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Effectiveness of post-operative pain management among patients who underwent general and orthopedic surgeries at a national referral hospital Asmara, Eritrea

Abstract

Background: Post-operative pain poses significant challenges with high global prevalence. Inadequately managed pain can result in patients increased medical complications, prolonged hospital stays and reduced effective pain management. The study was aimed at comparing the effectiveness of existing and severity-based POP management of patients who underwent general and orthopedic surgeries in Halibet National Referral Hospital.

Methods: This was a quasi-experimental study conducted among 118 patients who underwent general and orthopedic surgeries. Data was collected by using socio-demographic, clinical characteristics and visual analogue scale (VAS). The intervention group received a severity based (SBM) POP management, whereas the comparative group received the existing management (EM). Data on severity of POP and effectiveness of its management was collected using VAS. Descriptive statistics for the demographic and clinical data, median pain reduction, and Mann-Whitney U value were used to analyze data. $P< 0.05$ was taken as statistically significant.

Results:98.3% of the patients in the EM and 88.1% in the SBM experienced pain at the initial point after surgery with mild pain (30.5%) (11.9%), moderate pain (37.3%) (54.2%) and severe pain (30.5%) (22%) respectively. The common type of analgesic used in the EM was Diclofenac (63.72%). The median pain reduction was statistically insignificant (p=0.056) in the EM group, while a significant pain reduction (p<0.001) was seen in the SBM group. Significant difference in the effectiveness of POP management was found between EM and SBM groups in middle aged adults (p=0.026), females (p= 0.016), patients who took GA (p<0.001) and patients who had general surgery (p<0.001).

Conclusion: The management of POP should be based on the severity of pain experienced by the patient and use of the most suitable analgesics. Pain assessment should be performed for every post-operative patient using appropriate pain assessing tool and documented.

Keywords: POP, effectiveness of POP management, patients, general and orthopedic surgery, existing and severity-based management, VAS.

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Background

Postoperative pain is a form of acute pain that follows surgery and is one of the common immediate postoperative complications resulting from tissue injury during surgical procedure like skin incision, tissue dissection, manipulation and traction. Globally the prevalence of POP ranges from (50% -75%)[1] with reported 57% moderate to severe pain in the immediate postoperative period and 78% in the first 12 hours.[2] One of the essential components of surgical patient care is effective POP control. It is important to manage POP in order to achieve high quality of health services, create pain free environment and improve the health status of the patients. Pain management is crucial if managed inadequately it will result in suffering, increased risk of morbidity and mortality, longer stay in hospital and higher cost. Despite substantial advances in pain research and management, millions of people continue to suffer because of inadequate pain management.[3]

Inadequately managed pain leads to sympathetic stimulation that result in an increased heart rate and blood pressure, increasing the risk of complications. Pain limits coughing and decreases functional residual capacity, which, in turn increases the risk of atelectasis and pulmonary infection. Decreased mobility results in an increased risk of deep vein thrombosis. Anxiety, helplessness, loss of control, an inability to interact and sleep deprivation all contribute to psychological disturbances, which can increase the risk of persistent pain developing and decreasing patient satisfaction.[4] The goals of effective and appropriate pain management is to improve quality of life for the patient, facilitate rapid recovery and return to full function, reduce morbidity and allow early discharge from hospital.[5]

The WHO analgesic ladder outlines simple techniques using minimal resources to combat pain.[6] Non pharmacological methods also play an important role as a sole or in combination for reliving postoperative pain.[7] This model has been applied to acute pain by WFSA, which has produced a modified ladder for acute pain.[8] Simple analgesics such as acetaminophen, ibuprofen and diclofenac are cheap and readily available in most countries of the world.[9] Tilidine is a synthetic opioid painkiller.[10] It is proved to be a potent analgesic that is easily absorbed and has a wide area of application.[11] Ibuprofen is also a NSAID which is a non-selective cyclooxygenase inhibitor with analgesic, antipyretic and anti-inflammatory effects. Acetaminophen, a central acting prostaglandin synthase inhibitor, is also a medication with analgesic and antipyretic effects. Both are indicated for the treatment of mild to moderate pain.[12]

In Eritrea there has been no known study which addressed effectiveness of postoperative pain management. This study determined severity of POP and effectiveness of its management. Further the effectiveness of existing and severity based POP management were compared with the aim of improving POP management at Halibet National Referral Hospital.

