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Sedative-analgesics use in Intensive Care: A Critical analysis of prescribed analgo-sedatives, treatment outcomes, and adverse drug events in adult patients at Komfo Anokye Teaching Hospital

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Abstract

Background: Studies on the use of sedative-analgesics are limited in Africa and developing countries despite their high usage, benefits, and side effects among patients. Recent evidence on analgo-sedation suggests that protocols considering up-to-date scientific evidence and individual patient characteristics can improve treatment outcomes.

Objective: This study aimed to analyse the prescribed analgo-sedatives, protocols, outcomes and adverse events of sedative-analgesics in the ICU in a teaching hospital in Ghana.

Methods: This retrospective study reviewed data from adult patients admitted to the ICU of KATH from January 2017 to December 2019. Patient characteristics such as socio-demography, sedative-analgesic prescribed, and respondents' outcomes, including length of stay, survival and associated adverse drug events (ADE), were collected for analysis. The chi-square test was used to analyse associations between analgo-sedative usage, speciality and ICU stay, with $p < 0.05$ considered statistically significant.

Results: The most prescribed analgo-sedatives were Morphine+Midazolam (53.24%), Morphine (16.19%) and Midazolam (6.47%). The relative risk of developing an ADE with analgo-sedation use was 2.1 ($p < 0.001$). The median duration of stay was longer in sedated patients (3 days, IQR: 2-9) compared to non-sedated ones (1 day, IQR: 1-3, $p < 0.001$). Analgo-sedation also significantly increased the occurrence of adverse events (RR 2.1; $p < 0.001$). Patients who experienced ADEs had 98% decreased odds of survival compared to those without ADEs (aOR: 0.02, 95% CI: 0.01 - 0.05, $p < 0.001$). Critically ill patients had 73% lower odds of survival than severely ill patients (aOR: 0.27, 95% CI: 0.15 - 0.48, $p < 0.001$).

Conclusion: Analgo-sedation use is associated with prolonged ICU stays due to a significantly higher risk of adverse drug events, and treatment outcomes are associated with sedation protocols and patients' pre-existing medical conditions.

Keywords: Adverse drug events, analgo-sedation, critical care, intensive care, Teaching Hospitals, treatment outcomes

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INTRODUCTION

Critically ill patients may require invasive and life-saving procedures such as mechanical ventilation, dialysis, tracheostomy, and central venous catheters for survival [1]. Besides the benefit of anxiolysis and antinociception, sedative-analgesic medicines support the smooth administration of these critical procedures, enhance care delivery and improve patient safety [2]. These medications may predispose patients to increased morbidity [3,4]. Further, the choice of sedative-analgesic medicine

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can significantly affect patient outcome and the cost of treatment, as such inappropriate and excessive use may result in agitation, self-removal of devices and post-traumatic stress disorder, neuromuscular abnormalities, lung injury, and death [5]. However, it is believed that critically ill adult patients show good treatment outcomes when guideline-based management approaches for pain, agitation, and delirium (PAD) are used [6,7]. Thus, it is prudent to implement assessment-driven and standardised pain management protocols as these are shown to improve ICU outcomes and clinical practice [6,8]. Variations exist in the choice of analgo-sedation prescribed because of the patient's condition, intensivist preference, cost, and availability in resource-constrained settings [9]. More importantly, genetic variation [10] and environmental influences [11] can significantly impact therapeutic outcomes, making it imperative for every ICU to develop analgo-sedation protocols that take into account up-to-date scientific evidence that supports best clinical practice [12].

The recent SARS-CoV-2 pandemic prompted the urgent need for significant improvement in global ICU practices. The practice, particularly in sub-Saharan Africa, has been a greater focus and investment in primary healthcare, with almost a complete neglect of specialised care such as critical care. Evidence is still being compiled about the choice, efficacy, and safety of sedative-analgesic medicines in critically ill patients. Additionally, studies on sedative-analgesic usage are limited in Africa and developing countries despite the high usage, benefits, and side effects associated with them among patients [13]. To improve care for the critically ill, this study analysed retrospectively the choices (protocols), outcomes and adverse drug events of sedative-analgesic medicines used for analgo-sedation in critically ill patients at Komfo Anokye Teaching Hospital, which is a major referral centre serving the northern and middle belt of Ghana.

