

ASSESSMENT OF INTRAOPERATIVE AND IMMEDIATE POSTOPERATIVE PAIN MANAGEMENT IN ADULT ORTHOPEDIC SURGICAL PATIENTS AT THE POST ANESTHESIA CARE UNIT OF TIKUR ANBESSA SPECIALIZED HOSPITAL

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Abstract

Background

Despite the increased focus on pain management programs and the development of new standards for intraoperative and postoperative pain, assessment remains a concern for patients. Pain therapy is a central medical task and a legal duty and optimum pain control is a fundamental right for all patients.

Objectives

To evaluate the prevalence and intensity of pain in adult patients after orthopedic surgeries. To describe the practice of intraoperative and postoperative pain management in adult orthopedic surgical patients at Tikur Anbessa Specialized Hospital.

Methodology

Institutional based prospective cross-sectional study was conducted on 324 study participants to assess the immediate postoperative pain management in adult orthopedic surgical patients at the post anesthesia care unit. Visual Analogue Scale was used to assess the level of pain. Data was collected using a structured questionnaire and was analyzed using Statistical Package for Social Sciences, version 20.

Results

The total number of participants was 384. The number of male participants was 264 (60.9%) and female participants 150 (39.1%). Upper limb surgeries constituted 67.7% of the cases and fracture was the commonest cause for orthopedic surgeries 70.3%. Among the study participants 191 (49.7%) had experienced moderate to severe post-operative pain. Open Reduction and Internal Fixation constituted 68.2% of the operations done. Regional anesthesia accounted for 51.3% and general anesthesia 48.2%. Among those patients who were operated under general anesthesia 53% of them received morphine via intravenous route, 20.5% received combination of weak opioid and NSAID, and 18.9% received intravenous tramadol for intraoperative analgesia. Among the study participants 28.9% of them stayed in the PACU for two hours and the rest stayed for an hour.

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ACRONYMS

HIV/AIDS.....	Human Immune Deficiency Syndrome
NRS.....	Numeric Rating Scale
VRS.....	Verbal Rating Scale
PACU.....	Post Anesthesia Care Unit
ASA.....	American Society of Anesthesiologists
USA.....	United States of America
TASH.....	TikurAnbessa Specialized Hospital
VD/RS.....	Verbal Descriptor/ Rater Scale
VAS.....	Visual Analogue Scale
PPI.....	Present Pain Intensity
PPP.....	Pain Perception Profile
PRS.....	Pain Rating Scale
MPQ.....	McGills Pain Questionnaire
NSAID.....	Non-Steroidal Anti Inflammatory Drugs
PCA.....	Patient controlled Analgesia
TENS.....	Transcutaneous Electrical Nerve Stimulation
Prn.	Pro re nata (as needed)
PO.....	Post-Operative Period
IPO.....	Immediate Post-Operative Period
FMOE.....	Federal Ministry of Education
SPSS.....	Statistical Package for the Social Sciences
FMOH.....	Federal Ministry of Health
PNB.....	Peripheral Nerve Block

PAD.....Peripheral Arterial Disease
Mins.Minutes
Ex-fix.....External fixation
ORIF.....Open Reduction and Internal Fixation
I&D.....Irrigation and Debridement
IM.....Intramuscular
IV.....Intravenous
ml.....milliliter
mg.....milligram

1 Introduction

1.1 Background

Pain can be defined as a sensitive and emotional experience, which can result from actual or potential tissue injury (1). Genetic makeup, individual behavior, cultural influences, and socio-demographic characteristics like age and sex contribute a lot for the individual variation in perceiving pain (2). When not alleviated, pain can affect the pulmonary, cardiovascular, gastrointestinal, endocrine and immunological systems. Thus, it can be harmful to patients whose health has already been impaired by age, disease or injury. After surgical procedures, prolonged painful stimuli cause suffering, harm to the organism and postoperative complications, which consequently has a negative effect on patient recovery (1).

Generally, pain can be classified based on the etiology or origin and duration of pain. Classification of pain will help practitioners to successfully manage pain by taking into account its duration, involved body part, type of patient, intensity and its pathology(3). Pain can be divided based on etiology, into nociceptive and neuropathic pain. Nociceptive pain is a type of pain which arises due to or as a result of tissue damage. Postoperative pain can be a good example. Neuropathic pain on the other hand, is a kind of pain that arises from abnormal neural activity secondary to disease or injury of the nervous system. It is further subdivided into sympathetically mediated pain and non-sympathetically mediated pain. The first one arises from a peripheral nerve lesion and associated with autonomic changes. The second one is due to peripheral nerve damage without autonomic change(4).

Based on the duration of pain symptom it can be divided into acute and chronic pain. Acute pain is a type of pain symptom which lasts only up to 30 days of duration. Chronic pain is a type of pain that persists more than six months and it is not a symptom rather it is a disease state which will interfere with normal activity(5). However, poorly managed acute pain that might occur following surgery can produce pathophysiologic processes in both the peripheral and central nervous systems that have the potential to produce chronicity(6).

Incidence of postoperative pain has been reported to be between 47–100%. Ineffective postoperative pain management results in tangible and intangible costs. It has been repeatedly confirmed by studies in the past 3 to 4 decades that 20 to 80% of patients undergoing surgery suffer from inadequately treated pain and pain is classified as a serious public health problem both in the developed and in developing countries. In Africa, the issue of pain has been explored largely in relation to Human Immune Deficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS) and cancer, even though pain from surgical procedures poses a far greater burden. A Human Rights Watch's report showed that only 10% of these group patients are able to receive optimal pain management(7).

Assessing pain is the first and crucial step in properly managing pain. Not assessing pain accurately is one of the barriers for inadequate management of pain (8). There are different techniques in assessing pain; self-reported pain assessment tools and physiological and behavioral responses to pain can be of example. The self-reporting methods include numeric rating scale (NRS), the Wong-Backer FACES scale and Verbal Rating Scale (VRS). Physiological responses like tachycardia, increased respiratory rate and hypertension may indicate the presence of pain. The behaviors include splinting, moaning, distorted posture and hesitancy to move. Nonverbal methods can provide information regarding pain but the most accurate method is self-report(9).

Patients undergoing orthopedic surgeries usually have musculoskeletal dysfunctions, such as unstable fractures, deformities, joint disorders, infected or necrotic tissues, traumas or tumors. The most frequent surgical procedures include open reduction with internal fixation and closed reduction with internal fixation in fractures, arthroplasty, meniscectomy, joint replacement and amputation, among others. The goals of surgical procedures are as follows: to improve patients' body functions to recover their movement and stability, in addition to alleviating pain and incapacity(10).

Lack of success in providing relief from pain in the postoperative period is mainly associated with health professionals' insufficient knowledge about pain assessment, effective analgesic doses, the action time of such drugs and their adverse effects(1). Pain control in the postoperative period can include the prescription of analgesics at set times to prevent peaks of pain, use of sophisticated technology such as epidural catheters, and even cognitive-behavioral interventions such as relaxation, music and other educational activities. Adequate postoperative pain treatment is not only a pathophysiological issue, but also an ethical and economic one. In this way, better pain management prevents suffering, enables greater satisfaction of patients under care and reduces costs associated with possible complications that lead to longer periods of hospitalization(1).

1.2 Rationale of the study

Postoperative pain management remains one of the major challenges in the care of surgical patients. Although care has improved, studies show that postoperative pain continues to be inadequately treated and that patients still suffer moderate to severe pain after surgery (11).

Many researches concerning postoperative pain management were performed in different parts of the world. However, there was limited research done to assess the status of post operative pain management in Ethiopia. Research done in Jimma University Hospital also showed that postoperative pain is not properly managed(12).

Therefore, this research on assessment of intraoperative and immediate postoperative pain management at the PACU in adult orthopedic surgical patients provides information for clinicians to formulate guideline for management of intraoperative and postoperative pain in orthopedic patients and for hospital managers to allocate budget properly so as to use the limited resources efficiently and plan for optimum postoperative pain management.

1.3 Statement of the problem

Pain is a universal experience, and it is the most frequent reason for people seeking health care. Because perception and tolerance of pain vary widely from individual to individual, pain is difficult to define and describe. Essentially, pain is the way the brain interprets information about a particular sensation that the body is experiencing. Information (or “signals”) about this painful sensation are sent via nerve pathways to the brain. The way in which the brain interprets these signals as “pain” can be affected by many external factors, some of which can be controlled by special techniques (13).