Abbreviation: NSAID, Non-Steroidal Anti-Inflammatory Drugs; ASA, American Society of Anaesthesiologists; WFSA, World Federation Society of Anaesthesiologists; WHO, World Health Organization

Methods

Study setting and design

A quasi experimental study design was adopted to assess the effectiveness of severity based post-operative pain management (SBM) compared to the existing postoperative pain management (EM). The study was conducted in the period between March and May of 2018. It was carried out in Halibet National Referral Hospital, the second largest hospital located in the capital city which provides service at tertiary level.

Study participants

The study constituted a total of 134 who were scheduled for general and orthopedic elective surgeries. The eligibility to participate in the study was based on the respondent's willingness to take part in the study. Patients under the age of 18, those who were too old to comprehend and understand, those with ASA class III and above, patients who underwent bowel surgeries, those who were critically ill postoperatively, patient with known case of gastric ulcer, hepatic and renal diseases, or poly trauma and those with history of chronic pain were excluded from the study. Of the selected participants, finally 118 patients were found to fulfil the inclusion criteria.

Questionnaire

The questionnaire was sectioned into three to capture data on socio-demographic, clinical characteristics and POP assessment using visual analogue scale (VAS) and its management. Socio Demographic variables included age, sex, educational status, occupation, and ethnicity. While the clinical characteristics were type of surgery, type of anesthesia, type of analgesics used for POP management and previous history of surgery.VAS was used to assess and score patients on post-operative pain management.

Data collection procedure

Permission for conducting the study was initially obtained from the ethical committee of Asmara College of Health Sciences, Ministry of Health at the department of research and human resource development. Further permission was obtained from the study sites prior to carrying out the study. Verbal and written informed consent was obtained from the participants before conducting the study. The patients were informed on the aim of the study and that participation was voluntary. A researcher administered structured questionnaire was used to obtain socio-demographic and clinical characteristics. The researchers took part on a 2-day training on how to administer the questionnaire. The patients were randomly classified in to EM and SBM groups. Pain was assessed initially in the immediate postoperative period, there after every 12 hours for 3 days making a total of six pain assessments. In the SBM group appropriate analgesics were administered according to the level of pain of the patients. The POP management was developed based on WFSA and WHO pain management guideline which was modified to be applicable to the present setting.[13] The management included acetaminophen 500mg QID for mild pain, acetaminophen 500mg QID + ibuprofen 400mg TID for moderate pain and acetaminophen 500mg QID + ibuprofen 400mg TID + tilidine 50mg BID for severe pain. In the EM group the researchers observed the POP management that was being practiced in the setting. The data was obtained from the patient's records by checking the treatment charts.

Variable measurements

The research variables were divided into four categories which included, independent variables that investigated existing and severity-based POP management, dependent variable which took into account POP score and pain reduction, socio demographic variables that considered age, sex, educational status, occupation, ethnicity, clinical variables also looking at the type of surgery, type of anesthesia, type of analgesics used for POP management and previous history of surgery. The VAS pain rating scale is a standardized and validated pain assessment tool. The socio-demographic and clinical data were validated by obtaining content validity from the experts in the field of medicine, surgery and nursing.

Data analysis

The questionnaire was checked for its completeness and consistency by researchers; and the variables (responses) were coded and entered into SPSS software version 22. Descriptive analysis was used to summarize and show frequency distribution and percentages of the variables. Mean ± standard deviation was used for a continuous variable, percentages were used for categorical variables and median (IQR) was performed for level of pain and reduction of pain. Furthermore, effectiveness of POP management and association between effectiveness of POP management and socio demographic and clinical variables was analyzed using Chi-square and Mann-Whitney U. Effectiveness of POP management was observed based on statistical 5% and clinical ≥ 30% reduction of POP from previous pain score through POP management. All the analyses were considered significant at a p-value less than 0.05.

