Pain after surgery for knee replacement in Norway and for traumatic injury in Ethiopia: Observational cohort studies

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Doctoral Thesis

Series of dissertations submitted to the
Faculty of Medicine, University of Oslo

ISBN 978-82-348-0332-1

Cover: UiO.
Print production: Graphic center, University of Oslo.

Dedications

To my family members for their constant input, support, and love, especially to my mom (Tiruwork Shimekt), my dad (Getachew Enbakom), my husband (Professor Zeleke Mekonnen), and my two sons (Natannan Zeleke and Moses Zeleke).

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Acknowledgements

I am very grateful that Jimma University and University of Oslo gave me the opportunity to perform the research leading to this PhD. This doctoral thesis has been funded by the Research Council of Norway, the South Eastern Regional Health Authority, and the NORHED-SACCADE project. Without this collaboration and financial support, this work would never have been possible.

I wish to express my sincere gratitude to my main supervisor Associate Professor Maren Falch Lindberg and my co-supervisor Professor Anners Lerdal for their generosity, constant positivity, and insight during all phases of this work. I consider myself very fortunate to have them as my supervisors since they have supported me in many different ways and their guidance has helped me through the entire process. I am grateful for the statistical help from Dr Milada Cvancarova Småstuen and further wish to thank Professor Tefera Belachew for additional statistical advice. I would also like to thank Dr Caryl Gay, who provided valuable comments during the process of writing up the scientific articles, as well as Line Løw for her extensive administrative support.

This work would not have been possible without the encouragement, contributions and support of numerous people to whom I am very grateful. First, I wish to thank all the patients willing to offer their time and effort to participate in these studies and patiently fill in the questionnaires. I also wish to acknowledge and thank the data collectors for their enthusiastic and invaluable efforts. Furthermore, I would like to acknowledge Jimma Medical Center Hospital and Addis Ababa Burn Emergency and Trauma Hospital for allowing me to conduct this study at these two hospitals. This comprehensive study included data on total knee arthroplasty patients previously collected by Associate Professor Lindberg funded by Lovisenberg Diaconal Hospital, which provided a solid foundation for study I and II and enabled longitudinal follow-up, as well as original data collected from patients at two Ethiopian trauma centers for study III. My appreciation goes to all the people who supported me in completing this study directly or indirectly. It is impossible to mention you all by name.

Last but not least, thanks to my family for all their encouragement these past six years while I have been focused on this work. A warm thanks to my husband Professor Zeleke Mekonnen–

you have encouraged my academic thinking and the understanding you have shown all these years has been invaluable to me. My gratitude also goes to my children Natannan and Moses for being understanding and supportive. Many thanks to my sisters Hana Getachew and Aster Tesfaye who took on an extra workload when I was away - without your support, none of this would have been possible.

Summary

Background: Pain after orthopaedic surgery is a considerable clinical problem. Literature is scarce on postoperative pain trajectories, as well as investigating personal and surgical risk factors leading to a poor postoperative pain outcome in patients undergoing surgery following traumatic fracture in Ethiopia. Similarly, while several predictors of chronic pain after total knee arthroplasty (TKA) have been identified, further knowledge of pre- and perioperative associated factors for postoperative pain outcomes after TKA is needed.

Aims: This thesis aimed to assess the joint contributions of co-occurring preoperative symptoms (pain, fatigue, sleep problems, depression) to moderate-severe knee pain 12 months after TKA (study I), assess the association of daily rating worst pain intensity and daily opioid intake during the early postoperative period with moderate-severe knee pain 12 months after TKA (study II), and identify subgroups of patients with distinct acute postoperative pain trajectories, and evaluate the role of clinical, surgical, psychological and lifestyle factors with acute postoperative pain trajectory subgroups after traumatic fracture surgery (study III).

Methods: All studies included in this thesis are observational cohort studies. The sample for study I and II consists of 187 osteoarthritis patients were scheduled for elective primary TKA surgery at Lovisenberg Diaconal Hospital, Norway. The sample for study III comprises 218 patients who had traumatic fractures in upper and/or lower extremities and were scheduled for elective surgery at Jimma Medical Center (JMC) or Addis Ababa Burn Emergency and Trauma (AaBET) Hospital in Ethiopia. Data were collected from patients' medical records and patients answered a set of questionnaires about their pain, anxiety, depression, fatigue, sleep problems, and catastrophizing. Univariate and multivariate logistic regression models were used to measure the degree of association (study I – III). We used a growth mixture model to identify subgroups of patients with distinct trajectories of pain (study III).

Results: More than one-third of patients reported moderate-severe knee pain 12 months after TKA. Patients with co-occurrence of higher scores on both fatigue and pain measures prior to surgery had a 57% probability of experiencing moderate-severe knee pain 12 months after TKA. Similarly, patients with the co-occurrence of lower scores on both fatigue and pain prior to surgery had 14% probability of having moderate-severe knee pain 12 months after TKA (study

I). In study II, while significant in the univariate analyses, pain intensity on postoperative day (POD) 0–4 and opioid intake on POD 0–3 were no longer associated with moderate-severe knee pain 12 months after TKA after adjusting for possible confounders (i.e., BMI and preoperative pain). In study III, two subgroups of patients with distinct postoperative pain trajectories were identified: The rapid pain relief group (48% of the sample) and the consistently high pain group (52% of the sample). The sub-analyses stratified by cause of injury demonstrated that across all injury types, patients in the consistently high pain group were characterized by higher pain intensity before surgery. Additionally, in patients with fall-related injuries, those with longer duration of surgery were more likely to belong to the consistently high pain group. Those with a traffic-related injury who received nerve block anesthesia were less likely to belong to consistently high pain group.

Conclusion: This thesis suggested that the following personal factors: preoperative pain, fatigue, and the following surgical factors: duration of surgery, type of anesthesia were associated with moderate-severe postoperative pain. These factors may be important to identify orthopedic patients with higher risk for experiencing moderate-severe postoperative pain over time.

Sammendrag

Bakgrunn: Smerter etter ortopedisk kirurgi er et stort klinisk problem. Få studier har undersøkt postoperative smerteforløp, og personlige og kirurgiske risikofaktorer for mer alvorlige smerter hos pasienter som gjennomgår kirurgi etter frakturer ved traumatiske skader i Etiopia. Selv om flere risikofaktorer for kroniske smerter etter total kneprotese (TKP) har blitt identifisert i litteraturen er disse ikke fullt ut forstått. Derfor er det behov for mer kunnskap om pre- og perioperative faktorer som er assosiert med postoperative smerteutfall etter TKP.

Formål: Formålet med denne avhandlingen er å undersøke hvordan preoperative symptomer (Smerter, fatigue, søvnvansker, depresjon) er assosiert med moderate til sterke smerter 12 måneder etter TKP (studie I), undersøke assosiasjoner mellom daglige rangeringer av smerteintensitet og daglig opioidinntak i tidlig postoperativ fase og moderate til sterke smerter 12 mnd. etter TKP (Studie II), og identifisere subgrupper av pasienter med distinkte forløp av akutte postoperative smerteforløp, og undersøke sammenhengen mellom kliniske, kirurgiske, psykologiske og livsstils faktorer, med pasienter klassifisert i to subgrupper av akutte smerteforløp etter kirurgi for traumatiske frakturer (studie III).

