion formula using 50% proportion of old-age population with emergence delirium, 95%CI and margin of error of 5%.

$$n = (z_{\alpha/2})^2 pq/d^2,$$

Where; n= number of sample size, Zα/2 at 95%CI=1.96

p = proportion of emergence delirium, 50%

q =1-*p*; for this study, maximum variability is presumed, hence *p* = 0.5; *q* = 1-p=0.5

d= level of precision at 95 % confidence level, i.e. 5% of Sample size = 0.05, by incorporating in to the formula; n = (1.96)2 (0.5) (0.5)/ (0.05)2 = 384. Hence, a sample size of 384 was obtained.

Sampling Techniques

Multi-stage sampling techniques were implemented in the Four Teaching Hospitals of Ethiopia including Hawassa University Comprehensive Specialized Hospital, Jimma Medical Center, Tikur Ambessa Teaching and Specialized Hospital and Ambo Referral hospital was randomly selected assuming that 30% of those teaching hospitals were considered as representative and included in this study. The annual admission to PACU was obtained at each selected teaching hospital. Proportional sample size allocation was employed at each selected hospitals based on each hospital annual old-age patient PACU admission. Thus, the total calculated sample size was distributed to the annual PACU admission at each specific Teaching Hospital and with this regard the number obtained was taken as the sample size at each selected Teaching Hospital. Accordingly, the sample size was: 149, 123, 100, and 12 were taken from Tikur Ambessa Hospital, Jimma Medical Center, HUCSH, and Ambo Referral and teaching hospital respectively.

From each of the selected hospitals, each morning the daily schedule list was obtained, and old-age patients were selected using simple random sampling. Each patient selected as a sample and admitted to PACU in the study period was included.

Data collection instruments and Techniques

Data were collected using a structured questionnaire. We carried out the COVID-19 prevention strategy. At the time of admission to PACU, the patients' socio-demographics, pre-operative, intra and post-operative factors were reviewed and recorded. Data collection procedures included a review of patient records, an operation note and anesthesia chart, an interview with the patient, and direct observation of the patient's RASS score and CAM score. For data quality, 20 patients (5% of the sample size) were pre-tested at PACU and possible modifications were made. Regular monitoring and follow up took place during data collection.

Data management and analysis

The data were entered into the Epidata statistical software (version 4.6.0.6) and exported to the SPSS windows statistical software (version 25.0) for data processing and further statistical analysis. Bi-variable logistic regression was used to select candidate variables for multi-variable logistic regression. Variables with a p-value less than 25% in the bi-variable logistic regression were a candidate for the multi-variable logistic regression. A multi-variable logistic regression was fitted to identify factors independently

associated with emergence delirium and to control confounders. In the final model AOR and 95% CI was used to measure strength of association and statistical significance respectively.

Ethical Consideration

The ethical clearance letter was obtained from Jimma University Institutional Review Board and Verbal informed consent was obtained from each study participant. Confidentiality of the study participant was maintained. We applied the WHO Covid-19 prevention strategy.

Results

Socio-demographic characteristics

A total of 384 patients were included in the study making for a 100% response rate. Greater than half (57.8%) of the study participants were males and the rest, 162 (42.2%) were females. Regarding the age of the participants, 170 (44.3%) was aged between 65 and 74 years. The majority, 312 (81.3%) of the participants were married. With respect to educational status, greater than one-third (37.2%) of the study participants had no formal education.

Pre-operative Factors

As the distribution of pre-operative factors showed, ASA II held nearly three fourths (74.2%), of the ASA status of old-age patients, while ASA - I and ASA - III, were 84(21.9%) and 15(3.9%), respectively. Those patients who had a history of co-morbid disease were 76 (19.8%). Opioids were the most frequently given premedication, 120 (31.3%), followed by anti-cholinergic, 105 (27.3%) and other premedication like diazepam and steroids, 95 (24.7%). Regarding pre-operative hemoglobin levels, more than three-fourths (81.0%) of the old-age patients had normal hemoglobin levels, and the rest, 19.0% had low hemoglobin levels (anemic) (Table - 1).