Postoperative pain is a type of acute pain. The American Society of Anesthesiologists (ASA, 1995) defined pain in the postoperative setting as pain that is present in a surgical patient because of a preexisting surgical procedure, or a combination of disease-related and procedure-related resources (14).

Post operative pains are reported to be undertreated in many parts of the world even in developed countries. For example, in France postoperative pain was not adequately managed. Pain intensity monitoring was not also prescribed for all patients and evaluation tools were not standardized (15). A study conducted in a cohort of Danish post operative patients also found out that 45.5% of patients had uncontrolled pain. They experienced moderate to severe pain within 24 hours of their surgery (16). In the United States of America (USA) among surgeries performed within the year, 80% felt acute postoperative pain while the remaining 20% experienced severe pain. This inadequate pain management led to clinical, psychological and institutional consequences (17). A study performed to assess the characteristic of pain and patient satisfaction on pain management states that post operative pain management in rural and urban hospitals of USA was below optimal and strategies for effective pain management was not available (18).

Several reports have shown that persistent or uncontrolled pain is associated with increased incidence of postoperative nausea and delirium, prolonged post-anesthesia care unit (PACU) stay and delayed discharge from an ambulatory facility. Inadequate pain control may delay resumption of normal activities (19).

The practice of evaluating pain also varies greatly. A survey conducted in French showed that post operative pain evaluating tools were with lesser frequency and in all institution the

availability of pain was not a criterion for discharge from the recovery room (20). Another cross sectional study reported that there is a discrepancy between the records and that of the reports from the patients. The nurses' evaluation for pain is not adequate and they do not assess and score postoperative pain and do not evaluate the effect of given analgesic drugs (21).

A study done at Kenyatta National Hospital (Kenya) showed that fifty five percent of the patients who had undergone orthopedic surgery experienced post-operative pain of a higher intensity than they had expected while 25% and 20% of the patients experienced pain whose intensity was same as and less than they had expected, respectively (22).

A study which was conducted at Jimma University Specialized Hospital on postoperative pain management among surgically treated patients showed that incidence of postoperative pain was 91.4%, and remained high over 3 measurements (McNemar's; $p < 0.05$), and 80.1% of the patients were undertreated (7).

Generally, postoperative pain is not adequately managed and it is seen to be suboptimal. Coming to the Ethiopian setting, researches are limited assessing the management of postoperative pain, specifically postoperative pain following orthopedic surgeries. Therefore, this study is intended to give an insight to what the current status of intraoperative and immediate postoperative (specifically at the PACU) pain management in adult orthopedic surgical patients at Tikur Anbessa Specialized Hospital (TASH). The hospital is a tertiary level hospital and performs more than 900 elective adult orthopedic surgeries per annum. Hence, the study results would be used as a milestone to give some picture in postoperative pain management of adult orthopedic surgical patients in the country.

2 Literature review

Pain is a universal human experience and the most common cause of seeking medical care (23). The Subcommittee on Taxonomy of the International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." (24) Carr and Goudas describe pain as 'the normal, predicted physiological response to an adverse chemical, thermal or mechanical stimulus associated with surgery, trauma or an acute illness' and, thus, characterize it as a sensory response (25). According to Katz and Melzack, pain is a personal and subjective experience that can only be felt by the sufferer (26). This view is also supported by McCaffery's definition in which 'pain is whatever the experiencing person says it is and exists whenever they say it does' (27). In addition to pain being a physiological phenomenon, it is also influenced by psychological and cultural factors (28).

One of the major difficulties health care professionals encounter in assessing patients with pain is the lack of a clear correlation between the amount of pain reported and the amount of tissue pathology as revealed by physical examination and diagnostic tests. Individuals can experience severe pain in the presence of minimal organic pathology or little or no pain despite extensive disease processes. Any attempt to determine whether pain is in excess of what might be expected runs aground on the multiple psychosocial factors that influence the clinical pain experience, including the amount of threat to the person and his or her interests associated with the pain, cultural expectations about pain, and the family's history of coping with pain. Variance between pain reports and physical findings is common in clinical pain problems, and no validated method exists for determining when the mismatch is typical or "pathological" (29, 30, 31).

Acute pain, an essential biologic signal of the potential for or the extent of injury, is pain that lasts or is anticipated to last a short time, typically less than one month. It is often associated with anxiety and with hyperactivity of the sympathetic nervous system manifest by tachycardia, increased respiratory rate and blood pressure, diaphoresis and dilated pupils. Chronic pain is usually defined broadly and arbitrarily as pain persisting more than one month beyond the resolution of an acute tissue injury, pain persisting or recurring for more than three months, or pain associated with tissue injury that is expected to continue or progress. Chronic pain has no adaptive biologic role. Vegetative signs (lassitude, sleep disturbance, decreased appetite, loss of taste for food, weight loss, diminished libido, constipation) often develop gradually, and neuropsychiatric manifestations may follow (32).

Pain may be broadly classified as:

- Somatogenic (organic): explainable in terms of physiologic mechanisms, or

- Psychogenic: occurring without organic pathology sufficient to explain the degree of pain and disability and thought to be related mostly to psychological issues.

Somatogenic pain may be nociceptive or neuropathic. Nociceptive pain is judged to be commensurate with ongoing activation of somatic or visceral pain-sensitive nerve fibers. When somatic nerves are affected, pain is typically felt as aching or pressure (e.g., most cancer pain).

Neuropathic pain results from dysfunction in the nervous system; it is believed to be sustained by aberrant somatosensory processes in the peripheral nervous system, the central nervous system, or both (22).

Acute surgical pain refers to short-term pain that has an easily identifiable cause from the tissue damage that results from a surgical event. Acute pain is marked by a rapid onset, is perceived to be sharp in nature and may be followed by a dull, aching pain. The most severe post-surgical pain occurs within the first 24 to 36 hours after the procedure. Poorly managed perioperative pain may lead to untoward systemic events such as cardiovascular, pulmonary, thromboembolic or gastrointestinal complications. Local complications may be exacerbated such as pronounced weakness, muscle breakdown, insufficient wound healing and reflex sympathetic dystrophy. These detrimental physiologic effects may result in prolonged hospitalization and rehabilitation requirements. Thus, by optimally controlling post-surgical pain, improvement may be achieved in overall patient outcomes. In addition, post-operative emotional effects such as anxiety and depression may be more pronounced in patients who receive less than adequate pain management (33). Postoperative pain is usually greatest with thoracic, abdominal, head-neck, and orthopedic surgery and may persist up to 8 days after the surgical procedure (34).

Surgical pain management is complex because of variations in patients' pain experiences, the nature and extent of the surgery, the intensity and expected duration of pain, the myriad analgesics available in the market, the expertise of staff, the many techniques available to treat postoperative pain, and patient factors such as illness, age and psychological state". An integrated approach to pain management including cognitive behavioral interventions, systematic administration of appropriate medications, education of both staff and patients, as well as routine assessment of pain is recommended in order to make progress in providing pain management of a high standard (35).

Despite recent advances in the treatment of postoperative pain, it remains one of the most prevalent problems in health care today. Most patients receive some form of postoperative pain management, yet it is estimated that approximately 50% to 75% of patients still have inadequate pain relief (34). The incidence of moderate to severe pain with cardiac, abdominal, and orthopedic inpatient procedures has been reported as high as 25% to 50% (36).

Research has evolved to reflect changing ideas about pain. These have shifted from the notion of a purely sensory phenomenon to that of an experience composed of both sensory and reactive (emotional) components and, finally, to one in which sensory/discriminative, motivational/affective and cognitive/ behavioral components play a part (37). There are different pain measurement tools designed by researchers, some of them are:

- The Verbal Descriptor/Rater Scale (VD/RS)
- The Numerical Rating Scale (NRS)
- The Visual Analogue Scale (VAS)
- Present Pain Intensity (PPI)
- Johnson's Two-Component Scale
- Tursky's Pain Perception Profile (PPP)
- Margoles's pain chart
- Crying, Requires oxygen to maintain saturation greater than 95%, Increased vital signs, Expression, Sleeplessness (CRIES)
- The Pain Rating Scale (PRS)
- The McGill Pain Questionnaire (MPQ)

A pain assessment tool must be easy to understand, complete, valid, reliable and able to take into account the health status of the patient. In this respect the instrument should be:

- Appropriate, i.e. it should match the specific purpose of the study
- Reliable, in terms of reproducibility and internal consistency
- Valid, in that it measures patients' perceptions of pain
- Responsive to changes of importance to patients
- Precise (accurate and discriminating)
- Interpretable, in that meaningful scores are produced
- Acceptable to those completing it
- Feasible, i.e. the degree of burden and effort involved in using it is acceptable

The VAS is one of the most widely used assessment tools for postoperative pain (38). The use of the VAS as a pain measurement tool benefits the respondent, as it uses few words and, therefore, vocabulary is less of an issue. Provided that clear instructions are given to respondents, it is reasonably simple to complete. Furthermore, for the assessor:

- It is easy and brief to administer and score
- It is a good method of expressing pain severity

- Because it has the properties of a ratio scale it has a true zero point and, thus, differences between VAS measurements can be interpreted as meaningful percentages
- It has a continuous frequency distribution, which allows rigorous statistical tests to be conducted on average pain levels (39).