Metode: Alle studiene som inngår i denne avhandlingen er prospektive observasjonsstudier. Utvalget for studie I og II består av 187 artrosepasienter som gjennomgikk elektiv kirurgi med TKP ved Lovisenberg Diakonale Sykehus, Norge. Utvalget for studie III består av 218 pasienter som gjennomgikk elektiv traumekirurgi for frakturer i over og underekstremiteter ved Jimma Medical Center (JMC) eller Addis Ababa Burn Emergency and Trauma (AaBET) Hospital i Etiopia. Data ble innhentet fra pasientenes journal, og pasientene svarte på et spørreskjema om smerter, angst, depresjon, fatigue, søvnproblemer og katastrofetanker. Uni- og multivariate logistiske regresjonsmodeller ble benyttet for å undersøke grad av assosiasjoner (Studie I – III).

Vi benyttet Growth Mixture Modeling for å identifisere subgrupper av pasienter med distinkte forløp av smerter (Studie III).

Resultater: Mer enn en tredjedel av pasientene rapporterte moderate til sterke smerter 12 måneder etter TKP. Pasienter med høyere skårer på både fatigue og smerter før operasjon hadde en 57% probabilitet for å oppleve moderate til sterke smerter 12 måneder etter TKP. Tilsvarende hadde pasienter med lavere skår på både fatigue og smerter før operasjonen 14% probabilitet for å ha moderate til sterke smerter 12 måneder etter TKP (Studie I). I studie II fant vi at selv om smerteintensitet ved postoperativ dag (POD) 0 – 4, og opioidinntak gjennom POD 0-3 var signifikant i univariate analyser var disse faktorene ikke lenger assosiert med moderate til sterke smerter ved 12 måneder i de multivariate analysene kontrollert for mulige konfunderende faktorer (BMI, preoperative smerter). I studie III identifiserte vi to subgrupper med distinkt forskjellige forløp av postoperative smerter: «Rask smertelindring» (48% av utvalget) og «Konsistent høy smerte» (52% av utvalget). Subgruppeanalysene basert på skadeårsak viste at på tvers av alle skadeårsaker var pasientene i «konsistent høy smerte» karakterisert ved høyere smerteintensitet før operasjonen. I tillegg, hos pasienter med fall-relaterte skader hadde de med mer langvarig operasjonstid mer sannsynlighet for å være i subgruppa «konsistent høy smerte». De med trafikkskader som fikk nerveblokkade hadde mindre sannsynlighet for å være i subgruppen «konsistent høy smerte».

Konklusjon: Denne avhandlingen har vist at to personlige faktorer (preoperativ smerte, fatigue) og to kirurgiske faktorer (operasjonstid, type anestesi) var assosiert med moderate til sterke smerter. Faktorene kan ha betydning for å identifisere ortopediske pasienter med høyere risiko for moderate til sterke smerter over tid.

Abbreviations

AaBET: Addis Ababa Burn Emergency and Trauma

ASA: American society of anesthesiologists

BPI: Brief Pain Inventory

BPS: Biopsychosocial

BMI: Body Mass Index

HADS: Hospital Anxiety and Depression Scale

IASP: International Association for the Study of Pain

JMC: Jimma Medical Center

LFS: Lee Fatigue Scale

NRS: Numeric rating scale

OA: Osteoarthritis

POP: Postoperative pain

POD: Postoperative day

PSQI: Pittsburgh Sleep Quality Index

PCS: Pain Catastrophizing Scale

TKA: Total knee arthroplasty

UNESCO: United Nations Educational, Scientific and Cultural Organization

List of studies included in the thesis

Study I

Getachew M, Lerdal A, Småstuen MC, Gay CL, Aamodt A, Tesfaye M, Lindberg MF. High levels of preoperative pain and fatigue are red flags for moderate-severe pain 12 months after total knee arthroplasty-A longitudinal cohort study. *Musculoskeletal Care*. 2021 Jun; 19(2):186-192. doi: 10.1002/msc.1522.

Study II

Getachew M, Lerdal A, Småstuen MC, Gay CL, Aamodt A, Tesfaye M, Lindberg MF. Worst pain intensity and opioid intake during the early postoperative period were not associated with moderate-severe pain 12 months after total knee arthroplasty - a longitudinal study. *Scand J Pain*. 2022 Aug 8. doi: 10.1515/sjpain-2022-0007.

Study III

Getachew M, Lerdal A, Småstuen MC, Eshete MT, Desta T, Lindberg MF. Modifiable factors associated with a consistently high acute pain trajectory after surgical treatment of traumatic fractures in Ethiopia: a multi-center prospective cohort study. *J Orthop Surg Res*. 2023 Apr 10;18(1):288. doi: 10.1186/s13018-023-03770-0.

1 Introduction

My academic background comes from my education in two different but related areas: nursing and pharmacy. Over the course of my clinical experience as a health care provider in an orthopedic ward at Jimma University Hospital in Ethiopia, I witnessed many patients suffering from severe pain. As is common in low-income countries like mine, the hospital setting was part of an overburdened public healthcare system, with limited acute pain services, a lack of critical resources, such as staffing, equipment, and funding, and little evidence about pain trajectories and management.

By definition, pain is a multifactorial and highly personal experience (Raja et al. 2020), a continuous ongoing interaction between biological and psychosocial factors in the processes of illness and recovery. In this context, the experience of pain is characterized by remarkable inter-individual variability in these factors (Fillingim 2017; Coghill 2010). The mysterious science of pain increased my interest in looking forward to pain research and to contribute to the knowledge in this field. I unexpectedly had an opportunity to complete a Sandwich PhD at the University of Oslo, allowing me to address the question of which factors modulate pain among orthopedic patients?

Thus, together with my supervisors, I developed a research protocol for a clinical study with the title "pre-operative clinical and psychological predictors of acute pain trajectories and quality of life in traumatic fracture surgery patients at Jimma University Medical Center, Ethiopia." The protocol was similar to and included the same instruments as a previous study by my supervisors, which focused on osteoarthritis patients receiving TKA as elective surgery in Oslo, Norway.

I started as a PhD fellow in August, 2017. My PhD journey has been long and full of dramatic and unforeseen events, causing major delays in the recruitment of patients in my original study and constant adaptations to the project in order to reach the goal of the dissertation. I encountered a lot of difficulties, particularly civil war and political instability in Ethiopia, which caused periods of internet shut-down in Ethiopia, hindering my ability to search for literature and engage in online supervision with my supervisors, as well as periods when surgery was shut-down due to foreign surgeons leaving Ethiopia. I also experienced lockdown due to the COVID-

19 pandemic when I was in Oslo, and had 24 hours to leave the country before lockdown. These challenges extended throughout the data collection period, which was planned to last 7 months (February to August, 2019), but could not be completed until 07 October 2021. These situations also impacted my budget, and delayed my publications and PhD project time line (the deadline was January, 2021).

