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Post-operative pain management practice and associated factors among nurses working at public hospitals, in Oromia region, Ethiopia, 2021

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Abstract

Background: Management of postoperative pain leads to positive patient progress and shortens the duration of hospital stay. Nurses, who are spending most of their time with the patients, are expected to play big role in the postoperative pain management practice. However, there is paucity of information regarding postoperative pain management practice.

Objective: To assess postoperative pain management practice and associated factors among nurses working at public hospitals, in Oromia Region, Ethiopia, 2021.

Methods: Institutional based cross sectional study was employed among randomly selected 377 nurses working at public hospitals in Oromia, Ethiopia. Data was collected by distributing structured self-administered questionnaires that adapted from different literatures. The data were entered into Epi data version 3.1 and exported to SPSS version 22 for analysis. Variables with significant association in the bivariate analyses were entered into a multivariable regression analysis to identify the independent factors associated with nurses' postoperative pain management practice. Significant factors were declared at P<0.05.

Result: The result showed that, 66% of nurses had good pain management practice. Nurses favorable attitude towards post-operative pain management [AOR: 4.698, 95% CI: (2.725-8.100)], having access to read pain management guideline [AOR: 3.112, 95% CI: (1.652-5.862)], adequate knowledge of post-operative pain management [AOR: 2.939, 95% CI: (1.652-5.227)], working at Operation Room [AOR: 2.934, 95% CI: (1.27-6.795)] and received training on pain management [AOR: 3.289, 95% CI: (1.461-7.403)] were significantly associated with the practices of postoperative pain management.

Conclusion and recommendation: Sixty six percent of participants (nurses) have a good level of practice of postoperative pain management. Training, access to pain management guidelines, knowledge and attitude are significant factors in post-operative pain management practice. Governmental and other bodies concerned to post-operative care quality needs to show commitment on availing needed training and infrastructures.

Keywords: *Postoperative, pain management, knowledge, Attitude and practice*

Strengths and limitations of the study

Strength:

- All public hospitals in west shoa zone were included during data collection period.

Limitation:

- The study design was cross sectional, where cross-sectional study design cannot create causal attribution between independent variables and dependent variables.
- Since post-operative pain management is the multi-disciplinary approach but this study focus only among nurses.

Introduction

Post-operative pain (POP) is a form of acute pain following surgical trauma (1) as a result of the inflammatory reaction and initiation of afferent neurological barriers. The pain is felt in response to the inflammatory process resulted from tissue injury during surgical procedure like skin incision, tissue dissection, manipulation and traction (2). Unless adequately managed post-operative pain management can be complicated to delayed ambulation, reduced patient satisfaction and increased incidence of pulmonary complication (3).

Currently, it was estimated that about 28-32% of global disease requires surgical intervention (4). Over five million surgical interventions are needed in Ethiopia each year (5). The rise in the number of operations is not without risk. For instance, in the United States, between 10% and 60% and in Ethiopia 22% of patients were developed chronic pains as results of poorly managed postoperative pain (6, 7). Furthermore poorly managed postoperative pain can have a negative impact and is always associated with delayed mobility which can lead to delayed wound healing, deep vein thrombosis, pulmonary complications secondary to suppression of effective coughing, anxiety, sleep disturbance, myocardial infarction, depressed immune function and also can progress to chronic pain which impairs the ability to carry out daily activities and finally may leads to diminished quality of life (8).

Since, pain relief has been recognized as a human right and also considered as the “fifth” vital sign that must be regularly assessed and managed, the nurses should give inordinate attention to control postoperative pain(9). The roles and responsibilities of nurses in pain management; according to American nurses association (ANA), includes, assessment of pain, plan for pain

management strategies and evaluation of responses of the patients for the given interventions and to take actions accordingly. Since, nurses are always spending 24 hours at bedside to give care for the patients and also they are the point of contact between other health professionals and the patients, they are expected to play vital role in postoperative pain management practice (10). Post-operative pain management practice is a set of activities and an important aspect of nursing care to alleviate pain for the patients by pharmacologic and non-pharmacologic methods. These activities include assessing the pain, providing appropriate interventions to relieve the pain and reassessing the patients' pain after intervention. Assessing pain is the first and crucial step for properly managing pain. Techniques for pain assessments include patients self-report and observing for patients' physiological and behavioral responses to pain. The self-reporting methods include numeric rating scale (NRS), verbal rating scale (VRS), visual analogue scale (VAS) and the faces pain scale (FPS) (11).

Although, postoperative pain management continues to be a problem in developed and developing countries, sadly the suffering from untreated postoperative pain is larger and more worrying among the economically disadvantageous individuals in developing countries. Alleviating patients suffering is a core ethical and legal obligation for health professionals. However, in Ethiopia, discomfort due to post-operative pain remains prevalent and affects between 47%-100% of patients after surgery (7).

Undertreated POP can contribute to different socio economic burden such as increasing health care cost by delaying discharge directly and indirectly as a result of absenteeism from job or loss of production. Nowadays, there is a growing awareness on the etiology of pain and an advancement of pharmacological and non-pharmacological pain management. Despite of this, patients still experience unacceptable pain after surgical procedures. The study was conducted by aiming to identify nurses post-operative pain management practice at public hospitals found in Oromia, Ethiopia; so that the finding will best serve to prioritize the problem and develop strategies for improving post-operative pain management.

Methods

Study area, period and design

The study was done at public hospitals found in West Shoa zone, Oromia regional state, Ethiopia from June 1 to August 30/2021. There are one referral, three general and four districts (total of eight public hospitals) in that zone. These hospitals provide different health service ranging from

prevention of disease to surgical therapies for peoples in the area and closer zones in the Oromia region. So that post-operative nursing care is given for patients in need of the services. Cross sectional study design was implemented to identify post-operative pain management practice and associated factors among those nurses.

Population

Source Population

All nurses, who were working in surgical ward, Minor operation room (OR) and Major operation room (OR), Recovery rooms, Emergency, obstetrics and gynecology wards were included.

Study Population

All randomly selected nurses working in surgical ward, minor OR, major OR, recovery room, emergency room, obstetrics and gynecology wards were considered the study population.

Sample size determination

The sample size was determined by using single population proportion formula by considering that 65.2% nurses had good post-operative pain management practice (12) at a 5% level of significance, 5% margin of error and considering 10% non-response rate. With this calculation the final sample size was 384.

Sampling techniques

All public hospitals in the study area were included in the study. The total calculated sample size (384 nurses) was proportionally allocated to each hospital based on the number of their professional nurse. Finally by using the registration number of nurses at each hospital, participants of the study were selected randomly by the lottery methods.

Study variables

Dependent variable: level of Post-operative pain management practice

Independent variables: Socio demographic characteristics (Sex, Age, Marital Status, Educational status, Experience, Working unit/ward), Knowledge towards postoperative pain management, Attitude towards postoperative pain management, organizational factors (Availability of standardized tools, Guideline, Training on pain management).

Operational definitions

Good Practice: Refers to those study participants, who have scored mean and/or above the value of the total 18 practice questions.

Poor Practice: Refers to those study participants who have scored below the mean value of the total 18 practice questions.

Knowledge: Is measured by fifteen items in yes/no format. Correct answer was given "1" and "0" was given for incorrect and for not sure. Those who scored mean and above were labeled as having adequate knowledge where as those who scored less than mean labeled as having inadequate knowledge about post-operative pain management.

Attitude: Is measured by nine items in agree/disagree format. For correctly responded item "1" was given and "0" was given for incorrect and don't know. Those who scored mean and above considered as having favorable attitude where as those who scored below mean have unfavorable attitude towards postoperative pain management (12-14).

Data collection tool and data quality control

Structured self-administered questionnaire was used to collect data. The questioners were adapted from different studies conducted previously and modified. To assure the data quality, data collection tool was prepared after the intensive reviewing of relevant literatures and similar studies. The tool was reviewed by expert's panels. One clinical nurse specialist, three lecturers (masters of Science in nursing) and one registered nurse (BSC nurse) were participated in the panel (review of the questionnaire). The questionnaire was pretested on 5% of the study population at similar health care facilities. Training was given for data collectors by the principal investigator.

Data processing and analysis

The collected data was coded, cleaned, and entered in to Epi Data version 3.1software and finally exported to statistical package for social study (SPSS) version 22 Software for analysis. Descriptive analyses were performed first to understand the general characteristics of all the study variables. The results were presented in tables and graphs using summary measures such as percentages and mean. Bivariate logistic regression was carried out to identify the factors associated with nurses' postoperative pain management practice. Hosmer-Lemeshow test was

done to test for model fitness, the result was 0.45. Variables with p < 0.25 in the bivariate analyses were entered into a multivariable logistic regression analysis to identify the independent factors associated with the outcome variable. Finally, the result of bivariate and multivariable logistic regression analysis was presented in a crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence intervals. P ≤ 0.05 was considered statistically significant.

Result

Socio-demographic characteristics

A total of 384 questionnaires were distributed, of which 377 were completed and returned with the response rate of 98.2%. The majority of participants, 227(60.2%) were male, 200(53.1%) were married and 240 (63.7%) were between the age group of 26 and 34 years (**Table 1**).

Table 1: Socio-demographic characteristics of respondents, working at public hospitals in Oromia region, Ethiopia, 2021

Variables	Category	Frequency(n=377)	Percentage (%)
Sex	Male	227	60.2
	Female	150	39.8
Age	< 25	71	18.8
	26-34	240	63.7
	>35	66	17.5
Ethnicity	Oromo	360	95.5
	Amhara	17	4.5
Marital status	Married	200	53.1
	Single	177	46.9
Religion	Protestant	217	57.6
	Orthodox	103	27.3
	Muslims	40	10.6
	Wakefata	17	4.5
Educational level	Diploma	28	7.4
	Bachelor degree	346	91.8
	Masters	3	0.8
Years of experience	<5	234	62.1
	6-9	75	19.9

	>10	68	18
Work experience in surgical unit (in years)	<1	199	52.8
	2-4	140	37.1
	>5	38	10.1
Current area of practice	Medical ward	65	17.2
	Emergence ward	70	18.6
	Ob/Gyne ward	65	17.2
	OR and Recovery	72	19.1
	Surgical ward	105	27.9

Knowledge of nurses towards post-operative pain management

The mean score for knowledge was 8.89 with standard deviation of (±2.85). Thus, the results revealed that, from the total of 377 study participants, about 54.9 % (95% CI: (50.1, 60.2)) had adequate knowledge about POP management (**figure 1**).

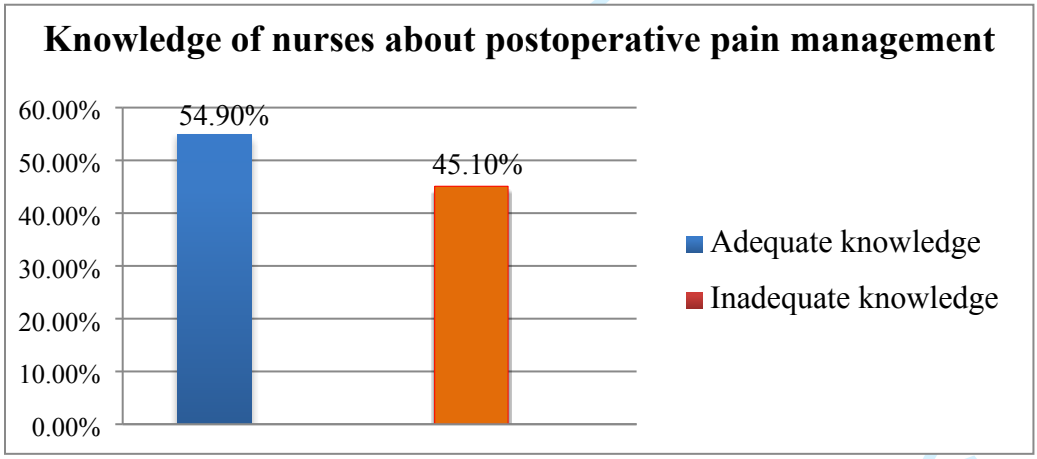

Figure 1: Knowledge levels of nurses on postoperative pain management at public hospitals in Oromia region, Ethiopia, 2021.

Nurses' attitude of postoperative pain management

The mean score for attitude was computed and it was 4.99 with standard deviation of 1.73. According to the classification outlined in the operational definition the percentage score of the categories showed that, among 377 respondents, 59.4% (95% CI: (54.6, 64.5)) of participants had favorable attitude towards post-operative pain management practice (**figure 2**).

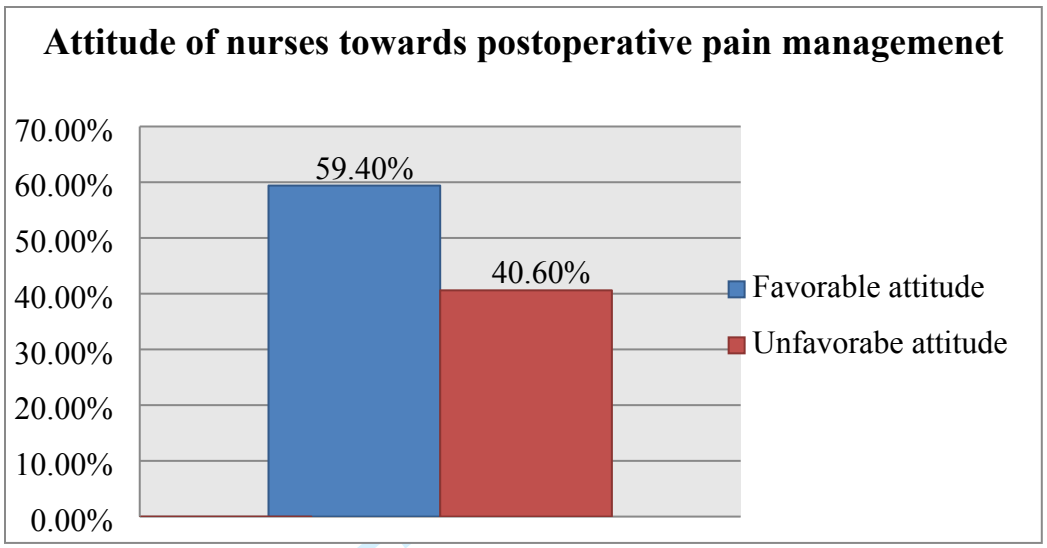

Figure 2: Attitude levels of nurses towards postoperative pain management at public hospitals in west shoa zone, Ethiopia, 2021.

Practices of nurses on postoperative pain management

The responses of nurses to the nine practice questions are computed and dichotomized in to good practice and poor practice. The mean score of the self-report practice of post-operative pain management was 10.37 with standard deviation of (±2.89). It was calculated based on the category specified in the operational definitions. Accordingly this study revealed that, about two third (66%) (95% CI: (61, 71) of the respondents had good postoperative pain management practice **(Table 2).**

Table 2: Practices of nurses on postoperative pain management, working at public hospitals in Oromia region, Ethiopia, 2021

Variables	Yes N (%)	No N (%)
Do you assess pain for the patients those able to communicate?	327(86.7%)	50 (13.3%)
Do you encourage the use of transcutaneous electrical nerve stimulator for pain management?	4(1%)	373(99%)
Do you combine opioids with NSAID's rather than single analgesic agents when managing POP as suggested by World health organization?	302(80.1%)	75 (19.9%)
Do you document the findings after pain assessment?	110(29.2%)	267 (70.8%)

Do you encourage prayer by patients or religious leader postoperatively?	206(54.6)	171 (45.4%)
Do you administer ordered pain medication, around the clock (regularly) as ordered?	374(99.2%)	3(0.8%)
Do you use music therapy to reduce pain?	2(0.5%)	375 (99.5%)
Do you reassess pain after giving pain medication in order to evaluate the effectiveness of pain medication?	338(89.7%)	39 (10.3%)
After surgery, do you provide comfortable positions to help relieve pain?	360(95.5%)	17 (4.5%)
Do you ask and help to support the painful areas when moving or coughing after surgery?	283(75.1%)	94 (24.9%)
Do you provide clean, calm and ventilated ward environment for postoperative pain management?	259(68.7%)	118 (31.3%)
Do you lay patients on neat, well-laid bed postoperatively?	294(78%)	83 (22%)
Do you use massage and stretch to reduce postoperative pain?	283(75.1%)	94 (24.9%)
Do you apply heat and cold compresses to manage POP?	288(76.4%)	89 (23.7%)
Do you encourage early ambulation/exercise with analgesia?	347(92%)	30 (8%)
Do you encourage use of acupuncture?	2(0.5%	375(99.5%)
Do you use patient distraction, relaxation, and guided imagery postoperatively to reduce pain?	131(34.2%)	246(65.2%)
Do you usually dress, bandage, splint and reinforce wound sites postoperatively?	359(95.2%)	18(4.8%)

Organizational related factors

According to the nurses response regarding the organizational factors majority, 273(72.4%) of the participants reported that they have not taken any training regarding postoperative pain management while 221(58.3%) did not accessed post-operative pain management guidelines to use for practice. Among those received training regarding postoperative pain management

59(56.7%), 39(37.5%), 2(1.9%) and 4(3.8%) received training by the means of lecturing, course, conference and work shop respectively.

Factors associated with postoperative pain management practice

To assess the factors associated with the nurses' postoperative pain management practice, bivariate analysis was done first. Accordingly, ten of the variables age of the participants, marital status, level of education, work experience, experience in postoperative area, current area of practice, training related to pain management, access to read pain management guideline, knowledge and attitude of the participants regarding POP management were found to be significantly associated with the nurses 'POP management practice at p-value of 0.25. These variables were included in multiple logistic regressions analysis. The model fit was checked by Hosmer and Lemeshow test (p-value=0.45) and it was fitted.

After adjustment, attitude, getting access to read guidelines, training, knowledge and current area of practice were significantly associated with the nurses' postoperative pain management practice. Accordingly, respondents who had Favorable attitude were almost 5 times more likely to practice than those who had unfavorable attitude [AOR: 4.698, 95% CI: (2.725, 8.100)]. Respondents who have taken POP management training were 3.2 times more likely to practice than those who did not take such training [AOR: 3.289, 95% CI: (1.461, 7.403)]. Similarly, study participants who get access to read pain management guidelines were 3.1 times more likely to practice compared to their counterparts [AOR: 3.112, 95% CI: (1.652, 5.862)]. The study also revealed that respondents who had adequate knowledge on postoperative pain management were 2.9 times more likely to practice than those who had inadequate knowledge [AOR: 2.939, 95% CI: (1.652, 5.227)] and participants those who were currently practicing in Operation Room were 2.9 times more likely practice compared with those practicing in medical ward [AOR: 2.934, 95% CI: 1.267, 6.795 P<0.012] (**Table 3**).