Effective pain therapy requires clinical competence and application of available therapeutic options. Initial steps of successful pain treatment include: an informative dialogue with the patient, conveying of confidence, and skillful choice of diagnostic and/or therapeutic options (33).

Pre-emptive analgesia refers to the reduction or prevention of pain prior to the noxious stimulus, thereby reducing the pain experienced as well as overall analgesic requirements. It involves the administration of analgesic epidurally or systemically, prior to surgical incision, to prolong or accentuate the effects of postoperative analgesic. Methods that have been studied in vivo include the use of local anesthetics for wound infiltration, epidural analgesia with local anesthetics, systemic or epidural opioids, non-steroidal anti-inflammatory drugs (NSAIDs), or a combination of NSAIDs, local anesthetics, and opioids. However, some have argued that it is an attractive theory well supported only in animal studies and the majority of studies on preemptive analgesia thus far have not shown a benefit over traditional analgesic regimens (34).

One noteworthy advance in postoperative analgesia is the concept of multimodal, or balanced, analgesia. In this method, opioids are used synergistically or additively with non-opioid analgesics through varying routes of administration. The purpose is to minimize side effects through narcotic-sparing effect while increasing pain relief (33).

Technological advances provide novel means to administer pain medication. One example is the PCA pumps that have been used for the past decade. Patients often report high levels of satisfaction with the pump versus conventional intramuscular or epidural opioids. Nonpharmacological therapies include techniques such as transcutaneous electrical stimulation (TENS), electroacupuncture, and psychological supportive therapeutic modalities (22).

There are different studies conducted worldwide regarding adequacy of postoperative pain management.

An observational study was conducted in Pakistan to assess the strategy, effectiveness and safety of postoperative pain management. The study found out that postoperative analgesia was given to patients either by the obstetric team or the anesthesia team. Postoperative pain was frequently managed by intravenous infusion of opioids in 94% of patients and other analgesics were also co-administered with the opioids in 99% of patients. The study employed VAS to assess

postoperative pain management and found out that pain at rest was mild in 89.7% of the patients, moderate in 9.5% and severe in 0.8% of the patients. Patients' opinion on postoperative pain management was satisfactory in 91.6 % of patients (40).

In a survey conducted in developing countries showed that management of postoperative pain is suboptimal and the analgesics given were not adequate. A questioner survey conducted in Thailand, India, China, Indonesia, the Philippines and Nigeria showed that management of pain is not optimal. In all countries most opioids are available except that oxycodone is not available in India, Indonesia, Thailand and Nigeria. Postoperative pain is managed by surgeons, anesthesiologist or by both in these countries. The frequent reasons given for not adequately managing postoperative pain are lack of potent analgesics, lack of knowledge and not giving priority for pain management (41).

The survey of prescription patterns and adequacy of analgesia conducted in the university college hospital in Ibadan, Nigeria found out that moderate to unbearable pain was reported by 68.7% of patients. It was also reported that 51.7% of the patients complained to have pain at 48 hours of surgery. The survey also showed that the prescribing pattern for analgesics in managing postoperative pain has not changed over the years to include the newly available drugs (42).

A prospective cohort study conducted in Brazil found out that moderate to severe postoperative pain is associated with age, chronic pain and depressive mood. Younger individuals and patients with chronic pain and depressive symptoms were shown to have higher risk for developing moderate to severe post operative pain (Caumo et al., 2002). Another study also found out that younger age and being unmarried are the independent predictors of severe acute and persistent post operative pain (43).

A study was conducted in Denmark to describe the current postoperative pain treatment in Danish tertiary university hospital. It was found out that postoperative pain was not recorded in most of the patients. It was also observed that greater than 75% of the patients receive opioids. However, sufficient 24 hour treatment was only given to 57%, 85% and 65% of patients during the first, second and third postoperative days respectively (44).

A study which was done at the surgical wards of Jimma University Specialized Hospital, Ethiopia showed that only few patients (2.5%) reported that they received pain medication within 15 minutes of complain of pain. However, a large number of patients (70.8%) never asked for pain medication during hospitalization. Despite the fact that only few patients requested for pain medication, 42.2% of the patients responded "Yes" when they were asked whether they want stronger medication for pain relief. Moreover, 14.2% of the patients reported that they never received the analgesics they requested. Most patients, 91.2% (n=230) reported that their physicians or nurses haven't discussed with them the importance of pain management (7). The

dominant pattern of analgesic prescriptions found in this study was scheduled one (68.7%); as needed (i.e., prn) orders for analgesics were noted in 31.1% of the orders. Analgesics that were prescribed with a fixed interval were administered 54% of the time; however, prn orders, irrespective of analgesic category, were only administered 5% of the time. The majority of patients were prescribed solo analgesics (89.29%). The remaining (10.71%) were prescribed dual analgesic: namely Diclofenac and Tramadol. It was also observed that forty five patients (10.1%) did not have prescription for any kind of specific analgesic. On average, the dose administered for Diclofenac was only 56.2% of the prescribed while for Tramadol it was 57.9% (7).

A study on Pain assessment intensity and pain relief in patients post-operative orthopedic surgery as part of a major research on "Assessment of Pain Intensity and Analgesia in Postoperative Patients of a Teaching Hospital in the State of Minas Gerais, Brazil" showed that With regard to pain, 65.7% patients had this symptom in the immediate postoperative period (IPO), 62.2% in the 1stpostoperative period (PO) and 75% in the 2ndPO. In terms of pain intensity, there was a predominance of mild pain in the IPO and 2nd PO (39.7% and 55.5%, respectively), whereas moderate pain prevailed in the 1st PO (36.3%) among patients interviewed. In the IPO, 1stPO and 2ndPO, non-steroidal anti-inflammatory drugs (NSAIDs), simple analgesics and opiates were the drugs most often prescribed simultaneously to 74.6%, 71.6% and 83.3% patients respectively (1).

A study which was conducted at St. Paul's Hospital Millennium Medical College showed that among the 416 study participants, 376 (90.4%) complained to have post operative pain. Of these, 257 (61.8%), 106 (25.5%) and 13 (3.1%) reported mild, moderate and severe pain respectively. Most of the patients that felt pain after their surgery, 374 (89.9%) had the pain on the surgical site. The presence of prior chronic pain in the study participants was also assessed and it was found out that 78 (18.8%) patients had chronic pain other than the post operative pain (12).

At the time of the survey, patients were prescribed with range of analgesics including strong opioids, weak opioids and NSAIDs. The most frequently used medication for the management of postoperative pain was diclofenac 157 (37.7%) followed by tramadol 110 (26.4%). Combination of diclofenac with tramadol was used for 140 (33.7%) of patients. Intra-operative analgesia was used for 119(28.6%) patients. Out of these patients, 97 (23.3%) of them were given tramadol as intra operative analgesia. Diclofenac was used for 12 (2.9%) of the patients. Pethidine and combination of diclofenac and tramadol were also used intra-operatively equally for 5 (1.2%) of the patients (12).

In St. Paul's Hospital Millennium Medical College, postoperative pain was mostly managed by either surgery residents or surgeons. Most of the prescriptions for anti-pain medications were written by surgeons 368 (89.5%) and surgery residents 43 (10.3%) and some were also written by general practitioners. Anesthetists or anesthesiologists had no role in managing post-

operative pain. However, intra-operative analgesics were prescribed by anesthesia professionals (12).