Accordingly, in July 2019, I and my supervisors discussed in-depth a strategy for overcoming these circumstances, and we have made two adjustments to the project:

The first adjustment was to move forward with a secondary data analysis using a Norwegian sample of TKA patients. Based on my review of the existing literature, I developed new proposals and prepared two scientific articles based on the sample patients undergoing elective TKA surgery in Norway (Lindberg 2017).

The second adjustment was to include an additional trauma center in Ethiopia, thereby expanding the project to a multicenter study. Based on the data collected in Ethiopia, I prepared a scientific article that identified subgroups of patients with distinct acute postoperative pain trajectories, and determined the associations of pre- and intraoperative factors with acute postoperative pain trajectory subgroups.

Patients undergoing orthopedic surgery still suffer from postoperative pain to varying degrees in both low- and high-income countries across the globe. While receiving treatment based on a standard acute pain management protocol, more than half of orthopedic patients experienced moderate to severe acute postoperative pain in high-income countries (Lindberg et al. 2013; Farčić et al. 2017; Zaslansky et al. 2015). At the time this study was initiated, there was no data regarding pain magnitude after orthopedic surgery in Ethiopia, but two studies found that 78% of patients in Gondar Hospital (Admassu, Hailekiros, and Abdissa 2016), and 91.4% of patients in Jimma Hospital (Woldehaimanot, Eshetie, and Kerie 2014) experienced moderate to severe acute postoperative pain following a variety of surgical procedures.

2 Background

2.1 Postoperative pain

All surgical procedures occur after an incision and the link between a surgical incision (noxious stimuli) and pain perception by the patient involves complex interactions between neural and immune networks within the peripheral and central nervous system. Multiple brain regions along with inhibitory and excitatory chemical messengers are involved in bottom-up as well as top-down modulation of noxious stimuli from the periphery by either enhancing or reducing transmission through multiple mechanisms. Moreover, multiple brain regions overlap with the same circuits that are involved with emotions and cognitions and that can shape a patient's experience of pain (Ossipov, Dussor, and Porreca 2010; Bannister 2019).

Most patients who undergo surgery recover and resume their normal daily activities within weeks. However, 10% to 50% of patients' pain persists after common operations (Gan 2017) and this is considered a major clinical as well as social, and economic problem globally (Henschke, Kamper, and Maher 2015). Poor control of acute postsurgical pain influences patient recovery, prolongs hospital stays, increases hospital morbidity, increases the risk of chronic pain, and adds to the burden of growing healthcare costs (Gan 2017).

2.2 Chronic pain

Chronic pain is defined as "pain that persists beyond the course of an acute disease or a reasonable time for an injury to heal or that is associated with a chronic pathologic process that causes continuous pain or the pain recurs at intervals of months or years. Some investigators use a duration of ≥ 6 months to designate pain as chronic" (Chekka and Benzon 2018).

A large-scale survey in the adult general population in 15 European countries and Israel showed that, on average, one in five individuals reported chronic pain, with osteoarthritis and joint pain (42%) accounting for the highest proportion; this survey also showed that the observed prevalence of chronic pain was highest (30%) in Norway (Breivik *et al.* 2006).

2.3 Osteoarthritis of the knee

Globally, the age-standardized prevalence of osteoarthritis (OA) increased by 9.3% between 1990 and 2017, and OA prevalence increased with age and was higher among women (Safiri et al. 2020). OA is a common progressive multifactorial joint disease, involving articular cartilage, subchondral bone, synovial membrane, and ligaments (O'Neill and Felson 2018), and is classically accompanied by chronic pain. Pain in OA is multifactorial; besides the mechanical factors and "wear and tear", both peripheral and central pain processing mechanisms are involved (O'Neill and Felson 2018; Neogi 2013).

Patients with knee OA typically have substantial functional impairment in their normal daily activities as well as chronic pain (Neogi 2013). TKA is considered an effective intervention to decrease pain and improve function in patients at an advanced stage of the disease. However, this is not the case for all patients. A systematic review reported that 10% to 34% of patients had moderate-severe pain persisting beyond 3 months after TKA (Beswick et al. 2012), and that approximately 20% of patients reported being dissatisfied following TKA (Gunaratne et al. 2017). Owing to this finding, the resolution of pain after TKA has become a major concern and the reasons for poor pain outcome after TKA have not been clearly identified. Because pain is a multifactorial process, to further improve the success of TKA, it is important to prioritize the identification of modifiable pre- and postoperative risk factors for chronic pain. This knowledge could assist clinicians with identifying patients at higher risk for poor pain outcome and might also help in developing preventive measures.

2.3.1 Pre- and postoperative factors associated with chronic pain after TKA

At the initiation of this study, we searched the research literature for pre-, intra-, and postoperative predictors of persistent pain after TKA. The next section describes the studies we found in the existing literature:

A meta-analysis of 32 studies representing almost 30 000 patients aimed to identify the preoperative factors that might predict chronic pain after TKA (Lewis et al. 2015). The results suggested that pain catastrophizing, poor mental health, preoperative knee pain severity, and pain at other sites were the strongest independent predictors of persistent pain based on a minimum follow-up of 3 months after TKA.

Another two systematic reviews addressed the influence of preoperative psychological factors on chronic pain outcomes (Khatib et al. 2015; Sorel et al. 2019). These reviews found that pain catastrophizing, mental distress, symptoms of anxiety and/or depression were significant predictors of chronic pain based on a longer minimum follow-up of one year after TKA.

The most recent meta-analysis (Ashoorion et al. 2022) examined risk factors for persistent pain after TKA with a minimum follow-up of 3 months, and discovered that younger age, female sex, pain catastrophizing, more preoperative pain were risk factors for persistent pain. Furthermore, this review found that BMI, preoperative range of motion, bilateral vs unilateral knee replacement, ASA score were not associated with persistent pain after TKA.

Other studies have found that higher BMI (Fisher et al. 2007), preoperative long-term use of opioids (Smith et al. 2017; Zywiel et al. 2011; Edwards et al. 2022), higher preoperative levels of negative affect, preoperative pain history, and disrupted sleep (Edwards et al. 2022) were predictors of chronic pain following TKA.

Likewise, there is literature to support that patients' acute postoperative pain experiences are potential contributors to chronic pain after TKA (Buvanendran et al. 2019; Lloret-Linares 2016; Singh et al. 2019; Puolakka et al. 2010; Ashoorion et al. 2022).

