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Cross-sectional Study

The magnitude and associated factors of post-operative pain among adult patients

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ABSTRACT

Background: Postoperative pain continues to be a serious consequence of surgical intervention. Several factors may contribute to the development of postoperative pain; these could be preoperative factors, demographic factors, anesthetic factors, and surgical factors.
Objective: The aim of this study was to assess the magnitude and factors associated with postoperative pain among surgical patients.
Methods: An institutional-based prospective longitudinal study included 265 postoperative patients from the surgical wards of Gambella General Hospital from April 15, 2021, to June 30, 2021. A consecutive sampling technique was used to recruit study participants. The patients were followed up for 24 h postoperatively. A numerical rating scale (NRS-11) is used for the assessment of pain. Data analysis was done using the Statistical Package for Social Science (SPSS) 25. Logistic regression analysis was used to calculate the association between dependent and independent variables with a 95% confidence interval and a p-value<0.05 was considered statistically significant.
Results: A total of 270 data points were collected. Of these, a total of 265 with a 98.1% response rate were analyzed. The incidence of postoperative pain was 69%, 74%, and 77.0% at 2 h, 12 h, and 24 h, respectively. The following factors were strongly associated with the dependent variable: patient age, 18–45 years old [AOR = 2.8; (95%CI: 1.13, 6.74, p = 0.026)], skin incision length, 10 cm [AOR = 2.5; (95%CI: 1.30, 5.13, p = 0.007)], preoperative pain [AOR = 2.4, (95%CI: 1.02, 5.60, p = 0.045)], and surgeon experience [AOR = 2.1, (95%CI:
Conclusion: and Recommendation: In the current study the magnitude of postoperative pain was high, 220 patients were complaining POP (83%). Age of the patient, length of skin incision, preoperative pain, and experience of surgeons were the independent associated factors for the experience of postoperative pain. Preoperative pain management should exercise among adult surgical patients in order to reduce the incidence of postoperative pain, and the length of surgical skin incisions should be minimized.

1. Introduction

Pain is an anticipated part of the postoperative experience due to the nature of the surgery and inadequate control of pain that has profound effects. Uncontrolled postoperative pain (POP) will result in clinical and psychological changes that place the patient at a higher risk of postoperative morbidity and mortality, and also may impair the quality of life [1]. Despite improved understanding of pain mechanisms, increased awareness of the magnitude of post-surgical pain, and other focused initiatives targeted at improving pain-related outcomes in recent decades, there continues to be a profound, unresolved healthcare problem [2].

Several studies done in developing countries showed that postoperative pain remains a common problem among surgical patients, and it's difficult to make a global evaluation of the magnitude of POP as the figures vary depending on the methods being used [3]. However, several studies revealed that the magnitude of POP ranges from 30% up to 80% of patients who experience pain postoperatively [4–6]. POP is considered as a form of acute pain due to surgical trauma with an inflammatory reaction and initiation of an afferent neuronal bombardment. It is a combined collection of several unpleasant sensory, emotional, and mental experiences precipitated by the surgical trauma and associated

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with autonomic, endocrine-metabolic, physiological, and behavioral responses [7–9].

POP could be divided based on several factors like pain duration, which classified pain into acute pain and chronic pain. The purpose of classifying postoperative pain based on those aforementioned factors is to help practitioners successfully manage pain by taking into account its duration, involved body part, type of patient, strength, and pathology [10]. It would be desirable preoperatively to distinguish patients who are at high risk of developing POP from those who have low risk because patients at high risk might benefit from protocolled analgesic interventions either pre-emptively or in the early phase of recovery from anesthesia [11]. Pain is always personal, subjective, and each individual learns the application of the word through experiences related to injury in early life, and biologists recognize that those stimuli which cause pain are liable to damage tissue [12,13]. It has been stated that several factors, such as genetic makeup, individual behavior, cultural influences, and socio-demographic characteristics like age and sex, contribute a lot to the individual variation in perceiving pain [13,14]. POP is a serious, complex, and multidimensional clinical problem that is one of the most frequently shown postoperative symptoms. Identification of the factors that are associated with the occurrence of POP would facilitate early intervention and better pain management [15,16].