Table 3: Binary and multiple logistic regression analysis results on factors associated with postoperative pain management practice among nurses working at public hospitals in west shoa zone, Ethiopia, 2021.

Variables	Category	Practice status		COR at (95% CI)	AOR at (95% CI)	P-value
		Good N (%)	Poor N (%)			

Age in years	< 25	51	20	1.0		
	26--34	151	89	0.665(0.373-1.188)*	0.706(0.341-1.465)	0.350
	>35	47	19	0.970(0.462-2.038)	0.387(0.116-1.294)	0.123
Marital status	Single	109	68	0.687(0.448-1.054)*	1.039(0.566-1.909)	0.901
	Married	140	60	1.0		
Educational level	BSc/above	234	115	1.763(0.812-3.830)*	2.495(0.863-7.209)	0.091
	Diploma	15	13	1.0		
Years of experience	<5	140	94	1.0		
	6-9	60	15	2.686(1.440-5.009)*	2.301(0.931-5.682)	0.071
	>10	49	19	1.732(0.959-3.126)*	1.613(0.499-5.217)	0.425
Experience in SW	<1	125	74	1.0		
	2-4	90	50	1.066(0.680-1.671)	1.796(0.387-8.342)	0.455
	>5	34	4	5.032(1.717-14.746)*	0.552(0.266-1.144)	0.110
Current area of practice	MW	31	34	1.0		
	EU	42	27	1.706(0.859-3.388)*	2.342(0.916-5.989)	0.076
	GW	48	17	3.097(1.482-6.470)*	1.683(0.708-4.002)	0.239
	OR/R	45	27	1.828(0.925-3.614)*	2.934(1.27-6.795)**	0.012
	SW	83	23	3.958(2.023-7.742)*	1.625(0.689-3.833)	0.267
Training on POPM	Yes	78	13	4.035(2.143-7.599)*	3.289(1.461-7.403)**	0.004
	No	171	115	1.0		
Access to pain management guidelines	Yes	133	23	5.234(3.126-8.763)*	3.112(1.652-5.862)**	0.001
	No	116	105	1.0		
Knowledge	Adequate	169	38	5.003(3.149-7.951)*	2.939(1.652-5.227)**	0.001
	Inadequate	80	90	1.0		
Attitude	Favorable	182	42	5.562(3.500-8.839)*	4.698(2.725-8.100)**	0.001
	Not favorable	67	86	1.0		

Notes: 1.00=Reference, *p-value<0.25, ** statistically significant at P<0.05, SW (surgical ward), MW (medical ward), EU (emergency unit), OR/R (operation or recovery room room).

Discussion

The current study revealed that overall postoperative pain management practices among 66%, (95% CI: 61, 71) nurses was found to be good. This finding is lower as compared to the study conducted in Rwanda on postoperative pain management, which was 88% (15). However, the finding of this study was greater than the study conducted in Addis Ababa in which only 6% of them had had good practice and the study done in Arsi zone, southeastern Ethiopia, where nearly half (47.9%) of their study participants had good pain management practice(12,16). This discrepancy may be due to nursing workload, access to read guideline, sample size, and use of different data collection tools. This study revealed that those who had favorable attitude were nearly five times more likely to have good postoperative pain management practices than those who did not. This is consistent with a study conducted in Addis Ababa and Ghana (13, 16).

Those who had received training were more than three times more likely to have good pain management practices than those who didn't. This finding was comparable with the study conducted at Debra Berhan, Northern Ethiopia (17). This is because those individuals who had taken POP management training could have current information on pain management which can promote the practice. The current study also identified that, those who got access to read pain management guidelines were 3.1 times more likely practices than their counterparts. This finding is supported by studies conducted in Greece and Debra Berhan (17, 18). This is because accessibility to refer guidelines can enhance the practices of POP management, according to the recommended standard. It is also currently the most advisable for clinicians that keeping up-to-date with evidence-based practice.

Individuals who were knowledgeable were nearly three (2.9) times more likely to have good practice than those who had inadequate knowledge. This finding was in line with the finding from Rwanda and Arsi zone of southeastern Ethiopia (12, 15). The possible justification is that, the right knowledge about pain and its management practice can avoids confusion regarding POP and the disease condition, which can also create clear understanding of its negative impact on the patients and on health institutions, unless appropriately managed. This study also showed association between nurses' current working area and level of practice.

Conclusion and recommendation

Sixty six percent of participants (nurses) have a good level of practice of postoperative pain management. Training on post-operative pain management (POPM), access to pain management guidelines, knowledge and attitude are significant factors in post-operative pain management practice. Regional health bureau, Zonal health offices, hospital administrations and other concerned bodies needs to work for enhancing post-operative pain management through organizing different trainings to improve knowledge and attitude of nurses and timely distributing standard pain assessment and management guidelines for enhancing accessibility.

Abbreviations

OR: operation room

POP: post-operative pain

SD: Standard deviation

SPSS: Statistical Package for the Social Sciences

DECLARATION

Availability of data

Datasets used are available from the corresponding authors on reasonable request.

Ethical approval and consent to participate

Ethical clearance was first obtained from Ambo University CMHS's ethical review board with ethical ID. Of AU/SGS/059/2020. The letter was written by the Zonal health office to obtain ethical approval to conduct the study in the Hospitals. Then the ethical clearance and support letter were taken to all public hospitals. All participants were asked for their willingness to participate in the study and were told that it would not have any risk to them. Written informed consent was obtained from each study subject before data collection after approved by ethical review board. Confidentiality of the information was assured, and the privacy of the respondents was maintained. All procedures were followed in accordance with the relevant guidelines and regulations as declaration of Helsinki.

Consent to publish

Not applicable.

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Author Contributions

AD, AK and DA were involved in the selection of design, development of the research proposal, data analysis, writing up of the different drafts and finalizing the research. YG and SA were participated in the reviewing of the different drafts of the study and drafting the manuscript.

Competing interests

The authors declare that there is no conflict of interest in this work.

Availability of the data

The data is available on responsible request from the corresponding author by the following address. E: mail: deebisa@gmail.com

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Postoperative pain management practice and associated factors among nurses working in public hospitals, Oromia region, Ethiopia, 2021. An institution based Cross-sectional Study.

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Abstract

Background: Management of postoperative pain leads to positive patient progress and shortens the duration of hospital stay. Nurses, who spend most of their time with the patients, are expected to play major role in the postoperative pain management practice. However, there is a lack of information on nurse's postoperative pain management practice and its associated factors. This study aims to assess postoperative pain management practice and associated factors among nurses working in public hospitals.

Methods: An institutional based cross-sectional study was used among randomly selected 377 nurses working in public hospitals in Oromia, Ethiopia from June 1- August 30/2021. Data were collected by distributing structured self-administered questionnaires that were adapted from different literature and a simple random sampling technique was employed to select the study participants. The data were entered into Epi data version 3.1 and exported to SPSS version 22 for analysis. Variables with significant association in the bivariate analyses were entered into a multivariate regression analysis to identify independent factors associated with postoperative pain management practice. Significant factors were declared at P<0.05.

Result: The result showed that 66% of nurses had good pain management practice. The attitude of nurse's towards post-operative pain management [AOR: 4.69, 95% CI: (2.72-8.10)], access to read the pain management guideline [AOR: 3.11, 95% CI: (1.65-5.86)], knowledge of post-operative pain management [AOR: 2.93, 95% CI: (1.65-5.22)], current working unit or ward [AOR: 2.93, 95% CI: (1.27-6.79)] and training in pain management [AOR: 3.28, 95% CI: (1.46-7.40)] were significantly associated with postoperative pain management practices.

Conclusion and recommendation: More than half of participants have a good practice in postoperative pain management. Training, access to pain management guidelines, current working unit, knowledge, and attitude are significant factors. Further study that use an observational checklist may be more explanatory in determining the level of practice.

Strengths and limitations of the study

Strength:

- All public hospitals in west shoa zone were included during data collection period.

Limitation:

- The study design was cross sectional, where cross-sectional study design cannot create causal attribution between independent variables and dependent variables.
- Since post-operative pain management is the multi-disciplinary approach but this study focus only among nurses.

Introduction

Post-operative pain (POP) is a form of acute pain after surgical trauma as a result of the inflammatory reaction and the initiation of afferent neurological barriers (1). Pain is felt in response to the inflammatory process resulting from tissue injury during surgical procedure such as, skin incision, tissue dissection, manipulation, and traction (2). Surgery is typically followed by acute pain, and correct identification of the type of pain allows the selection of an appropriate effective treatment (3).

POP is a critical community health issue in both economically developed and developing countries. Currently, it is estimated that about 28-32% of global disease requires surgical intervention (4). More than five million surgical interventions are needed in Ethiopia each year (5). The increase in the number of operations is not without risk. Unless adequately managed, post-operative pain can be complicated by delayed ambulation, reduced patient satisfaction and increased incidence of pulmonary complication (6). For example, persistent pain after major abdominal surgery can lead to shallow breathing which facilitates retention of secretion, with eventual development of pneumonia contributing to organ dysfunction, and prolonged convalescence (7). Furthermore, poorly managed postoperative pain is always associated with delayed mobility which can lead to delayed wound healing, deep vein thrombosis, anxiety, sleep disturbance, myocardial infarction, depressed immune function, and can also progress to chronic pain which impairs the ability to carry out daily activities, and ultimately may leads to decreased quality of life (8). In the United States, between 10% and 60% and in Ethiopia, 22% of the patients were developed chronic pains as a results of poorly managed postoperative pain (9, 10). Hence, in

Ethiopia, discomfort due to post-operative pain remains prevalent and affects between 47%-100% of patients after surgery (10).

Hence, pain relief has been recognized as a human right and is also considered as the 'fifth' vital sign that must be regularly assessed and managed; nurses must pay attention to control postoperative pain (11). The roles and responsibilities of nurses in pain management; according to the American nurses association (ANA), include assessment of pain, plan for pain management strategies, and evaluation of responses of the patients for the given interventions and to take actions accordingly. Since nurses are always spending 24 hours at bedside to provide care for patients, and are also the point of contact between other health professionals and patients, they are expected to play a vital role in postoperative pain management practice (12). Alleviating patient suffering is also a core ethical and legal obligation for health professionals, and the nursing process can support this practice through enhanced pain assessment, nursing diagnoses, care planning, and implementation and evaluation of perioperative interventions that support the vulnerable population (13, 14).

In Ethiopia emergency and elective surgical interventions are provided at all levels of hospitals which are primary, secondary (general) and tertiary (referral) hospitals for diagnostic or therapeutic purposes (15). According to the national surgical care strategic plan, Ethiopia, post-operative patient in the wards shall receive post-operative care from qualified nurses. Hospitals establish a nursing workforce that identifies priority areas that include perioperative care (16). Post-operative pain management practice is an important aspect of nursing care to alleviate pain for the patients using pharmacologic and non-pharmacologic methods (10). Post-operative pain management practice includes a set of measures that evaluate pain, provide appropriate interventions to relieve the pain and re-assess the patients' pain after intervention. Assessing pain is the first and crucial step in properly managing pain (4). Techniques for pain assessments include patient self-report and observing for patient's physiological and behavioral responses to pain. The self-reporting methods include numeric rating scale (NRS), verbal rating scale (VRS), visual analog scale (VAS), and the faces pain scale (FPS) (17).

From different study conducted factors like level of education, experiences, working area, favorable attitude, presence of guideline and standardized tool, training, and adequate knowledge were factor significantly associated with post-operative pain management practice (6-18).

Although postoperative pain management continues to be a problem in developed and developing countries, the suffering from untreated postoperative pain is sadly greater and more worrying among economically disadvantageous individuals in developing countries. Today, there is a growing awareness of the etiology of pain and the advancement of pharmacological and non-pharmacological pain management. However information on post-operative pain management by nurses and their associated factors in Oromia region, Ethiopia, was scarce. Previous studies focused mainly on tertiary hospitals, where advanced care is expected. Furthermore, the studies were conducted on nurses who were statically (fixed shift) working in the operation room and surgical ward, despite most nurses working in patient wards have an exposure to the post-operative patient through a ward rotation. The study was carried out with the aim of identify nurses post-operative pain management practice at public hospitals found in Oromia, Ethiopia; so that the finding will best serve to prioritize the problem and develop strategies for improving post-operative pain management.

Methods

Study design

A cross sectional study design was implemented to identify post-operative pain management practice and associated factors among these nurses.

Study Setting

The study was carried out in public hospitals found in the West Shoa zone, Oromia regional state, Ethiopia from June 1 to August 30/2021. Oromia is one of the eleven regional states in Ethiopia, while the west shoa zone is among the administrative areas found in the Oromia region, Ethiopia. There are one referral, three general, and four districts (total of eight public hospitals) in that zone.

Participants

All nurses who were worked in surgical ward, medical wards, minor operation room (OR) and major operation room (OR), recovery rooms, emergency, obstetrics and gynecology wards were included. The working wards were purposely due to the fact that hospitals in the area are applying ward rotation quarterly so that all nurses have exposure to the postoperative services. There are 564 nurses working in the selected wards of public hospitals in the West shoa zone of Oromia region, Ethiopia.

A sample size was calculated and determined using a single population proportion formula considering that 65.2% of nurses had good post-operative pain management practice (12) at a 5% significance level, 5% margin of error, and considering a 10% non-response rate. With this calculation, the final sample size was 349. A non-response rate of 10% (35) nurses was considered, and the sample size becomes 384. The total calculated sample size (384 nurses) was proportionally allocated to each hospital according to the number of their nurses working on the selected wards. Study participants were selected from nurses working on the wards of those hospitals by using simple random sampling technique. The nurses' registration numbers at each hospital, collected from the daily attendance sheet of hospitals, were used to randomly select the study participants using the lottery methods, simple random sample technique.

Patient and public involvement

No patient and public involved

Study variables

The dependent variable of the study was the level of post-operative pain management practice. Independent variables were socio demographic characteristics such as sex, age, marital status, educational status, experience, working unit/ward, knowledge towards postoperative pain management, attitude towards postoperative pain management and organizational factors such as availability of standardized tools, guideline, and pain management training.

Operational definitions

Good Practice: Refers to those study participants, who have scored mean and/or above the value of the total 18 practice questions.

Poor Practice: Refers to those study participants who have scored below the mean value of the total 18 practice questions.

Knowledge: Is measured by fifteen items in yes/no format. Correct answer was given "1" and "0" was given for incorrect and for not sure. Those who scored mean and above were labeled as having adequate knowledge where as those who scored less than mean labeled as having inadequate knowledge about post-operative pain management.

Attitude: Is measured by nine items in agree/disagree format. For correctly responded item "1" was given and "0" was given for incorrect and don't know. Those who scored mean and above

considered as having favorable attitude where as those who scored below mean have unfavorable attitude towards postoperative pain management (12-14).

Data source (measurements)

Post-operative pain management practice was measured using 18 post-operative pain management practice questions with correct/incorrect response options. Depending on the descriptive analysis of the collected data, the post-operative pain management practice was classified as good practice and poor practice. The mean score of the participant's response to the questions was calculated to determine the good and poor post-operative pain management practice.

Nurses' knowledge of post-operative pain management was measured using 15 questions with a 'yes' or 'no' response options. Those who scored mean and above correct answers were labeled as having adequate knowledge while those who scored less than mean were labeled as having inadequate knowledge of post-operative pain management. Similarly, to measure nurses' attitude towards post-operative pain, 9 questions with a two response options, agree or disagree, were used. Those nurses who scored mean and above were considered to have a favorable attitude, where as those who scored below mean have an unfavorable attitude towards postoperative pain (18, 19, 20). The organizational factors such as on job training and presence of post-operative pain management guideline are also collected through related questions.

Data collection tools, process, quality assurance and analysis

The data were collected using a structured self-administered questionnaire. The questioners were adapted from different studies conducted previously and modified in order to achieve the objectives of the current study (18, 19, 20) **(Annex 1)**. To ensure data quality, the questionnaire was reviewed by expert panels. The cross-sectional STROBE checklist was used for each components of the manuscript as the reference **(Annex 2).** A clinical nurse specialist, three lecturers (Masters of Science in nursing), and one registered Nurse (BSC nurse) were participated in the panel. The questionnaire was pre-tested on 5% of the study population at the Wollega referral and teaching hospital one week before the data collection date. A reliability test was calculated for the practice, knowledge, and attitude components of the questionnaire, to check the internal consistency. The result indicates that 0.781, 0.743 and 0.833 for practice, knowledge and attitude related items, respectively. The principal investigator gave training for data collectors.

The collected data was coded, cleaned and entered into Epi Data version 3.1 software and finally exported to statistical package for social study (SPSS) version 22 software for analysis. Descriptive

analyses were performed first to understand the general characteristics of all the study variables. The results were presented in tables and graphs using summary measures such as percentages and mean. Bivariate logistic regression was carried out to identify factors associated with postoperative pain management practice of nurses'. The Hosmer-Lemeshow test was performed to test fitness of the model, the result was 0.45. Variables with $p < 0.25$ in the bivariate analyses were entered into multivariate logistic regression analysis to identify independent factors associated with the outcome variable. Finally, the result of bivariate and multivariate logistic regression analysis was presented in a crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence intervals. The level of significance was established at a value (P) ≤ 0.05.

Result

Socio-demographic characteristics

A total of 384 questionnaires were distributed, of which 377 were completed and returned with the response rate of 98.2%. The majority of participants, 227(60.2%) were male, 200(53.1%) were married and 240 (63.7%) were between the age group of 26 and 34 years (**Table 1**).

Table 1: Socio-demographic characteristics of respondents, working at public hospitals in Oromia region, Ethiopia, 2021

Variables	Category	Frequency(n=377)	Percentage (%)
Sex	Male	227	60.2
	Female	150	39.8
Age	< 25	71	18.8
	26-34	240	63.7
	>35	66	17.5
Ethnicity	Oromo	360	95.5
	Amhara	17	4.5
Marital status	Married	200	53.1
	Single	177	46.9
Religion	Protestant	217	57.6
	Orthodox	103	27.3
	Muslims	40	10.6
	Wakefata	17	4.5

Educational level	Diploma	28	7.4
	Bachelor degree	346	91.8
	Masters	3	0.8
Years of experience	<5	234	62.1
	6-9	75	19.9
	>10	68	18
Work experience in surgical unit (in years)	<1	199	52.8
	2-4	140	37.1
	>5	38	10.1
Current area of practice	Medical ward	65	17.2
	Emergence ward	70	18.6
	Ob/Gyne ward	65	17.2
	OR and Recovery	72	19.1
	Surgical ward	105	27.9

Knowledge of nurses towards post-operative pain management

The mean score for knowledge was 8.89 with standard deviation of (±2.85). Thus, the results revealed that, from the total of 377 study participants, about 54.9 % (95% CI: (50.1, 60.2)) had adequate knowledge about POP management (**figure 1**).