2.3.2 Knowledge gap at the start of the study about factors associated with chronic pain after TKA

Firstly, in OA patients, while pain is the predominant symptom, a number of studies reported that fatigue (Fishbain et al. 2003; Power et al. 2008), sleep disturbances (Pickering et al. 2016), and psychological distress (Stubbs et al. 2016) are frequently co-occurring symptoms in OA patients. Furthermore, a number of studies highlighted that each symptom has the potential to intensify the expression of other symptoms (Parmelee, Tighe, and Dautovich 2015; Smith et al. 2009; Hawker et al. 2011; Irwin et al. 2012; Fishbain et al. 2003; Pickering et al. 2016; Tanaka, Minamiarita, and Kito 2015). Interestingly, while fatigue is common in OA patients, to my knowledge no single study assessed the contribution of fatigue on pain outcomes after TKA. Furthermore, studies examining the impact of these 4 most prevalent preoperative symptoms (i.e., pain, depression, sleep quality, fatigue) on chronic pain outcomes after TKA are rare, and most of the studies address these symptoms in isolation or only two symptoms at a time.

Secondly, a few studies have explored the association between acute postoperative pain and chronic pain after TKA (Buvanendran et al. 2019; Puolakka et al. 2010; Singh et al. 2019; Thomazeau et al. 2016). However, the analyses in these studies did not account for patients' preoperative pain level, a confounder that is known to predict pain following TKA (Lewis et al. 2015). Moreover, these studies were limited by short follow-up periods i.e., six months (Thomazeau et al. 2016; Singh et al. 2019; Buvanendran et al. 2019), despite a systematic review reporting that, on average, clinically important improvement typically occurs over the first 12 months (Browne, Bastaki, and Dawson 2013).

Thirdly, opioids are an important component of multimodal perioperative pain management (Parvizi, Miller, and Gandhi 2011). Unfortunately, long-term, and even short-term opioid administration, as well as high doses may result in patients becoming more sensitive to pain, potentially leading to highly intense pain over time (Yi and Pryzbylkowski 2015). In fact, there is evidence that the use of opioid medication for more than one month prior to surgery is associated with more severe pain at rest and walking during the first six postoperative days (Aasvang et al. 2016), and that the long-term use of oral opioid medications for knee pain before surgery increased the risk of persistent pain for up to two years after TKA (Smith et al. 2017; Zywiel et al. 2011). However, studies on the relationship between early postoperative opioid intake and how they relate to chronic postoperative pain after TKA are scarce. To my knowledge, only one study (van Gulik et al. 2012) found the association between a higher intraoperative remifentanil dose and severe pain one year after cardiac surgery. Based on the entire above-mentioned research gap, we designed two studies:

- Study I assessed the contributions of co-occurring preoperative symptoms (pain, fatigue, sleep problems, depression) in relation to moderate-severe knee pain 12 months after TKA.
- Study II assessed the associations of daily ratings of worst pain intensity and daily opioid intake during the early postoperative period, with moderate-severe knee pain 12 months after TKA.

2.4 Traumatic fractures

Musculoskeletal injuries, particularly fractures, are a global public health problem (Wu *et al.* 2021). Trauma or injury is a growing national concern in Ethiopia (Ali et al. 2020). Among patients hospitalized for traumatic injuries, fractures represent the most common injury. In Asia, Africa and the United States (Mehrpour et al. 2015; ME et al. 2018; Amin et al. 2014; Gichuhi 2007; Pan et al. 2014), fractures occur in 29% to 76% of all injuries, and in Ethiopia, they occur in 33% to 41% of all injuries (Woldemichael and Berhanu 2011; Seyoum 2020).

In this study, traumatic fracture is described as an injury to bone that is caused by road traffic collisions, blunt injuries, falls, or other physical injuries. A traumatic bone fracture is a complete or incomplete discontinuity of bone. Pain has always been implicated as a symptom of traumatic fractures. The periosteum has an abundant supply of sensory and sympathetic fibers; the mechanical distortion of the periosteum has been remarkably sensitive and is suggested to be the major source of the immediate sharp and intense pain after trauma (Alves et al. 2016). A review of ten studies reported that orthopedic trauma patients experienced moderate to severe pain intensity during 1 to 14 days of their hospitalization in developed countries (Prastika, Kitrungrote, and Damkliang 2016).

In early fracture management, a multimodal approach to pain management is recommended (Hsu et al. 2019), and based on the severity of the fracture, either non-surgical or surgical methods are considered to realign the fractured bone. Of the surgical procedures, open reduction and internal fixation with devices, such as wires, plates and screws, and nails, are often considered to align the fractured bone segments. When the surrounding soft tissue is severely damaged, the use of internal fixation may be harmful, and thus, external fixation is usually considered to maintain the alignment of the bone until definitive surgery can be performed (Mock and International Association for the Study of Traditional 2004).

2.5 Acute pain after orthopedic and traumatic fracture surgery

Surgery always involves damage of tissues and nerve fibers; acute pain after surgery is a complex process involving activation of the pain receptors (nociceptors), chemical mediators and inflammation. Thus, the physiologic response and experience to the noxious stimuli is often abrupt in onset and both serves a protective function against a myriad of dangers and nurtures

tissue healing (Armstrong and Herr 2022; Aydede and Shriver 2018; St John Smith 2018). Acute pain usually lasts a few hours or days but often extends up to 30 days (Kent et al. 2017).

Even if acute pain serves a protective function, this is not always the case, and some patients suffer from more pain than others. A number of studies have shown that 20% to 71% of orthopedic surgery patients experienced moderate to severe intensity of pain in the immediate as well as early postoperative period (Robleda et al. 2014; Edgley et al. 2019; Chou et al. 2008; Storesund et al. 2016; Khalil, Shajrawi, and Henker 2021; Won et al. 2018; Radinovic et al. 2014; Haonga et al. 2011; Lindberg et al. 2013). In Ethiopia, the study of acute pain after orthopedic surgery has been the subject of only one recent study (Arefayne, Seid Tegegne, et al. 2020), which reported that 70.5% of patients after emergency orthopedic surgery experienced moderate to severe postoperative pain in the first 24 hours.

A pain trajectory is described as a longitudinal path showing dynamic changes in an individual patient's multiple pain measures over time. Assessing multiple pain scores over time helps to identify patients whose pain improved and those whose pain did not improve. Such an approach using repeated measurements to adequately characterize the rate of resolution of acute pain is more advantageous and increases the accuracy of information compared to the traditional approach to pain assessment that uses a single time measurement or aggregate of pain score (Chapman et al. 2011). Chapman *et al*. applied this method in a variety of clinical populations with acute pain, and characterized the direction of the pain resolution as having a decreasing, increasing or stable trajectory (Chapman et al. 2011; Chapman, Fosnocht, and Donaldson 2012; Chapman et al. 2012).

Moreover, the International Association for the Study of Pain (IASP) recently updated their definition of pain "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" (Raja et al. 2020). The definition also includes a statement that "pain is always a personal experience that is influenced to varying degrees by biological, psychological and social factors" (Raja et al. 2020). Accordingly, what is painful to one person may not be painful to another person. Different people may describe the same stimuli in different ways, and these individual differences in the experience of pain are likely the pain modulatory pathways affected by either one or many

interactions of each person's biological, psychological, and sociocultural background (Fillingim 2017; Melzack and Wall 1965; Coghill 2010; Gatchel et al. 2019).