MATERIALS AND METHODS

Study design and sites

Komfo Anokye Teaching Hospital (KATH) is in the Greater Kumasi Metropolitan Area of the Ashanti Region of Ghana. It is the only referral hospital in the middle belt of Ghana with a total bed capacity of 1200 and serves over 75% of the administrative regions in Ghana as well as some other neighbouring countries. The adult ICU is a level 3 ICU with an 8-bed capacity under the Directorate of Anaesthesia and Intensive Care. KATH has the following category of staff strength: Consultant Anaesthesiologist (1), Specialists Anaesthesiologists (10), Physicians (14), Pharmacists (2), Critical Care Nurses (7), General Nurses (24) and without a Specialist Intensivist.

Study design and data collection

This study was a retrospective review of ICU patients' medical records (paper charts) from January 2017 to December 2019 on the use of sedative-analgesic medicines. Records were entered into a Microsoft Excel sheet for data cleaning and protected using codes. The participants' records were accessed for research purposes within a period of 4 months (December 2019 to March 2020). For uniformity and simplicity, patients with different medical cases were all grouped under the "Medical" speciality of care. Similarly, surgical, obstetrics and gynaecology (O&G) and trauma cases were respectively grouped as "Surgical"," O&G", and "Trauma" specialities of care. Patient characteristics collected and analysed include socio-demographic data, continuous/ intermittent sedative-analgesics used, patient's length of stay, survival and associated adverse drug events (ADE). The doses of analgesics/sedatives used and the procedure for evaluating and monitoring sedation and pain in the KATH adult ICU are presented in tables.

Records of all critically ill adult patients (16 years or above) admitted to the ICU between 1st January 2017 and 31st December 2019 were included in the study. Prospective participants whose records were not complete were excluded from the study.

Data analysis

The data collected were analysed using IBM SPSS (version 25.0) and presented as mean ± standard deviation, frequencies and percentages where appropriate. Socio-demographic characteristics, reason/diagnosis for ICU admission, analgo-sedation status, the use of analgesics/sedative medicines, adverse events occurrence and duration of ICU stay among patients were presented using descriptive statistics. Mean and standard deviation were used to describe continuous variables with a normal distribution. Frequencies were used to describe categorical variables. Chi-square tests were used for inferential analysis to determine the associations between analgo-sedation and the diagnosis for ICU admission, analgo-sedation and ADE, analgo-sedation and duration of ICU stay, and analgo-sedation and survival of admitted patients, with $p < 0.05$ considered as statistically significant. Survival times and duration of ICU were analysed using Kaplan-Meier's curves. To minimise the effect of confounding factors on survival, disease severity (Quick Sequential Organ Failure Assessment, qSOFA score was used since the parameters were not complete to use the Sequential Organ Failure Assessment, SOFA score, diagnosis, age, and the presence of adverse events were adjusted using regression analysis. Contingency analysis using Fisher's exact test was used to determine the association between ADE and analgo-sedation.

RESULTS

A total of 355 patients were recruited for this study. Documentation on all 355 adult patients was complete, and therefore all were included, with females comprising 45.4% (n = 161) and males 54.6% (n = 194). The median age was 42 years (IQR: 30 – 59). Ninety-two (25.9%) of the patients were aged ≤ 30 years, and 12.4% (n = 44) were aged 51 to 60 years. Approximately half the patients were diagnosed

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as surgical cases (50.7%, n = 180), and trauma cases were 13.2% (n = 47). The majority of the patients (73.2%, n = 260) had an adverse event, while 51.0% (n = 181) represented mortality. The median age among patients with no analgo-sedation was 43.5 years (IQR: 28.5 - 63), and among patients who survived was 39.5 years (IQR: 29 - 53) (Table 1).