3 Objectives

3.1 General objectives

- To assess the prevalence of immediate post-operative pain (at the PACU) and adequacy of its management in adult orthopedic surgical patients at TASH.

3.2 Specific objectives

- To determine the prevalence of immediate postoperative pain in adult orthopedic surgical patients.
- To describe the pain management methods currently employed.
- To assess the adequacy of the pain management methods used.
- To identify any pitfalls in the pain management.
- To formulate acceptable and workable recommendations to improve the pain management.

4 Methodology

4.1 Eligibility criteria and ethical considerations

4.1.1 Inclusion criteria

1. Only adult patients (those aged 18 years and above) were recruited.
2. Patients undergoing elective orthopedic surgery.
3. Only those patients able to communicate verbally were included.
4. Only those who gave informed consent were included in the study.

4.1.2 Exclusion criteria

1. Patients not meeting the above inclusion criteria.
2. Patients having concurrent pain-causing condition.
3. Patients who were not admitted for recovery
4. Patients who were unconscious during the data collection period
5. Subjects who declined consent

4.1.3 Ethical considerations

Before the data collection, verbal consent was obtained from each patient. The study participants were informed about the purpose of the study, why and how they were selected. Moreover, patients were told that they are free to withdraw from the study at any time during the research. Any specific patient identifiers were not included in the data collection tool.

4.2 Study setting

The study was conducted at Addis Ababa University, College of Health Sciences, Tikur Anbessa Specialized Hospital. It is the largest public specialized hospital in Ethiopia located at Addis Ababa under the Ethiopian Federal Ministry of Education (FMOE).

4.3 Study design

A quantitative prospective cross sectional study design was employed from August 2017 to October 2017.

4.4 Source and study population

The source population was constituted of all patients who underwent orthopedic surgery at TASH and the study population included all adult patients who had elective orthopedic surgical procedure and were admitted to the PACU between August 2017 and October 2017.

4.5 Sample size determination

The sample size was calculated using single proportion formula; assuming that the expected prevalence of postoperative pain to be 50 %; with margin of error (w) 5% and a confidence

interval of 95% (Z=1.96). Therefore, the sample size is calculated to be 384. With the assumption of 10% incomplete data the final sample size is determined to be 423.

$$n = \frac{z^2 p(1-p)}{w^2}$$

Where:

n = required sample size

p = prevalence of post operative pain

w = margin of error

4.6 Study variables

4.6.1 Dependent variable

- Postoperative pain

4.6.2 Independent variables

- Age
- Sex
- Marital status
- Education
- Occupation
- Residence
- Indication for surgery
- Type of anesthesia
- Intraoperative and postoperative pain management modalities
- Duration of the surgery

4.7 Data collection and management

Data was collected using a number of ways. These include:

1. Review of patients' medical records i.e. files, treatment sheets and intraoperative anesthetic charts.
2. Use of interview schedule, which was administered to the subjects and responses filled in by the researcher.
3. Use of pain-rating scales (VAS) to assess the level of postoperative pain experienced by the patients.

The interviews were transcribed into language that the patient understands and the completed questionnaires were verified. Four nurses working at TASH were trained and three of them were assigned as a data collector. In addition first year anesthesiology residents at AAU were also involved in the data collection process.

The data was entered, cleaned, and analyzed using Statistical Package for the Social Sciences (SPSS) version 20.

4.8 Dissemination of the result

The study result will be presented to Addis Ababa University, School of Medicine, Department of Anesthesiology and documents are disseminated to all responsible bodies in the study area, and Addis Ababa University School of Medicine.

5 Results

A total of 384 patients above the age of 18 and who had undergone major orthopedic procedure at Tikur Anbessa Specialized Hospital from August 2017 to October 2017 were included in the survey.

5.1 Socio-demographic characteristics of study participants

Among the total of 384 patients 234 (60.9%) were males while 150 (39.1%) were females. Mean age of patients was 38.79 (SD 18.079). The minimum age was 18 and the maximum was 87. Of the total participants, 133 (34.6%) were single, 186 (48.4%) were married, 27 (7%) were divorced and 38 (9.9%) were widowed (Table 1).

The educational status of the study participants was those who attended TVET/College/University 52 (13.5%), secondary school 84 (21.9%), primary level education 114 (39.7%) and those who were illiterate account the highest number of participants 147 (35.3%). Among the total of participants, 134 (34.9%) were unemployed, 46 (12%) were government employee, 65 (16.9%) were private employee while 139 (36.2%) were self-employee (Table 1). The usual residence of the study participants were urban 162 (42.2%) while those who live in the rural area were 222 (57.8%) (Table 1).

Table 1: Socio-demographic characteristics of patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

Socio-demographic characteristics		n (%)
Sex	Male	234 (60.9)
	Female	150 (39.1)
Marital status	Single	133 (34.6)
	Married	186 (48.4)
	Divorced	27 (7)
	Widowed	38 (9.9)
Educational level	Illiterate*	134 (34.9)
	Primary school	114 (29.7)
	Secondary school	84 (21.9)
	Attended TVET/College/University	52 (13.5)
Occupation	Unemployed**	134 (34.9)
	Government employee	46 (12)
	Private employee	65 (16.9)
	Self-employee	139 (36.2)
Usual residence	Urban***	162 (42.2)
	Rural	222 (57.8)

* cannot read or write, ** with no source of income of their own, *** of relating to, or constituting a city or town

5.2 Preoperative

Surgeries of the lower limb constituted 260 (67.7%) whereas upper limb surgeries 112 (29.2%), upper and lower limb combined surgeries 11 (2.9%), spine and lower extremity 1 (0.3%) accounted of the operations during the study period (Table 2). Fracture was the leading cause for major orthopedic surgeries among the study participants 270 (70.3%)(Figure 1). Neoplasm 40 (10.4%) followed as a second leading cause for major orthopedic surgery (Figure 1). Among this trauma was the major cause for fracture and it constitutes 281 (95.3%) whereas pathologic fracture accounted for 14 (4.7%) (Figure 2).

Majority of the patients 304 (79.2%) did not have history of previous surgery while the remaining 80 (20.8%) had previous surgery.

Table 2: Site of lesion (surgery) of patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

Site of lesion	n (%)
Upper limb	112 (29.2)
Lower limb	260 (67.7)
Upper and lower limb	11 (2.9)
Lower limb and spine	1 (0.3)

Among the study participants 244 (63.5%) of patients expected a moderate level of pain post operatively while 76 (19.8%) and 62 (16.1%) of patients expected high and mild level of pain respectively (Table 3).Regarding premedication only 2 (0.5%) of the patients received a benzodiazepine (diazepam 5mg oral premedication and 1 (0.3%) patient received an opioid premedication (fentanyl 25ug IV).

Table 3: Expected post-operative level of pain of patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

Expected level of pain	n (%)
Very low or low	2 (0.5)
Mild	62 (16.1)
Moderate	244 (63.5)
High	76 (19.8)

Figure 1: preoperative diagnosis of patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