Surgery is associated with potential harm such as pain during and after the procedure, deep vein thrombosis, pulmonary embolism, coronary ischemia, myocardial infarction, pneumonia, poor wound healing, insomnia, and demoralization. This all has economic and medical implications, such as extended lengths of stay, readmissions, and patient dissatisfaction with medical care and chronic postoperative pain [17,18]. Possible post-surgical management and treatment options include multimodal analgesia involving opioids, non-steroidal anti-inflammatory, paracetamol, regional block and other adjuvants depending on the severity of pain [6]. Untreated POP has many consequences, including; prolonged duration of hospital stay, chronic pain, respiratory infection, myocardial infarction, atelectasis, and death [19–21], and impaired quality of life, increased medical costs, prolonged opioid use [2].

2. Methods

2.1. Study design, study period and study area

After ethical committee approval from the University of Gondar, College of Medicine and Health Sciences, an intuitional prospective longitudinal study was conducted to assess the magnitude and factors associated with the POP among 270 adult surgical patients in Gambella General Hospital from April 15th, 2021 to June 30th, 2021. Gambella General Hospital is located in Gambella, Ethiopia. This hospital is the only hospital serving the Gambella people in the National Regional State. Which is located in the southwestern part of, Ethiopia and the borders of oromia region to the North and East as well as a state to the south, and South Sudan to the west. Gambella is a name for both the region and the city, which is located about 753 km West of Addis Ababa (capital city of Ethiopia) perched at an elevation of 526 m above sea level. The article has been registered with the UIN of the research registry (7982) and it was reported in line with the STROCSS criteria [22]. The study population consisted of all adult patients who underwent surgery during the study period. This study included all patients over 18 years of age and not more than 65 years of age after written informed consent. Patients who were discharged before the first 24 h postoperatively, patients with documented cognitive disability, uncooperative patients, and any difficulty with communication were excluded.

2.2. Sample size determination and sampling procedure

The sample size required for this study was obtained by using single proportion formula where the initial sample size was obtained, by considering a 5% degree of precision (d). The magnitude was taken from a previous study, the magnitude of POP was 78% [7].

$$N = \frac{(Z_1 - \alpha/_2{}^2 \ P \ (1 - P)}{D^2 \ 2}$$

$$N = \frac{(1.96) \ \times 0.78(1 - 0.78) \ = 264}{2 \ (0.05)}$$

Adding 10% non-responding rate, the final sample size required was:

$$NF = 264 \times 10\% = 264 + 26.4 = 290.4, \sim 290.$$

Where,

N = the required sample size
$Z_{1\text{-}a/2}$ = critical value for normal distribution (standard curve) at 95% confidence level.
P = the proportion of patients
D = the margin of error (5%) desired precision.

All consecutive patients who fulfilled the inclusion criteria were collected until the sample sized was reached.

2.2.1. Dependent variable of the study

Post-operative pain (POP).

2.2.2. Independent variables of the study

Socio-demographic variable: Age, sex, smoking status, marital status, and educational status.

Preoperative related variables: ASA status, preoperative history of analgesic intake, preoperative history of acute or chronic pain.

Intraoperative related variables: Duration of surgery, type of surgery, length of skin incision, type of anesthesia, and duration of anesthesia.

Postoperative related factors: type of analgesics used postoperatively.