Twenty-three (23) different types of analgo-sedation protocols were used. These protocols were obtained through a combination of five sedative-analgesic medicines. There was a significant relationship between analgo-sedation and the speciality for ICU admission (p = 0.021). Overall, analgo-sedation was used mostly on surgical patients (55.76%, n = 155), followed by medical, trauma, and O&G patients. The most preferred combination protocol for all types of patients was morphine plus midazolam. Several other protocols were used, but at lower frequencies. On the use of individual medicines, 84.2% of the patients received analgo-sedation protocols that contained morphine. Similarly, midazolam, ketamine, and propofol-based protocols were administered to 72.8%, 11.5%, and 6.8% of respondents, respectively. Morphine was the most preferred mono-sedative-analgesic medicine in O&G, whereas midazolam was preferred in surgery, trauma, and medical patients (Table 2).

There was a significant statistical relationship between diagnosis and analgo-sedation ($\chi 2$ = 28.06; p < 0.001). More so, 50.0% (n = 38) of the patients who had no analgo-sedation were medically diagnosed, and 55.9% (n = 156) of the patients who were sedated were surgically diagnosed (Table 3). The median duration of stay was longer in sedated patients (3 days, IQR: 2 - 9) compared to non-sedated ones (1 day, IQR: 1 - 3), with a statistically significant difference (p < 0.001). Patients who died had a longer stay if sedated (4 days, IQR: 2 - 10). Similarly, among survivors, sedated patients had longer stays (3 days, IQR: 2 - 8.5) (Table 4). Relative to patients with O&G diagnoses, those with medical conditions had 73% decreased odds of survival (aOR: 0.27, 95% CI: 0.08 - 0.92, p = 0.037). Patients who experienced adverse events had 98% decreased odds of survival compared to those with uneventful cases (aOR: 0.02, 95% CI: 0.01-0.05, p < 0.001). Critically ill patients had 73% lower odds of survival than those classified as severe (aOR: 0.27, 95% CI: 0.15 - 0.48, p < 0.001) (Table 5).

Overall, cardiovascular-related ADE were most frequent. Approximately 74.65% of cardiovascular ADE occurred in patients who received analgo-sedation. Hypotension was the highest occurring cardiovascular ADE amongst analgo-sedated patients (20.42%, n = 103, RR = 1.41; p = 0.1564). However, there was a higher relative risk of hypertension among analgo-sedated patients 2.53 (n = 55; 12.91%, p = 0.0159). Similarly, the relative risk of tachycardia within the analgo-sedated patients was 2.48 (n = 72;16.90%; p = 0.0033). Tachypnoea or abnormally rapid but shallow

Table 1: Socio-demographic Characteristics of adult Respondents admitted from January 2017 to December 2019 at the ICU of KATH

Variable	Female (n=161)	Male (n=194)	Total (n=355)
Median age (IQR)	45 (31 - 63)	42 (30 - 56)	42 (30 - 59)
Age			
≤30	39 (24.2)	53 (27.3)	92 (25.9)
31-40	33 (20.5)	41 (21.1)	74 (20.8)
41-50	26 (16.1)	35 (18.0)	61 (17.2)
51-60	19 (11.8)	25 (12.9)	44 (12.4)
61+	44 (27.3)	40 (20.6)	84 (23.7)
Diagnosis			
Medical	58 (36.0)	45 (23.2)	103 (29.0)
O & G	25 (15.5)	0 (0.0)	25 (7.0)
Surgical	68 (42.2)	112 (57.7)	180 (50.7)
Trauma	10 (6.2)	37 (19.1)	47 (13.2)
Adverse event			
Eventful	122 (75.8)	138 (71.1)	260 (73.2)
Uneventful	39 (24.2)	56 (28.9)	95 (26.8)
Final outcome			
Died	88 (54.7)	93 (47.9)	181 (51.0)
Survived	73 (45.3)	101 (52.1)	174 (49.0)
Clinical classification			
Critical	104 (64.6)	105 (54.1)	209 (58.9)
Severe	57 (35.4)	89 (45.9)	146 (41.1)
	161	194	
Analgo-sedation			
Median (IQR)	Yes	42 (31 - 58)	
	No	43.5(28.5 - 63)	
Final Outcome			
Median (IQR)	Died	45 (32 - 65)	
	Survived	39.5(29 - 53)	

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breathing was the most significant adverse effect amongst analgo-sedated patients with a relative risk of 9.94 (n = 36; 8.45%, p = 0.0013). The relative risk of pyrexia was also statistically significant at 2.52 (n = 49; 11.50%; p = 0.0485) in Table 6.