Nurses' attitude of postoperative pain management

The mean score for attitude was computed and it was 4.99 with standard deviation of 1.73. According to the classification outlined in the operational definition the percentage score of the categories showed that, among 377 respondents, 59.4% (95% CI: (54.6, 64.5)) of participants had favorable attitude towards post-operative pain management practice (**figure 2**).

Practices of nurses on postoperative pain management

The responses of nurses to the nine practice questions are computed and dichotomized in to good practice and poor practice. The mean score of the self-report practice of post-operative pain management was 10.37 with standard deviation of (±2.89). It was calculated based on the category

specified in the operational definitions. Accordingly this study revealed that, about two third (66%) (95% CI: (61, 71) of the respondents had good postoperative pain management practice **(Table 2).**

Table 2: Practices of nurses on postoperative pain management, working at public hospitals in Oromia region, Ethiopia, 2021

Variables	Yes N (%)	No N (%)
Do you assess pain for the patients those able to communicate?	327(86.7%)	50 (13.3%)
Do you encourage the use of transcutaneous electrical nerve stimulator for pain management?	4(1%)	373(99%)
Do you combine opioids with NSAID's rather than single analgesic agents when managing POP as suggested by World health organization?	302(80.1%)	75 (19.9%)
Do you document the findings after pain assessment?	110(29.2%)	267 (70.8%)
Do you encourage prayer by patients or religious leader postoperatively?	206(54.6)	171 (45.4%)
Do you administer ordered pain medication, around the clock (regularly) as ordered?	374(99.2%)	3(0.8%)
Do you use music therapy to reduce pain?	2(0.5%)	375 (99.5%)
Do you reassess pain after giving pain medication in order to evaluate the effectiveness of pain medication?	338(89.7%)	39 (10.3%)
After surgery, do you provide comfortable positions to help relieve pain?	360(95.5%)	17 (4.5%)
Do you ask and help to support the painful areas when moving or coughing after surgery?	283(75.1%)	94 (24.9%)
Do you provide clean, calm and ventilated ward environment for postoperative pain management?	259(68.7%)	118 (31.3%)
Do you lay patients on neat, well-laid bed postoperatively?	294(78%)	83 (22%)
Do you use massage and stretch to reduce postoperative pain?	283(75.1%)	94 (24.9%)

Do you apply heat and cold compresses to manage POP?	288(76.4%)	89 (23.7%)
Do you encourage early ambulation/exercise with analgesia?	347(92%)	30 (8%)
Do you encourage use of acupuncture?	2(0.5%	375(99.5%)
Do you use patient distraction, relaxation, and guided imagery postoperatively to reduce pain?	131(34.2%)	246(65.2%)
Do you usually dress, bandage, splint and reinforce wound sites postoperatively?	359(95.2%)	18(4.8%)

Organizational related factors

According to the nurses response regarding the organizational factors majority, 273(72.4%) of the participants reported that they have not taken any training regarding postoperative pain management while 221(58.3%) did not accessed post-operative pain management guidelines to use for practice. Among those received training regarding postoperative pain management 59(56.7%), 39(37.5%), 2(1.9%) and 4(3.8%) received training by the means of lecturing, course, conference and work shop respectively.

Factors associated with postoperative pain management practice

To assess the factors associated with the nurses' postoperative pain management practice, bivariate analysis was done first. Accordingly, ten of the variables age of the participants, marital status, level of education, work experience, experience in postoperative area, current area of practice, training related to pain management, access to read pain management guideline, knowledge and attitude of the participants regarding POP management were found to be significantly associated with the nurses 'POP management practice at p-value of 0.25. These variables were included in multiple logistic regressions analysis. The model fit was checked by Hosmer and Lemeshow test (p-value=0.45) and it was fitted.

After adjustment, attitude, getting access to read guidelines, training, knowledge and current area of practice were significantly associated with the nurses' postoperative pain management practice. Accordingly, respondents who had Favorable attitude were almost 5 times more likely to practice than those who had unfavorable attitude [AOR: 4.698, 95% CI: (2.725, 8.100)]. Respondents who have taken POP management training were 3.2 times more likely to practice than those who did

not take such training [AOR: 3.289, 95% CI: (1.461, 7.403)]. Similarly, study participants who get access to read pain management guidelines were 3.1 times more likely to practice compared to their counterparts [AOR: 3.112, 95% CI: (1.652, 5.862)]. The study also revealed that respondents who had adequate knowledge on postoperative pain management were 2.9 times more likely to practice than those who had inadequate knowledge [AOR: 2.939, 95% CI: (1.652, 5.227)] and participants those who were currently practicing in Operation Room were 2.9 times more likely practice compared with those practicing in medical ward [AOR: 2.934, 95% CI: 1.267, 6.795 P<0.012] (**Table 3**).

Table 3: Binary and multiple logistic regression analysis results on factors associated with postoperative pain management practice among nurses working at public hospitals in west shoa zone, Ethiopia, 2021.

Variables	Category	Practice status		COR at (95% CI)	AOR at (95% CI)	P-value
		Good N (%)	Poor N (%)			
Age in years	< 25	51	20	1.0		
	26--34	151	89	0.665(0.373-1.188)*	0.706(0.341-1.465)	0.350
	>35	47	19	0.970(0.462-2.038)	0.387(0.116-1.294)	0.123
Marital status	Single	109	68	0.687(0.448-1.054)*	1.039(0.566-1.909)	0.901
	Married	140	60	1.0		
Educational level	BSc/above	234	115	1.763(0.812-3.830)*	2.495(0.863-7.209)	0.091
	Diploma	15	13	1.0		
Years of experience	<5	140	94	1.0		
	6-9	60	15	2.686(1.440-5.009)*	2.301(0.931-5.682)	0.071
	>10	49	19	1.732(0.959-3.126)*	1.613(0.499-5.217)	0.425
Experience in SW	<1	125	74	1.0		
	2-4	90	50	1.066(0.680-1.671)	1.796(0.387-8.342)	0.455
	>5	34	4	5.032(1.717-14.746)*	0.552(0.266-1.144)	0.110
Current area of practice	MW	31	34	1.0		
	EU	42	27	1.706(0.859-3.388)*	2.342(0.916-5.989)	0.076
	GW	48	17	3.097(1.482-6.470)*	1.683(0.708-4.002)	0.239

	OR/R	45	27	1.828(0.925-3.614)*	2.934(1.27-6.795)**	0.012
	SW	83	23	3.958(2.023-7.742)*	1.625(0.689-3.833)	0.267
Training on POPM	Yes	78	13	4.035(2.143-7.599)*	3.289(1.461-7.403)**	0.004
	No	171	115	1.0		
Access to pain management guidelines	Yes	133	23	5.234(3.126-8.763)*	3.112(1.652-5.862)**	0.001
	No	116	105	1.0		
Knowledge	Adequate	169	38	5.003(3.149-7.951)*	2.939(1.652-5.227)**	0.001
	Inadequate	80	90	1.0		
Attitude	Favorable	182	42	5.562(3.500-8.839)*	4.698(2.725-8.100)**	0.001
	Not favorable	67	86	1.0		

Notes: 1.00=Reference, *p-value<0.25, ** statistically significant at P<0.05, SW (surgical ward), MW (medical ward), EU (emergency unit), OR/R (operation or recovery room room).

Discussion

The current study revealed that general postoperative pain management practices among 66% nurses were found to be good. This finding is lower compared to the study conducted in Rwanda on postoperative pain management, which was 88% (21). However, the finding of this study was greater than the study conducted in Addis Ababa in which, only 6% of them had good practice (18). The discrepancy may be attributed to the fact that the previous study at Addis Ababa hospitals was mainly concerned to nurses working in the adult post-operative care units such as major and minor operation room and adult surgical wards. The result is also higher compared to the finding of a study conducted in the Arsi zone, southeastern Ethiopia, where almost half (47.9%) of the study participants had good pain management practice (22). This discrepancy can be attributed to access to the guideline, sample size, and the use of different data collection tools. In the current study, participants were selected using the probability method, the sample was larger than the previous study participants.

More than fifty percent (53.41%) of nurses who have good practice have an access to the POP management guideline. Furthermore as POP is managed pharmacologically or none-

pharmacologically it might be important to describe the care provided in terms the mode of management due to the fact that nurses have professionally independent accountability to the none-pharmacological care and collaborative role in pharmacological/medical care. It is also not convincing to determine the management of POP using only the self-report of nurses, suggesting the need to use observational checklist. In addition, since post-operative pain management is the multi-disciplinary approach and the current study was based on only nurses, it may not reflect the practice of post-operative care provided for patients who received operation services at hospitals. This study revealed that those who had a favorable attitude were nearly five times more likely to have good postoperative pain management practices than those who did not. This is consistent with a study conducted in Addis Ababa and Ghana (19, 22). This similarity could be attributed to the fact that attitude is the most important value in nursing (23). But the current study reveals that only around 60% percent of nurses have a favorable attitude which might suggest the importance of improving the nurse's attitude with respect to the practice of POP management.

Those who had received training were more than three times more likely to have good pain management practices than those who did not. This finding was comparable to the study conducted in Debra Berhan, northern Ethiopia (24). A study conducted on the knowledge, attitude and practice of nurses working at Jimma Medical center revealed that prior training on pain management were significantly associated with post-operative pain management practice (25). This might be due to the fact that those people who had taken POP management training could have current information on pain management which can promote the practice. This underscores the need for timely on-job-training in post-operative pain management. The current study also identified that those who got access to read pain management guidelines were three times more likely to practices post-operative pain management than their counterparts. This finding is supported by studies conducted in Greece and Debra Berhan (24, 26). This is because accessibility to refer guidelines can enhance the practices of POP management, according to the recommended standard. It is also currently the most advisable for clinicians that stay up-to-date with evidence-based practice.

Individuals who were knowledgeable were nearly three times more likely to have good practice than those who had inadequate knowledge. This finding is in line with the finding of a study in Rwanda and Arsi zone of southeastern Ethiopia (18, 21). The possible justification is that the right

knowledge about pain and its management practice can avoid confusion regarding POP and the disease condition, which can also create a clear understanding of its negative impact on patients and on health institutions, unless appropriately managed. This study also showed an association between the current working area of nurses and level of practice, which is consistent with the finding of the study conducted at the Jimma Medical center (25).

Conclusion and recommendation

More than half of nurses have a good level of practice in postoperative pain management. Training in post-operative pain management (POPM), access to pain management guidelines, knowledge, and attitude are significant factors in post-operative pain management practice. The regional health bureau, Zonal health offices, hospital administrations and other concerned bodies needs to work to improve post-operative pain management through organizing different trainings to improve knowledge and attitude of nurses and timely distributing standard pain assessment guidelines for enhancing accessibility.

Abbreviations

OR: operation room

POP: post-operative pain

SD: Standard deviation

SPSS: Statistical Package for the Social Sciences

DECLARATION

Availability of data

Datasets used are available from the corresponding authors on reasonable request.

Ethical approval and consent to participate

Ethical clearance was first obtained from Ambo University CMHS's ethical review board with ethical ID. Of AU/SGS/059/2020. The letter was written by the Zonal health office to obtain ethical approval to conduct the study in the Hospitals. Then the ethical clearance and support letter were taken to all public hospitals. All participants were asked for their willingness to participate in the study and were told that it would not have any risk to them. Written informed consent was obtained from each study subject before data collection after approved by ethical review board.

Confidentiality of the information was assured, and the privacy of the respondents was maintained. All procedures were followed in accordance with the relevant guidelines and regulations as declaration of Helsinki.

Consent to publish

Not applicable.

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Author Contributions

AD, AK and DA were involved in the selection of design, development of the research proposal, data analysis, writing up of the different drafts and finalizing the research. YG and NA were participated in the reviewing of the different drafts of the study and drafting the manuscript.

Competing interests

The authors declare that there is no conflict of interest in this work.

Availability of the data

The data is available on responsible request from the corresponding author by the following address. E: mail: deebisa@gmail.com

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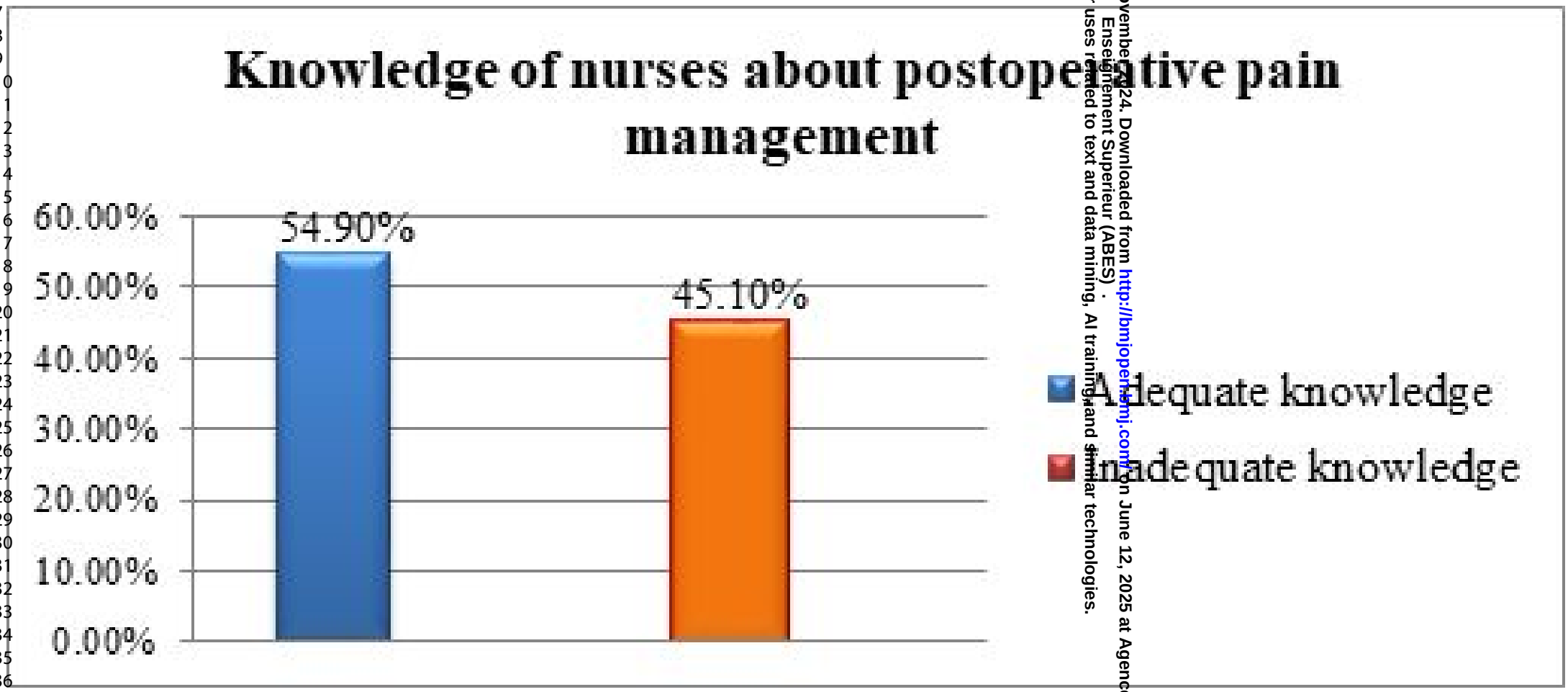
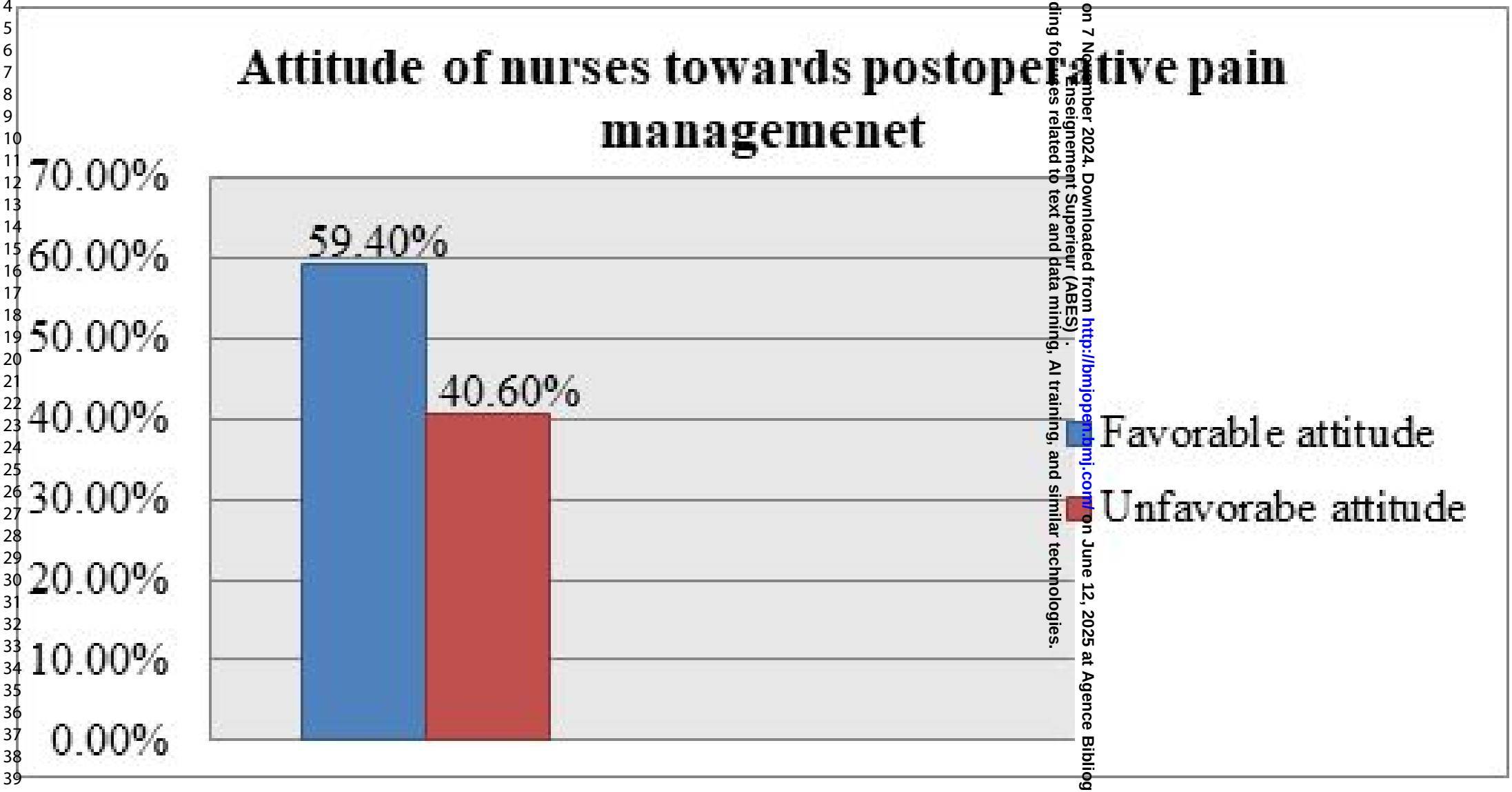
Figure legends

Figure 1: Knowledge of nurses on postoperative pain management at public hospitals in west shoa zone, Ethiopia, 2021.