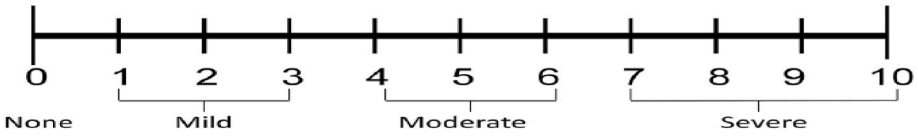
Operational definition The Numerical rating scale (NRS-11) is an 11-point numeric rating scale. On the scale, 0 indicates no headache and 1–3 indicates mild pain. 4–6 is moderate pain (interferes significantly with activities of daily living), and 7–10 is severe pain (disabling; unable to perform activities of daily living). Even though it determines the severity of pain using a telephone interview, NRS is more practical than a visual analog scale (VAS), easier to understand, and does not need clear vision [23].

2.3. Data collection and data processing

Data collection was conducted via interview and chart review after taking informed written consent from the responsible data collectors. The patients were visited three times, with the initial visit being at 2 h, 12 h, and 24 h postoperatively. During the data collection period, patients who were at any risk of complications due to pain were shared with responsible bodies for intervention.

2.4. Data quality, assurances, entry and analysis

The training was given to the data collectors for one day on how to collect the data based on the questionnaire. Questionnaires were prepared in English and translated into the local language. The principal investigator reviewed the collected data for completeness, accuracy, and clarity. This quality checking was done daily after data collection. Data clean-up and crosschecking were done before analysis. The EpiData Association (EPI data) version 4.6.0.0 and SPSS version 25 are being used for the entry and analysis of the collected data. Descriptive analysis was completed by using frequency; percentage and logistic regression



were used to identify associated factors for postoperative pain.

3. Results

This study analyzed 265 patients with a 98.1% response rate. However, the remaining patients were not analyzed because of their incompleteness. Age 18–45 years old patients were taking the majority 198(74.7%), while 67(25.3%) patients were ≥46 years old. The mean and standard deviation age of the participant was 37.3 ± 11.2 years. Most participants were females 149(65.80%). Based on ASA classification, 203(76.6%) were in ASA I and ASA II while 62(23.4%) were classified under ASA III &IV. 156(58.9%) patients were average weight. The majority of patients were protestant Christian and Agnuak was the dominant ethnicity in the study area and accounted for 31. %.117 study participants were of college and above educational status (Table 1).

The magnitude of POP 69%,74% and 77% at 2hr, 12hr and 24hr respectively. This study also showed that the majority patients developed mild pain in the first second 2hr and severe pain after 12hr and 24hr following surgery (Table 2).

Among 265 study participants, 190(71.7%) were operated on under general anesthesia while the remaining patients were done under spinal anesthesia and the majority of patients experience mild pain at 2hr after general anesthesia, in addition, these 56 patients were experienced severe pain at 12hr after spinal anesthesia. A large proportion of subjects (56.6%) were undergone emergency surgery and large numbers of patients experienced severe pain at 2hr, and 24 h. Which was compared to elective surgery. Of a total of 265 patients, scheduled for surgery, 89.8% had preoperative pain and experienced all types of pain (mild, moderate, and severe POP) during the follow-up time. Propofol and ketamine was the most frequent induction agent in this study, but the majority of patients experienced POP after propofol induction in the first 2 nd h, 12hr, and 24hr following surgery.

Table 1
Socio demographic characteristics of the participants(N = 265).

Variables	Category	Frequency	(%)
Age	18–45years	198	74.7
	≥46 years	67	25.3
BMI kg/m2	<18.5	21	7.9
	18.5–24.9	156	58.9
	25–29.9	51	19.3
	>30	37	13.9
Sex	Male	116	43.8
	Female	149	56.2
ASA	I and II	203	76.6
	III and IV	62	23.4
Religion	Protestant	157	59.0
	Muslim	56	21.1
	Orthodox	52	19.2
Marital status	Single	53	19.2
	Married	178	66.9
	Divorced	19	7.1
	Widowed	15	5.6.0
Ethnicity	Agnuak	83	31.2
	Nuer	75	28.2
	Opwo	26	9.8
	Komo	33	12.4
	Majanger	20	7.5
	Others*	28	10.5
Educational status	Illiterate	30	11.3
	Primary school	43	16.2
	Secondary school	75	28.2
	College and above	117	40.0

Others*: Amhara, Oromo, Tigre.

