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ORIGINAL RESEARCH

Prevalence and Risk Factors for Acute Postoperative Pain After Elective Orthopedic and General Surgery at a Tertiary Referral Hospital in Tanzania

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Background: In Africa, postoperative pain management is still a major problem with a prevalence of postoperative pain in up to 95.2% of the patients. There are little data on the prevalence and potential risk factors for postoperative pain in Tanzania. Therefore, we aimed to investigate these at Kilimanjaro Christian Medical Centre in Northern Tanzania. Our goal is to optimize pain management.

Methods: A prospective cohort study was carried out from December 2016 to April 2017. Patients ≥18 years admitted for elective general or orthopedic surgery were included in the study. Demographic data were collected during a pre-operative visit, and pain was assessed with a numerical rating scale (NRS 0–10) at 4, 24, 36 and 48 hours postoperatively. A NRS >3 was considered as moderate to severe postoperative pain. Potential risk factors for postoperative pain were identified using univariate and multivariable binary logistic regression analyses.

Results: A total of 281 patients were included in the study. The prevalence of postoperative pain was 61%, 73%, 67% and 58% at 4, 24, 36 and 48 hours after surgery, respectively. Pethidine was the most frequently prescribed analgesic for postoperative pain management (85.1%) in the first 24 hours postoperatively; only 1% received paracetamol or diclofenac, and 13% received tramadol. In the multivariable model, general anesthesia and intra-operative analgesia (OR = 3.70, 95% CI 1.70–8.04) were significant risk factors for postoperative pain.

Conclusion: Pain is still inadequately managed at Kilimanjaro Christian Medical Centre leading to a high prevalence (73% on the first day after surgery) of reported postoperative pain in this study. It reflects the need for adequate postoperative analgesia, especially in low- and middle-income countries. Further research identifying risk factors in larger cohorts can be performed if adequate analgesia is given.

Keywords: postoperative pain, prevalence, risk factors, Tanzania

Introduction

Postoperative pain management remains a major problem and challenge for many surgeons and anesthesiologists, especially in low- and middle-income countries.[1] The incidence of moderate and severe pain varies across the world and is about 14% to 55% in Western countries, being the highest on the day of surgery.[2,3] In low- and middle-income countries' data are scarce but prevalence goes up to 95%,

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which was shown in a Kenyan and Ethiopian cohort.[4,5] Even in the most sophisticated settings with the availability of different types of analgesics, loco-regional anesthesia techniques, and the introduction of Acute Pain Services[6] inadequate postoperative pain relief still occurs.

Postoperative pain may lead to a wide range of postoperative complications, like an increased risk of thromboembolic events, respiratory impairment, anxiety, sleep disturbance, prolonged hospital stay and chronic pain after surgery which causes a burden to the patient, health care providers and community and increases healthcare-related costs.[7–9] A recent large cohort study found that higher postoperative pain and unacceptable pain are associated with more postoperative complications, underscoring the importance of appropriate postoperative pain management.[10]

Several potential risk factors for postoperative pain have been reported for Western countries, like pre-existing pain, anxiety, younger age, female gender, and type of surgery.[11,12] Identifying those at increased risk and treating their postoperative pain adequately aiming at early ambulation and recovery may eventually reduce complications.

Data on actual prevalence of postoperative pain in specific types of surgery, and risk factors for developing postoperative pain in low- and middle-income countries are still scarce. Therefore, our goal was to determine the prevalence of postoperative pain after general and orthopedic surgery at Kilimanjaro Christian Medical Centre in Tanzania. Additionally, we aimed to identify risk factors in this population for increased risk of postoperative pain, which subsequently can help to individualize postoperative pain management and improve postoperative outcome.

Methods

Study Design

This prospective cohort study was conducted at Kilimanjaro Christian Medical Centre, which is a tertiary hospital situated in Northern Tanzania with a bed capacity of over 500 and a catchment area of 11.784 million people. More than 1.859 patients are operated annually in the general surgery and orthopedic departments.