Table - 1. A cross-tabulation of the pre-operative factors in old-age patients who underwent elective surgery in the Teaching Hospitals of Ethiopia, Ethiopia (n=384)

Variables	Categories		Frequency (%)	Emergence delirium, frequency (%)	
				Yes(n=106)	No(n=278)
				106(27.6)	278(72.4)
Patient ASA status	ASA-1		84(21.9)	25(29.8)	59(70.2)
	ASA-2		285(74.2)	73(25.6)	112(74.4)
	ASA-3		15(3.9)	8(53.3)	7(46.7)
Comorbidity	Yes		76(19.8)	35(46.1)	41(53.9)
	No		308(80.2)	71(23.1)	237(76.9)
Premedication	Anticholinergics	Yes	105 (24.7)	57(60)	48(40)
		No	289(75.3)	49(17.0)	240(83.0)
	Opioids	Yes	120(31.3)	65(54.2)	55(45.8)
		No	264(68.8)	41(15.5)	223(84.5)
	Others (steroids, diazepam)	Yes	95(27.3)	37(35.2)	58(64.8)
		No	279(72.7)	69(24.7)	210(75.3)
Pre-operative Hgb levels	Anemic		73(19.0)	61(83.6)	12(16.4)
	Not-anemic		311(81.0)	45(14.5)	266(85.5)

Intra-operative and post-operative factors

General anesthesia was provided to nearly more than half of the old-age participants (54.2%). 85 (39.9%) of the participants were induced with ketofol, and the majority (86.4%) of the participants were maintained with inhalation anesthetics, with isoflurane accounting for nearly two-thirds (67.9%) of the participants. The majority of surgeries took longer than two hours, with 314 (81.8%) taking longer than that (Table - 2).

Table - 2. A cross-tabulation of the intra-operative and post- operative factors in old-age patients who underwent elective surgery at Teaching Hospitals of Ethiopia, Ethiopia (n=384)

Variables	Categories	Frequency (%)	Emergence delirium, frequency (%)	
			Yes(n=106)	No(n=278)
			106(27.6)	278(72.4)
Types of anesthesia	Regional Anesthesia	176(45.8)	34(19.3)	142(80.7)
	General Anesthesia	208(54.2)	72(34.6)	136(65.4)
Induction agent	Ketamine	28(13.1)	10(35.7)	18(64.3)
	Propofol	62(29.1)	25(40.3)	37(59.7)
	Thiopental	38(17.9)	14(36.8)	24(63.2)
	Ketofol	85(39.9)	29(34.1)	56(65.9)
Maintenance agent(s)	Inhalational	184(86.4)	73(39.7)	111(60.3)
	Propofol	3(1.4)	1(33.3)	2(66.7)
	Others	26(12.2)	4(15.4)	22(84.6)
Inhalational agent for maintenance	Halothane	68(32.1)	34(50)	34(50)
	Isoflurane	144(67.9)	44(30.6)	100(69.4)
Duration of surgery	Short duration (<2hours)	70(18.2)	16(22.9)	54(77.1)
	Longer duration (>2hours)	314(81.8)	90(28.7)	224(71.3)
Post-operative pain	No – mild	362(94.3)	93(25.7)	269(74.3)
	Moderate – severe	22(5.7)	13(59.1)	9(40.9)

General surgery operations were the most commonly performed procedures among old-age patients as compared to other specialties, accounting for 98 (25.5%) of the total, as shown in the bar chart (Figure 1).

Two-thirds (66.7) of old-age patients were calm and the rest were agitated, 36(9.4%), restless, 33(8.6%), combative, 32(8.3%) and very agitated, 27(7.0%) respectively according to the PACU sedation score, as shown in the (Figure-2)

Prevalence of emergence delirium

The prevalence of emergence delirium in old-age patients who underwent elective surgery at Teaching Hospitals of Ethiopia was 106 (27.6%).