Figure 2: Attitude levels of nurses towards postoperative pain management at public hospitals in west shoa zone, Ethiopia, 2021.





Annex: 1 Questionnaires

Part I: Socio-Demographic Characteristics of Respondents

Instruction: Please circle the number of your choice.

It. no.	Questions	Responses	Remark
101	Sex of participants	1. Male 2. Female	
102	How old are you?	----------years	
103	What is your ethnicity	1. Amhara 2. Oromo 3.Tigre 4.Others_____	
104	What is your marital status?	1. Married 2. Single 3. Divorced 4. Widowed	
105	What is your religion?	1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5.Others(specify)_____	
106	What is your level of qualification?	1. Diploma 2. Bachelor degree 3. Master's degree and above	
107	How many years of work What experience do you have?	1. _____	
108	How long have you been working in a postoperative area	1._____	
109	Where is your current area of Practice?	1._____	

110	Have you received any training related to POP management?	1. Yes 2. No	If No Skip to Q12
111	If yes, How do you receive training?	1. Lecture 2. Course 3. Conference 4. Workshop	
112	Do you have access to read pain management guidelines in your hospital?	1. Yes 2. No	If No Skip to next
113	If yes, How often do you read the guidelines?	1 Always 2 Monthly 3 Quarterly 4 Yearly	

Part II: Respondents' knowledge of Post-operative pain assessment and management-related questions

Instruction: Please circle the number of your choice.

Item No.	Items	Response
201	When a patient requests increasing amounts of analgesics to control pain, this usually indicates that the patient is psychologically dependent.	1. Yes 2. No 3. not sure
202	Vital signs are always reliable indicators of the intensity of a patient's pain.	1. Yes 2. No

		3. not sure
203	Pain assessment includes onset, duration, variability, location, and intensity of pain.	1. Yes 2. No 3. not sure
204	When using the WHO pain ladder to treat acute pain, treatment should go from bottom to top.	1. Yes 2. No 3. not sure
205	Combining analgesics that work by different mechanisms may result in better pain control with fewer side effects than using a single analgesic agents	1. Yes 2. No 3. not sure
206	Pain should be assessed before and after administering pain medications.	1. Yes 2. No 3. not sure
207	Observation is one part of the method used in surgical pain assessment	1. Yes 2. No 3. not sure
208	The side effects of narcotics should be observed at least 20 minutes after Administration	1. Yes 2. No 3. not sure
209	The recommended route of administration of opioid analgesics with brief, severe pain of sudden onset such as POP is intramuscular.	1. Yes

		2. No 3. not sure
210	Analgesics for POP should initially be given around the clock on a fixed schedule.	1. Yes 2. No 3. not sure
211	Pre-surgery injection such as anesthesia is given for pain management	1. Yes 2. No 3. not sure
212	Respiratory depression rarely occurs in patients who have been receiving stable doses of Opioids over months.	1. Yes 2. No 3. not sure
2013	Opioids should not be used in patients with a history of substance abuse.	1. Yes 2. No 3. not sure
214	A rating scale ranging from (0) "no pain at all to (10) the worst pain" is essential to adopt in pain assessment.	1. Yes 2. No 3. not sure
215	If a patient sleeps with no movement postoperatively, this indicates that the patient is not in pain.	1. Yes 2. No 3. not sure

Part III: Respondents' attitude toward Post-operative pain assessment and management-related questions Instruction:

Please click the box you choose

Item S.No.	Questions	Response		
		Agree	Dis agree	Don't know
301	Your patient should experience discomfort before giving the next dose of pain medications.			
302	Distraction can reduce pain intensity			
303	A patient's spiritual beliefs may lead them to think pain and suffering are necessary.			
304	Using pain measurement instruments is integral in postoperative pain management.			
305	Morphine is a very strong drug; patients in postoperative pain would be content with just one dose.			
306	Nurses can best judge the patient's pain intensity because they spent 24 hours with the patients			
307	Lack of pain expression does not mean lack of pain.			
308	Effective analgesia is an essential part of postoperative Management			
109	Pain is what the patient says it is.			

Part IV: Items to assess practice

Direction: Read the following questions carefully and encircle your choice. If your choice is "yes" tick also on how frequently you practice it and skip to the next questions if your choice is "never".

401	Do you assess pain for patients able to communicate? If your choice is never to skip to Q4	1. yes 2. never	If yes how frequently? I always sometimes
402	Do you use a pain assessment tool for the pain scale? If never used go to Q404	1. yes 2. never	If yes how frequently? I always sometimes
403	If use, Please! Name the tool(s) you used.	_____, _____	
404	If your answer for Q401 & 402 above is never, What Were the barriers that hindered you from pain assessment? You can choose multiple options.		1. Nursing workload 2. Lack of standard pain assessment tool in hospital 3. lack of training in pain management 4. Lack of pain management Guidelines in the hospital 5. Patient's inability to communicate 6.Other(specify)_____
405	Do you encourage the use of transcutaneous electrical nerve stimulators for pain management	1. yes 2. never	If yes how frequently? I always sometimes
406	Do you combine opioids with NSAIDs rather than single analgesic agents when managing POP as suggested by the World Health Organization?	1. yes 2. never	If yes how frequently? I always sometimes

407	Do you document the findings after the pain assessment?	1. yes 2. never	If yes how frequently? always sometimes
408	If your answer for Q407 is never, what was the reason for your not documenting the finding? If not choose never, go to Q409. You can choose multiple options		1. Nursing workload 2. No designed area for charting 3. Lack of familiarity with the assessment tools 8.Other(specify)_____
409	Do you encourage prayer by patients or religious leaders postoperatively?	1. yes 2. never	If yes how frequently? I always sometimes
410	Do you administer ordered pain medication, around the clock (regularly) as ordered?	1. yes 2. never	If yes how frequently? I always sometimes
411	Do you use music therapy to reduce postoperative pain?	1. yes 2. never	If yes how frequently? always sometimes
412	Do you reassess pain after giving pain medication to evaluate the effectiveness of pain medication?	1. yes 2. never	If yes how frequently? I always sometimes
413	After surgery, do you provide comfortable positions to help relieve pain?	1. yes 2. never	If yes how frequently? always sometimes
414	Do you ask and help to support the painful areas when the patients moving or coughing after surgery?	1. yes 2. never	If yes how frequently? always sometimes

415	Do you provide a clean, calm, and well-ventilated ward environment for POP management?	1. yes 2. never	If yes how frequently? I always sometimes
416	Do you lay the patients on neat, well-laid beds postoperatively?	1. yes 2. never	If yes how frequently? always sometimes
417	Do you encourage massaging and stretching to reduce POP?	1. yes 2. never	If yes how frequently? always sometimes
418	Do you apply heat and cold compresses to manage postoperative pain?	1. yes 2. never	If yes how frequently? I always sometimes
419	Do you encourage early ambulation/exercise with analgesia?	1. yes 2. never	If yes how frequently? I always sometimes
420	Do you encourage the use of acupuncture?	1. yes 2. never	If yes how frequently? I always sometimes
421	Do you use patient distraction, relaxation, and guided imagery postoperatively to reduce pain?	1. yes 2. never	If yes how frequently? I always sometimes
422	Do you dress, bandage, splint, and reinforce wound sites postoperatively?	1. yes 2. never	If yes how frequently? I always sometimes

Annex 2 STROBE Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on Line number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	23-48
Introduction			**61**
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	60-117
Objectives	3	State specific objectives, including any prespecified hypotheses	118-121
Methods			**122**
Study design	4	Present key elements of study design early in the paper	123-125
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	126-130
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	131-147
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	148-153
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	167-181
Bias	9	Describe any efforts to address potential sources of bias	*57-60*
Study size	10	Explain how the study size was arrived at	138-142
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	168-180
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	182-203
		(*b*) Describe any methods used to examine subgroups and interactions	182-200
		(*c*) Explain how missing data were addressed	185-192
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	170-175
		(*e*) Describe any sensitivity analyses	185-192
Results			204

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	206-208
		(b) Give reasons for non-participation at each stage	,,
		(c) Consider use of a flow diagram	,,
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	206-221
		(b) Indicate number of participants with missing data for each variable of interest	207
Outcome data	15*	Report numbers of outcome events or summary measures	227-230
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	243-269
		(*b*) Report category boundaries when continuous variables were categorized	,,
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	,,
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	,,
Discussion			270
Key results	18	Summarise key results with reference to study objectives	320-327
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	56-60
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	271-327
Generalisability	21	Discuss the generalisability (external validity) of the study results	182-203
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	360-362

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Postoperative pain management practice and associated factors among nurses working in public hospitals, Oromia region, Ethiopia, 2021. An institution based Cross-sectional Study.

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Abstract

Background: Management of postoperative pain leads to positive patient progress and shortens the duration of hospital stay. Nurses, who spend most of their time with the patients, are expected to play major role in the postoperative pain management practice. However, there is a lack of information on nurse's postoperative pain management practice and its associated factors. This study aims to assess postoperative pain management practice and associated factors among nurses working in public hospitals.

Methods: An institutional based cross-sectional study was used among randomly selected 377 nurses working in public hospitals in Oromia, Ethiopia from June 1- August 30/2021. Data were collected by distributing structured self-administered questionnaires that were adapted from different literature and a simple random sampling technique was employed to select the study participants. The data were entered into Epi data version 3.1 and exported to SPSS version 22 for analysis. Variables with significant association in the bivariate analyses were entered into a multivariate regression analysis to identify independent factors associated with postoperative pain management practice. Significant factors were declared at P<0.05.

Result: The result showed that 66% of nurses had good pain management practice. The attitude of nurse's towards post-operative pain management [AOR: 4.69, 95% CI: (2.72-8.10)], access to read the pain management guideline [AOR: 3.11, 95% CI: (1.65-5.86)], knowledge of post-operative pain management [AOR: 2.93, 95% CI: (1.65-5.22)], current working unit or ward [AOR: 2.93, 95% CI: (1.27-6.79)] and training in pain management [AOR: 3.28, 95% CI: (1.46-7.40)] were significantly associated with postoperative pain management practices.

Conclusion and recommendation: More than half of participants have a good practice in postoperative pain management. Training, access to pain management guidelines, current working unit, knowledge, and attitude are significant factors. Further study that use an observational checklist may be more explanatory in determining the level of practice.

Strengths and limitations of the study

Strength:

- All public hospitals in west shoa zone were included during data collection period.

Limitation:

- The study design was cross sectional, where cross-sectional study design cannot create causal attribution between independent variables and dependent variables.
- Since post-operative pain management is the multi-disciplinary approach but this study focus only among nurses.

Introduction

Post-operative pain (POP) is a form of acute pain after surgical trauma as a result of the inflammatory reaction and the initiation of afferent neurological barriers (1). Pain is felt in response to the inflammatory process resulting from tissue injury during surgical procedure such as, skin incision, tissue dissection, manipulation, and traction (2). Surgery is typically followed by acute pain, and correct identification of the type of pain allows the selection of an appropriate effective treatment (3).

POP is a critical community health issue in both economically developed and developing countries. Currently, it is estimated that about 28-32% of global disease requires surgical intervention (4). More than five million surgical interventions are needed in Ethiopia each year (5). The increase in the number of operations is not without risk. Unless adequately managed, post-operative pain can be complicated by delayed ambulation, reduced patient satisfaction and increased incidence of pulmonary complication (6). For example, persistent pain after major abdominal surgery can lead to shallow breathing which facilitates retention of secretion, with eventual development of pneumonia contributing to organ dysfunction, and prolonged convalescence (7). Furthermore, poorly managed postoperative pain is always associated with delayed mobility which can lead to delayed wound healing, deep vein thrombosis, anxiety, sleep disturbance, myocardial infarction, depressed immune function, and can also progress to chronic pain which impairs the ability to carry out daily activities, and ultimately may leads to decreased quality of life (8). In the United States, between 10% and 60% and in Ethiopia, 22% of the patients were developed chronic pains as a results of poorly managed postoperative pain (9, 10). Hence, in

Ethiopia, discomfort due to post-operative pain remains prevalent and affects between 47%-100% of patients after surgery (10).

Hence, pain relief has been recognized as a human right and is also considered as the 'fifth' vital sign that must be regularly assessed and managed; nurses must pay attention to control postoperative pain (11). The roles and responsibilities of nurses in pain management; according to the American nurses association (ANA), include assessment of pain, plan for pain management strategies, and evaluation of responses of the patients for the given interventions and to take actions accordingly. Since nurses are always spending 24 hours at bedside to provide care for patients, and are also the point of contact between other health professionals and patients, they are expected to play a vital role in postoperative pain management practice (12). Alleviating patient suffering is also a core ethical and legal obligation for health professionals, and the nursing process can support this practice through enhanced pain assessment, nursing diagnoses, care planning, and implementation and evaluation of perioperative interventions that support the vulnerable population (13, 14).

In Ethiopia emergency and elective surgical interventions are provided at all levels of hospitals which are primary, secondary (general) and tertiary (referral) hospitals for diagnostic or therapeutic purposes (15). According to the national surgical care strategic plan, Ethiopia, post-operative patient in the wards shall receive post-operative care from qualified nurses. Hospitals establish a nursing workforce that identifies priority areas that include perioperative care (16). Post-operative pain management practice is an important aspect of nursing care to alleviate pain for the patients using pharmacologic and non-pharmacologic methods (10). Post-operative pain management practice includes a set of measures that evaluate pain, provide appropriate interventions to relieve the pain and re-assess the patients' pain after intervention. Assessing pain is the first and crucial step in properly managing pain (4). Techniques for pain assessments include patient self-report and observing for patient's physiological and behavioral responses to pain. The self-reporting methods include numeric rating scale (NRS), verbal rating scale (VRS), visual analog scale (VAS), and the faces pain scale (FPS) (17).

From different study conducted factors like level of education, experiences, working area, favorable attitude, presence of guideline and standardized tool, training, and adequate knowledge were factor significantly associated with post-operative pain management practice (6-18).

Although postoperative pain management continues to be a problem in developed and developing countries, the suffering from untreated postoperative pain is sadly greater and more worrying among economically disadvantageous individuals in developing countries. Today, there is a growing awareness of the etiology of pain and the advancement of pharmacological and non-pharmacological pain management. However information on post-operative pain management by nurses and their associated factors in Oromia region, Ethiopia, was scarce. Previous studies focused mainly on tertiary hospitals, where advanced care is expected. Furthermore, the studies were conducted on nurses who were statically (fixed shift) working in the operation room and surgical ward, despite most nurses working in patient wards have an exposure to the post-operative patient through a ward rotation. The study was carried out with the aim of identify nurses post-operative pain management practice at public hospitals found in Oromia, Ethiopia; so that the finding will best serve to prioritize the problem and develop strategies for improving post-operative pain management.

Methods

Study design

A cross sectional study design was implemented to identify post-operative pain management practice and associated factors among these nurses.

Study Setting

The study was carried out in public hospitals found in the West Shoa zone, Oromia regional state, Ethiopia from June 1 to August 30/2021. Oromia is one of the eleven regional states in Ethiopia, while the west shoa zone is among the administrative areas found in the Oromia region, Ethiopia. There are one referral, three general, and four districts (total of eight public hospitals) in that zone.

Participants

All nurses who were worked in surgical ward, medical wards, minor operation room (OR) and major operation room (OR), recovery rooms, emergency, obstetrics and gynecology wards were included. The working wards were purposely due to the fact that hospitals in the area are applying ward rotation quarterly so that all nurses have exposure to the postoperative services. There are 564 nurses working in the selected wards of public hospitals in the West shoa zone of Oromia region, Ethiopia.

A sample size was calculated and determined using estimated by using the width of the 95%CI of the mean practice score by considering 65.2% of nurses had good post-operative pain management practice (12) at a 5% significance level, 5% margin of error, and considering a 10% non-response rate. With this calculation, the final sample size was 349. A non-response rate of 10% (35) nurses was considered, and the sample size becomes 384. The total calculated sample size (384 nurses) was proportionally allocated to each hospital according to the number of their nurses working on the selected wards. Study participants were selected from nurses working on the wards of those hospitals by using simple random sampling technique. The nurses' registration numbers at each hospital, collected from the daily attendance sheet of hospitals, were used to randomly select the study participants using the lottery methods, simple random sample technique.

Patient and public involvement

No patient and public involved

Study variables

The dependent variable of the study was the level of post-operative pain management practice. Independent variables were socio demographic characteristics such as sex, age, marital status, educational status, experience, working unit/ward, knowledge towards postoperative pain management, attitude towards postoperative pain management and organizational factors such as availability of standardized tools, guideline, and pain management training.

Operational definitions

Good Practice: Refers to those study participants, who have scored mean and/or above the value of the total 18 practice questions.

Poor Practice: Refers to those study participants who have scored below the mean value of the total 18 practice questions.

Knowledge: Is measured by fifteen items in yes/no format. Correct answer was given "1" and "0" was given for incorrect and for not sure. Those who scored mean and above were labeled as having adequate knowledge where as those who scored less than mean labeled as having inadequate knowledge about post-operative pain management.

Attitude: Is measured by nine items in agree/disagree format. For correctly responded item "1" was given and "0" was given for incorrect and don't know. Those who scored mean and above

considered as having favorable attitude where as those who scored below mean have unfavorable attitude towards postoperative pain management (12-14).