Table 2
Magnitude and severity of POP by time of assessment (N = 265).

Time	Degree of POP			
	Mild	Moderate	Severe	Percentage
At 2hr(n=183)	100(54.6%)	43(23.5%)	40(21.9%)	69%
At 12hr(n=196)	36(18.4%)	64(32.6%)	96(49%)	74%
At 24hr(n=204)	59(28.9%)	69(33.8%)	76(37.3%)	77%

Most of the time, in the study area the intraoperative maintenance drug was inhalational agents and ketamine (54.7%, 30.2%) respectively, but the majority of patients experienced POP after the maintenance of inhalational agents than ketamine. In addition to this, diclofenac and tramadol were the preferable intraoperative analgesia for the majority of patients (69.4% and 20%) respectively. However, among those patients who took tramadol analgesia, intraoperative most patients experienced severe POP after 12hr and 24 h. In addition to the above, majority of the patients 154(58.0%) had a length of skin incision ≥10 cm and experienced mild, moderate, and severe pain after the 2 nd h, 12hr, and 24 h. Around 58.5% of patients were done by surgeons who had less than 4years of work experience and the majority of patients developed mild to severe pain during the follow-up period. In this study, one of the relevant variables was postoperative analgesia and 218(82.3%) patients were taken analgesia after surgery (Table 3).

3.1. Risk factors associated with POP

Hosmer Lemeshow test of goodness of fit was used to check the appropriateness of the model for analysis of this study. Age of the patient, BMI, length of skin incision, preoperative pain, the experience of the surgeon, type of surgery, postoperative analgesia, and surgical duration were associated with POP in the bivariate logistic regression at a p-value<0.2. However, variables like age of the patients, length of skin incision, preoperative pain, and experience of surgeons were statistically associated with the dependent variables in multivariate logistic regression at a p-value<0.05.

Hence, the odds of those aged 18–45year old was 2.8 times were more likely to develop pain after surgery than those aged ≥46 years old [AOR = 2.8, (95% CI:1.13, 6.74 and p = 0.026)]. Moreover, surgery with the length of skin incision ≥10 cm was 2.5 times more likely to experience pain after surgery than the length of skin incision <10 cm [AOR = 2.5, (95%CI: 1.30, 5.13 and p = 0.007)] (Table 4).

Patients who had preoperative pain were 2.4 times more likely the occurrence in POP than patients with no pain [AOR = 2.4, (95%CI: 1.02, 5.60 and p = 0.045)]. The current study also showed that patients who were operated on by < 3 years of work experience surgeons 2 times more likely to develop POP than ≥ 3 years work experience of surgeons [AOR = 2.1, (95%CI:7.2, 9.22 and p = 0.039)](Table 4).

4. Discussion

The purpose of this study was to determine the magnitude of POP and identify the associated factors. In the current study, the POP was 69%, 74%, and 77.0% at 2hr, 12hr, and 24 h respectively, and the over prevalence was 83%. This finding is consistent with the survey and a prospective cross sectional studies done in the previous study, which

Table 3
Magnitude of POP at the 2nd post-operative hour, 12hr and 24hr of the study participants (N = 265).