Factors Associated with Emergence Delirium among old-age patients who underwent elective surgery at PACU

Bi-variable and multi-variable logistic regression of factors associated with emergence delirium in old-age patients who underwent elective surgery at Teaching Hospitals of Ethiopia

Bi-variable logistic regression was fitted to identify candidate variables for the multi-variable logistic regression. Accordingly, educational status, marital status, premedication with opioids and anti-cholinergic, comorbidity, pre-operative hemoglobin level, types of anesthesia, maintenance agent, post-operative pain, and post-operative sedation were associated with emergence delirium at p-value of < 0.25 (Table - 3)

Table - 3. Bivariable logistic regression of factors associated with emergence delirium in old-age patients who underwent elective surgery in the Teaching Hospitals of Ethiopia, Ethiopia (n=384)

Variables	Categories		Emergence delirium, frequency (%)		COR(95% CI)	p-value
			Yes(n=106)	No(n=278)		
			106 (27.6)	278(72.4)		
Educational status	High education		26(22.6)	89(77.4)	1	
	Low education		18(14.3)	108(85.7)	0.57(0.22 – 0.66)	**0.22**
	No		62(43.4)	81(56.6)	2.62(0.90 – 3.40)	**0.18**
Marital status	Married		71(22.8)	241(77.2)	1	
	Single		23(46.9)	26(53.1)	3.0(0.46 – 3.33)	**0.22**
	Divorced		12(52.2)	11(47.8)	4.16(1.57 – 8.75)	**0.23**
Comorbidity	No		71(23.1)	237(76.9)	1	
	Yes		35(46.1)	41(53.9)	2.85(2.11 – 10.0)	**0.16**
Pre-operative Hemoglobin level	Not-anemic		45(14.5)	266(85.5)	1	
	Anemic		61(83.6)	12(16.4)	30.1(3.10 – 26.0)	**0.24**
Types of anesthesia	Regional anesthesia		34(19.3)	142(80.7)	1	
	General Anesthesia		72(34.6)	136(65.4)	2.21 (1.82 – 9.2)	**0.22**
Premedication	Anti-cholinergic	No	49(17)	240(83)	1	
		Yes	57(60)	38(40)	7.35(5.5 – 11.3)	**0.12**
	Opioids	No	41(15.5)	223(84.5)	1	
		Yes	65(54.2)	55(45.8)	6.43(20 – 55)	**0.23**
Types of surgery	Others(Plastics and EENT)		2(7.4)	23(92.6)	1	
	Urology		8(19.5)	33(80.5)	2.79(1.21 – 9.33)	0.44
	Neurologic surgery		10(37.0)	17(63.0)	6.76(2.0 – 17.15)	**0.23**
	Oral and maxillofacial		10(19.6)	41(80.4)	2.80(0.42 – 8.55)	0.26

	Gynecology	10(22.7)	34(77.3)	3.38(1.06 – 12.0)	0.54
	Thoracic	13(41.9)	18(58.1)	8.31(4.44 – 21.1)	**0.19**
	Orthopedics	18(27.7)	49(72.3)	4.22(0.65 – 3.88)	**0.20**
	General surgery	35(35.7)	63(64.3)	6.39(1.46 – 17.2)	**0.22**
Post- operative pain	No-mild	93(25.7)	269(74.3)	1	
	Moderate- severe	13(59.1)	9(40.9)	4.18(7.3 – 17.1)	**0.23**
Sedation levels	Calm or no answers	56(21.9)	200(78.1)	1	
	Restless	10(31.3)	22(68.7)	1.62(22 – 38)	**0.22**
	Agitated	9(33.3)	18(66.7)	1.78(2.4 – 3.1)	**0.24**
	Very agitated	17(47.2)	19(52.8)	3.19(1.5 – 6.4)	**0.19**
	Combative	14(42.4)	19(57.6)	2.63(1.6 – 8.1)	**0.21**

N.B: Bold p-value = significant association on bivariable logistic regression at p-value < 0.25. 1- Reference group

Factors independently associated with emergence of delirium in old-age patients who underwent elective surgery at Teaching Hospitals of Ethiopia

Multi-variable logistic regression was fitted to identify factors independently associated with emergence delirium. Accordingly, pre-operative low hemoglobin levels, premedication of opioids and anti-cholinergic, and moderate to severe post-operative pain at PACU were significantly associated with emergence delirium in multi-variable logistic regression at a p-value of <0.05.