Results

Socio-demographic characteristics

Majority of the patients, 71(60.2%) were males and females were 47 (39.8%). The overall Mean age of the patients was 42.65(±14.13). Concerning educational status most of the patients 45 (38.1%) were primary level and only 11 (9.3%) were tertiary level. The rest of the demographic and clinical details of the participants are shown in Table 1.

Clinical Characteristics of the patients

The summary on the clinical characteristics of the patients is illustrated in Table 2. A high proportion of patients 71(60.2%) had spinal anaesthesia whereas orthopaedic surgery was 66 (55.9%). Among the patients who had general surgery 29 (55.8%) performed major surgery. History of previous surgery was found only in 38 (32.2%) of the patients and majority of the patients 105 (89%) were ASA grade I.

Severity of POP

In the EM prior to treatment, 98.3% of the patients experienced POP. Majority of them (67.8%) were in moderate to severe pain. On day 0 prevalence of POP was 96.6%, where mild pain was (28.8%),

moderate pain was (55.9%) and severe pain was (11.9%). On day 1, 98.3% of the patients experienced POP where moderate to severe was 39%. During day 2, 81.4% of the patients had POP where 20.3% had moderate to severe pain. In the SBM prior to intervention, 88.1% of the patients suffered POP, out of which 76.2% were in moderate to severe pain. On day 0, 89.8% of the patients suffered POP in which 57.7% had moderate to severe pain. On day 1, 94.9% of the patients had POP and only 18.6% had moderate to severe pain. During day 2 57.6% the patients had POP, in which majority 52.5% were in mild pain. The severity of POP in the EM and SBM from day 0 to day 2 is demonstrated in Table 3.

Type of analgesic used

In the EM group of the patients who suffered POP (81.4%), (44.1%) and (49.2%) received analgesia during day 0, 1, and 2 respectively. The types of analgesics administered were Diclofenac (63.72%), Ibuprofen (32.35%), Acetaminophen (12.74%), Metamizol and Pethidine (0.98%) each. In the SBM all patients who had experienced POP received analgesia. The type of analgesics used in the SBM were acetaminophen as a solo analgesic 53.1%, acetaminophen plus ibuprofen 36.73% and acetaminophen plus ibuprofen plus Tilidine 10.18%.

Clinically effective pain reduction

Clinically effective pain reduction was found in 44.8% and 65.4% of the patients in the EM and SBM groups respectively at the 1st post-treatment pain assessment. At the 2nd post-treatment pain assessment of the patients, 45.6% in EM group and 54.3% in SBM group had clinically effective pain reduction. At the 3rd post-treatment pain assessment, 50% in the EM group and 52.1% in the SBM group clinically effective pain reduction was found. At the 4th post-treatment pain assessment, majority of the patients (75%) had clinically effective pain reduction in the SBM group, but only 31.4% of the patients had in the EM group. In the 5th post-treatment pain assessment, 47.8% had clinically effective pain reduction in the EM group whereas in the SBM group majority of the patients (80.0%) had clinically effective pain reduction.

Effectiveness of POP management in the EM group and SBM group

Summary of the median pain reduction found at the series post-treatment pain assessment in the EM group and SBM group is shown in Table 4. The median pain reduction found at the series post-treatment pain assessment in the EM was statistically insignificant with (Chi-square=9.23, p=0.560). On the other hand, the median pain reduction at the series of post-treatment pain assessment found in the SBM was statistically significant with (Chi-square=22.70, p<0.001).

Significance of clinically effective pain reduction

At the 1st post-treatment pain assessment the pain reduction was significantly greater than 30% in the SBM while in the EM was not significantly different from 30%. At the 2nd post-treatment pain assessment the pain reduction was significantly less than 30% in both the EM and SBM. At the 3rd post-treatment pain assessment the pain reduction was not significantly different from 30% in both the EM and SBM. At the 4th post-treatment pain assessment in the EM the pain reduction was significantly less than 30% whereas in the SBM was not significantly different from 30%. At the 5th post-treatment pain assessment the pain reduction was significantly greater than 30% in the SBM while in the EM was not significantly different from 30%. Table 5 displays the significance of clinically effective pain reduction.