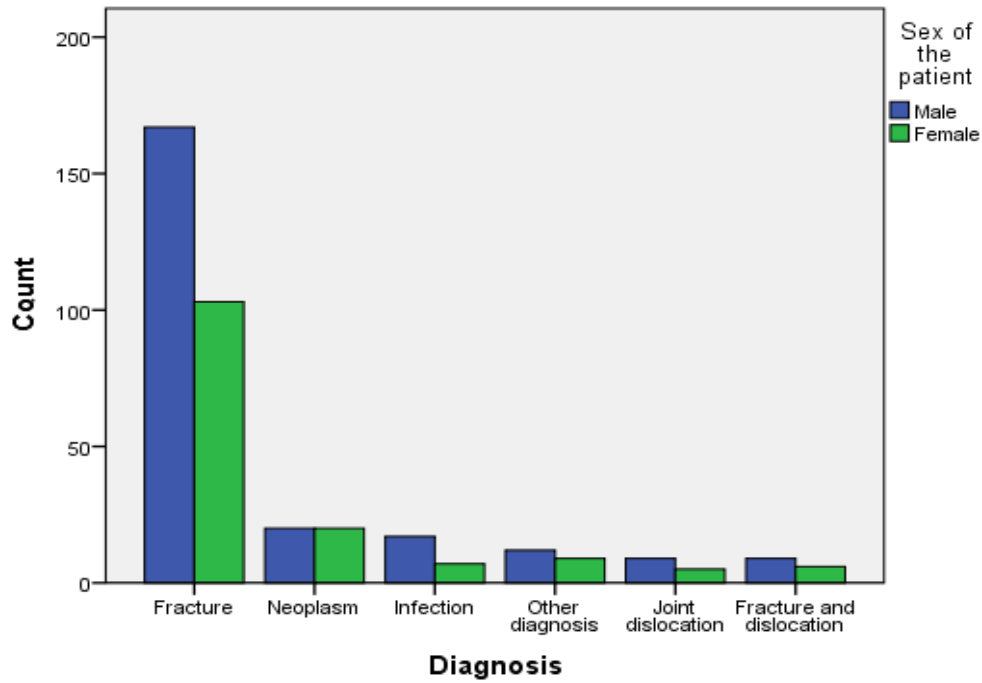
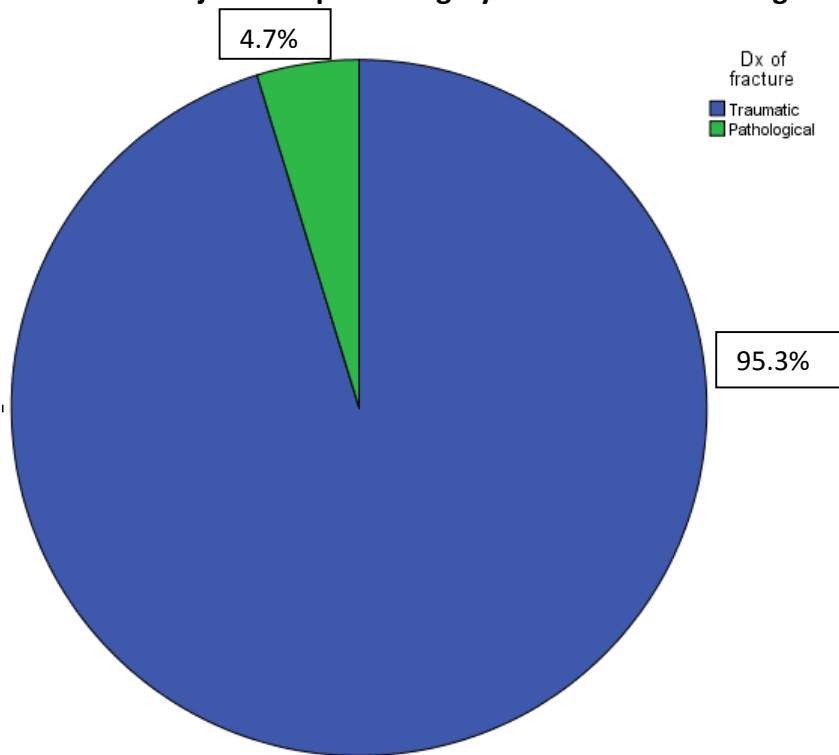


Figure 2: Sub classification of the diagnosis of fracture among patients(n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

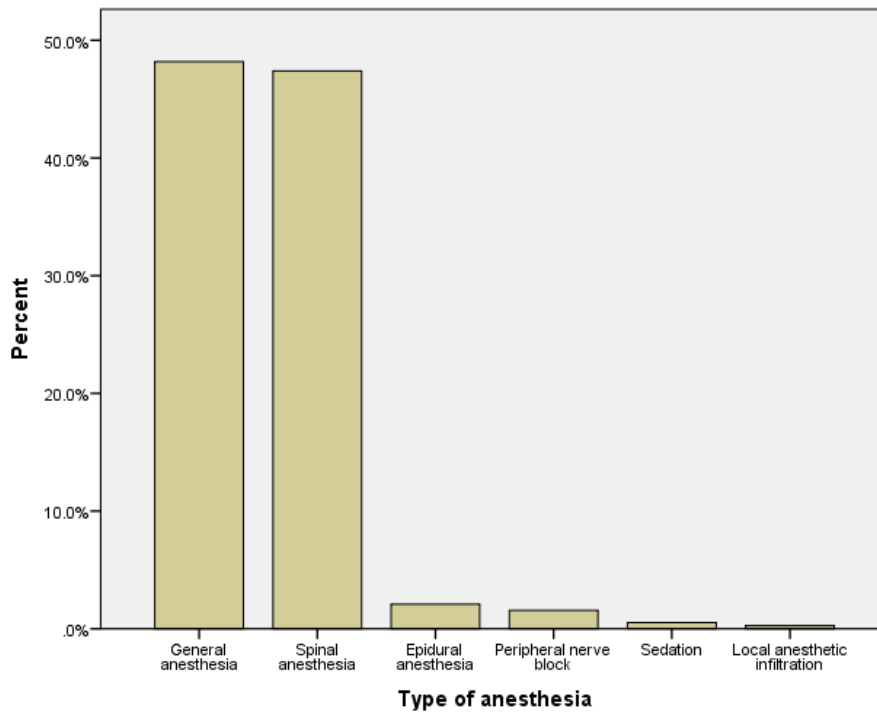


5.3 Intraoperative

Open Reduction and Internal Fixation (ORIF) is the highest type of operation performed during the study period 262 (68.2%) followed by excisional biopsy 40 (10.4%) and Irrigation and Drainage (I&D) 32 (8.3%) respectively (Table 4).

Regional anesthesia was the commonest type of anesthesia administered during the surgeries 199 (51.3%). Among the regional anesthesia spinal anesthesia accounted for 182 (47.4%) while epidural anesthesia 8 (2.1%), and peripheral nerve block 6 (1.6%). The rest of the operations were performed by administration of general anesthesia 185 (48.2%)(Figure 3). Majority of the operations done under general anesthesia were upper limb surgeries 106 (57.3%) and spinal anesthesia were administered for most of the lower limb surgeries (Figure 4).

Figure 3: Type of anesthesia administered for patients (n=384) who underwent major orthopedic surgery in TASH between

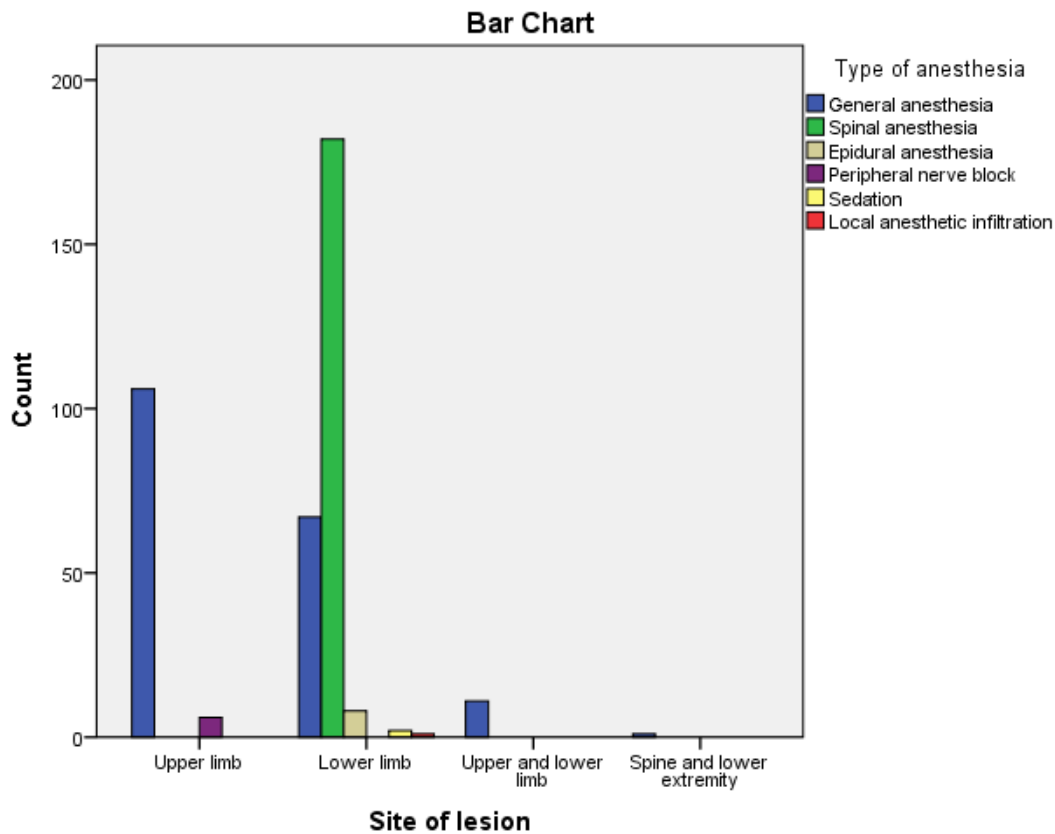


August – October, 2017

Table 4: Type of surgeries performed on patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

Type of surgery	n (%)
ORIF	262 (68.2)
Excisional biopsy	40 (10.4)
I&D	32 (8.3)
Amputation	17 (4.4)
Joint replacement	14 (3.6)
External fixation	8 (2.1)
Debridement	11 (2.9)

Figure 4: Relationship between site of surgery and type of anesthesia among patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017



Among patients who were operated under general anesthesia 98 (53%) received morphine (IV), 38 (20.5%) received combination of diclofenac (IM) and tramadol (IV), 35 (18.9%) received tramadol (IV) intraoperatively (Table 5). Among those patients which spinal anesthesia was conducted only 3 (1.6%) patients received tramadol intraoperatively. Those which undergone epidural and peripheral nerve block anesthesia did not receive any additional systemic analgesic intraoperatively (Table 5).