Based on this background, the resolution of patients' acute pain after surgery may be varied, and several factors may contribute to the variability in pain resolution or pain trajectories. Identifying the pre- and intraoperative factors that influence the course of acute pain after traumatic fracture surgery may help to identify patients at increased risk for developing severe postoperative pain and in the clinical decision-making process to ameliorate high levels of postoperative pain.

2.5.1 Factors associated with acute pain after different surgical procedures

In our search of the literature, studies of a variety of surgeries in developing countries including Ethiopia, have identified a number of preoperative risk factors for moderate to severe postoperative pain including: previous surgery (Kasahun et al. 2022), lower educational status (Eshete et al. 2019), younger age (Eshete et al. 2019; Admassu, Hailekiros, and Abdissa 2016), female sex (Admassu, Hailekiros, and Abdissa 2016), longer duration of surgery (Argaw et al. 2019; Kasahun et al. 2022), presence of preoperative anxiety, nerve block (Kasahun et al. 2022), length of incision ≥10 cm (Admassu, Hailekiros, and Abdissa 2016; Kasahun et al. 2022), general anesthesia (Ndebea, Heuvel, et al. 2020; Admassu, Hailekiros, and Abdissa 2016).

A retrospective study by Armstrong *et al* (Armstrong et al. 2020) investigated risk factors for pre- and postoperative pain in patients undergoing elective orthopedic procedures and found that anxiety, current smoking, and preoperative opioid use increased the severity of preoperative pain, and pain in the first 48 postoperative hours. Also found that a correlation between history of alcohol use and lower pain score in the first 48 hours postoperatively.

In 2019, a meta-analysis of 33 studies by Yang *et al* (Yang et al. 2019), they evaluated preoperative factors might predict severe postoperative pain following different types of surgical procedures. The most important factors identified in this meta-analysis were: younger age, female sex, smoking, presence of preoperative pain, history of anxiety and depressive symptoms, sleep difficulties, and higher BMI.

2.5.2 Factors associated with acute pain after traumatic fracture surgery

At the time of proposed this study, I conducted a literature search to identify published studies on factors associated with acute postoperative pain after traumatic fracture surgery, with the primary source for identifying publications being PubMed and Africa Journals OnLine. The search was limited to publications on traumatic fracture surgery, adults, and in the English language. I also searched through the references of included studies to identify any publications missed by the queries.

Initially, from 2000 to 2023, a total of 456 studies were found, and after excluding non-relevant as well as duplicates studies, we were left with eight studies. Of these studies, three were retrospective and five were prospective studies. Through this literature search, there was no single study until 2020 from Ethiopia.

In summary, the eight studies from 2000 to 2023 showed that the following risk factors for acute postoperative pain with the follow-up time ranging from one hour to three days after surgery: female sex (Storesund et al. 2016; Edgley et al. 2019), preoperative pain (Arefayne, Seid Tegegne, et al. 2020; Chou et al. 2008), anticipated postoperative pain (Chou et al. 2008), preoperative anxiety (Robleda et al. 2014; Arefayne, Seid Tegegne, et al. 2020), fracture severity (Won et al. 2018), previous surgery (Edgley et al. 2019), patients' expectations about postoperative pain, general anesthesia vs regional anesthesia (Arefayne, Seid Tegegne, et al. 2020), preoperative smoking, and better physical health status (Khalil, Shajrawi, and Henker 2021), preoperative higher pain catastrophizing (Subedi et al. 2021). The only protective factor identified was younger age (Robleda et al. 2014).

2.5.2.1 Knowledge gap at the start of the study about factors associated with acute pain after traumatic fracture surgery

As we described above in our summary of the existing literature, not surprisingly, the current state of knowledge on acute pain is based on studies mainly from upper middle and high-income countries (Chou et al. 2008; Robleda et al. 2014; Yang et al. 2019; Storesund et al. 2016). However, the findings of such studies cannot necessarily be generalized to populations in low-income countries like Ethiopia, due to huge gap between such countries' health care systems,

patients' access to health services, trained health personnel and material resources, and socio-economic and cultural attitudes s (Sinatra 2010).

Secondly, there is evidence that the incidence of severe pain in the immediate postoperative period is two-fold higher in orthopedic surgery compared with other types of surgery (Ekstein and Weinbroum 2011). Similarly, Gerbershagen *et al* (Gerbershagen et al. 2013) shows that orthopedic and trauma procedures were ranked as having the highest pain intensity scores after surgery. Moreover, given the high incidence of injuries reported in Ethiopia (Woldemichael and Berhanu 2011; Azaj, Seyoum, and Nega 2013), information on acute postoperative pain after traumatic fracture surgery is of particular importance in the Ethiopian context.

Although a number of studies emerged after the initiation of this study (Edgley et al. 2019; Won et al. 2018; Khalil, Shajrawi, and Henker 2021; Arefayne, Seid Tegegne, et al. 2020; Subedi et al. 2021), to my knowledge, there is still an extreme scarcity of studies that have used multiple assessments of pain course, modeled the trajectories of acute postoperative pain and evaluated factors associated with these trajectories.

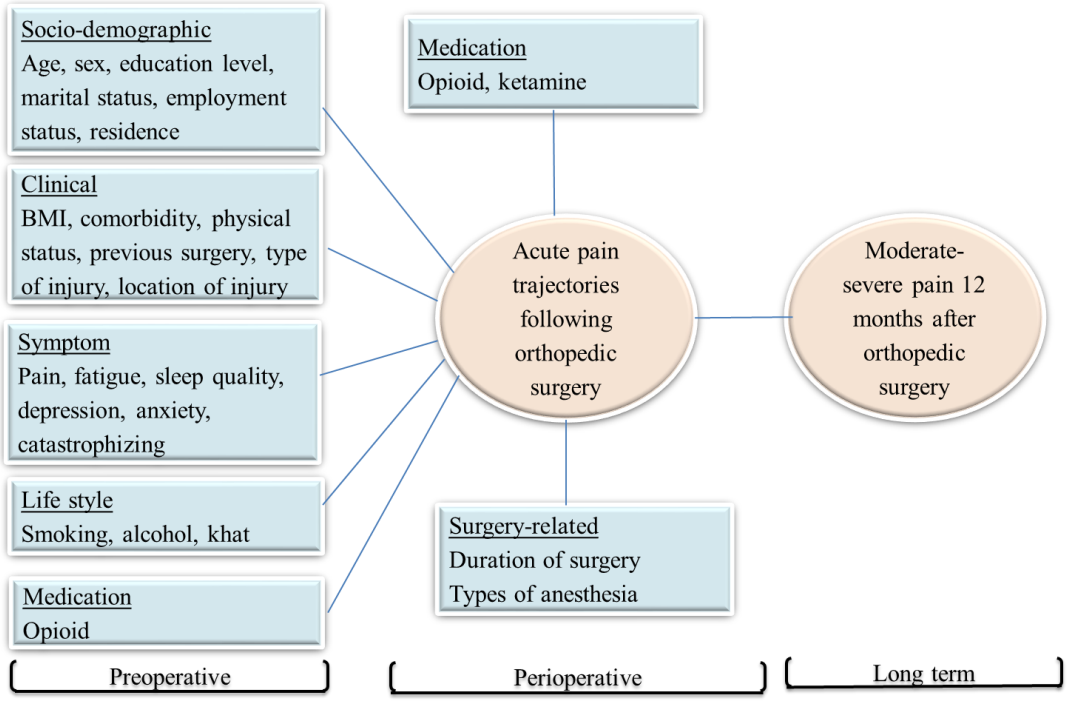
Based on these critical research gaps, we designed study III to identify subgroups of patients with distinct acute postoperative pain trajectories, and evaluate the associations between clinical, surgical, psychological and lifestyle factors and acute postoperative pain trajectory subgroups after traumatic fracture surgery.