When compared to participants who did not receive opioids premedication, those who received opioids premedication were 8 times (AOR: 8.0, 95%CI: 3.22 – 27.8), more likely to suffer emergence delirium. Anti-cholinergic premedication increased the risk of emergence delirium in old-age patients by 8.5 times (AOR: 8.5, 95%CI: 8.5(6.85 – 17.35) as compared to those who had not.

When compared to those with normal pre-operative hemoglobin, old-age patients with low pre-operative hemoglobin were 2 times (AOR; 2.0, 95% CI, 1.77 – 3.46) more likely suffer emergence delirium. When

compared to old-age patients experiencing mild pain in the PACU, those experiencing moderate to severe pain were 3.10 times (AOR; 3.10, 95% CI, 2.07 – 9.84) more likely to develop emergence delirium (Table- 4)

Table - 4. Results of multivariable logistic regression of factors independently associated with emergence delirium in old-age patients who underwent elective surgery at Teaching Hospitals of Ethiopia, Ethiopia (n=384)

Variables	Categories		AOR(95% CI)
Educational status	High education		1
	Low education		1.33(0.11 – 1.14)
	No		1.21(0.03 – 2.58)
Marital status	Married		1
	Single		0.88(0.19 – 2.33)
	Divorced		1.11(0.37 – 1.66)
Comorbidity	No		1
	Yes		9.45(0.83 – 22.99)
Pre-operative Hemoglobin levels	Not-anemic		1
	Anemic		**1.98(1.77 – 3.46)**
Types of anesthesia	Regional anesthesia		1
	General Anesthesia		4.33(0.5 – 11.66)
Premedication	Anticholinergic	No	1
		Yes	**8.5(6.85 – 17.35)**
	Opioids	No	1
		Yes	**7.89(3.22 – 27.8)**
Post- operative pain	No-mild		1
	Moderate- severe		**3.10(2.07 – 9.84)**
Sedation level	Calm or no answers		1
	Restless		3.11(0.29 – 1.88)
	Agitated		0.80(0.33 – 1.66)
	Very agitated		1.11(0.04 – 18.06)
	Combative		2.75(0.36 – 22.5)

N.B: Bold: Significant association on multivariable logistic regression

Discussion

In this study, the overall prevalence of emergence delirium among old-age patients who underwent elective surgery in the teaching hospitals of Ethiopia was 27.6%.

An observational study conducted at University of Gondar Hospital, in Ethiopia found that the Prevalence of emergence delirium at PACU among old-age patients who underwent surgical procedures was 40.7%. Another observational study conducted in China showed that, the Prevalence of emergence delirium among old-age patients at PACU was 37.0%. Our finding is relatively low as compared to the previous study. This variation might be explained by the inclusion of patients who underwent emergency surgery (which had high Prevalence of emergence delirium as it permits limited time to optimize patients operated in emergency setting), and might be due to the large sample size used in the previous study and tool difference (17,21).

A prospective study carried out in Thailand and a retrospective study done in Korea showed that the Prevalence of emergence delirium among old-age patients was 11.6% and 18.3%, respectively. Our finding is relatively high as compared to previous study. A possible explanation for this discrepancy might be due to inadequate pre-operative optimization and reassurance of the patient, and or inadequate post-operative pain management in the present study, and the clinical set-up differences (20,23).