Association of selected socio-demographic and clinical variables with effectiveness of POP management

From the selected socio-demographic variables middle aged adults with a (P-value 0.026) andfemales with a (p-value 0.016) were found to have significant difference with effectiveness of POP managementbetween the EM andSBM. Regarding to the type of anesthesia, the effectiveness of POP management in those patients who took GA had significant difference (p- value<0.001). The effectiveness of POP management those patients who had general surgery had significant difference (p-value <0.001) between the EM and SBM. The rest association of the selected socio-demographic and clinical variables with effectiveness of POP management is expressed in Table 6.

Table 1 Socio-demographic characteristics of the patient

Variables		EM n (%)	SBM n (%)	Total n (%)	p-value
Gender					0.851
	Male	36 (61.0%)	35 (59.3%)	71 (60.2%)	
	Female	23 (39.0%)	24 (40.7%)	47 (39.8%)	
Age M(SD)		41.19(±13.25)	44.12(±14.93)	42.65 (±14.13)	0.851
	18-39	24(40.7%)	23(39.0%)	47(39.8%)	
	40- 64	35(59.3%)	36(61.0%)	71(60.2%)	
Level of Education					0.463
	Tertiary level	3(5.1%)	8(13.6%)	11(9.3%)	
	Secondary level	21(35.6%)	18(30.5%)	39(33.1%)	
	Primary level	23(39.0%)	22(37.3%)	45(38.1%)	
	Illiterate	12(20.3%)	11(18.6%)	23(19.5%)	
Ethnicity					0.569
	Tigrigna	51(86.4%)	53(89.8%)	104(88.1%)	
	Others*	8(13.6%)	6(10.2%)	14(11.9%)	
Occupation					0.856
	Employed	13(22.0%)	12(20.3%)	25(21.2%)	
	Self-employed	21(35.6%)	19(32.2%)	40(33.9%)	
	Unemployed	25(42.4%)	28(47.5%)	53(44.9%)	

*Includes Tigre, Saho, Bilen and Nara

Table 2 Clinical characteristics of the patients in the EM and SBM. Data is presented in n(%)

Variables		EM n (%)	SBM n (%)	Total n (%)	p-value
Type of Anesthesia					0.851
	General Anesthesia	24 (40.7%)	23 (39.0%)	47 (39.8%)	
	Spinal Anesthesia	35 (59.3%)	36 (61.0%)	71 (60.2%)	
Type of Surgery					1
	General Surgery	26(44.1%)	26(44.1%)	52(44.1%)	
	Orthopedic Surgery	33(55.9%)	33(55.9%)	66(55.9%)	
Type of General Surgery					0.78
	Major surgery	14(53.8%)	15(57.7%)	29(55.8%)	
	Minor surgery	12(46.2%)	11(42.3%)	23(44.2%)	
Type of Orthopedic Surgery					0.566
	Upper Extremity	7(21.2%)	9(27.3%)	16(24.4%)	
	Lower Extremity	26(78.8%)	24(72.7%)	50(75.8%)	
History of Previous Surgery					0.694
	Yes	20(33.9%)	18(30.5%)	38(32.2%)	
	No	39(66.1%)	41(69.5%)	80(67.8%)	
ASA grade					0.769
	ASA I	53(89.8%)	52(88.1%)	105(89.0%)	
	ASA II	6(10.2%)	7(11.9%)	13(11.0%)	

Table 3 Severity of POP

		Day 0	Day 1	Day 2
EM				
	No pain	3.40%	1.70%	18.60%
	Mild pain	28.80%	59.30%	61.00%
	Moderate pain	55.90%	37.30%	16.90%
	Severe pain	11.90%	1.70%	3.40%
SBM				
	No pain	10.20%	5.10%	42.40%
	Mild pain	32.20%	76.30%	52.50%
	Moderate pain	42.40%	16.90%	5.10%
	Severe pain	15.30%	1.70%	0.00%