The mean duration of surgery was found to be 157.9 minutes (min) (SD 49.2). The minimum duration of surgery was 30 minutes and the maximum 320 min.

Table 5: Type of anesthesia and intraoperative analgesics used in patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

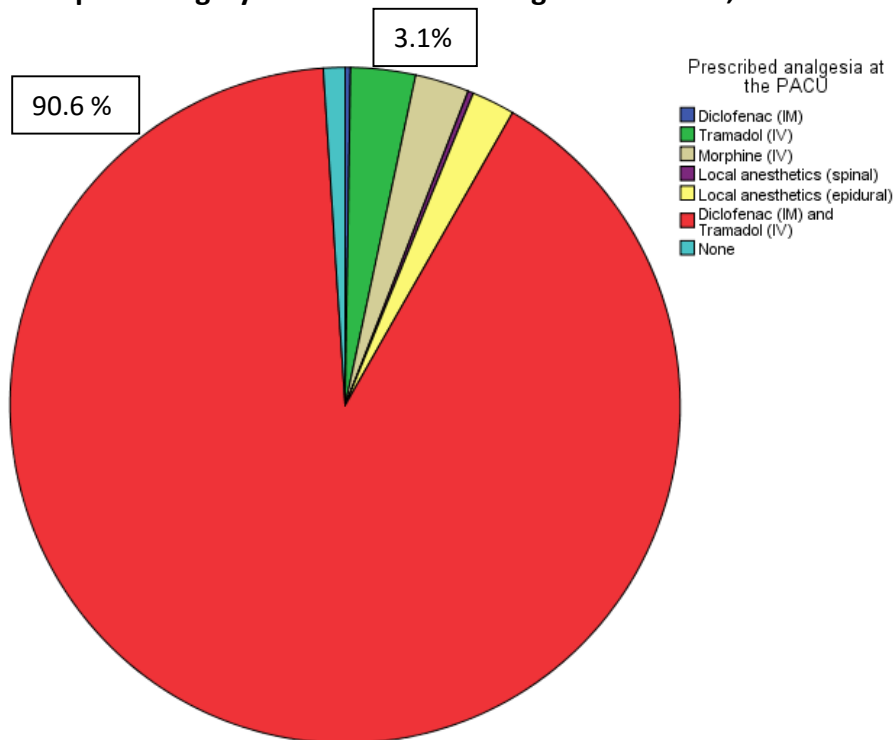
Intraoperative analgesics	Type of anesthesia			
	General anesthesia	Spinal anesthesia	Epidural anesthesia	Peripheral nerve block
Morphine (IV)	98 (53%)	0.0%	0.0%	0.0%
Tramadol (IV)	35 (18.9%)	3 (1.6%)	0.0%	0.0%
Diclofenac (IM) and Tramadol (IV)	38 (20.5%)	0.0%	0.0%	0.0%
Diclofenac (IM) and Morphine (IV)	3 (1.6%)	0.0%	0.0%	0.0%
PNB* and Tramadol (IV)	5 (2.7%)	0.0%	0.0%	0.0%
PNB and Morphine (IV)	2 (1.1%)	0.0%	0.0%	0.0%
PNB	4 (2.2%)	0.0%	0.0%	0.0%

* Peripheral Nerve Block

5.4 Postoperative

The commonest analgesic prescribed at the post operative period (in the PACU) was combination of diclofenac 75mg IM and tramadol 50mg IV 348 (90.6%) followed by tramadol 50mg IV 12 (3.1%) and morphine 3-5mg IV 10 (2.6%) as a sole analgesic agent (Figure 5). Orthopedic residents account for 351 (91.4%) in prescribing the post operative analgesics. Consultant anesthesiologist, consultant surgeon, anesthesiology residents, and nurse anesthetists prescribed in 12 (3.1%), 8 (2.1%), 8 (2.1%), and 4 (1%) of cases respectively (Table 6).

Figure 5: Prescribed analgesics at the PACU for patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

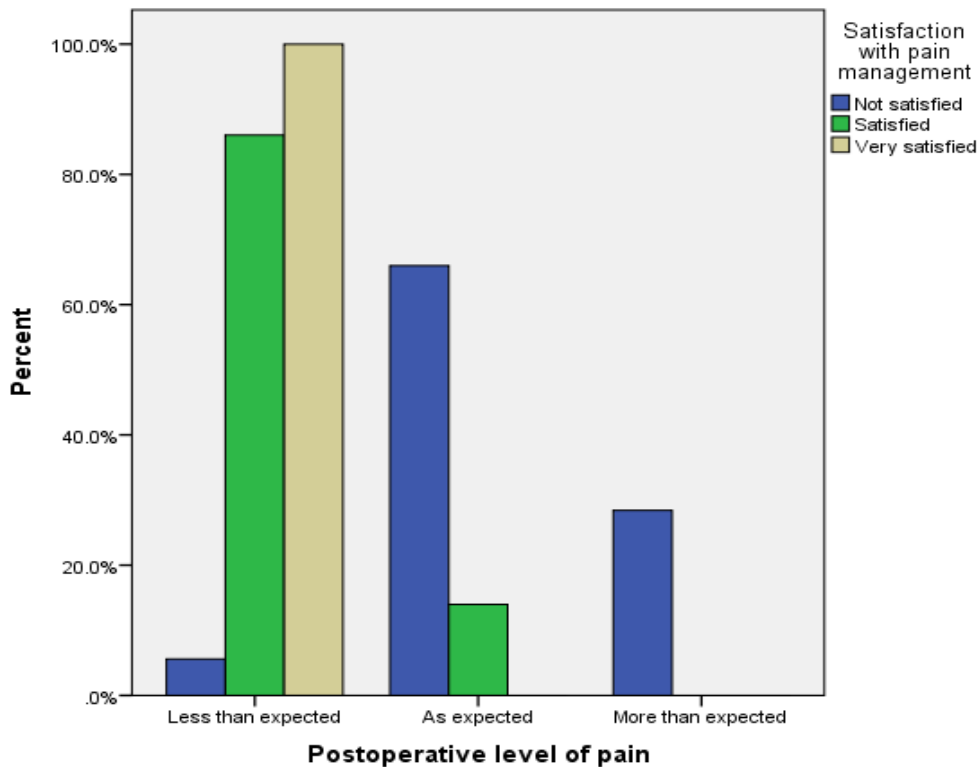


From patients who reported post operative pain of less than expected 160 (93%) were satisfied and among those who experienced post operative pain as expected 130 (83.3%) were not satisfied. All patients who had post operative pain of more than expected were not satisfied 56 (100%) (Figure 6).