Approval for this study was obtained from the Kilimanjaro Christian Medical University College Research Ethics Review Committee with protocol number 2224. Procedures followed were in accordance with the Declaration of Helsinki. Written informed written consent was obtained from all participants.

Study Population

Patients aged 18 years or older, admitted for elective surgery were eligible for inclusion. Exclusion criteria were: not able to communicate (e.g. due to cognitive deficits or unconscious patients) and no consent for the study. All participating patients received usual care for undergoing an elective surgical procedure. Depending on the type of patient and surgery, patients were given general anesthesia, spinal anesthesia or a peripheral nerve block. For general anesthesia, induction was with ketamine, propofol or thiopental and suxamethonium followed by maintenance with volatile anesthetics (halothane, sevoflurane or isoflurane) with or without pancuronium depending on the type of surgery, need for muscle relaxation or controlled ventilation. For spinal anesthesia, a total of 15 mg of bupivacaine was administered intrathecally. For peripheral nerve block, a maximum of 20 mL of bupivacaine 0.5% was administered on the targeted location: which was mostly a supraclavicular block for upper limb surgery, and femoral and/or sciatic (at the popliteal level) block for lower limb surgeries.

A hospital-wide acute pain protocol exists, which consists of a multimodal and stepwise pain management approach, according to WHO-analgesic ladder. The surgeon prescribes postoperative analgesia based on the procedure, size and site of the wound, and not on the patients' pain assessment. Usually, surgeons prescribe pethidine 100 mg intramuscular 8 hourly for the first 24 hours after major surgery, which is followed with either paracetamol 1 gr orally 8 hourly if patients have oral intake, or tramadol 100 mg intramuscular 8 hourly. This prescription is given with or without diclofenac 75 mg intramuscular 8 hourly for the next 24 hour before switching to paracetamol oral.

Data Collection

Demographic characteristics like age, sex, American Society of Anesthesiologists (ASA) classification, history of chronic pain (≥3 months, and use of analgesics), level of education (none, primary and/or secondary school, college), details of planned surgery, preoperative pain scores were collected the night before surgery. After surgery, the type of performed surgery, type of anesthesia, peri-operative pain management, and postoperative administered analgesics were documented. At 4, 24, 36 and 48 hours postoperatively, pain scores were assessed by using a numerical rating scale (NRS), ranging from 0 to 10 (0 = no pain, NRS 10 = worst pain imaginable). NRS scores

were classified as "none/mild" when the score was 0 to 3, "moderate" when the score was 4 to 7, and "severe" when the score was 8 to 10.[13,14] In this study, a NRS more than 3 was considered as moderate to severe pain.[15] All study-related measurements were done by a trained study person.

Data Analysis

Data were analyzed using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. IBM Corporation, Armonk, NY, USA). Data were examined for distributions; continuous variables were summarized, using measures of central tendency with their corresponding measures of dispersion, depending on their distribution. Categorical variables were summarized using frequency and proportions. To quantify the relationship between potential risk factors and having moderate to severe postoperative pain (NRS > 3), a binary logistic regression model was estimated. The Odds Ratios (ORs) with 95% Confidence Intervals (CIs) for the pain score and risk factors were estimated, using univariate and multivariable binary logistic regression analyses. Significant risk factors emerging from the univariate regression analyses were introduced in the second model for adjusting for confounding. A P-value less than 0.05 was considered statistically significant.

Results

Data collections were carried out from December 2016 to April 2017. In total, 296 patients were enrolled, and 15 patients were excluded for analysis: 9 cases were cancelled (n=1 due to deep venous thrombosis, n=8 surgery was postponed due to delay in surgery schedule), 4 patients were admitted to the intensive care and not able to communicate postoperatively (n=3 ventilated postoperatively; n=1 critically ill postoperatively needing inotropes). In total, 281 patients completed all questionnaires and these data were included for analysis.