There was a significant (p < 0.001) association between analgo-sedation protocol type and the occurrence of ADE. A very high occurrence (94.44%) of ADE was recorded in patients administered midazolam alone, but upon the addition of propofol or ketamine to midazolam, ADE occurrence reduced to 50.00% and 66.67%, respectively.

ADE occurrence versus diagnosis under the speciality of care, surgical ICU patients recorded the highest (47.59%), followed by medical patients (32.76%), trauma patients (14.64%) and then O&G patients (5.01%). Of a total of 170 medical patients who experienced ADE, 81.77% were cardiovascular-related. Comparing the occurrence of cardiovascular-related ADE, 30.23% of ADE in medical patients was hypotension, whereas 8.70% experienced hypertension. Among O & G patients, 20% recorded cardiovascular-related ADE. Surgical patients 25.67% versus 17.65%), and Trauma patients (16.67% versus 22.92%) (Table 5).

Table 2: Analgo-sedation protocols and preferences amongst ICU type of patients

Analgo-sedation protocol	Type of patients (n = 278)					Significance
	Medical	O&G	Surgical	Trauma	Total (%)	
Ketamine	4	-	2	2	8 (2.88)	Pearson
Midazolam	12	-	5	1	18 (6.47)	Chi-Square
Midazolam, paracetamol	0	-	-	1	1 (0.36)	Value =
Midazolam/Ketamine	3	-	-	-	3 (1.08)	130.84a
Midazolam/Ketamine/Paracetamol	-	-	1	-	1 (0.36)	df = 100
Midazolam/Propofol	1	-	1	-	2 (0.72)	*P* = 0.021
Midazolam/Propofol/Ketamine	1	-	-	-	1 (0.36)	
Morphine	4	2	35	4	45(16.19)	
Morphine/Ketamine	-	-	5	-	5 (1.80)	
Morphine/Midazolam	28	13	83	24	148 (53.24)	
Morphine/Midazolam/Ketamine/Propofol	-	-	-	1	1 (0.36)	
Morphine/Midazolam/Ketamine	3	1	4	-	8 (2.88)	
Morphine/Midazolam/Ketamine/Paracetamol	-	-	2	-	2 (0.72)	
Morphine/Midazolam/Paracetamol	1	-	5	2	8 (2.88)	
Morphine/Midazolam/Propofol	2	-	5	2	9 (3.24)	
Morphine/Midazolam/Propofol/Paracetamol	-	-	-	1	1 (0.36)	
Morphine/Paracetamol	1	-	2	3	6 (2.16)	
Morphine/Propofol	-	-	1	-	1 (0.36)	
Morphine/Propofol/Ketamine	1	-	-	-	1 (0.36)	
Propofol	-	-	1	-	1 (0.36)	
Propofol/Ketamine	1	-	-	-	1 (0.36)	
Propofol/Ketamine/Paracetamol	1	-	-	-	1 (0.36)	
Other	2	-	3	1	6 (2.16)	
Total (%)	65(23.38)	16(5.76)	155(55.76)	42(15.10)	278 (100)	

Table 3: Diagnosis and analgo-sedation

Variable	No Analgo-sedation		Analgo-sedation		χ2 (p-value)
	f	%(95% CI)	f	%(95% CI)	
Diagnosis					28.06 (<0.001)
Medical	38	50 (0.39-0.61)	65	23.3 (0.19-0.29)	
O & G	9	11.8 (0.06-0.21)	16	5.7 (0.04-0.09)	
Surgical	24	31.6 (0.22-0.43)	156	55.9 (0.5-0.62)	
Trauma	5	6.6 (0.03-0.15)	42	15.1 (0.11-0.2)	

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Table 4: Analgo-sedation use and duration of ICU stay of patients