Data source (measurements)

Post-operative pain management practice was measured using 18 post-operative pain management practice questions with correct/incorrect response options. Depending on the descriptive analysis of the collected data, the post-operative pain management practice was classified as good practice and poor practice. The mean score of the participant's response to the questions was calculated to determine the good and poor post-operative pain management practice.

Nurses' knowledge of post-operative pain management was measured using 15 questions with a 'yes' or 'no' response options. Those who scored mean and above correct answers were labeled as having adequate knowledge while those who scored less than mean were labeled as having inadequate knowledge of post-operative pain management. Similarly, to measure nurses' attitude towards post-operative pain, 9 questions with a two response options, agree or disagree, were used. Those nurses who scored mean and above were considered to have a favorable attitude, where as those who scored below mean have an unfavorable attitude towards postoperative pain (18, 19, 20). The organizational factors such as on job training and presence of post-operative pain management guideline are also collected through related questions.

Data collection tools, process, quality assurance and analysis

The data were collected using a structured self-administered questionnaire. The questioners were adapted from different studies conducted previously and modified in order to achieve the objectives of the current study (18, 19, 20) **(Annex 1)**. To ensure data quality, the questionnaire was reviewed by expert panels. The cross-sectional STROBE checklist was used for each components of the manuscript as the reference **(Annex 2).** A clinical nurse specialist, three lecturers (Masters of Science in nursing), and one registered Nurse (BSC nurse) were participated in the panel. The questionnaire was pre-tested on 5% of the study population at the Wollega referral and teaching hospital one week before the data collection date. A reliability test was calculated for the practice, knowledge, and attitude components of the questionnaire, to check the internal consistency. The result indicates that 0.781, 0.743 and 0.833 for practice, knowledge and attitude related items, respectively. The principal investigator gave training for data collectors.

The collected data was coded, cleaned and entered into Epi Data version 3.1 software and finally exported to statistical package for social study (SPSS) version 22 software for analysis. Descriptive

analyses were performed first to understand the general characteristics of all the study variables. The results were presented in tables and graphs using summary measures such as percentages and mean. Bivariate logistic regression was carried out to identify factors associated with postoperative pain management practice of nurses'. The Hosmer-Lemeshow test was performed to test fitness of the model, the result was 0.45. Variables with $p < 0.25$ in the bivariate analyses were entered into multivariate logistic regression analysis to identify independent factors associated with the outcome variable. Finally, the result of bivariate and multivariate logistic regression analysis was presented in a crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence intervals. The level of significance was established at a value (P) ≤ 0.05.

Result

Socio-demographic characteristics

A total of 384 questionnaires were distributed, of which 377 were completed and returned with the response rate of 98.2%. The majority of participants, 227(60.2%) were male, 200(53.1%) were married and 240 (63.7%) were between the age group of 26 and 34 years (**Table 1**).

Table 1: Socio-demographic characteristics of respondents, working at public hospitals in Oromia region, Ethiopia, 2021

Variables	Category	Frequency(n=377)	Percentage (%)
Sex	Male	227	60.2
	Female	150	39.8
Age	< 25	71	18.8
	26-34	240	63.7
	>35	66	17.5
Ethnicity	Oromo	360	95.5
	Amhara	17	4.5
Marital status	Married	200	53.1
	Single	177	46.9
Religion	Protestant	217	57.6
	Orthodox	103	27.3
	Muslims	40	10.6
	Wakefata	17	4.5

Educational level	Diploma	28	7.4
	Bachelor degree	346	91.8
	Masters	3	0.8
Years of experience	<5	234	62.1
	6-9	75	19.9
	>10	68	18
Work experience in surgical unit (in years)	<1	199	52.8
	2-4	140	37.1
	>5	38	10.1
Current area of practice	Medical ward	65	17.2
	Emergence ward	70	18.6
	Ob/Gyne ward	65	17.2
	OR and Recovery	72	19.1
	Surgical ward	105	27.9

Knowledge of nurses towards post-operative pain management

The mean score for knowledge was 8.89 with standard deviation of (±2.85). (**Figure 1**).

Nurses' attitude of postoperative pain management

The mean score for attitude was computed and it was 4.99 with standard deviation of 1.73. (**Figure 2**).

Practices of nurses on postoperative pain management

The responses of nurses to the nine practice questions are computed and dichotomized in to good practice and poor practice. The mean score of the self-report practice of post-operative pain management was 10.37 with standard deviation of (±2.89). It was calculated based on the category specified in the operational definitions. Accordingly this study revealed that, about two third (66%) (95% CI: (61, 71) of the respondents had good postoperative pain management practice **(Table 2).**

Table 2: Practices of nurses on postoperative pain management, working at public hospitals in Oromia region, Ethiopia, 2021

Variables	Yes N (%)	No N (%)
Do you assess pain for the patients those able to communicate?	327(86.7%)	50 (13.3%)
Do you encourage the use of transcutaneous electrical nerve stimulator for pain management?	4(1%)	373(99%)
Do you combine opioids with NSAID's rather than single analgesic agents when managing POP as suggested by World health organization?	302(80.1%)	75 (19.9%)
Do you document the findings after pain assessment?	110(29.2%)	267 (70.8%)
Do you encourage prayer by patients or religious leader postoperatively?	206(54.6)	171 (45.4%)
Do you administer ordered pain medication, around the clock (regularly) as ordered?	374(99.2%)	3(0.8%)
Do you use music therapy to reduce pain?	2(0.5%)	375 (99.5%)
Do you reassess pain after giving pain medication in order to evaluate the effectiveness of pain medication?	338(89.7%)	39 (10.3%)
After surgery, do you provide comfortable positions to help relieve pain?	360(95.5%)	17 (4.5%)
Do you ask and help to support the painful areas when moving or coughing after surgery?	283(75.1%)	94 (24.9%)
Do you provide clean, calm and ventilated ward environment for postoperative pain management?	259(68.7%)	118 (31.3%)
Do you lay patients on neat, well-laid bed postoperatively?	294(78%)	83 (22%)
Do you use massage and stretch to reduce postoperative pain?	283(75.1%)	94 (24.9%)
Do you apply heat and cold compresses to manage POP?	288(76.4%)	89 (23.7%)
Do you encourage early ambulation/exercise with analgesia?	347(92%)	30 (8%)
Do you encourage use of acupuncture?	2(0.5%	375(99.5%)
Do you use patient distraction, relaxation, and guided imagery postoperatively to reduce pain?	131(34.2%)	246(65.2%)

Do you usually dress, bandage, splint and reinforce wound sites postoperatively?	359(95.2%)	18(4.8%)

Organizational related factors

According to the nurses response regarding the organizational factors majority, 273(72.4%) of the participants reported that they have not taken any training regarding postoperative pain management while 221(58.3%) did not accessed post-operative pain management guidelines to use for practice. Among those received training regarding postoperative pain management 59(56.7%), 39(37.5%), 2(1.9%) and 4(3.8%) received training by the means of lecturing, course, conference and work shop respectively.

Factors associated with postoperative pain management practice

To assess the factors associated with the nurses' postoperative pain management practice, bivariate analysis was done first. Accordingly, ten of the variables age of the participants, marital status, level of education, work experience, experience in postoperative area, current area of practice, training related to pain management, access to read pain management guideline, knowledge and attitude of the participants regarding POP management were found to be significantly associated with the nurses 'POP management practice at p-value of 0.25. These variables were included in multiple logistic regressions analysis. The model fit was checked by Hosmer and Lemeshow test (p-value=0.45) and it was fitted.

After adjustment, attitude, getting access to read guidelines, training, knowledge and current area of practice were significantly associated with the nurses' postoperative pain management practice. Accordingly, respondents who had Favorable attitude were almost 5 times more likely to practice than those who had unfavorable attitude [AOR: 4.698, 95% CI: (2.725, 8.100)]. Respondents who have taken POP management training were 3.2 times more likely to practice than those who did not take such training [AOR: 3.289, 95% CI: (1.461, 7.403)]. Similarly, study participants who get access to read pain management guidelines were 3.1 times more likely to practice compared to their counterparts [AOR: 3.112, 95% CI: (1.652, 5.862)]. The study also revealed that respondents who had adequate knowledge on postoperative pain management were 2.9 times more likely to practice than those who had inadequate knowledge [AOR: 2.939, 95% CI: (1.652, 5.227)] and

participants those who were currently practicing in Operation Room were 2.9 times more likely practice compared with those practicing in medical ward [AOR: 2.934, 95% CI: 1.267, 6.795 P<0.012] (**Table 3**).

Table 3: Binary and multiple logistic regression analysis results on factors associated with postoperative pain management practice among nurses working at public hospitals in west shoa zone, Ethiopia, 2021.

Variables	Category	Practice status		COR at (95% CI)	AOR at (95% CI)	P-value
		Good N (%)	Poor N (%)			
Age in years	< 25	51	20	1.0		
	26--34	151	89	0.665(0.373-1.188)*	0.706(0.341-1.465)	0.350
	>35	47	19	0.970(0.462-2.038)	0.387(0.116-1.294)	0.123
Marital status	Single	109	68	0.687(0.448-1.054)*	1.039(0.566-1.909)	0.901
	Married	140	60	1.0		
Educational level	BSc/above	234	115	1.763(0.812-3.830)*	2.495(0.863-7.209)	0.091
	Diploma	15	13	1.0		
Years of experience	<5	140	94	1.0		
	6-9	60	15	2.686(1.440-5.009)*	2.301(0.931-5.682)	0.071
	>10	49	19	1.732(0.959-3.126)*	1.613(0.499-5.217)	0.425
Experience in SW	<1	125	74	1.0		
	2-4	90	50	1.066(0.680-1.671)	1.796(0.387-8.342)	0.455
	>5	34	4	5.032(1.717-14.746)*	0.552(0.266-1.144)	0.110
Current area of practice	MW	31	34	1.0		
	EU	42	27	1.706(0.859-3.388)*	2.342(0.916-5.989)	0.076
	GW	48	17	3.097(1.482-6.470)*	1.683(0.708-4.002)	0.239
	OR/R	45	27	1.828(0.925-3.614)*	2.934(1.27-6.795)**	0.012
	SW	83	23	3.958(2.023-7.742)*	1.625(0.689-3.833)	0.267
Training on POPM	Yes	78	13	4.035(2.143-7.599)*	3.289(1.461-7.403)**	0.004
	No	171	115	1.0		
	Yes	133	23	5.234(3.126-8.763)*	3.112(1.652-5.862)**	0.001

Access to pain management guidelines	No	116	105	1.0		
Knowledge	Adequate	169	38	5.003(3.149-7.951)*	2.939(1.652-5.227)**	0.001
	Inadequate	80	90	1.0		
Attitude	Favorable	182	42	5.562(3.500-8.839)*	4.698(2.725-8.100)**	0.001
	Not favorable	67	86	1.0		

Notes: 1.00=Reference, *p-value<0.25, ** statistically significant at P<0.05, SW (surgical ward), MW (medical ward), EU (emergency unit), OR/R (operation or recovery room room).

Discussion

The current study revealed that general postoperative pain management practices among 66% nurses were found to be good. This finding is lower compared to the study conducted in Rwanda on postoperative pain management, which was 88% (21). However, the finding of this study was greater than the study conducted in Addis Ababa in which, only 6% of them had good practice (18). The discrepancy may be attributed to the fact that the previous study at Addis Ababa hospitals was mainly concerned to nurses working in the adult post-operative care units such as major and minor operation room and adult surgical wards. The result is also higher compared to the finding of a study conducted in the Arsi zone, southeastern Ethiopia, where almost half (47.9%) of the study participants had good pain management practice (22). This discrepancy can be attributed to access to the guideline, sample size, and the use of different data collection tools. In the current study, participants were selected using the probability method, the sample was larger than the previous study participants.

More than fifty percent (53.41%) of nurses who have good practice have an access to the POP management guideline. Furthermore as POP is managed pharmacologically or none-pharmacologically it might be important to describe the care provided in terms the mode of management due to the fact that nurses have professionally independent accountability to the none-pharmacological care and collaborative role in pharmacological/medical care. It is also not convincing to determine the management of POP using only the self-report of nurses, suggesting

the need to use observational checklist. In addition, since post-operative pain management is the multi-disciplinary approach and the current study was based on only nurses, it may not reflect the practice of post-operative care provided for patients who received operation services at hospitals. This study revealed that those who had a favorable attitude were nearly five times more likely to have good postoperative pain management practices than those who did not. This is consistent with a study conducted in Addis Ababa and Ghana (19, 22). This similarity could be attributed to the fact that attitude is the most important value in nursing (23). But the current study reveals that only around 60% percent of nurses have a favorable attitude which might suggest the importance of improving the nurse's attitude with respect to the practice of POP management.

Those who had received training were more than three times more likely to have good pain management practices than those who did not. This finding was comparable to the study conducted in Debra Berhan, northern Ethiopia (24). A study conducted on the knowledge, attitude and practice of nurses working at Jimma Medical center revealed that prior training on pain management were significantly associated with post-operative pain management practice (25). This might be due to the fact that those people who had taken POP management training could have current information on pain management which can promote the practice. This underscores the need for timely on-job-training in post-operative pain management. The current study also identified that those who got access to read pain management guidelines were three times more likely to practices post-operative pain management than their counterparts. This finding is supported by studies conducted in Greece and Debra Berhan (24, 26). This is because accessibility to refer guidelines can enhance the practices of POP management, according to the recommended standard. It is also currently the most advisable for clinicians that stay up-to-date with evidence-based practice.

Individuals who were knowledgeable were nearly three times more likely to have good practice than those who had inadequate knowledge. This finding is in line with the finding of a study in Rwanda and Arsi zone of southeastern Ethiopia (18, 21). The possible justification is that the right knowledge about pain and its management practice can avoid confusion regarding POP and the disease condition, which can also create a clear understanding of its negative impact on patients and on health institutions, unless appropriately managed. This study also showed an association

between the current working area of nurses and level of practice, which is consistent with the finding of the study conducted at the Jimma Medical center (25).

Conclusion and recommendation

More than half of nurses have a good level of practice in postoperative pain management. Training in post-operative pain management (POPM), access to pain management guidelines, knowledge, and attitude are significant factors in post-operative pain management practice. The regional health bureau, Zonal health offices, hospital administrations and other concerned bodies needs to work to improve post-operative pain management through organizing different trainings to improve knowledge and attitude of nurses and timely distributing standard pain assessment guidelines for enhancing accessibility.

Abbreviations

OR: operation room

POP: post-operative pain

SD: Standard deviation

SPSS: Statistical Package for the Social Sciences

DECLARATION

Availability of data

Datasets used are available from the corresponding authors on reasonable request.

Ethical approval and consent to participate

Ethical clearance was first obtained from Ambo University CMHS's ethical review board with ethical ID. Of AU/SGS/059/2020. The letter was written by the Zonal health office to obtain ethical approval to conduct the study in the Hospitals. Then the ethical clearance and support letter were taken to all public hospitals. All participants were asked for their willingness to participate in the study and were told that it would not have any risk to them. Written informed consent was obtained from each study subject before data collection after approved by ethical review board. Confidentiality of the information was assured, and the privacy of the respondents was maintained. All procedures were followed in accordance with the relevant guidelines and regulations as declaration of Helsinki.

Consent to publish

Not applicable.

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Author Contributions

AD, AK and DA were involved in the selection of design, development of the research proposal, data analysis, writing up of the different drafts and finalizing the research. YG and NA were participated in the reviewing of the different drafts of the study and drafting the manuscript. In general, NA is the guarantor. AD is acted as the guarantor and AK is responsible for the overall content

Competing interests

The authors declare that there is no conflict of interest in this work.

Availability of the data

The data is available on responsible request from the corresponding author by the following address. E: mail: deebisa@gmail.com