2.6 Theoretical/conceptual frame work

The biopsychosocial (BPS) model of pain is the theoretical framework for this thesis. Historically, pain has been viewed as biophysical, as a sensory experience related to the existence of tissue pathology and having a very linear direct relationship between pain and tissue injury. A more recent theory integrating the body, mind, and society is known as the BPS model, originally developed by George Engel in 1977. This model suggests that pain should not be viewed as either exclusively physical or exclusively psychological; each individual experiences pain in unique ways through an individual's genetic composition, prior learning history, current psychological status, and sociocultural effects (Gatchel et al. 2019). It is important to identify modifiable pre-, intra-, and postoperative factors which increase patients' risk of experiencing higher postoperative pain score, in order to plan preventive pain management.

The three studies in this thesis are grounded in both the findings from previous studies and the BPS model used as a framework (**Figure 1**). The BPS model can be a valuable framework for describing factors such as a patient's psychological and social factors in addition to the biologic aspects of disease that affect the pain experience.

Figure 1 Theoretical framework of the association between pre-, intra-, and postoperative factors with acute pain trajectories and chronic pain following orthopedic surgery



3 Objectives of this thesis

The overall aim of the thesis was to identify the pre-, intra-, and postoperative factors associated with knee pain 12 months after TKA and acute postoperative pain trajectories after traumatic surgery.

3.1 The specific objectives

1. To explore the contributions of co-occurring preoperative symptoms (pain, fatigue, sleep problems, depression) in relation to moderate-severe knee pain 12 months after TKA.
2. To explore the associations of daily ratings of worst pain intensity and daily opioid intake during the early postoperative period, with moderate-severe knee pain 12 months after TKA.
3. To identify subgroups of patients with distinct acute postoperative pain trajectories, and evaluate the associations between clinical, surgical, psychological and lifestyle factors and acute postoperative pain trajectory subgroups after traumatic fracture surgery.

4 Methods and patients

4.1 Study design, settings and sample size

The study design, settings and sample size of the three studies included in this thesis are provided below in **Table 1**.

Table 1 Summary of study design, settings, and sample size of the three studies in this thesis.

	Study I and II	Study III
Design	Secondary analysis of data from a larger, prospective longitudinal study	Multi-center prospective cohort study
Setting	Lovisenberg Diaconal Hospital, Oslo, Norway	At two major Universities teaching referral Hospitals in Jimma and Addis Ababa, Ethiopia (i.e., Jimma Medical Center (JMC); Addis Ababa Burn Emergency and Trauma (AaBET) hospital).
Sample size	The study was originally planned for a different aim and powered accordingly: "Based on a priori power analysis with an alpha level of 0.05, power of 0.80 and a medium effect size (f= 0.25) for multiple regressions, which generated a sample size estimation of 180. Worst pain score from the Brief Pain Inventory was used as the primary outcome for the power analysis. We aimed to include 200 patients to account for a potential attrition rate of 10%"(Lindberg 2017). However, given the number of covariates we wanted to assess, we had enough statistical power to perform all the preplanned analyses.	The sample size estimation suggested that a sample of 200 patients would provide adequate power to estimate regression coefficients with sufficient precision with a model including 10 possible associated factors (rule of thumb). Allowing for an estimated 10% attrition rate, we calculated that a final sample size of 220 would provide sufficient statistical power to evaluate these potentially associated factors.

4.2 Patient eligibility and recruitment

Patients were recruited for studies I and II at Lovisenberg Diaconal Hospital, Oslo, Norway if they met the inclusion criteria as shown in **Figure 2:** age ≥18 years, scheduled for primary TKA for osteoarthritis, able to read or write in Norwegian, signed the consent form, and no diagnosis of dementia (Lindberg 2017).

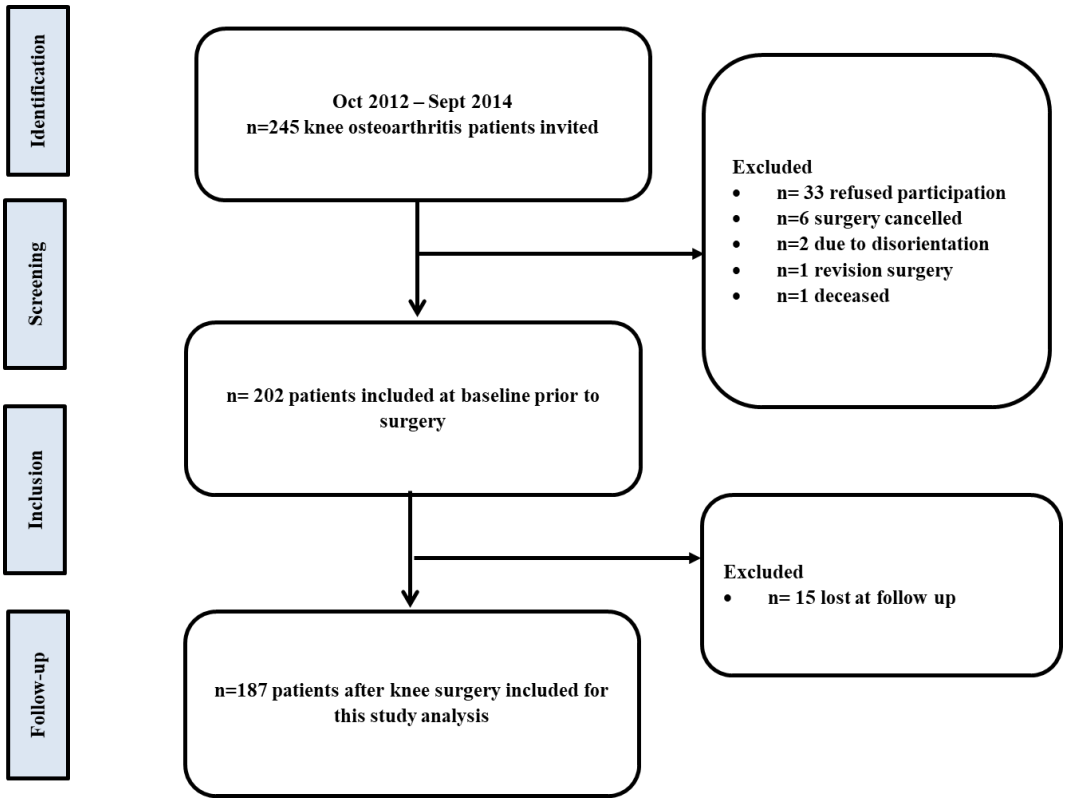


Figure 2 Flow chart of patient recruitment at Lovisenberg Diaconal Hospital, Oslo, Norway (study I and II).