Variable	Duration of stay Median (IQR)	95% CI	Rank sum	U; p-value
Analgo-sedation Status				
No Analgo-sedation	1 (1 - 3)	(1 - 1)	8154	-6.89; <0.001
Analgo-sedation	3 (2 - 9)	(3 - 4)	55036	
Outcome				
Died				
No Analgo-sedation	1 (1 - 1)	(1 - 1)		
Analgo-sedation	4 (2 - 10)	(3 - 5)		
Survive				
No Analgo-sedation	2 (1 - 3)	(1.2 - 3)		
Analgo-sedation	3 (2 - 8.5)	(3 - 4.3)		
Diagnosis				
Medical				
No Analgo-sedation	1 (1, - 3)	(1 - 2)		
Analgo-sedation	4 (2 - 10)	(3 - 6)		
O & G				
No Analgo-sedation	1 (1 - 1)	(1 - 1.9)		
Analgo-sedation	3 (2.5 - 4.5)	(2.5 - 4.5)		
Surgical				
No Analgo-sedation	1 (1 - 3)	(1 - 2.3)		
Analgo-sedation	3 (2 - 7)	(2 - 4)		
Trauma				
No sedation	1 (1 - 1)	(1 - 3)		
Analgo-sedation	6 (2 - 13)	(2.1 - 11)		

Table 5: Risk factors and survival

Variable	Died	Survived	χ2 (p-value)	cOR (95% CI), p-value	aOR (95% CI), p-value
age			11.22 (0.024)		
≤30	40 (22.1)	52 (29.9)		1	1
31-40	36 (19.9)	38 (21.8)		0.81 (0.44-1.50), 0.507	0.62 (0.27-1.42), 0.260
41-50	26 (14.4)	35 (20.1)		1.04 (0.54-1.99), 0.917	0.61 (0.25-1.47), 0.270
51-60	24 (13.3)	20 (11.5)		0.64 (0.31-1.32), 0.228	1.19 (0.47-3.00), 0.709
61+	55 (30.4)	29 (16.7)		0.41 (0.22-0.75), 0.004	0.54 (0.23-1.23), 0.142
Gender			1.59 (0.207)		
Female	88 (48.6)	73 (42.0)			
Male	93 (51.4)	101 (58.0)			
Diagnosis			21.12 (<0.001)		
O & G	12 (6.6)	13 (7.5)		1	1
Medical	72 (39.8)	31 (17.8)		0.40 (0.16-0.97), 0.042	0.27 (0.08-0.92), 0.037
Surgical	76 (42.0)	104 (59.8)		1.26 (0.55-2.92), 0.585	1.19 (0.39-3.59), 0.764
Trauma	21 (11.6)	26 (14.9)		1.14 (0.43-3.02), 0.788	1.56 (0.46-5.21), 0.473
Analgo-Sedation Protocol			3.52 (0.061)		
No Analgo-sedation	46 (25.4)	30 (17.2)			
Analgo-sedation	135 (74.6)	144 (82.8)			
Adverse Event			113.56 (<0.001)		
Uneventful	4 (2.2)	91 (52.3)		1	1
Eventful	177 (97.8)	83 (47.7)		0.02 (0.01-0.06), <0.001	0.02 (0.01-0.05), <0.001
Clinical Classification			46.02 (<0.001)		
Severe	43 (23.8)	103 (59.2)		1	1
Critical	138 (76.2)	71 (40.8)		0.21 (0.14-0.34), <0.001	0.27 (0.15-0.48), <0.001