Table 6: Post operative analgesics prescribers at the PACU for patients (n=324) who underwent major orthopedic surgery in TASH between August – October, 2017

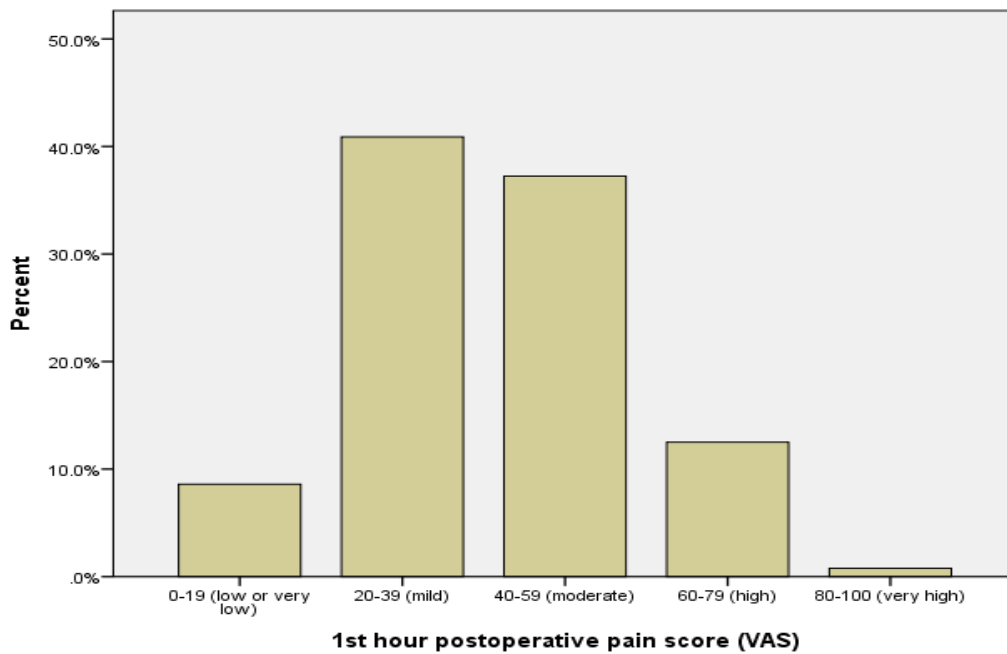
Analgesics prescribed by	n (%)
Orthopedics surgical resident	351 (91.4)
Consultant anesthesiologist	12 (3.1)
Consultant surgeon	8 (2.1)
Anesthesiology resident	8 (2.1)
Nurse anesthetists	4 (1)

Figure 6: Level of post operative pain and patient satisfaction of patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017



Only 111 (28.9%) patients out of 384 study participants stayed for two hours in the PACU and all of them stayed for one hour in the PACU. Among those patients who stayed for one hour in the PACU 143 (37.2%) reported a moderate level of pain on the VAS (40-59), mild pain 157 (40.9%), high level of pain 48 (12.5%), very low or low level of pain 33 (8.6%), and very high level of pain was experienced by 3 (0.8%) (Figure 7). Among the 111 patients who stayed for the second hour in the PACU post operative pain score was 52 (13.5%) mild, 33 (8.6%), 15 (3.9%), and 11 (2.9%).

Figure 7: Post operative pain score (VAS) of patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

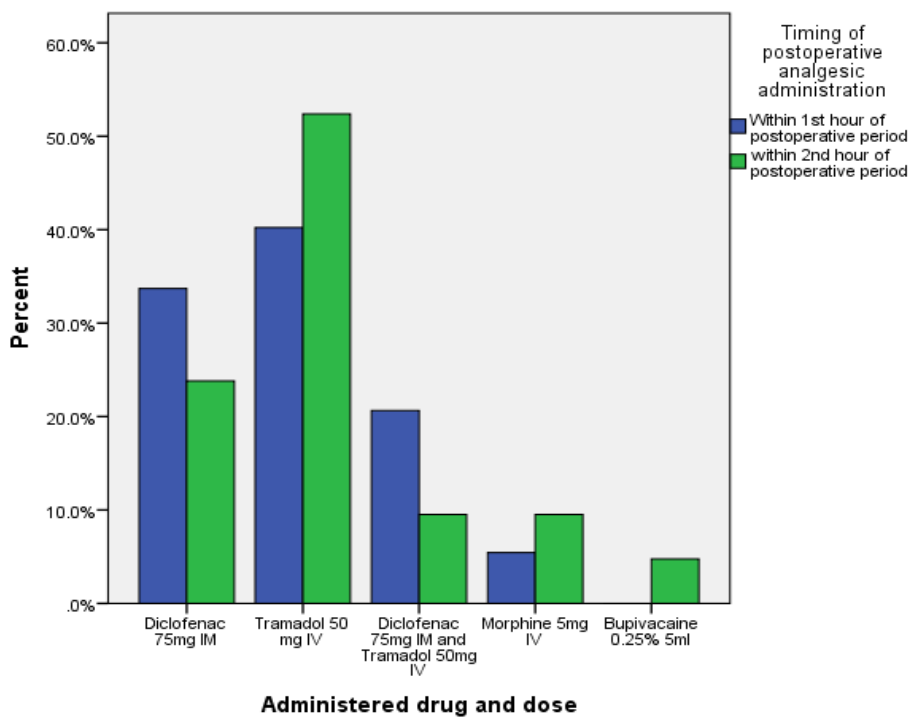


Patients who were operated under general anesthesia 82 (44%) reported moderate level of pain, 53 (28.6%) mild pain, 41 (22.1%) high level of pain during the first post-operative period

(Figure 8). Those who were operated under regional anesthesia 103 (52.2%) reported mild level of pain and 60 (30.4%) reported moderate level of pain (Figure 8).

Out of 324 study participants 113 (29.4%) received prescribed analgesics at the PACU. During the first post-operative hour 92 (24.5%), and during the second post-operative hour 21 (5.5%) patients were given prescribed analgesics. Tramadol 50mg IV accounted for 48 (42.5%) of the administered post-operative analgesics, combination of diclofenac 75 mg IM and tramadol 50mg IV, 21 (18.6%) , diclofenac 75mg IM 36 (31.9%), morphine 3-5mg IV 7 (6.2%), and bupivacaine 0.25%, 5ml via epidural catheter 1 (0.9%) (Figure 8).

Figure 8: Analgesics given in the PACU and timing of drug administration of patients (n=113) who underwent major orthopedic surgery in TASH between August – October, 2017



Out of 99 patients who received morphine 3-5 mg IV as an intraoperative analgesic during general anesthesia 53 (53.5%) experienced moderate level of pain, 15 (15.1%) higher level of pain during the first post-operative period. Among 35 patients who received tramadol 50mg IV

for intraoperative analgesia 9 (25.7%) experienced high and moderate level of pain each. Among 39 patients who received diclofenac 75mg IM and tramadol 50mg IV 21 (53.8%) reported moderate level of pain and 16 (41%) reported high level of pain during the first post-operative period. Among 3 patients who received diclofenac 75mg IM and morphine 3-5 mg IV 2 (66.6%) experienced mild post-operative pain (Table 7).

Table 7: The level of reported post operative pain during the 1st hour in relation to the type of intraoperative analgesics used for patients (n=384) who underwent major orthopedic surgery in TASH between August – October, 2017

		1st hour postoperative pain score (VAS)					Total
		0-19 (low or very low)	20-39 (mild)	40-59 (moderate)	60-79 (high)	80-100 (very high)	
Intraoperative analgesia	Tramadol (IV)	2	12	9	9	3	35
	Local anesthetics (spinal)	25	89	59	6	0	179
	Local anesthetics (epidural)	1	7	0	0	0	8
	Local anesthetics (PNB)	2	8	0	0	0	10
	Morphine (IV)	0	31	53	15	0	99
	Diclofenac (IM) and Tramadol (IV)	0	2	21	16	0	39
	Diclofenac (IM) and Morphine (IV)	0	2	0	1	0	3
	Local anesthetic (spinal) and Tramadol (IV)	1	1	1	0	0	3
	Local anesthetic (PNB) and Tramadol (IV)	2	3	0	0	0	5
	Local anesthetics (PNB) and Morphine (IV)	0	2	0	0	0	2
	Local anesthetic infiltration	0	0	0	1	0	1
	Total	33	157	143	48	3	384

6 Discussion

This study is a cross sectional survey designed to assess prevalence of postoperative pain and its management in Tikur Anbessa Specialized Hospital. Among the study participants 191 (49.7%) of patients experienced Moderate to high (severe) level of pain during the 1st post-operative hour. This finding shows a lesser level of post-operative pain than that was expected by the study participants preoperatively 320 (83.3%). But this study shows a higher number of moderate to severe post-operative pain compared to a study done at Saint Paul Millennium Medical College 119 (28.6%) surgical patients out of 423 study participants (12). This result may be due to the time difference of post-operative pain assessment and the type of operations performed.