Patient characteristics are depicted in Table 1. The number of patients, who received general (n=141) or orthopedic surgery (n=140) were equally divided in this group. Fifty-two percent of the patients were male. Patients were aged between 18 and 85 (44.2 ± 16.4) years. The majority of the patients had only primary education (43.8%), and approximately one-third (29.5%) had a history of chronic pain.

Table 1 Characteristics of Study Participants (n=281)

Characteristics	n (%)
Age (years)	
18–30	65 (23.1)
31–40	63 (22.4)
41–50	48 (17.1)
51–60	55 (19.6)
61–70	34 (12.1)
>70	16 (5.7)
Sex	
Male	146 (52.0)
Female	135 (48.0)
Education	
No education	17 (6.0)
Primary	123 (43.8)
Secondary	87 (31.0)
Post-Secondary	54 (19.2)
ASA score	
1	179 (63.7)
2	98 (34.9)
3	4 (1.4)
Type of surgery	
General surgery	141 (50.2)
Orthopedics	140 (49.8)
Anesthesia	
General anesthesia	123 (43.8)
Spinal anesthesia	107 (38.1)
Peripheral nerve block	51 (18.1)
History of chronic pain	
Yes	83 (29.5)
No	198 (70.5)

Prevalence of Moderate to Severe Postoperative Pain

The prevalence of postoperative pain is shown in Figure 1. The total prevalence of moderate to severe postoperative pain (NRS > 3) was 60.9%, 72.6%, 67.3% and 57.7% at 4, 24, 36 and 48 hours postoperatively, respectively. Severe pain (NRS > 7) was experienced by 16.4%, 15.3%, 14.2% and 16.4% at 4, 24, 36 and 48 hours postoperatively, respectively.

All patients received analgesics postoperatively (Figure 2), but were given monotherapy. Pethidine was the most frequently prescribed analgesic for postoperative pain management (85.1%) in the first 24 hours. Only 1% received paracetamol or diclofenac, and 13% received tramadol.

Risk Factors for Postoperative Pain

When potential risk factors univariately were introduced into the binary logistic regression model, younger age (trend), female sex, type of surgery, anaesthesia plan

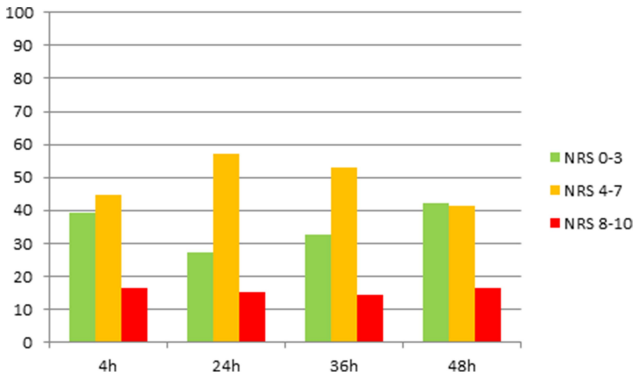


Figure 1 Prevalence (%) of postoperative pain at 4, 24, 36, and 48 postoperative hours, respectively (n=281).

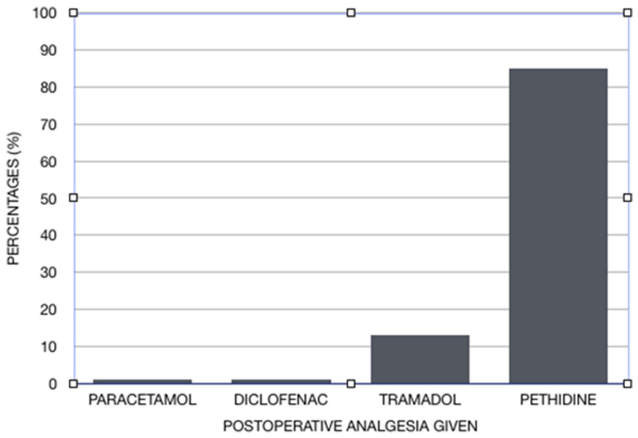


Figure 2 Prescribed analgesics for postoperative pain management in the first 24 hours after surgery (n=281).