Variables	Category	Frequency (%)	at 2hr(n = 183)			At 12hr(n = 196)			At 24hr (n = 204)		
			mild	moderate	severe	mild	moderate	severe	mild	moderate	severe
Age(year)	18–45	198(74.7)	45	34	29	20	41	68	28	39	63
	≥46	67(25.3)	55	9	11	16	23	28	31	30	13
Urgency of surgery	Emergency	150(56.6)	40	23	19	16	34	50	30	39	50
	Elective	115(43.3)	60	20	21	20	30	46	29	30	26
Preoperative pain	Yes	238(89.8)	73	30	26	22	50	76	40	51	56
	no	27(10.2)	27	13	14	14	14	20	19	18	20
Type of anesthesia	General anesthesia	190(71.4)	82	21	15	19	32	44	27	39	42
	Spinal anesthesia	75(28.4)	18	19	25	17	32	52	32	30	34
preoperative analgesia	Yes	192(72.5)	35	27	15	13	30	51	36	30	25
	No	73(27.5)	65	16	25	23	34	45	23	39	51
Induction agents	Ketamine	84(31.7)	20	8	10	6	18	26	9	20	14
	Propofol	104(39.2)	38	15	12	15	12	20	20	15	26
	Thiopental	65(24.4)	32	13	10	10	30	44	19	23	30
	Others	12(4.5)	10	7	8	5	4	6	11	11	6
Patient maintenance	Inhalational	145(54.7)	34	13	10	10	34	42	29	29	28
	Inhalational + opioid	40(15.1)	38	15	16	18	15	20	14	15	26
	ketamine	80(30.2)	28	15	14	8	15	34	16	25	22
Intraoperative analgesia	Diclofenac	184(69.4)	12	6	10	10	16	20	18	19	16
	Pethidine	25(9.4)	8	6	6	6	14	20	12	19	18
	Tramadol	53(20)	31	8	10	8	12	43	10	11	22
	None	3(1.2)	49	23	14	12	22	13	19	20	20
Surgical duration	<2hr	97(36.6)	28	20	17	11	28	34	32	28	33
	≥2hr	168(63.4)	72	23	23	25	36	65	27	41	43
Anesthesia duration	<2 h	90(34)	67	21	24	19	32	57	27	34	42
	≥2 h	175(66)	33	22	16	17	32	39	32	35	34
Type of surgery	Intra-abdominal	77(29)	43	13	9	8	24	34	16	21	26
	Head &neck	20(7.5)	10	8	5	8	8	16	8	13	8
	Gynecology & obstetric	86(32.5)	17	6	10	6	8	20	16	17	14
	Urogenital	16(6)	8	5	5	4	10	6	5	6	10
	Orthopedic	66(25)	22	13	11	10	14	20	12	12	18
Experience of surgeon	<4years	155(58.5)	68	23	18	20	44	56	49	36	51
	≥4years	110(41.5)	32	20	12	16	20	40	10	33	25
Length of skin incision	<10 cm	111(41.9)	42	10	12	10	20	46	20	17	16
	≥10 cm	154(58.1)	58	33	18	26	44	50	39	52	60
Post-operative analgesia	Yes	218(82.3)	65	25	18	28	50	80	37	40	44
	No	47(17.7)	35	18	16	8	14	16	22	29	34

Table 4
Bivariate and multivariate binary logistic regression: factors associated with POP in Gambella General Hospital April–June 2021 (N = 265).

Variables	Category	POP (%)		OR (95%CI)		
		No(n = 45)	Yes (n = 220)	COR	AOR	p-Value
Patient's age	18–45 year	15(33.3%)	161(73.2%)	4.38(1.93,9.93)	2.8(1.13, 6.74)	0.026
	≥46 year	30(66.7%)	59(26.2%)	1*	1**	
Preoperative pain	Yes	21(46.7%)	147(66.8%)	3.28(1.36,7.1)	2.4 (1.02, 5.60)	0.045
	No	24(53.3%)	73(33.2%)	1*	1**	
Length of skin incision	≥10 cm	17(37.8%)	150(68.2%)	2.73(1.43,5.19)	2.5(1.30,5.13)	0.007
	<10 cm	28(62.2%)	70(31.8%)	1*	1**	
Experience of surgeon	<5years	16(35.6%)	123(55.9%)	2.51(1.9–7.71)	2.1(1.7–9.22)	0.039
	≥5years	29(64.4%)	97(44.1%)	1*	1**	