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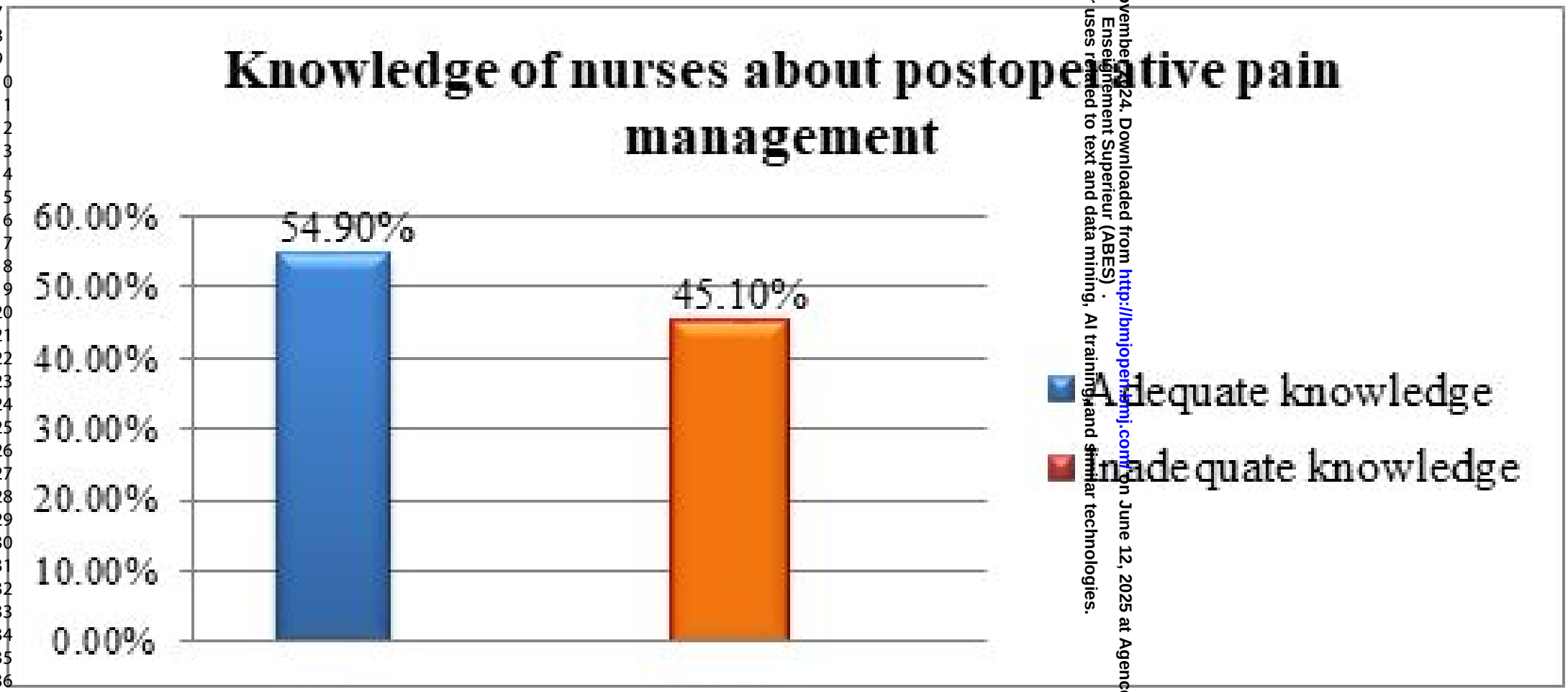
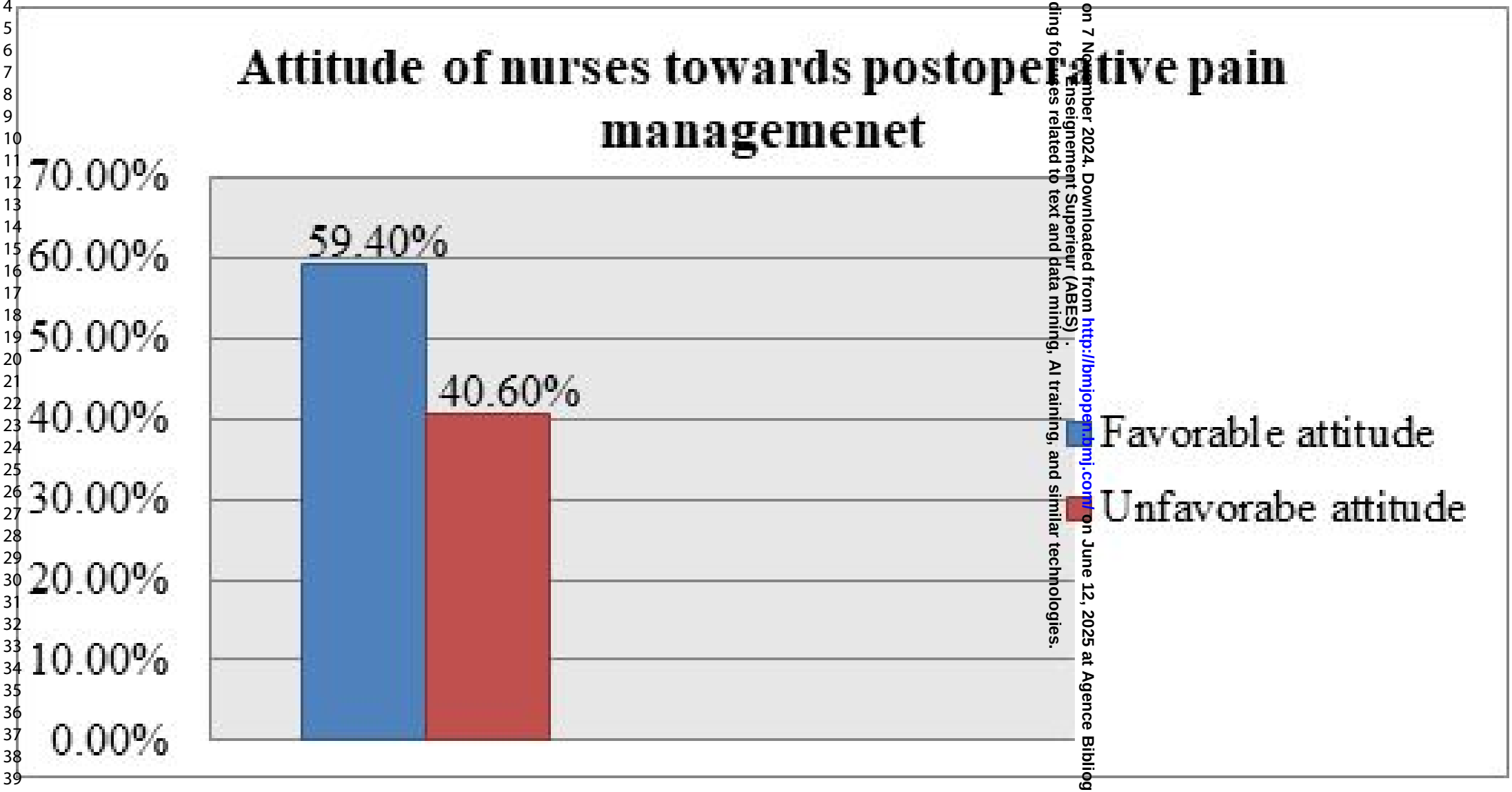
Figure legends

Figure 1: Knowledge of nurses on postoperative pain management at public hospitals in west shoa zone, Ethiopia, 2021.

Figure 2: Attitude levels of nurses towards postoperative pain management at public hospitals in west shoa zone, Ethiopia, 2021.





Annex: 1 Questionnaires

Part I: Socio-Demographic Characteristics of Respondents

Instruction: Please circle the number of your choice.

It. no.	Questions	Responses	Remark
101	Sex of participants	1. Male 2. Female	
102	How old are you?	----------years	
103	What is your ethnicity	1. Amhara 2. Oromo 3.Tigre 4.Others_____	
104	What is your marital status?	1. Married 2. Single 3. Divorced 4. Widowed	
105	What is your religion?	1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5.Others(specify)_____	
106	What is your level of qualification?	1. Diploma 2. Bachelor degree 3. Master's degree and above	
107	How many years of work What experience do you have?	1. _____	
108	How long have you been working in a postoperative area	1._____	
109	Where is your current area of Practice?	1._____	

110	Have you received any training related to POP management?	1. Yes 2. No	If No Skip to Q12
111	If yes, How do you receive training?	1. Lecture 2. Course 3. Conference 4. Workshop	
112	Do you have access to read pain management guidelines in your hospital?	1. Yes 2. No	If No Skip to next
113	If yes, How often do you read the guidelines?	1 Always 2 Monthly 3 Quarterly 4 Yearly	

Part II: Respondents' knowledge of Post-operative pain assessment and management-related questions

Instruction: Please circle the number of your choice.

Item No.	Items	Response
201	When a patient requests increasing amounts of analgesics to control pain, this usually indicates that the patient is psychologically dependent.	1. Yes 2. No 3. not sure
202	Vital signs are always reliable indicators of the intensity of a patient's pain.	1. Yes 2. No

		3. not sure
203	Pain assessment includes onset, duration, variability, location, and intensity of pain.	1. Yes 2. No 3. not sure
204	When using the WHO pain ladder to treat acute pain, treatment should go from bottom to top.	1. Yes 2. No 3. not sure
205	Combining analgesics that work by different mechanisms may result in better pain control with fewer side effects than using a single analgesic agents	1. Yes 2. No 3. not sure
206	Pain should be assessed before and after administering pain medications.	1. Yes 2. No 3. not sure
207	Observation is one part of the method used in surgical pain assessment	1. Yes 2. No 3. not sure
208	The side effects of narcotics should be observed at least 20 minutes after Administration	1. Yes 2. No 3. not sure
209	The recommended route of administration of opioid analgesics with brief, severe pain of sudden onset such as POP is intramuscular.	1. Yes

		2. No 3. not sure
210	Analgesics for POP should initially be given around the clock on a fixed schedule.	1. Yes 2. No 3. not sure
211	Pre-surgery injection such as anesthesia is given for pain management	1. Yes 2. No 3. not sure
212	Respiratory depression rarely occurs in patients who have been receiving stable doses of Opioids over months.	1. Yes 2. No 3. not sure
2013	Opioids should not be used in patients with a history of substance abuse.	1. Yes 2. No 3. not sure
214	A rating scale ranging from (0) "no pain at all to (10) the worst pain" is essential to adopt in pain assessment.	1. Yes 2. No 3. not sure
215	If a patient sleeps with no movement postoperatively, this indicates that the patient is not in pain.	1. Yes 2. No 3. not sure

Part III: Respondents' attitude toward Post-operative pain assessment and management-related questions Instruction:

Please click the box you choose

Item S.No.	Questions	Response		
		Agree	Dis agree	Don't know
301	Your patient should experience discomfort before giving the next dose of pain medications.			
302	Distraction can reduce pain intensity			
303	A patient's spiritual beliefs may lead them to think pain and suffering are necessary.			
304	Using pain measurement instruments is integral in postoperative pain management.			
305	Morphine is a very strong drug; patients in postoperative pain would be content with just one dose.			
306	Nurses can best judge the patient's pain intensity because they spent 24 hours with the patients			
307	Lack of pain expression does not mean lack of pain.			
308	Effective analgesia is an essential part of postoperative Management			
109	Pain is what the patient says it is.			

Part IV: Items to assess practice

Direction: Read the following questions carefully and encircle your choice. If your choice is "yes" tick also on how frequently you practice it and skip to the next questions if your choice is "never".

401	Do you assess pain for patients able to communicate? If your choice is never to skip to Q4	1. yes 2. never	If yes how frequently? I always sometimes
402	Do you use a pain assessment tool for the pain scale? If never used go to Q404	1. yes 2. never	If yes how frequently? I always sometimes
403	If use, Please! Name the tool(s) you used.	_____, _____	
404	If your answer for Q401 & 402 above is never, What Were the barriers that hindered you from pain assessment? You can choose multiple options.		1. Nursing workload 2. Lack of standard pain assessment tool in hospital 3. lack of training in pain management 4. Lack of pain management Guidelines in the hospital 5. Patient's inability to communicate 6.Other(specify)_____
405	Do you encourage the use of transcutaneous electrical nerve stimulators for pain management	1. yes 2. never	If yes how frequently? I always sometimes
406	Do you combine opioids with NSAIDs rather than single analgesic agents when managing POP as suggested by the World Health Organization?	1. yes 2. never	If yes how frequently? I always sometimes

407	Do you document the findings after the pain assessment?	1. yes 2. never	If yes how frequently? always sometimes
408	If your answer for Q407 is never, what was the reason for your not documenting the finding? If not choose never, go to Q409. You can choose multiple options		1. Nursing workload 2. No designed area for charting 3. Lack of familiarity with the assessment tools 8.Other(specify)_____
409	Do you encourage prayer by patients or religious leaders postoperatively?	1. yes 2. never	If yes how frequently? I always sometimes
410	Do you administer ordered pain medication, around the clock (regularly) as ordered?	1. yes 2. never	If yes how frequently? I always sometimes
411	Do you use music therapy to reduce postoperative pain?	1. yes 2. never	If yes how frequently? always sometimes
412	Do you reassess pain after giving pain medication to evaluate the effectiveness of pain medication?	1. yes 2. never	If yes how frequently? I always sometimes
413	After surgery, do you provide comfortable positions to help relieve pain?	1. yes 2. never	If yes how frequently? always sometimes
414	Do you ask and help to support the painful areas when the patients moving or coughing after surgery?	1. yes 2. never	If yes how frequently? always sometimes

415	Do you provide a clean, calm, and well-ventilated ward environment for POP management?	1. yes 2. never	If yes how frequently? I always sometimes
416	Do you lay the patients on neat, well-laid beds postoperatively?	1. yes 2. never	If yes how frequently? always sometimes
417	Do you encourage massaging and stretching to reduce POP?	1. yes 2. never	If yes how frequently? always sometimes
418	Do you apply heat and cold compresses to manage postoperative pain?	1. yes 2. never	If yes how frequently? I always sometimes
419	Do you encourage early ambulation/exercise with analgesia?	1. yes 2. never	If yes how frequently? I always sometimes
420	Do you encourage the use of acupuncture?	1. yes 2. never	If yes how frequently? I always sometimes
421	Do you use patient distraction, relaxation, and guided imagery postoperatively to reduce pain?	1. yes 2. never	If yes how frequently? I always sometimes
422	Do you dress, bandage, splint, and reinforce wound sites postoperatively?	1. yes 2. never	If yes how frequently? I always sometimes

Annex 2 STROBE Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on Line number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	23-48
Introduction			**61**
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	60-117
Objectives	3	State specific objectives, including any prespecified hypotheses	118-121
Methods			**122**
Study design	4	Present key elements of study design early in the paper	123-125
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	126-130
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	131-147
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	148-153
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	167-181
Bias	9	Describe any efforts to address potential sources of bias	*57-60*
Study size	10	Explain how the study size was arrived at	138-142
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	168-180
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	182-203
		(*b*) Describe any methods used to examine subgroups and interactions	182-200
		(*c*) Explain how missing data were addressed	185-192
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	170-175
		(*e*) Describe any sensitivity analyses	185-192
Results			204

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	206-208
		(b) Give reasons for non-participation at each stage	,,
		(c) Consider use of a flow diagram	,,
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	206-221
		(b) Indicate number of participants with missing data for each variable of interest	207
Outcome data	15*	Report numbers of outcome events or summary measures	227-230
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	243-269
		(*b*) Report category boundaries when continuous variables were categorized	,,
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	,,
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	,,
Discussion			270
Key results	18	Summarise key results with reference to study objectives	320-327
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	56-60
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	271-327
Generalisability	21	Discuss the generalisability (external validity) of the study results	182-203
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	360-362

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Post-operative pain management practice and associated factors among nurses working at public hospitals, in Oromia region, Ethiopia, 2021. An institution based cross-sectional study.

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Abstract

Background: Management of postoperative pain leads to positive patient progress and shortens the duration of hospital stay. There is a lack of information on nurse's postoperative pain management practice and its associated factors.

Objective: To assess postoperative pain management practice and associated factors among nurses working in public hospitals of West Shoa Zone, Oromia, Ethiopia, 2021.

Design: An institutional based cross sectional study was employed

Setting: Study was conducted among eight public hospitals (Two tertiary hospitals and six Secondary hospitals) which were located in West shoa zone in Oromia, Ethiopia.

Participants: Totally 377 participants were selected by using simple random sampling. From this 277 were male and 100 participants were female. All nurses who were worked in surgical ward, medical wards, minor operation room and major operation room, recovery rooms, emergency, obstetrics and gynecology wards were included.

Methods: Data was collected by distributing structured self-administered questionnaires that adapted from different literatures and were entered into Epi data version 3.1 and exported to SPSS version 22 for analysis. Variables with significant association in the bivariate analyses were entered into a multivariable regression analysis to identify the independent factors associated with nurses' postoperative pain management practice. Significant factors were declared at P<0.05.

Result: The result showed that, 66% of nurses had good pain management practice. Nurses favorable attitude towards post-operative pain management [AOR: 4.698, 95% CI: (2.725-8.100)], having access to read pain management guideline [AOR: 3.112, 95% CI: (1.652-5.862)], adequate knowledge of post-operative pain management [AOR: 2.939, 95% CI: (1.652-5.227)], working at Operation Room [AOR: 2.934, 95% CI: (1.27-6.795)] and received training on pain management [AOR: 3.289, 95% CI: (1.461-7.403)] were significantly associated with the practices of postoperative pain management.

Conclusion and recommendation: Sixty six percent of participants (nurses) have a good level of practice of postoperative pain management. Training, access to pain management guidelines, knowledge and attitude are significant factors in post-operative pain management practice. Governmental and other bodies concerned to post-operative care quality needs to show commitment on availing needed training and infrastructures.

Strengths and limitations of the study

Strength:

- All public hospitals in west shoa zone were included during data collection period.

Limitation:

- The study design was cross sectional, where cross-sectional study design cannot create causal attribution between independent variables and dependent variables.
- Since post-operative pain management is the multi-disciplinary approach but this study focus only among nurses.
- A notable limitation of the study lies in the definition of adequate knowledge and favorable attitude, which was determined based solely on the mean value of approximately 50%, assuming a normal distribution of the data. This approach may not accurately reflect the true distribution of knowledge and attitudes among the participants, potentially oversimplifying the complexities of these constructs

Introduction

Post-operative pain (POP) is a form of acute pain after surgical trauma as a result of the inflammatory reaction and the initiation of afferent neurological barriers (1). Pain is felt in response to the inflammatory process resulting from tissue injury during surgical procedure such as, skin incision, tissue dissection, manipulation, and traction (2). Surgery is typically followed by acute pain, and correct identification of the type of pain allows the selection of an appropriate effective treatment (3).

POP is a critical community health issue in both economically developed and developing countries. Currently, it is estimated that about 28-32% of global disease requires surgical intervention (4). More than five million surgical interventions are needed in Ethiopia each year (5). The increase in the number of operations is not without risk. Unless adequately managed, post-operative pain can be complicated by delayed ambulation, reduced patient satisfaction and increased incidence of pulmonary complication (6). For example, persistent pain after major abdominal surgery can lead to shallow breathing which facilitates retention of secretion, with eventual development of pneumonia contributing to organ dysfunction, and prolonged convalescence (7). Furthermore, poorly managed postoperative pain is always associated with

delayed mobility which can lead to delayed wound healing, deep vein thrombosis, anxiety, sleep disturbance, myocardial infarction, depressed immune function, and can also progress to chronic pain which impairs the ability to carry out daily activities, and ultimately may leads to decreased quality of life (8). In the United States, between 10% and 60% and in Ethiopia, 22% of the patients were developed chronic pains as a results of poorly managed postoperative pain (9, 10). Hence, in Ethiopia, discomfort due to post-operative pain remains prevalent and affects between 47%-100% of patients after surgery (10).

Hence, pain relief has been recognized as a human right and is also considered as the 'fifth' vital sign that must be regularly assessed and managed; nurses must pay attention to control postoperative pain (11). The roles and responsibilities of nurses in pain management; according to the American nurses association (ANA), include assessment of pain, plan for pain management strategies, and evaluation of responses of the patients for the given interventions and to take actions accordingly. Since nurses are always spending 24 hours at bedside to provide care for patients, and are also the point of contact between other health professionals and patients, they are expected to play a vital role in postoperative pain management practice (12). Alleviating patient suffering is also a core ethical and legal obligation for health professionals, and the nursing process can support this practice through enhanced pain assessment, nursing diagnoses, care planning, and implementation and evaluation of perioperative interventions that support the vulnerable population (13, 14).

In Ethiopia emergency and elective surgical interventions are provided at all levels of hospitals which are primary, secondary (general) and tertiary (referral) hospitals for diagnostic or therapeutic purposes (15). According to the national surgical care strategic plan, Ethiopia, post-operative patient in the wards shall receive post-operative care from qualified nurses. Hospitals establish a nursing workforce that identifies priority areas that include perioperative care (16). Post-operative pain management practice is an important aspect of nursing care to alleviate pain for the patients using pharmacologic and non-pharmacologic methods (10). Post-operative pain management practice includes a set of measures that evaluate pain, provide appropriate interventions to relieve the pain and re-assess the patients' pain after intervention. Assessing pain is the first and crucial step in properly managing pain (4). Techniques for pain assessments include patient self-report and observing for patient's physiological and behavioral responses to

pain. The self-reporting methods include numeric rating scale (NRS), verbal rating scale (VRS), visual analog scale (VAS), and the faces pain scale (FPS) (17).