With regard to study participants' post-operative level of pain and satisfaction, 172 (44.8 %) had post-operative pain of less than expected. Those who had post-operative level of pain as expected were 156 (40.6%) and 56 (14.6%) had pain more than expected. Study participants who were satisfied with the pain management are 186 (48.4%), 197 (51.3%) were not satisfied and 1 (0.3%) was very satisfied. A study done at Kenyatta National Hospital showed that out of 92 study participants 9% of them reported that they were very satisfied, 50% satisfied, and the remaining 41% were not satisfied with the pain management (22). This result may be due to time difference of post-operative pain assessment.

The commonest prescribed post-operative analgesia was found to be combination of intramuscular diclofenac and intravenous tramadol 348 (90.6%). And post-operative analgesics were commonly prescribed by orthopedic residents 351 (91.4%). But intravenous tramadol alone was the main stay of post-operative pain management among patients who received general anesthesia 48 (42.5%). A study done at Kenyatta National Hospital showed that 68% of the study participants received intramuscular pethidine, 20% combination of opioids and NSAIDs, and 12% only NSAIDs for post-operative pain management (22). The same study showed that post operative analgesics were mostly prescribed by the surgical senior house officers 93% and anesthetists were involved in 7% of the cases (22).

Most patients did not stay more than one hour in the PACU. Only 111 (28.9%) of patients stayed for two hours in the PACU.

Only 6 (5.3%) of patients undergoing upper limb surgery received a peripheral nerve block, the rest of the surgeries were done by general anesthesia 106 (94.7%). In this study it was found that spinal anesthesia was the main stay of anesthetic management for lower limb surgeries 182 (70%).

7 Limitations of the study

It was routine that patients were early transferred from PACU to the wards. This created a significant problem for assessment of the post-operative pain score trend in the PACU. It had also an impact on the assessment of patient response to the administered analgesics post operatively.

8 Conclusion

From the findings of this study it can be concluded that most orthopedic surgical patients were feeling moderate to severe pain in their post-operative period at the PACU of Tikur Anbessa Specialized Hospital. The prevalence of moderate to severe post-operative pain in adult orthopedic patients was found to be 49.7%. The finding of this study suggests that post-operative pain was not effectively managed. The analgesic choices that were employed to manage post-operative pain were also very limited (mainly intravenous weak opioids). In addition to this, post-operative pain was not assessed using appropriate pain rating scale and was not documented for every patient.

The prescribed analgesics at the PACU were not timely administered for patients in need. In addition anesthesia providers are not well involved in the post-operative pain management.

9 Recommendations

Based on the findings of the study the following recommendations can be made:

1. Majority of upper limb surgeries should be done under regional anesthesia unless contraindicated and in order to practice this consultant anesthesiologists and anesthesiology residents should be well versed with regional anesthesia techniques.
2. Assessment of pain should be performed for every post-operative patient using appropriate pain rating scales and should be documented.
3. Variety of analgesics should be included in the management of post operative pain depending on the level of pain felt by the patient. And for the ones that are already in use dosage must be properly titrated for the level of pain the patient is experiencing.
4. Documented pain rating scales should be used as a guide for choosing analgesics as well as changing type of medication according to the patients' pain.
5. Anesthesia providers should discuss with the patients about postoperative pain and its management.
6. A multidisciplinary acute pain service should be set up at the Tikur Anbessa Specialized Hospital to assist with and advice on acute postoperative pain management in the Hospital.

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11 Annex

11.1 Data abstraction tool

Addis Ababa University
College of Health Sciences
School of Medicine

Data abstraction tool

Bio demographical data

Age: _____years

Gender: Male Female

Educational status: Illiterate Grade 1-8 Grade 9-12

Attended TVET/College/University

Occupation: Government employee Private employee Self employee

Marital status: Married Single Divorced Widowed

Usual residence: Urban Rural

Pre-operative

Diagnosis:

Fracture: Traumatic Pathological

Neoplasm: Malignant Benign

Inflammation: Infection Other

Site of lesion:

Upper limb Lower limb Spine

Planned surgery: _____

Previous surgery: Yes No

Expected level of pain post-operatively:

None Very low or low Mild Moderate High Very high

Premedication:

Drug	Dose	Route	Time

Intraoperative

Operation: _____

Duration of surgery: _____ hours

Anesthesia: General Regional

Analgesia

Drug	Dose	Route	Time(s)

Post-operative

Prescribed analgesics at the PACU

Drug	Dose	Route	Time(s)

Analgesics prescribed by

Surgeon: Consultant

Resident

Anesthesiologist: Consultant

Resident

Anesthetist

Other: _____

Level of pain:

Less than expected

As expected

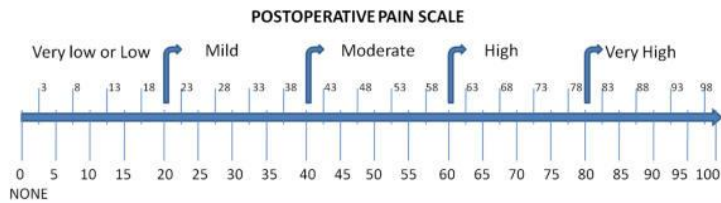
More than expected

Satisfaction with pain management: Not satisfied

Satisfied

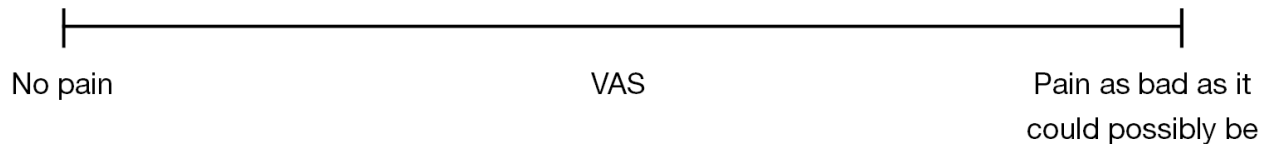
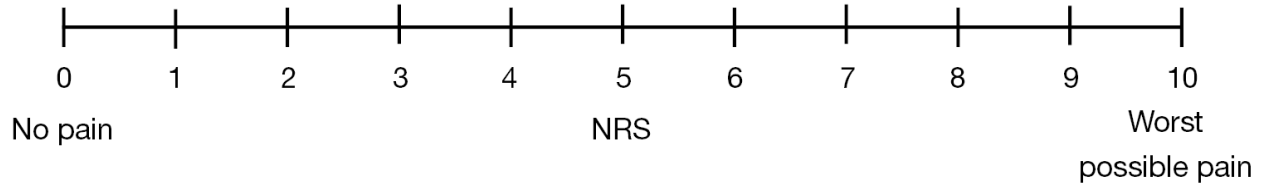
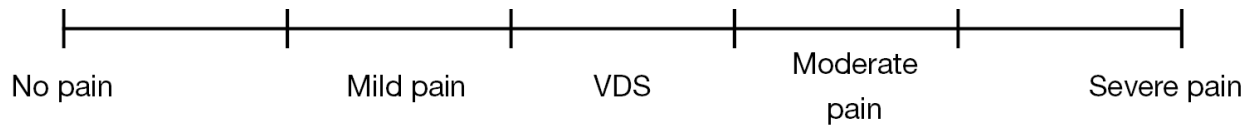
Very satisfied

Hours postop	1	2	3	4
BP				
PR				
RR				
SPO ₂				
T ⁰ (axillary)				
Pain score				
Intervention				



Please, select a point on the scale indicating the level of pain you are feeling or felt in the indicated period. The number **0** indicates **no pain** and **100** the **worst pain** possible and felt in the period.

11.2 Pain assessment tools



11.3 Verbal consent form before conducting interview

Greeting

Hello, my name is _____ and I'm a data collector for the study entitled "assessment of intraoperative and immediate postoperative pain management at the PACU in adult orthopedic surgical patients of Tikur Anbessa Specialized Hospital". It is a study aimed to assess the level of pain you are experiencing after having surgery in this hospital. I will ask you few questions that will only take few minutes of your time regarding this matter.

Being a part of this study will not affect in any way the service you are getting in this hospital. You are selected randomly to participate in the study just because you undergo a surgery in this hospital no other special criteria. You are free to withdraw from the study and you can stop answering to any questions that are forwarded to you at any time you want. In the study any answer you gave will be confidential and in addition your name, address or any information that identifies you will not be used.

Do you agree to participate in the study? Yes No