OR=Odd ratio, C I=Confidence interval.
COR=Crude Odd ratio.
AOR = Adjusted Odd ratio.
1*, Significant from the bivariate logistic regression model.
1**, Significant from the multivariate logistic regression model.

was done in, the USA, Nigeria, and India [4,24,25]. But there were differences regarding the time of follow-up. Moreover, This finding was in the range of global and USA incidence of POP from 30% to 80% and between 74% and 88% [4,6]. Similarly, this study was also comparable to the survey study done in the USA which showed that the incidence of POP range from 74 to 88% [17,26]. This study was also consistent with a descriptive prospective hospital based study, done in the same country, which showed that the magnitude of POP was ranging from 77.5% to 85.5% following surgery [27].

In the current study, the prevalence rate of POP in the first 24 postoperative hours was high as we mentioned above (83%) compared to other studies done in a different country [4,28,29]. It might be due to poor management of pain in the present study.

The magnitude of this study was also high compared to a prospective follow-up study done in Kenya [30] at 30 min,24hr., and 48 h. It might be due to different types of surgery. There were day cases where surgeries were done in Kenya, but major surgeries were done in the current study. In addition to this, the prevalence of the current study was high in all degrees of pain [28]. Similarly, a study done in the same country showed the consistent result to this study, that the magnitude of POP was 59% and 2.4% at 24 and 48 h [31]. However, the result of this finding was higher as compared with a study done in Kenya, South

Africa, Korea, Netherland, and Portugal [3,28,32,33]. The variation of this study's results with others could be explained by the presence of POP management from different study populations involves in these studies and the methodology being used.

The incidence of moderate (74%) and severe (77%) pain was higher than in other survey and systematic review studies [11,28,34]. It could be only major surgeries were analyzed in present study. A cohort study showed a relatively lower magnitude of 25.8% of POP after surgery that was lower than our finding, and the reasons for this lower POP magnitude might be due to their implementation of multimodal analgesia [35].

Our study showed that in the first 2 h, post-surgery 54.6% experienced mild pain while 45.4% of the respondents presented with severe pain. This result was not comparable to a hospital-based prospective longitudinal study done in Rwanda 64% of patients experienced moderate to severe pain, while 36% of patients develop mild pain at 6 h postoperatively. The patients were followed up for 48 h postoperatively [31]. It might be due to the different time's initial visit of patients [33]. The scheduling of evaluation of the patients postoperatively stated by the majority of the studies was different from our study, the majority of the studies showed that the first assessment was done at 12 h 24 h, and 48 h postoperatively [36,37]. While our study first assessed the patient at 2 h, postoperatively, this could also explain the differences between the results. In different a prospective study done in Japan and a retrospective study done in Germany, there were evidence about the intensity of pain was affected by gender and showed that the pain threshold is lower in women than males and most women verbalize their pain more often than men [38–40]. In addition, this gender also had a predictive effect on outpatients and showed that females had the risk of pain twice more than male patients but not in patients [11]. In contrast a prospective study done in Canada shown men had high prevalence rate of pain than women [41]. However, in the current study, there was no difference in the prevalence of pain between males and females. Age was one factors in our study and the younger age was found to be one of the factors associated with the development of POP. This finding was similar to other several studies [3,16,38,42]. The reduction of pain in older age may be because of aged patients have a blunted peripheral nociceptive function, which may decrease pain in some contexts, and reduce opioid requirements than younger age patients [16]. Some evidences showed that advancing age appears to reduce the influence of specific genes on the experience of pain [43]. Body Mass Index (BMI) was also one of the variables used in our study but not significantly associated with the POP and supported by studies [41,44]. However, it was one of the factor of POP(40), it might be obesity is lead to pain because of excess mechanical stresses and its pro-inflammatory state.