In our study, old-age patients who had been given opioids premedication were 8 times (AOR: 8.0, 95%CI: 3.22 – 27.8), more likely to develop emergence delirium as compared to those who were not given opioids premedication. This is in corroboration with the study conducted in Gondar, which agreed that old-age patients who had taken perioperative opioids were 5 times (AOR: 5.0, 95%CI: 1.265–20.565), more likely to develop emergence delirium as compared to those who had not taken intravenous opioids. Similarly, the study conducted in China agreed that those old-age surgical patients who had taken peri-operative opioids were incredibly suffering from emergence delirium. Another study asserted that old-age patients who had pain management with opioids were more likely to develop emergence delirium as compared to those who had managed with non-opioids analgesics. This finding is supported by another study which argued that opioids increase the likelihood of adverse outcomes such as delirium. This variation might be explained as there exist increased drug sensitivity in the old-age patients due to the dramatic changes in receptor function which heightened sensitivity of the brain toward adverse effects of opioids leading to delirium (17, 21, 24, 25).

Old-age patients who had anti-cholinergic premedication were 8.5 times (AOR: 8.5, 95%CI: 8.5(6.85 – 17.35), more likely to develop emergence delirium as compared to those who were not given anti-cholinergic premedication. The finding of our study is in agreement with a study conducted in Australia, which contended that old-age patients who had taken anti-cholinergic medication were significantly associated with an increased risk of experiencing emergence delirium. Another study conducted in India argued that an anti-cholinergic medication like atropine was significantly associated with the emergence of delirium. The possible explanation might be due to anti-cholinergic medication blocks cholinergic transmission on the post-synaptic muscarinic receptors (M1 receptors), which were primarily located in the central nervous systems and involved in perception, attention and cognitive function (26,27).

Old-age patients who had low pre-operative hemoglobin were 2 times (AOR; 2.0, 95% CI, 1.77 – 3.46), more likely to develop emergence delirium as compared to those who had normal hemoglobin. Similar finding was observed in an observational study conducted in Germany which ascertained that old-age patients

who had low hemoglobin in the post-operative period were 4 times (AOR; 4.0, 95% CI, 1.36–11.48), more likely to develop post-operative delirium as compared to old-age patients who had normal hemoglobin levels. Another study found that old-age patients with more frequent low pre-operative hemoglobin levels experienced delirium. The possible explanation for this might be due to low hemoglobin level limit the cerebral oxygen delivery, in a sense in adequate cerebral oxygen supply with increased metabolic demand resulted in an imbalance of neurotransmitters, disintegration of blood brain barriers, and subsequent neuro-inflammation (18, 22).

In our study, old-age patients who had post-operative pain (Numeric Rating Scale >5) at PACU were 3.10 times (AOR; 3.10, 95% CI, 2.07 – 9.84), more likely to develop emergence delirium as compared to those who had no pain. Our finding is supported by a study conducted in Gondar, which extrapolated that emergence delirium was more likely when the pain numeric rating scale was greater than or equal to five (NRS ≥5). Comparably, the study conducted in Korea asserted that patients with pain (NRS ≥6) were 3.6 times more likely to develop emergence delirium, and more than half of those patients with emergence delirium were reported to have severe immediate post-operative pain at PACU. This was argued by another study which concluded that inadequate analgesia in the perioperative period had been strongly associated with emergence delirium. The possible explanation for this might be due to the perceived psychological effects of pain and pain may favors an alterations in the neurotransmitter systems inducing the pro-inflammatory mediators and impairs the physiological stress response resulting in neuro-physiological dysfunctions that may potentiate cognitive impairments that may manifested as delirium (7,21,28).

Strength and Limitation of the study

To the best of our knowledge, this is one of the interesting studies to investigate the Prevalence of emergence delirium and associated factors among old-age patients who underwent elective surgery at PACU. This study will primarily maximize the old-age patient’s safety and to reduce the Prevalence of emergence delirium among old-age patients who underwent elective surgery.

The limitations of our study were ascertained that, we did not assessed emergence delirium among old-age patients after PACU discharge, or during hospital stay and the long-term outcome of emergence delirium. Therefore, we had no remark on the continued effects of emergence delirium beyond the PACU in the post-operative period and the consequence it may have on patient outcomes.

Conclusion And Recommendation

The prevalence of emergence delirium among old-age patients who underwent elective surgery in the teaching hospitals in Ethiopia was high.