Table 6: Frequency of adverse event occurrence with analgo-sedation

Organ system	Adverse event	Total Respondents, n (%)	Analgo-sedated Respondents, n (%)	Significance (RR; p-value)
Cardiovascular	Hypotension	104 (20.04)	87 (20.42)	1.41; 0.1564
	Tachycardia	80 (15.41)	72 (16.90)	2.48; 0.0033**
	Hypertension	61 (11.75)	55 (12.91)	2.53; 0.0159*
	Bradycardia	64 (12.33)	46 (10.80)	0.71;0.1805
	Asystole	60 (11.56)	39 (9.15)	0.98; 1.0000
	Cardiac Arrest	20 (3.85)	14 (3.29)	0.64; 0.4001
	Unrecordable BP	5 (0.96)	3 (0.70)	-
	Ventricular Fibrillation	4 (0.77)	1 (0.24)	-
	Ventricular Tachycardia	1 (0.19)	1 (0.24)	-
Central nervous system	Seizures	7 (1.35)	6 (1.40)	1.66; 1.0000
	Agitation	3 (0.58)	3 (0.70)	-
	Insomnia	1 (0.19)	1 (0.24)	-
Respiratory	Tachypnea	37 (7.13)	36 (8.45)	9.94; 0.0013**
	Hypoxemia	10 (1.93)	8 (1.88)	1.10; 1.0000
	Unrecordable O_2 Saturation	1 (0.19)	1 (0.24)	
Thermoregulatory	Pyrexia	55 (10.60)	49 (11.50)	2.52; 0.0485*
	Hypothermia	5 (0.96)	3 (0.70)	-
Gastrointestinal	Constipation	1 (0.19)	1 (0.24)	

DISCUSSION

The emergence of the COVID-19 pandemic profoundly highlighted the urgent need for enhanced investment in critical care systems globally, particularly within Intensive Care Units (ICUs). One important area in ICU management is the use of sedative-analgesic (analgo-sedative) medications, which play a vital role in patient care. However, despite their benefits in managing pain and anxiety, these drugs have also be linked to adverse outcomes if not used optimally [1]. This study, therefore, explored the patterns of sedative-analgesic usage, treatment protocols, clinical outcomes, and adverse events in the ICU of a major teaching hospital in Ghana.

In this study, geriatric patients accounted for about 20% of all ICU admissions, with a higher proportion of male admissions compared to females. This finding is comparable with data from similar studies conducted in other regions, which also report a predominance of male patients in ICU settings [6,7,14]. The main reasons for ICU admission in this study were surgical and medical in nature. A substantial number of these patients were postoperative, with common complications such as pain and anxiety requiring critical care and the use of sedative-analgesics. In line with global best practice, ICU pain management strategies aim to minimise prolonged sedation to reduce the incidence of delirium, shorten ICU stays, and improve overall patient outcomes [15,16]. Many critically ill patients, particularly those with severe back and lower limb pain, also require sedation as part of their treatment [3,5]. These factors may explain the high proportion of surgical and medical admissions observed in this study. A concerning finding was the relatively high mortality rate of 50.84%, significantly higher than the 7 – 20% range typically reported in more developed nations [17,18]. This discrepancy could be attributed to systematic challenges involving limited healthcare resources, shortages in skilled ICU personnel, and the absence of specialised ICU sub-disciplines [19-21].

The study reported the use of 23 different analgo-sedative protocols involving five primary sedative-analgesic medications. Among these, morphine and midazolam were the most frequently prescribed drugs across all medical specialties. In low-income settings, cost and drug availability are major determinants of medication choice [19,20]. As such, advanced sedative-analgesics like dexmedetomidine, fentanyl, remifentanil, buprenorphine, and nalbuphine—despite their established efficacy—were not used during the study period. In addition to cost and availability, healthcare workers' familiarity with specific medications is also a critical factor in protocol selection [21]. The absence of an intensivist at the facility during the study period may have further influenced the preference for more familiar drugs like morphine and midazolam. In this study, although propofol and ketamine were used in some cases, their application was limited. This is because propofol is generally not recommended for long-term sedation, and ketamine use may be restricted due to its potential neuropsychiatric side effects [22,23]. Surgical patients, whether undergoing elective or emergency

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procedures, were more likely to receive sedative-analgesia postoperatively. This is consistent with clinical standards, as adequate sedation and pain control are vital for postoperative recovery and patient safety in life-saving interventions [15,16].

Interestingly, approximately half of the patients who did not receive analgo-sedation were medical admissions. This may reflect varying approaches to sedation between medical and surgical specialties. However, the specific type of sedative-analgesic used did not significantly affect the duration of stay. These results are consistent with previous large-scale trials, such as MIDEX and PRODEX, which found midazolam to be associated with longer mechanical ventilation and ICU stays [24]. A major contributor to prolonged ICU stay could be knowledge gaps among health professionals regarding analgo-sedation management, including improper use of assessment tools, lack of clear protocols, and insufficient training [16]. Interestingly, age was not significantly associated with ICU mortality after adjusting for other variables. This contradicts findings from studies conducted in Malaysia and South Korea, which observed increased mortality with older age [25,26]. Furthermore, our study found that neither gender nor whether patients received analgo-sedation had a significant impact on mortality.