Table 4 Median pain reduction found during the series of post-treatment pain assessment in the EM group and SBM group

Management Type	Median (IQR)	Minimum	Maximum	Chi-square(df)	p-value
EM				9.23(4)	0.056
At Pre-treatment	4.50(3.70)	0	10		
At post-treatment 1	1.00(3.70)	-4.7	8		
At post-treatment 2	0.40(3.70)	-5.1	7.1		
At post-treatment 3	0.00((3.70)	-8.4	7.5		
At post-treatment 4	0.20(2.40)	-3.3	5		
At post-treatment 5	0.40(1.50)	-5.1	5.5		
SBM				22.70(4)	<0.001
At Pre-treatment	4.60(2.80)	0	9.5		
At post-treatment 1	1.70(3.50)	-4	7.6		
At post-treatment 2	0.00(4.00)	-4.4	7.1		
At post-treatment 3	0.20(3.20)	-6.5	5.2		
At post-treatment 4	0.80(2.10)	-4	6.5		
At post-treatment 5	0.30(1.00)	-3	4.8		

Table 5 Significance of clinically effective pain reduction

	Difference	95% CI	p-value
At post-treatment 1			
EM	-20.97	(-43.21, 1.27)	0.064
SBM	14.54	(2.61, 26.48)	0.018
At post-treatment 2			
EM	-63.58	(-120.13, -7.03)	0.028
SBM	-44.31	(-85.43, -3.19)	0.035
At post-treatment 3			
EM	-62.8	(-131.09, 5.49)	0.071
SBM	-38	(-81.24, 5.23)	0.083
At post-treatment 4			
EM	-31.06	(-57.55, -4.56)	0.022
SBM	4.02	(-22.05, 30.09)	0.757
At post-treatment 5			
EM	-14.29	(-38.29, 9.71)	0.237
SBM	24.01	(1.61, 46.42)	0.036

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Table 6 Association of selected socio-demographic and clinical variables with effectiveness of POP

Variables			Median	Mann-Whitney U	P-value
Age					
	18-39	EM	2.05(3.77)	268.5	0.873
		SBM	3.06(3.38)		
	40-64	EM	1.34(3.70)	436.5	0.026
		SBM	3.06(3.38)		
Gender					
	Male	EM	1.95(4.00)	591.5	0.658
		SBM	3.06(3.06)		
	Female	EM	0.90(3.48)	163	0.016
		SBM	3.19(2.19)		
Type of anesthesia					
	GA	EM	0.81(2.60)	103.5	<0.01
		SBM	3.06(2.02)		
	SA	EM	3.28(3.40)	606	0.783
		SBM	3.20(3.31)		
Type of Surgery	General Surgery	EM	0.88(3.17)	169	0.002
		SBM	3.41(1.92)		
	Orthopedic Surgery	EM	2.40(3.64)	519	0.744
		SBM	2.58(3.19)		

Discussion

This is the first study of its nature in the country that compares and discusses the effectiveness of existing and severity-based POP management. Since the study was done in the tertiary hospitals it will provide a great image in the management of postoperative pain. POP was previously stated the most undesirable outcome.[5] In reflection to that, in this current study, the prevalence of POP in the immediate post-surgery in the SBM group was found to be 88.1%, but in the EM, group was 98.3%. The reason for the decrease of the POP prevalence in the SBM group could be due to the effect of pre-emptive analgesia which was given 1 hour before surgery. In congruent to this finding, in a study done by Admassu et al. (2016) a similar findings were attained on the EM but higher numbers in the SBM.[2]

Regarding the severity of POP in the EM moderate to severe pain was found to be (67.8%) while in the SBM was (57.7%) which was higher in the EM. On day 2 in the EM moderate to severe pain was (20.3%) while in the SBM was (5.1%). In comparison to the above findings Sommer et al., (2008) found lower incidence of moderate to severe pain during day 0 compared to the EM and SBM.[14] In addition, on day 2 the findings were similar to the EM but higher compared to the SBM findings.