From different study conducted factors like level of education, experiences, working area, favorable attitude, presence of guideline and standardized tool, training, and adequate knowledge were factor significantly associated with post-operative pain management practice (6-18).

Although postoperative pain management continues to be a problem in developed and developing countries, the suffering from untreated postoperative pain is sadly greater and more worrying among economically disadvantageous individuals in developing countries. Today, there is a growing awareness of the etiology of pain and the advancement of pharmacological and non-pharmacological pain management. However information on post-operative pain management by nurses and their associated factors in Oromia region, Ethiopia, was scarce. Previous studies focused mainly on tertiary hospitals, where advanced care is expected. Furthermore, the studies were conducted on nurses who were statically (fixed shift) working in the operation room and surgical ward, despite most nurses working in patient wards have an exposure to the post-operative patient through a ward rotation. The study was carried out with the aim of identify nurses post-operative pain management practice at public hospitals found in Oromia, Ethiopia; so that the finding will best serve to prioritize the problem and develop strategies for improving post-operative pain management.

Methods

Study design

Cross sectional study design was implemented to identify post-operative pain management practice and associated factors among those nurses working in public Hospital of West Shoa zone.

Study Setting and period

The study was done at public hospitals found in West Shoa zone, Oromia regional state, Ethiopia from June 1 to August 30/2021. There are one referral, three general and four districts (total of eight public hospitals) in that zone. These hospitals provide different health service ranging from prevention of disease to surgical therapies for peoples in the area and closer zones in the Oromia region. So that post-operative nursing care is given for patients in need of the services.

Participants

All nurses who were worked in surgical ward, medical wards, minor operation room (OR) and major operation room (OR), recovery rooms, emergency, obstetrics and gynecology wards were included. The working wards were purposely due to the fact that hospitals in the area are applying ward rotation quarterly so that all nurses have exposure to the postoperative services. There are 564 nurses working in the selected wards of public hospitals in the West shoa zone of Oromia region, Ethiopia.

A sample size was calculated and determined by using single proportion population formula using the width of 95% CI of the mean practice score by considering 65.2% of nurses had good post-operative pain management practice (12) at, 5% margin of error, and considering a 10% non-response rate. With this calculation, the final sample size was 349. A non-response rate of 10% (35) nurses was considered, and the sample size becomes 384. The total calculated sample size (384 nurses) was proportionally allocated to each hospital according to the number of their nurses working on the selected wards. Study participants were selected from nurses working on the wards of those hospitals by using simple random sampling technique. The nurses' registration numbers at each hospital, collected from the daily attendance sheet of hospitals, were used to randomly select the study participants using the lottery methods, simple random sample technique.

Study variables

The dependent variable of the study was the level of post-operative pain management practice. Independent variables were socio demographic characteristics such as sex, age, marital status, educational status, experience, working unit/ward, knowledge towards postoperative pain management, attitude towards postoperative pain management and organizational factors such as availability of standardized tools, guideline, and pain management training.

Data source (measurements)

Post-operative pain management practice was measured using 18 post-operative pain management practice questions with correct/incorrect response options. Depending on the descriptive analysis of the collected data, the post-operative pain management practice was classified as good practice and poor practice. The mean score of the participant's response to the

questions was calculated to determine the good and poor post-operative pain management practice.

Nurses' knowledge of post-operative pain management was measured using 15 questions with a 'yes' or 'no' response options. Those who scored mean and above correct answers were labeled as having adequate knowledge while those who scored less than mean were labeled as having inadequate knowledge of post-operative pain management. Similarly, to measure nurses' attitude towards post-operative pain, 9 questions with a two response options, agree or disagree, were used. Those nurses who scored mean and above were considered to have a favorable attitude, where as those who scored below mean have an unfavorable attitude towards postoperative pain (18, 19, 20). The organizational factors such as on job training and presence of post-operative pain management guideline are also collected through related questions.

Operational definitions

Good Practice: Refers to those study participants, who have scored mean and/or above the value of the total 18 practice questions.

Poor Practice: Refers to those study participants who have scored below the mean value of the total 18 practice questions.

Knowledge: Is measured by fifteen items in yes/no format. Correct answer was given "1" and "0" was given for incorrect and for not sure. Those who scored mean and above were labeled as having adequate knowledge where as those who scored less than mean labeled as having inadequate knowledge about post-operative pain management.

Attitude: Is measured by nine items in agree/disagree format. For correctly responded item "1" was given and "0" was given for incorrect and don't know. Those who scored mean and above considered as having favorable attitude where as those who scored below mean have unfavorable attitude towards postoperative pain management (12-14).

Data collection tools, process, quality assurance and analysis

The data were collected using a structured self-administered questionnaire. The questioners were adapted from different studies conducted previously and modified in order to achieve the objectives of the current study (18, 19, 20) **(Annex 1).** To ensure data quality, the questionnaire was reviewed by expert panels. The cross-sectional STROBE checklist was used for each components of the manuscript as the reference **(Annex 2).** A clinical nurse specialist, three

lecturers (Masters of Science in nursing), and one registered Nurse (BSC nurse) were participated in the panel. The questionnaire was pre-tested on 5% of the study population at the Wollega referral and teaching hospital one week before the data collection date. A reliability test was calculated for the practice, knowledge, and attitude components of the questionnaire, to check the internal consistency. The result indicates that 0.781, 0.743 and 0.833 for practice, knowledge and attitude related items, respectively. The principal investigator gave training for data collectors.

The collected data was coded, cleaned and entered into Epi Data version 3.1 software and finally exported to statistical package for social study (SPSS) version 22 software for analysis. Descriptive analyses were performed first to understand the general characteristics of all the study variables. The results were presented in tables and graphs using summary measures such as percentages and mean. Bivariate logistic regression was carried out to identify factors associated with postoperative pain management practice of nurses'. The Hosmer-Lemeshow test was performed to test fitness of the model, the result was 0.45. Variables with $p < 0.25$ in the bivariate analyses were entered into multivariate logistic regression analysis to identify independent factors associated with the outcome variable. Finally, the result of bivariate and multivariate logistic regression analysis was presented in a crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence intervals. The level of significance was established at a value (P) ≤ 0.05.

Patient and public involvement

No patient and public involved

Result

Socio-demographic characteristics

A total of 384 questionnaires were distributed, of which 377 were completed and returned with the response rate of 98.2%. The majority of participants, 227(60.2%) were male, 200(53.1%) were married and 240 (63.7%) were between the age group of 26 and 34 years (**Table 1**).

Table 1: Socio-demographic characteristics of respondents, working at public hospitals in Oromia region, Ethiopia, 2021

Variables	Category	Frequency(n=377)	Percentage (%)
Sex	Male	227	60.2

	Female	150	39.8
Age	< 25	71	18.8
	26-34	240	63.7
	>35	66	17.5
Ethnicity	Oromo	360	95.5
	Amhara	17	4.5
Marital status	Married	200	53.1
	Single	177	46.9
Religion	Protestant	217	57.6
	Orthodox	103	27.3
	Muslims	40	10.6
	Wakefata	17	4.5
Educational level	Diploma	28	7.4
	Bachelor degree	346	91.8
	Masters	3	0.8
Years of experience	<5	234	62.1
	6-9	75	19.9
	>10	68	18
Work experience in surgical unit (in years)	<1	199	52.8
	2-4	140	37.1
	>5	38	10.1
Current area of practice	Medical ward	65	17.2
	Emergence ward	70	18.6
	Ob/Gyne ward	65	17.2
	OR and Recovery	72	19.1
	Surgical ward	105	27.9

Knowledge of nurses towards post-operative pain management

The mean score for knowledge was 8.89 with standard deviation of (±2.85). Thus, the result revealed that, from the total of 377 study participants, about 54.9% (95% CI, 50.1, 60.2) had adequate knowledge about POP management. (**Figure 1**).

Nurses' attitude of postoperative pain management

The mean score for attitude was computed and it was 4.99 with standard deviation of 1.73. According to the classification outlined in the operational definition, the percentage score of categories showed that, among 377 respondents, 59.4% (95% CI, 54.6, 64.5) of participants had favorable attitude towards post-operative pain management practice (**Figure 2**).

Practices of nurses on postoperative pain management

The responses of nurses to the nine practice questions are computed and dichotomized in to good practice and poor practice. The mean score of the self-report practice of post-operative pain management was 10.37 with standard deviation of (±2.89). It was calculated based on the category specified in the operational definitions. Accordingly this study revealed that, about two third (66%) (95% CI: (61, 71) of the respondents had good postoperative pain management practice **(Table 2).**

Table 2: Practices of nurses on postoperative pain management, working at public hospitals in Oromia region, Ethiopia, 2021

Variables	Yes N (%)	No N (%)
Do you assess pain for the patients those able to communicate?	327(86.7%)	50 (13.3%)
Do you encourage the use of transcutaneous electrical nerve stimulator for pain management?	4(1%)	373(99%)
Do you combine opioids with NSAID's rather than single analgesic agents when managing POP as suggested by World health organization?	302(80.1%)	75 (19.9%)
Do you document the findings after pain assessment?	110(29.2%)	267 (70.8%)
Do you encourage prayer by patients or religious leader postoperatively?	206(54.6)	171 (45.4%)
Do you administer ordered pain medication, around the clock (regularly) as ordered?	374(99.2%)	3(0.8%)
Do you use music therapy to reduce pain?	2(0.5%)	375 (99.5%)

Do you reassess pain after giving pain medication in order to evaluate the effectiveness of pain medication?	338(89.7%)	39 (10.3%)
After surgery, do you provide comfortable positions to help relieve pain?	360(95.5%)	17 (4.5%)
Do you ask and help to support the painful areas when moving or coughing after surgery?	283(75.1%)	94 (24.9%)
Do you provide clean, calm and ventilated ward environment for postoperative pain management?	259(68.7%)	118 (31.3%)
Do you lay patients on neat, well-laid bed postoperatively?	294(78%)	83 (22%)
Do you use massage and stretch to reduce postoperative pain?	283(75.1%)	94 (24.9%)
Do you apply heat and cold compresses to manage POP?	288(76.4%)	89 (23.7%)
Do you encourage early ambulation/exercise with analgesia?	347(92%)	30 (8%)
Do you encourage use of acupuncture?	2(0.5%	375(99.5%)
Do you use patient distraction, relaxation, and guided imagery postoperatively to reduce pain?	131(34.2%)	246(65.2%)
Do you usually dress, bandage, splint and reinforce wound sites postoperatively?	359(95.2%)	18(4.8%)

Organizational related factors

According to the nurses response regarding the organizational factors majority, 273(72.4%) of the participants reported that they have not taken any training regarding postoperative pain management while 221(58.3%) did not accessed post-operative pain management guidelines to use for practice. Among those received training regarding postoperative pain management 59(56.7%), 39(37.5%), 2(1.9%) and 4(3.8%) received training by the means of lecturing, course, conference and work shop respectively.

Factors associated with postoperative pain management practice

To assess the factors associated with the nurses' postoperative pain management practice, bivariate analysis was done first. Accordingly, ten of the variables age of the participants, marital

status, level of education, work experience, experience in postoperative area, current area of practice, training related to pain management, access to read pain management guideline, knowledge and attitude of the participants regarding POP management were found to be significantly associated with the nurses 'POP management practice at p-value of 0.25. These variables were included in multiple logistic regressions analysis. The model fit was checked by Hosmer and Lemeshow test (p-value=0.45) and it was fitted.

After adjustment, attitude, getting access to read guidelines, training, knowledge and current area of practice were significantly associated with the nurses' postoperative pain management practice. Accordingly, respondents who had Favorable attitude were almost 5 times more likely to practice than those who had unfavorable attitude [AOR: 4.698, 95% CI: (2.725, 8.100)]. Respondents who have taken POP management training were 3.2 times more likely to practice than those who did not take such training [AOR: 3.289, 95% CI: (1.461, 7.403)]. Similarly, study participants who get access to read pain management guidelines were 3.1 times more likely to practice compared to their counterparts [AOR: 3.112, 95% CI: (1.652, 5.862)]. The study also revealed that respondents who had adequate knowledge on postoperative pain management were 2.9 times more likely to practice than those who had inadequate knowledge [AOR: 2.939, 95% CI: (1.652, 5.227)] and participants those who were currently practicing in Operation Room were 2.9 times more likely practice compared with those practicing in medical ward [AOR: 2.934, 95% CI: 1.267, 6.795 P<0.012] (**Table 3**).

Table 3: Binary and multiple logistic regression analysis results on factors associated with postoperative pain management practice among nurses working at public hospitals in west shoa zone, Ethiopia, 2021.

Variables	Category	Practice status		COR at (95% CI)	AOR at (95% CI)	P-value
		Good N (%)	Poor N (%)			
Age in years	< 25	51	20	1.0		
	26--34	151	89	0.665(0.373-1.188)*	0.706(0.341-1.465)	0.350
	>35	47	19	0.970(0.462-2.038)	0.387(0.116-1.294)	0.123
Marital status	Single	109	68	0.687(0.448-1.054)*	1.039(0.566-1.909)	0.901
	Married	140	60	1.0		

Educational level	BSc/above	234	115	1.763(0.812-3.830)*	2.495(0.863-7.209)	0.091
	Diploma	15	13	1.0		
Years of experience	<5	140	94	1.0		
	6-9	60	15	2.686(1.440-5.009)*	2.301(0.931-5.682)	0.071
	>10	49	19	1.732(0.959-3.126)*	1.613(0.499-5.217)	0.425
Experience in SW	<1	125	74	1.0		
	2-4	90	50	1.066(0.680-1.671)	1.796(0.387-8.342)	0.455
	>5	34	4	5.032(1.717-14.746)*	0.552(0.266-1.144)	0.110
Current area of practice	MW	31	34	1.0		
	EU	42	27	1.706(0.859-3.388)*	2.342(0.916-5.989)	0.076
	GW	48	17	3.097(1.482-6.470)*	1.683(0.708-4.002)	0.239
	OR/R	45	27	1.828(0.925-3.614)*	2.934(1.27-6.795)**	0.012
	SW	83	23	3.958(2.023-7.742)*	1.625(0.689-3.833)	0.267
Training on POPM	Yes	78	13	4.035(2.143-7.599)*	3.289(1.461-7.403)**	0.004
	No	171	115	1.0		
Access to pain management guidelines	Yes	133	23	5.234(3.126-8.763)*	3.112(1.652-5.862)**	0.001
	No	116	105	1.0		
Knowledge	Adequate	169	38	5.003(3.149-7.951)*	2.939(1.652-5.227)**	0.001
	Inadequate	80	90	1.0		
Attitude	Favorable	182	42	5.562(3.500-8.839)*	4.698(2.725-8.100)**	0.001
	Not favorable	67	86	1.0		

Notes: 1.00=Reference, *p-value<0.25, ** statistically significant at P<0.05, SW (surgical ward), MW (medical ward), EU (emergency unit), OR/R (operation or recovery room room).

Discussion

The current study revealed that general postoperative pain management practices among 66% nurses were found to be good. This finding is lower compared to the study conducted in Rwanda on postoperative pain management, which was 88% (21). However, the finding of this study was greater than the study conducted in Addis Ababa in which, only 6% of them had good practice

(18). The discrepancy may be attributed to the fact that the previous study at Addis Ababa hospitals was mainly concerned to nurses working in the adult post-operative care units such as major and minor operation room and adult surgical wards. The result is also higher compared to the finding of a study conducted in the Arsi zone, southeastern Ethiopia, where almost half (47.9%) of the study participants had good pain management practice (22). This discrepancy can be attributed to access to the guideline, sample size, and the use of different data collection tools. In the current study, participants were selected using the probability method, the sample was larger than the previous study participants. The methodological limitations, includes potential sample bias, as it lacks details on the selection process and sample size, which may not be representative of the broader nursing population. Furthermore, the temporal context of the referenced studies is not addressed, which may affect the comparability of practices over time.

More than fifty percent (53.41%) of nurses who have good practice have an access to the POP management guideline. Furthermore as POP is managed pharmacologically or none-pharmacologically it might be important to describe the care provided in terms the mode of management due to the fact that nurses have professionally independent accountability to the none-pharmacological care and collaborative role in pharmacological/medical care. It is also not convincing to determine the management of POP using only the self-report of nurses, suggesting the need to use observational checklist. In addition, since post-operative pain management is the multi-disciplinary approach and the current study was based on only nurses, it may not reflect the practice of post-operative care provided for patients who received operation services at hospitals. The methodological limitations of the study discussed include reliance on self-reported data from nurses, which may not accurately reflect their actual practices in postoperative pain (POP) management. This approach can introduce bias and undermine the validity of the findings, as nurses may overestimate their adherence to guidelines.

This study revealed that those who had a favorable attitude were nearly five times more likely to have good postoperative pain management practices than those who did not. This is consistent with a study conducted in Addis Ababa and Ghana (19, 22). This similarity could be attributed to the fact that attitude is the most important value in nursing (23). But the current study reveals that only around 60% percent of nurses have a favorable attitude which might suggest the importance of improving the nurse's attitude with respect to the practice of POP management.

Those who had received training were more than three times more likely to have good pain management practices than those who did not. This finding was comparable to the study conducted in Debra Berhan, northern Ethiopia (24). A study conducted on the knowledge, attitude and practice of nurses working at Jimma Medical center revealed that prior training on pain management were significantly associated with post-operative pain management practice (25). This might be due to the fact that those people who had taken POP management training could have current information on pain management which can promote the practice. This underscores the need for timely on-job-training in post-operative pain management. The current study also identified that those who got access to read pain management guidelines were three times more likely to practices post-operative pain management than their counterparts. This finding is supported by studies conducted in Greece and Debra Berhan (24, 26). This is because accessibility to refer guidelines can enhance the practices of POP management, according to the recommended standard. It is also currently the most advisable for clinicians that stay up-to-date with evidence-based practice. The methodological limitations of the findings presented in the paragraph include potential confounding variables that may not have been adequately controlled for, such as the participants' previous experience, the specific content and duration of the training received, and the context in which pain management guidelines were accessed

Individuals who were knowledgeable were nearly three times more likely to have good practice than those who had inadequate knowledge. This finding is in line with the finding of a study in Rwanda and Arsi zone of southeastern Ethiopia (18, 21). The possible justification is that the right knowledge about pain and its management practice can avoid confusion regarding POP and the disease condition, which can also create a clear understanding of its negative impact on patients and on health institutions, unless appropriately managed. This study also showed an association between the current working area of nurses and level of practice, which is consistent with the finding of the study conducted at the Jimma Medical center (25). The methodological limitations of the findings include the potential for selection bias, as the study may have only included nurses with varying levels of knowledge, which could skew the results. Additionally, the reliance on self-reported knowledge and practice levels may lead to inaccuracies, as participants might exaggerate their understanding of pain management. The cross-sectional design limits the ability to infer causality between knowledge and practice.