Patients were recruited for study III at two major University teaching referral Hospitals in Jimma and Addis Ababa, Ethiopia (i.e., JMC and AaBET) if they met the inclusion criteria as shown in **Figure 3**: age ≥18 years, had an upper and/or lower extremity fracture related to injury, fully conscious with no cognitive impairment, able to communicate in either Amharic or Afan Oromo language and signed the consent form.

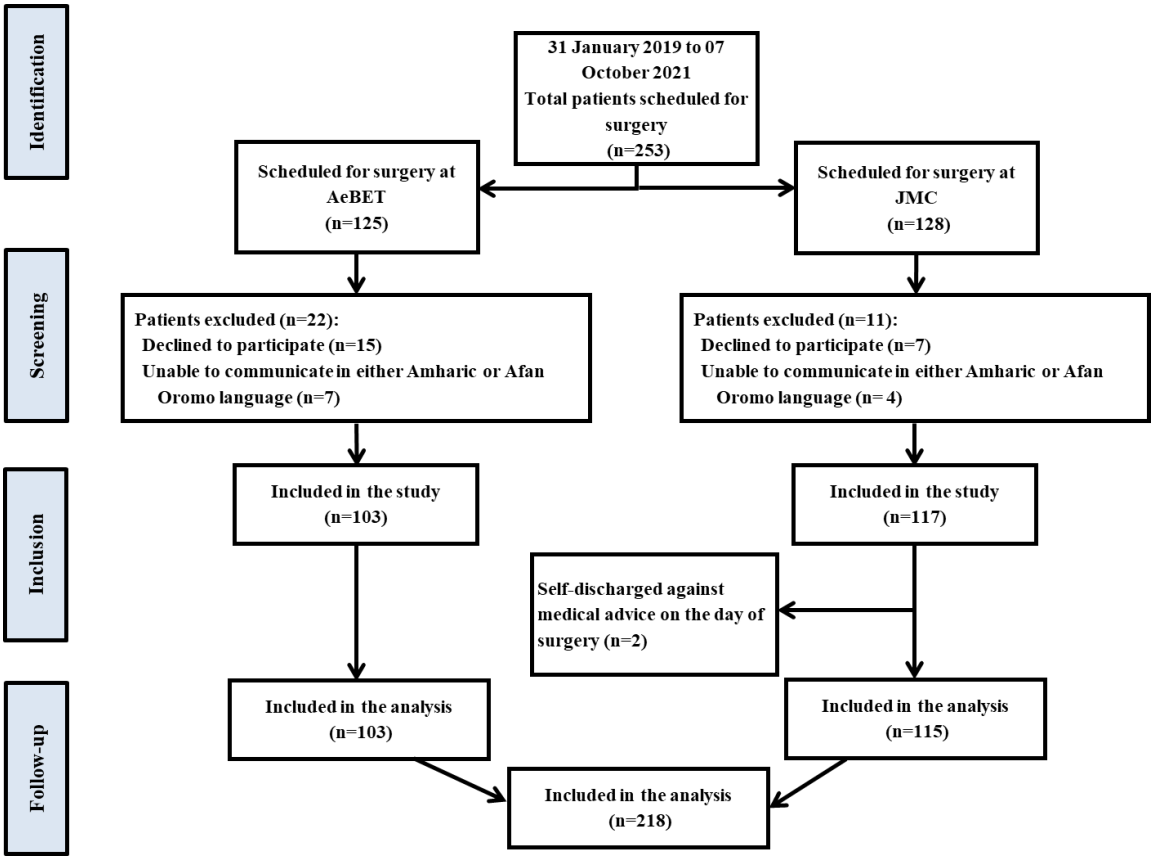


Figure 3 Flow chart of patient recruitment at University teaching Hospitals in Ethiopia: JMC and AaBET (study III).

4.3 Instruments and definitions, data collection procedures

The following instruments/questionnaires were used to measure pain, anxiety, depression, catastrophizing, sleep quality, fatigue, sociodemographic, lifestyles, and clinical variables.

Pain

The Brief Pain Inventory (BPI) was used to assess worst pain intensity and pain localization. The original BPI was developed by Cleeland (Daut, Cleeland, and Flanery 1983). In all three studies, the "worst pain intensity" item rated on an 11-point numeric rating scale (NRS) ranging from 0 (no pain) to 10 (worst imaginable pain) was used to measure pain both at baseline and at follow-up because it meets the main criteria defined in the FDA draft guidance for patient-reported outcomes in terms of ability to detect a clinically meaningful change (Atkinson et al. 2010).

In study I and study II, a validated and reliable Norwegian version of BPI was used (Klepstad et al. 2002). The outcome for studies I and II was moderate-severe knee pain 12 months after TKA, defined as having a worst pain score ≥4 (Kapstad et al. 2008) during the last 24 hrs., and a body map that indicated pain in the operated knee.

For study III, a validated and reliable Ethiopian version of the BPI was used (Anshabo et al. 2017). The outcomes for study III, the daily ratings of worst pain intensity at the surgical site over the last 24 hours, were collected on postoperative day (POD)1, POD2, POD3, POD4, and day of discharge. Accordingly, these pain ratings were used to determine patients' acute postoperative pain trajectories.

Anxiety and depression

The Hospital Anxiety and Depression Scale (HADS) was used to measure patients' psychological distress from anxiety and depression. This is a 14-item scale, consisting of seven items on the depression subscale and seven items on the anxiety subscale, scored on a 4-point Likert scale (0–3), ranging from "not at all" to "most of the time" over the last week and yielding a total score between 0 and 21 for each subscale. Scores ≥8 indicate clinically significant (Zigmond and Snaith 1983). The Norwegian version of the HADS was used in study I, and it was found to have acceptable psychometric properties in a large population-based study in Norway (Mykletun, Stordal, and Dahl 2001). For study III, the validated Ethiopian version of the

HADS was used and has been found to have acceptable psychometric properties in HIV patients (Reda 2011).

Sleep quality

The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality in study I. It is a 19-item self-rated questionnaire consisting of seven sub-scores: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each sub-score has a 0–3 scale, and the seven sub-scores are summed to yield one global score that ranges from 0 to 21. A global PSQI score ≥ 5 yielded a diagnostic sensitivity of 89.6% and specificity of 86.5% (kappa = 0.75, $p < 0.001$) in distinguishing good and poor sleep quality (Buysse et al. 1989).

Fatigue

A 5-item short form of the Lee Fatigue Scale (LFS) was used to assess fatigue severity in study I and has adequate psychometric properties (Lerdal et al. 2013). Patients rated the severity of fatigue on five items on visual analogue scores (0–10 cm) and scores ≥ 5 were considered indicative of severe fatigue.