The analgesics used in the EM group were diclofenac (63.72%), Ibuprofen (32.35%) and acetaminophen (12.74%). While in the SBM group acetaminophen only was used in (53.1%) and combined analgesic used were acetaminophen+Ibuprofen (36.73%), and acetaminophen+ ibuprofen+ tilidine (10.18%). In contrary an Ethiopian study found out that, the common analgesia used in POP management were Diclofenac (37.7%), Tramadol (26.4%), combination of diclofenac and tramadol (33.7%).[15] Other literature revealed that strong and weak opioids, non-opioids, combination of analgesics were used in the POP management.[15-19] According to the WHO pain management guide line a mono therapy with NSAIDs or acetaminophen for mild pain, a combination weak opioid and NSAIDs for moderate pain and strong opioids ± NSAIDs for severe pain is recommended.[13] In this study as regards to EM, patients suffering from moderate to severe pain were treated using common NSAIDs. On the contrary, the SBM patients were treated according to the severity of their pain using a WHO/ WAFSA pain management guide lines modified to be applicable to the setting in order to avoid or reduce opioid related complications.

During the series of post-treatment pain assessment period there was reduction of pain in both the EM and SBM. However, the effectiveness of POP management within the EM was found to be statistically insignificant (p=0.056) while in the SBM the effectiveness of the POP management was found to be statistically significant ((p<0.001)). The reason for the above findings could be because the EM follows a PRN (when needed) administration of analgesia whenever the patient complain pain, use of solo analgesic mainly NSAIDs regardless of the severity of the patients pain and not including opioids in the POP management. On the contrary in the SBM all the patients were managed according to their pain intensity which was assessed via VAS, regular administration of analgesics based on which pain category the patient is and use of combination of drugs in the POP management. Moreover the use of non-pharmacological methods also would have contributed in the management.[7] Association was estimated between effectiveness of POP management and selected socio-demographic variables. Out of the selected socio-demographic variables significant difference in the effectiveness of POP management was found in middle aged adults and females. In this group of patients, the median reduction of pain was higher in the SBM than in the EM. These findings emphasize groups of patients known to experience higher intensity of POP as reported by.[20]

Moreover, the study showed that effectiveness of POP management in the SBM had significant difference compared to EM when associated with types of surgery and anesthesia. Regarding the type of surgery those patients who underwent general surgery were found to have higher median pain reduction in the SBM (3.41) than in the EM (0.88). Concerning the type of anesthesia those patients who had general anesthesia were found to have higher median pain reduction in the SBM (3.06) than in the EM (0.81). This could be due inadequate pain management compared to the intensity of pain. Other studies reported that patients who underwent general surgery suffered more severe pain as compared to other surgeries.[20]

Conclusion

In this study pain among patients who received SBM significantly reduced on a series of post-treatment pain assessment period. As for the recommendations, the management of POP should be based on the severity of pain experienced by the patient and include variety

of analgesics as initiated by the researchers for this study, the MOH should adopt or use similar pain management guide line to be followed in the hospitals.

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Authors' contributions

MYH, MKH, MMA, YMA, MBM participated in designing and coordination of the study. EHT: design of study, analysis and interpretation of the data, drafting and critical commenting of manuscript; SFB and BYK: participated in designing and coordination of the study, drafting and revising the manuscript critically for important intellectual content. All authors have read and approved the manuscript.

Availability of data and materials

The complete dataset supporting the conclusions of this article is available from the corresponding author and can be accessed upon a reasonable request.

Ethics approval and consent to participate

Ethical approval for this study was granted by Asmara College of Health Sciences and the Ministry of Health research ethical approval committee. In addition, after brief explanation of the purpose of the study, written consent was obtained from the study participants and those who volunteered and participated in the study.

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Consent for publication

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Competing interests

The authors declare that they have no competing interests.

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