(general anesthesia compared to peripheral nerve block) and intra-operative analgesia plan were significantly associated with having postoperative pain ($P < 0.05$). Having a history of chronic pain did not affect postoperative pain. In the multivariable analysis, only general anesthesia (compared to spinal anesthesia and peripheral nerve block) and intra-operative analgesia were significantly associated with postoperative pain ($P < 0.001$) (Table 2). Intraoperative pain management was lacking in 39.8% of the patients.

Discussion

The aim of our study was to determine the prevalence of postoperative pain after general and orthopedic surgery at Kilimanjaro Christian Medical Centre in Tanzania. Additionally, we aimed to identify risk factors in this population for increased risk of postoperative pain. Around 70% of the patients who underwent general and orthopedic surgery experienced moderate or severe pain in the first 48 hours postoperatively; of which 15% to 16% of the cases experienced severe pain. We anticipated to identify risk factors for postoperative pain including age; however, only general anesthesia was a risk factor among the present patients. This is probably due to the lack of perioperative analgesia given that risk factors are hard to find, and perhaps not so interesting, when almost all patients experience moderate and severe pain.

We found a high prevalence (around 70%) of moderate or severe acute postoperative pain in our study. In an Ethiopian cohort of surgical patients receiving several types of surgery an incidence of postoperative pain of 91.4%, with a mean pain intensity of 6.72 ± 1.44 was found.[4] At a Western Cape referral hospital, moderate to severe pain was found in 62% of 1231 patients undergoing several types of surgery.[12] A large systematic literature review pooled pain scores from 165 studies of acute pain management, following major surgery (abdominal, thoracic, orthopedic, and gynecological) described that in the first 24 hours after surgery, the mean incidence of moderate to severe pain and severe pain was 30% and 11%, respectively. The incidence of these pain levels varied by analgesic technique: lower incidence was reported with patient-controlled intravenous and epidural analgesia compared with intramuscular analgesia.[16] The lower prevalence in developed countries could be explained due to the use of advanced regional anesthesia techniques, pain protocols and the presence of acute pain services.[2,17–19]

In our hospital surgeons are responsible for postoperative pain management. Internationally, responsibility of postoperative pain care provision pends between surgeons and anesthesiologists.[20] A combined effort and interest of both specialties to reduce postoperative pain would be ideal. Despite the multimodal acute pain protocol according to WHO-standards, patients in the Kilimanjaro Christian Medical Centre are given monotherapy: pethidine is the most used drug the first 24 hours, afterwards is switched to paracetamol, without assessing pain and asking about the effectiveness of the given treatment.[21] Comparable to our study, other studies in low- and middle-income countries also found that pain assessment on the ward was inadequate and that postoperative pain management mainly depends on medical staff experience and not on internationally perioperative pain management protocols.[4,12] Additionally, we found that intraoperative pain management was lacking in almost 40% of the patients, which means that anesthesia staff also lacks the understanding of a multimodal pain management approach. Thus, more adequate teaching of medical staff

Table 2 Odds Ratios (OR) Obtained from Univariate and Multivariable Binary Logistic Regression Analyses, Estimating the Association Between Potential Risk Factors and Postoperative Pain (n=281)