In the current study religion and ethnicity were not significantly associated with POP. This result was supported by a previous prospective longitudinal study that was done in Ethiopia [45]. In contrast to our study, a study showed that religion had a positive effect to minimize the intensity of pain after surgery due to, they had used prayer as a non-pharmacological alternative to managing pain [46].

The American Society of anesthesiologist physical status classification of the patient was not a significant factor in the dependent factor in the present study and supported by Tanzania's study [47]. In contrast to our results, a study done in Chicago showed that POP was two times more likely to be experienced by those patients who were classified under ASA > II [48]. The possible reason was still unclear.

Preoperative pain was one of the factors associated with POP. This was consistent with other studies [16,49–51]. The potential reasons might first, it could be that noxious afferent input from the area to be operated upon, has produced neuroplastic changes in the spinal cord (sensitization by up-regulation of receptor subsystems) that become manifest as a relatively hyperplastic state in the postoperative period. Second, it could also be that the patient's preoperative pain and focus on the operation [30].

The length of the skin incision was one of the statistically significant factors associated with the occurrence of POP among the study participant. This study showed that those whose skin incision ≥10 cm were 2.58 times more likely to develop POP than those whose skin incision was <10 cm which was supported by other studies [11,38,42]. The reason could be due to the amount of tissue injury and more damage to nerves that are involved in the affected surgical fields. In the current study, the duration of surgery had no significant associated factor for POP and is supported by many studies [44,52,53]. It might be due to good intraoperative used for pain management. But the duration of surgery had a significant association with POP in a study done in Germany [40], the authors suggested that the long duration of surgery plays a role in determining POP after awakening. Studies showed that POP was associated with the type of surgery; the incidence was higher in patients were underwent general surgery and orthopedic procedures [54]. Similarly, the type of surgery was an important and significant factor in POP in many studies which were in a different country [41,55–57]. But in our study type of surgery was not a statistically significant association variable with the POP. On the other view type of anesthesia also had no additional predictive factor for the dependent variable in the current study and supported by a study was done in the Netherlands [11].

The experience of the surgeon was the main significant associated factor in the present study. Patients who were operated on by more senior surgeons developed less pain than junior surgeons'. The possible reason might be less experienced surgeons cut more tissues than experienced surgeons, but it needs further studies and it was not supported by other studies. In our study perioperative use of analgesia was not significantly associated with factors with POP, it might be the half-life and duration of analgesia which was used in our hospital was not more than 90 min. However, preoperative use of analgesia was one of the factors of severe pain in another study [47].

5. Strength and limitation of the study

The strength of this study was it showed that mild, moderate, and severe pain but it had limitations. One of the limitations of this study was the small sample size compared to others due to Covid 19. The other challenge for this study was patients were followed by data collectors only for the first 24 h.

6. Conclusion and recommendation

The overall finding showed that the magnitude of POP was high in Gambella General Hospital (83%). Age of the patients, length of skin incision, preoperative pain, and surgeons' experience were the independent associated factors for the occurrence of POP. POP was not adequately controlled following surgery. There is a need to review and improve the methods and practices of postoperative pain management in the study area.

Ethical approval

This study was carried out after getting permission from the ethical review committee of the University of Gondar Comprehensive and Specialized Hospital. Official letters submitted to Gambella General Hospital.

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Not applicable.

Author contribution

CO conceived, designed the study and performed the data analysis, interpretation of the result, and YA drafting and editing the manuscript. HY and HA participated in designing the study, data analysis and data

interpretation,. All authors read and approved the final manuscript.

Research registration number

1. Name of the registry: Research registry.
2. Unique Identifying number or registration ID: 7982.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): https://www.researchregistry.com/browse-the-registry#home/.

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Consent

Not applicable.

Availability of data and materials

The data was analyzed during this study were included in this published article.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

No conflicts of interest in all authors.

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Appendix A. Supplementary data

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