The administration of pre-operative anti-cholinergic and opioids were independently associated with emergence delirium. Thus, anesthesia teams should emphasize on pre-operative optimization and reducing or, if possible omit opioids and anti-cholinergic premedications in old-age patients.

Low pre-operative hemoglobin was independently associated with emergence delirium. Hence, surgical teams and anesthesia providers should optimize patients with low pre-operative hemoglobin.

Post-operative pain at PACU was independently associated with emergence delirium. Anesthetists and PACU teams should ensure adequate post-operative analgesia with wise selection and dosing of analgesics (particularly, those devoid of opioids side effects), which may reduce the prevalence of emergence delirium.

Abbreviations

AOR – Adjusted Odds Ratio; ASA – American Society of Anesthesiologist; CAM – Confusion Assessment Method. COR – Crude Odds Ratio; CI – Confidence Interval; Hgb – Hemoglobin; ICU – Intensive Care Unit; NRS – Numeric Rating Score; PACU – Post-Anesthesia Care Unit; RASS – Richmond Agitation Sedation Scale; WHO – World Health organization.

Declarations

Ethics approval and consent to participate

Ethical letter was taken from Jimma University Institutional Review Board with Ref.No.JHRPG1/1269/21

We received proper patient consents to participate in this study. Confidentiality was maintained throughout the study.

Availability of data and materials: Data are available with corresponding author address up on reasonable request

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Competing interest: no competing interest in this work.