Variable	Total	Pain n (%)	Univariate	P-value	Multivariable	P-value
			Crude OR (95% CI)		Adjusted OR (95% CI)	
Age (yrs)						
=<30	65	48 (73.8)	1		1	
31–40	63	50 (79.4)	1.36 (0.60–3.11)	0.462	1.69 (0.65–4.42)	0.283
41–50	48	36 (75.0)	1.06 (0.45–2.50)	0.890	1.28 (0.47–3.50)	0.634
51–60	55	35 (63.6)	0.62 (0.28–1.35)	0.229	0.67 (0.26–1.74)	0.409
61–70	34	27 (79.4)	1.37 (0.50–3.71)	0.540	1.49 (0.47–4.77)	0.500
>70	16	8 (50.0)	0.35 (0.12–1.10)	0.071	0.37 (0.10–1.40)	0.142
Sex						
Male	146	98 (67.1)	1		1	
Female	135	106 (78.5)	1.79 (1.05–3.06)	0.033	1.40 (0.70–2.78)	0.345
Education						
No education	17	11 (64.7)	1		1	
Primary	123	87 (70.7)	1.32 (0.45–3.84)	0.612	0.71 (0.18–2.83)	0.629
Secondary	87	65 (74.7)	1.61 (0.53–4.87)	0.398	0.90 (0.21–3.81)	0.888
College	54	41 (75.9)	1.72 (0.53–5.57)	0.365	1.21 (0.26–5.64)	0.809
History of chronic pain						
Yes	83	66 (79.5)	1		1	
No	198	138 (69.7)	0.59 (0.32–1.09)	0.094	0.67 (0.32–1.41)	0.291
Surgery						
General	142	114 (80.0)	1		1	
Orthopedics	139	90 (64.7)	0.45 (0.26–0.77)	0.004	1.24 (0.55–2.82)	0.605
Anesthesia						
General anesthesia	123	104 (84.5)	1		1	
Spinal anesthesia	107	83 (77.6)	0.63 (0.32–1.23)	0.178	0.29 (0.11–0.81)	0.017
Peripheral nerve block	51	17 (33.3)	0.09 (0.04–0.20)	<0.001	0.07 (0.02–0.19)	<0.001
Intraoperative analgesia						
Yes	169	111(65.7)	1		1	
No	112	93 (83.0)	2.56 (1.42–4.60)	0.002	3.70 (1.70–8.04)	0.001

is needed to improve the understanding of the importance of appropriate acute postoperative pain management. With help of international partners, acute pain training programs have been set up and it would be of interest to perform a follow-up study in future in order to raise awareness and subsequently improved pain management.

Our study found that female sex, type of surgery, anaesthesia plan, and intra-operative analgesia plan were potential risk factors for developing acute postoperative pain in the univariate analysis. These risk factors are comparable with results in other studies worldwide, such as studies in the Netherlands, South Africa and Sweden.[6,9,11,12,18,22] However, in the multivariate analyses, only general anesthesia (compared to spinal anesthesia and peripheral nerve block) and intra-operative analgesia were significantly associated with postoperative pain. Not only the low sample size made that risk factors were not statistically significant, almost all patients (73% on the first postoperative day) had moderate to severe pain. We feel that reliable risk factors cannot be found when analgesia is undermanaged. We therefore recommend future studies on risk factors being performed when adequate analgesia is provided.

This study has some limitations. We had a delay in dissemination of our results due to logistical circumstances and lack of staff, thus current prevalence rates can be different. Furthermore, as stated above the sample size was too low for identifying potential risk factors in the

multivariable analyses. A further limitation was that we did not evaluate psychological factors, such as anxiety and depression, which are known risk factors for the development of acute postoperative pain.[23] Current screening instruments to assess psychological factors are not validated for a Tanzanian population. For future studies, it would be of interest to evaluate if similar psychological factors are risk factors for postoperative pain in low- and middle-income countries as in Western countries.

Conclusion

This was the first study looking at the prevalence and risk factors of postoperative pain in Tanzania. Postoperative pain is undermanaged at Kilimanjaro Christian Medical Center in Tanzania and 73% of patients experience moderate and severe pain on the first day after surgery. It reflects the need of adequate postoperative analgesia, especially in low- and middle-income countries. This study subscribes the need for further implementation and teaching of medical staff concerning acute pain management. Future research with a larger sample size, investigating potential risk factors to identify patients at risk for postoperative pain, may help to individualize and improve perioperative pain management.

Disclosure

The authors report no conflicts of interest for this work.

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