Nonetheless, the survival rate and median survival time were significantly higher for patients who received analgo-sedation, as similar presented in the findings of Wang et al. (2019), who reported improved ICU survival with the implementation of analgo-sedation [27]. These findings underscore the importance of optimising analgesic-sedative use in low-income settings to improve patient outcomes. Though not statistically significant, male patients exhibited better survival outcomes than females. Other studies have similarly suggested that, despite similar survival rates, men may have better functional outcomes, possibly due to age differences or underlying health conditions [28,29]. The study also found that medical diagnoses were associated with significantly lower survival odds (aOR: 0.27), comparable with findings from Abate et al. (2023) in Ethiopia [30]. Patients with adverse drug events (ADEs) also had significantly lower survival (aOR: 0.02), highlighting the importance of careful drug monitoring procedures. Higher disease severity was associated with worse outcomes, supporting the work of Oliveira et al. (2024), who linked higher severity with increased mortality during both early and late ICU phases [31].

Notably, patients who received analgo-sedation were 2.1 times more likely to experience an ADE. This finding is consistent with existing literature linking prolonged sedation to increased ADEs [32-34]. Cardiovascular-related events were most common, especially hypotension with compensatory tachycardia, likely due to frequent use of opioids and benzodiazepines [35,36]. Opioids reduce sympathetic tone and cause vasodilation, while benzodiazepines can result in hypotension, especially when co-administered [36]. Hypertension was also commonly reported, especially in trauma patients, possibly due to increased sympathetic activity [37]. This provides an indication that while sedative-analgesic use was associated with longer survival, it also carried a high risk of ADEs.

Despite the rigour of the statistical analysis and appropriate methodology employed, this study had a few limitations. The retrospective design and small sample size reduce generalizability. Grouping patients by diagnosis limited individualised analysis. Variables such as comorbidities, sepsis, and mechanical ventilation—which could influence ICU stay and survival—were not fully controlled. However, the strength of the study are captured in its detailed exploration of sedation protocols and associated outcomes. The findings can serve as a baseline for future prospective studies, particularly in low-resource settings where such data is scarce. Further research in sub-Saharan Africa is necessary to develop region-specific clinical guidelines.

Conclusion

This study highlights the prevalent use of analgo-sedatives in the ICU, with Morphine and Midazolam being the most prescribed medications. While analgo-sedation is essential for patient management, its use is associated with prolonged ICU stays and a significantly higher risk of adverse drug events, which significantly reduces survival odds. The findings emphasise the need for carefully tailored sedation protocols that consider patient-specific factors to optimise outcomes and minimise risks. Future research should focus on developing evidence-based guidelines for sedation practices in resource-limited settings to enhance patient safety and treatment efficacy.

DECLARATIONS

Ethical consideration

Dual independent ethical clearance for the study was given by the Committee on Human Research, Publications and Ethics, Kwame Nkrumah University of Science and Technology, School of Medical Sciences (reference number CHRPE/AP/681/19); and the Research and Development Unit of Komfo Anokye Teaching Hospital, Kumasi (reference number RD/CR19/198). Individual permission and consent were not possible as medical records (paper charts) were the principal source of data. For confidentiality, patient names and addresses were not recorded.

Consent to publish

All authors agreed on the content of the final paper.

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Competing Interest

The authors declare no conflict of interest.

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Author contribution

All the authors contributed to the drafting and preparation of the manuscript. JA, MSF, and KBM collected the data. AM, JA, PKTAG, CA and KBM planned the study design and carried out the data analysis. JA, KBM and AM drafted the manuscript. CA and KBM conceived the idea and carried out project management and supervision of the study. KBM revised the final manuscript, and all the authors approved the final manuscript.

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Availability of data

Data is available upon request to the corresponding author.

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