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Figures

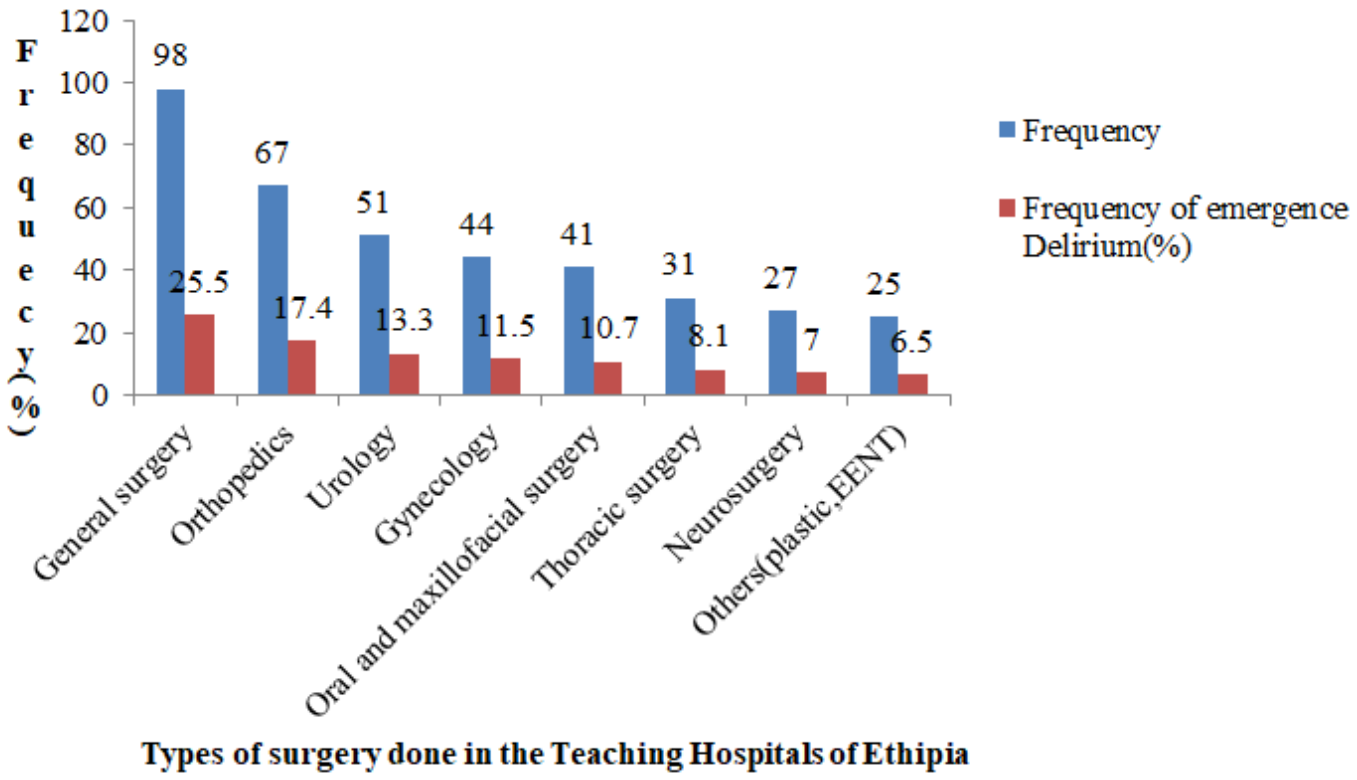

Figure 1

The frequency of types of surgery done and its respective magnitude of emergence delirium in old-age patients who underwent elective surgery at Teaching Hospitals of Ethiopia

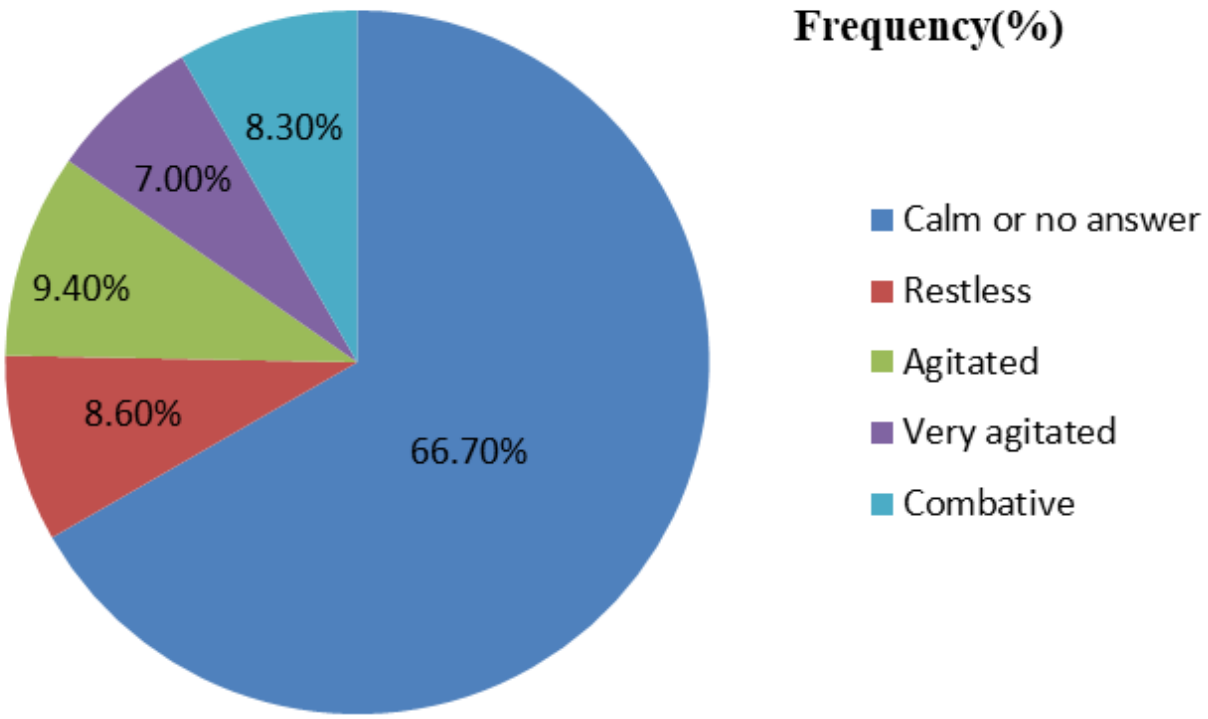

Figure 2

The frequency of sedation score in old-age patients who underwent elective surgery in the Teaching Hospitals of Ethiopia