Conclusion and recommendation

More than half of participants (nurses) have a good level of practice of postoperative pain management. Training on post-operative pain management (POPM), access to pain management guidelines, knowledge and attitude are significant factors in post-operative pain management practice. Regional health bureau, Zonal health offices, hospital administrations and other concerned bodies needs to work for enhancing post-operative pain management through organizing different trainings to improve knowledge and attitude of nurses and timely distributing standard pain assessment and management guidelines for enhancing accessibility. To enhance the validity of future research, it is essential to develop more nuanced and comprehensive definitions of adequate knowledge and favorable attitude that consider a broader range of factors and distribution patterns, rather than relying solely on statistical averages.

Abbreviations

OR: operation room

POP: post-operative pain

SD: Standard deviation

SPSS: Statistical Package for the Social Sciences

DECLARATION

Availability of data

Datasets used are available from the corresponding authors on reasonable request.

Ethical approval and consent to participate

Ethical clearance was first obtained from Ambo University CMHS's ethical review board with ethical ID. Of AU/SGS/059/2020. The letter was written by the Zonal health office to obtain ethical approval to conduct the study in the Hospitals. Then the ethical clearance and support letter were taken to all public hospitals. All participants were asked for their willingness to participate in the study and were told that it would not have any risk to them. Written informed consent was obtained from each study subject before data collection after approved by ethical review board. Confidentiality of the information was assured, and the privacy of the respondents

was maintained. All procedures were followed in accordance with the relevant guidelines and regulations as declaration of Helsinki.

Consent to publish

Not applicable.

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Author Contributions

AD, AK and DA were involved in the selection of design, development of the research proposal, data analysis, writing up of the different drafts and finalizing the research. YG and NA were participated in the reviewing of the different drafts of the study and drafting the manuscript. In general, NA is the guarantor who is responsible for the overall content

Competing interests

The authors declare that there is no conflict of interest in this work.

Availability of the data

The data is available on responsible request from the corresponding author by the following address. E: mail: deebisa@gmail.com

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Ambo University: The funder has no role in the study design, data collection, analysis, and publication.

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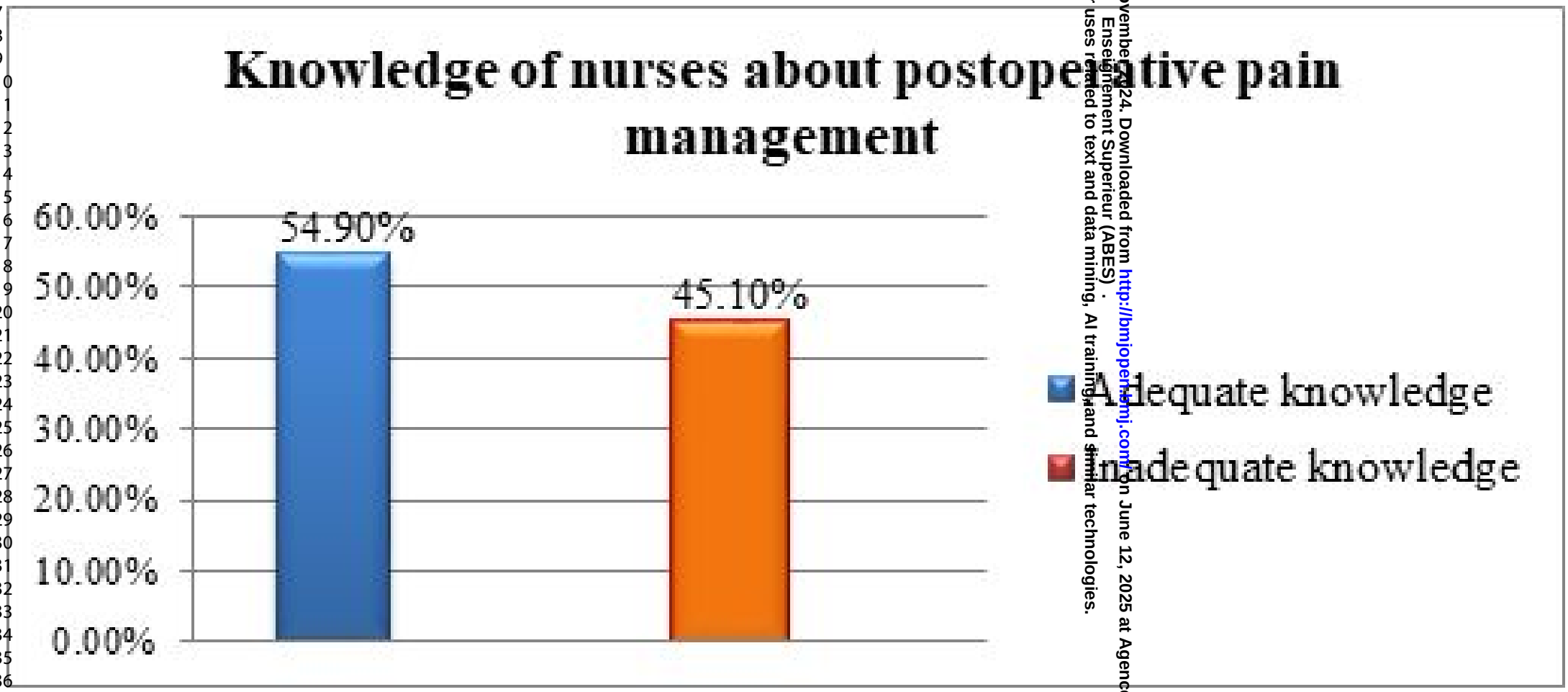
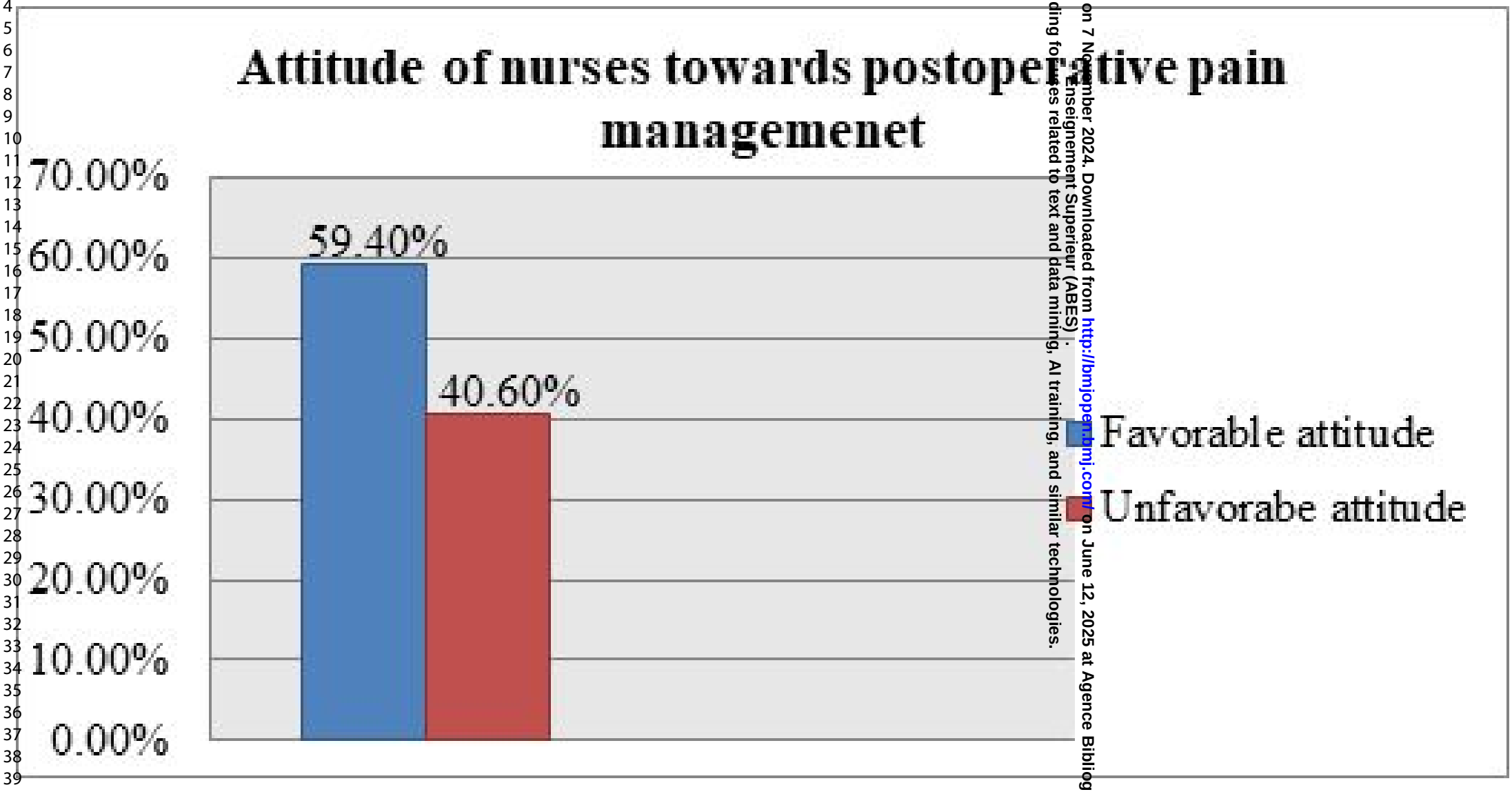
Figure legends

27. **Figure 1:** Knowledge of nurses on postoperative pain management at public hospitals in west shoa zone, Ethiopia, 2021.
28. **Figure 2:** Attitude levels of nurses towards postoperative pain management at public hospitals in west shoa zone, Ethiopia, 2021.





Annex: 1 Questionnaires

Part I: Socio-Demographic Characteristics of Respondents

Instruction: Please circle the number of your choice.

It. no.	Questions	Responses	Remark
101	Sex of participants	1. Male 2. Female	
102	How old are you?	----------years	
103	What is your ethnicity	1. Amhara 2. Oromo 3.Tigre 4.Others_____	
104	What is your marital status?	1. Married 2. Single 3. Divorced 4. Widowed	
105	What is your religion?	1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5.Others(specify)_____	
106	What is your level of qualification?	1. Diploma 2. Bachelor degree 3. Master's degree and above	
107	How many years of work What experience do you have?	1. _____	
108	How long have you been working in a postoperative area	1._____	
109	Where is your current area of Practice?	1._____	

110	Have you received any training related to POP management?	1. Yes 2. No	If No Skip to Q12
111	If yes, How do you receive training?	1. Lecture 2. Course 3. Conference 4. Workshop	
112	Do you have access to read pain management guidelines in your hospital?	1. Yes 2. No	If No Skip to next
113	If yes, How often do you read the guidelines?	1 Always 2 Monthly 3 Quarterly 4 Yearly	

Part II: Respondents' knowledge of Post-operative pain assessment and management-related questions

Instruction: Please circle the number of your choice.

Item No.	Items	Response
201	When a patient requests increasing amounts of analgesics to control pain, this usually indicates that the patient is psychologically dependent.	1. Yes 2. No 3. not sure
202	Vital signs are always reliable indicators of the intensity of a patient's pain.	1. Yes 2. No

		3. not sure
203	Pain assessment includes onset, duration, variability, location, and intensity of pain.	1. Yes 2. No 3. not sure
204	When using the WHO pain ladder to treat acute pain, treatment should go from bottom to top.	1. Yes 2. No 3. not sure
205	Combining analgesics that work by different mechanisms may result in better pain control with fewer side effects than using a single analgesic agents	1. Yes 2. No 3. not sure
206	Pain should be assessed before and after administering pain medications.	1. Yes 2. No 3. not sure
207	Observation is one part of the method used in surgical pain assessment	1. Yes 2. No 3. not sure
208	The side effects of narcotics should be observed at least 20 minutes after Administration	1. Yes 2. No 3. not sure
209	The recommended route of administration of opioid analgesics with brief, severe pain of sudden onset such as POP is intramuscular.	1. Yes

		2. No 3. not sure
210	Analgesics for POP should initially be given around the clock on a fixed schedule.	1. Yes 2. No 3. not sure
211	Pre-surgery injection such as anesthesia is given for pain management	1. Yes 2. No 3. not sure
212	Respiratory depression rarely occurs in patients who have been receiving stable doses of Opioids over months.	1. Yes 2. No 3. not sure
2013	Opioids should not be used in patients with a history of substance abuse.	1. Yes 2. No 3. not sure
214	A rating scale ranging from (0) "no pain at all to (10) the worst pain" is essential to adopt in pain assessment.	1. Yes 2. No 3. not sure
215	If a patient sleeps with no movement postoperatively, this indicates that the patient is not in pain.	1. Yes 2. No 3. not sure

Part III: Respondents' attitude toward Post-operative pain assessment and management-related questions Instruction:

Please click the box you choose

Item S.No.	Questions	Response		
		Agree	Dis agree	Don't know
301	Your patient should experience discomfort before giving the next dose of pain medications.			
302	Distraction can reduce pain intensity			
303	A patient's spiritual beliefs may lead them to think pain and suffering are necessary.			
304	Using pain measurement instruments is integral in postoperative pain management.			
305	Morphine is a very strong drug; patients in postoperative pain would be content with just one dose.			
306	Nurses can best judge the patient's pain intensity because they spent 24 hours with the patients			
307	Lack of pain expression does not mean lack of pain.			
308	Effective analgesia is an essential part of postoperative Management			
109	Pain is what the patient says it is.			

Part IV: Items to assess practice

Direction: Read the following questions carefully and encircle your choice. If your choice is "yes" tick also on how frequently you practice it and skip to the next questions if your choice is "never".

401	Do you assess pain for patients able to communicate? If your choice is never to skip to Q4	1. yes 2. never	If yes how frequently? I always sometimes
402	Do you use a pain assessment tool for the pain scale? If never used go to Q404	1. yes 2. never	If yes how frequently? I always sometimes
403	If use, Please! Name the tool(s) you used.	_____, _____	
404	If your answer for Q401 & 402 above is never, What Were the barriers that hindered you from pain assessment? You can choose multiple options.		1. Nursing workload 2. Lack of standard pain assessment tool in hospital 3. lack of training in pain management 4. Lack of pain management Guidelines in the hospital 5. Patient's inability to communicate 6.Other(specify)_____
405	Do you encourage the use of transcutaneous electrical nerve stimulators for pain management	1. yes 2. never	If yes how frequently? I always sometimes
406	Do you combine opioids with NSAIDs rather than single analgesic agents when managing POP as suggested by the World Health Organization?	1. yes 2. never	If yes how frequently? I always sometimes

407	Do you document the findings after the pain assessment?	1. yes 2. never	If yes how frequently? always sometimes
408	If your answer for Q407 is never, what was the reason for your not documenting the finding? If not choose never, go to Q409. You can choose multiple options		1. Nursing workload 2. No designed area for charting 3. Lack of familiarity with the assessment tools 8.Other(specify)_____
409	Do you encourage prayer by patients or religious leaders postoperatively?	1. yes 2. never	If yes how frequently? I always sometimes
410	Do you administer ordered pain medication, around the clock (regularly) as ordered?	1. yes 2. never	If yes how frequently? I always sometimes
411	Do you use music therapy to reduce postoperative pain?	1. yes 2. never	If yes how frequently? always sometimes
412	Do you reassess pain after giving pain medication to evaluate the effectiveness of pain medication?	1. yes 2. never	If yes how frequently? I always sometimes
413	After surgery, do you provide comfortable positions to help relieve pain?	1. yes 2. never	If yes how frequently? always sometimes
414	Do you ask and help to support the painful areas when the patients moving or coughing after surgery?	1. yes 2. never	If yes how frequently? always sometimes

415	Do you provide a clean, calm, and well-ventilated ward environment for POP management?	1. yes 2. never	If yes how frequently? I always sometimes
416	Do you lay the patients on neat, well-laid beds postoperatively?	1. yes 2. never	If yes how frequently? always sometimes
417	Do you encourage massaging and stretching to reduce POP?	1. yes 2. never	If yes how frequently? always sometimes
418	Do you apply heat and cold compresses to manage postoperative pain?	1. yes 2. never	If yes how frequently? I always sometimes
419	Do you encourage early ambulation/exercise with analgesia?	1. yes 2. never	If yes how frequently? I always sometimes
420	Do you encourage the use of acupuncture?	1. yes 2. never	If yes how frequently? I always sometimes
421	Do you use patient distraction, relaxation, and guided imagery postoperatively to reduce pain?	1. yes 2. never	If yes how frequently? I always sometimes
422	Do you dress, bandage, splint, and reinforce wound sites postoperatively?	1. yes 2. never	If yes how frequently? I always sometimes

Annex 2 STROBE Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on Line number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	23-48
Introduction			**61**
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	60-117
Objectives	3	State specific objectives, including any prespecified hypotheses	118-121
Methods			**122**
Study design	4	Present key elements of study design early in the paper	123-125
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	126-130
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	131-147
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	148-153
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	167-181
Bias	9	Describe any efforts to address potential sources of bias	*57-60*
Study size	10	Explain how the study size was arrived at	138-142
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	168-180
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	182-203
		(*b*) Describe any methods used to examine subgroups and interactions	182-200
		(*c*) Explain how missing data were addressed	185-192
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	170-175
		(*e*) Describe any sensitivity analyses	185-192
Results			204

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	206-208
		(b) Give reasons for non-participation at each stage	,,
		(c) Consider use of a flow diagram	,,
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	206-221
		(b) Indicate number of participants with missing data for each variable of interest	207
Outcome data	15*	Report numbers of outcome events or summary measures	227-230
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	243-269
		(*b*) Report category boundaries when continuous variables were categorized	,,
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	,,
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	,,
Discussion			270
Key results	18	Summarise key results with reference to study objectives	320-327
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	56-60
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	271-327
Generalisability	21	Discuss the generalisability (external validity) of the study results	182-203
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	360-362

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.