Pain catastrophizing

The Pain Catastrophizing Scale (PCS) was used to assess patients' level of pain catastrophizing. It is a reliable and valid instrument developed by Sullivan *et al* and published in 1995. It contains 13 items with a 5-point Likert scale (0-4) ranging from "not at all" to "all the time," and yields a total score with a range of 0-52. Higher scores indicate more catastrophizing (Sullivan, Bishop, and Pivik 1995). Since no Ethiopian version of the PCS was found at the time of the study, a systematic process recommended for translating instruments by Sousa and Rojjanasrirat (2011) was employed to translate the original English version of the PCS to Amharic and Afan Oromo languages for the purpose of study III.

4.3.1 Data collection procedures- studies I and II

OA patients received information about the study by mail. Then upon admission for TKA surgery, a study nurse screened and invited eligible patients to participate. After patients signed a

consent form, data were collected through patient chart review and self-report measures. The surgical technique, including anesthesia, pain management and physiotherapy were standardized. Twelve months after TKA surgery, patients were mailed the follow-up questionnaire, which measured pain, and returned it in a pre-paid envelope. In the case of no reply, one reminder was sent (Lindberg 2017). **Table 2** provides an overview of the data collection and variables.

4.3.2 Data collection procedures- study III

Prior to data collection, two days of training were conducted to familiarize the research assistants with the context and content of the questionnaires, and the methods to be used for data collection. The research assistants were bilingual speakers of Amharic and Afan Oromo.

The procedure for data collection was similar across the two study sites. All patients on the waiting list scheduled for elective surgical fixation of their fractures were screened for the inclusion criteria on the day before the planned surgery. Patients who fulfilled the inclusion criteria were approached consecutively, informed about the aims of the study and invited to participate. Those who were willing to participate signed an informed consent form.

Demographic and clinical data were collected through patients' chart review. Self-reported data was assessed using face-to-face interviewer-administered questionnaires for all patients (i.e., the research assistant read the questions out loud and marked the patients' responses in the questionnaire). This approach was chosen due to the adult literacy rate of 51% in Ethiopia (UNESCO Institute for Statistics, July 2017 reports), suggesting that more than half of patients would not be able to complete a written questionnaire without help. All the data were collected during the patient's hospitalization and the data collection process was closely monitored. An overview of the data collections and variables are shown in **Table 2.**

4.4 Questionnaires and PCS translation for study III

The Ethiopian population is extremely diverse regarding culture, language and ethnicity. Amharic and Afan Oromo are the two most common local languages, predominantly spoken in the geographic area where this study was performed. Thus, the data collection questionnaires were prepared in English to assessed the following variables: age, sex, education, residence, previous surgery, type of injury, location of injury, duration of surgery, types of anesthesia, and

lifestyle variables (i.e., smoking, alcohol, khat). This English questionnaire was then directly translated into Amharic and Afan Oromo.

In addition, the HADS and BPI (items i.e., worst pain intensity, pain localization) was translated to Afan Oromo language and the PCS instrument was translated into Amharic and Afan Oromo languages. To accomplish this task, a team of experienced translation experts (bilingual and bicultural) from Addis Ababa and Jimma University, department of language and psychology was assembled. The team did a standard forward and back-translation, as recommended by Sousa and Rojjanasrirat (Sousa and Rojjanasrirat 2011). Finally, before the actual data collection, the translated questionnaires were assessed using a pretest of 5% of the planned sample of 220 (i.e., 11 Afan Oromo speakers and 11 Amharic speakers) in the target population who were admitted at JMC to determine whether it worked as expected and whether the respondents found any of the items confusing or unclear. Based on feedback from the team and considering the pretest inter-rater agreement among the sample was greater than 80% (Sousa and Rojjanasrirat 2011), we used the translated questionnaires.

Table 2 Overview of data collection: variables, measurements/sources, and time points included in the three studies.

Variables	Measurements/scales/sources	Data collection time points									Studies		
				Postoperative day									
		Preoperative	Intraoperative	0	1	2	3	4	Day of discharge	After 12 months	Study I	Study II	Study III
Socio-demographic													
Age and sex	medical record	X									X	X	X
Education level	Interview/ medical record	X									X		X
Residence	Interview	X											X
Marital status	medical record	X									X		
Employment status	medical record	X									X		
Clinical													
Body mass index	kg/m^2, medical record	X									X	X	
Physical status	1-3, medical record	X									X	X	
Comorbidity	yes/no, number, medical record	X									X		
Previous surgery	yes/no, interview	X											X
Location of injury	medical record	X											X
Type of injury	medical record	X											X
Duration of surgery	minutes, medical record		X										X
Types of anesthesia	medical record		X										X
Ketamine	number of days, medical record			X	X							X	
Opioid intake	morphine equivalent mg, medical record	X$^{\infty}$		X	X	X	X					X	
Contralateral knee pain	yes/no, medical record	X										X	
Sleep quality	Pittsburgh Sleep Quality Index©	X									X		
Fatigue	Lee Fatigue Scale©	X									X		
Pain	Brief Pain Inventory	X									X©	X©	X§
Postoperative pain	Brief Pain Inventory©									X	X		
Postoperative pain	Brief Pain Inventory©			X	X	X	X	X		X		X	
Postoperative pain	Brief Pain Inventory§				X	X	X	X	X				X§
Depression	Hospital Anxiety and Depression Scale	X									X©		X§
Anxiety	Hospital Anxiety and Depression Scale§	X											X
Catastrophizing	Pain Catastrophizing Scale§	X											X
Lifestyle													
Smoking	yes/no, interview	X											X
Alcohol	yes/no, interview	X											X
Khat	yes/no, interview	X											X

Note: § = interview, © = self-report measures, X$^{\infty}$ = preoperative opioid yes/no

4.5 Statistics

In this thesis, all statistical analyses were conducted using SPSS and Stata. Continuous data were described with means and standard deviations, and categorical data were described with frequencies and percentages. Univariate and multivariate logistic regression models were used and statistical significance was declared at p <0.05. An adjusted odds ratio (OR) with 95% confidence intervals (CI) were used to measure the degree of association.

4.5.1 Statistical analysis-study I

We selected candidate variables (pain, depression, sleep quality, fatigue) based on previous literature about frequently co-occurring symptoms in OA patients waiting for TKA surgery (Neogi 2013; Fishbain et al. 2003; Power et al. 2008; Pickering et al. 2016; Khatib et al. 2016; Sharma et al. 2016). Firstly, crude associations between pairs of categorical variables were assessed using chi-square tests. Secondly, variables with a *p*-value <0.1 in the univariate analyses were considered for inclusion into a multivariate logistic model. Before being included in the multiple regression analysis, the risk factors were tested for multicollinearity by checking the Variance Inflation Factor (VIF) statistics. Multicollinearity was determined using the generally accepted cut-off for VIF scores of > 2.5.

Several logistic regression models were fitted and the best model was chosen based on its predictive power and Akaike Information Criterion. The odds of having moderate-severe knee pain (worst pain score ≥4) 12 months after TKA derived from the logistic regression models were then transformed into probabilities and the results were used to construct a risk matrix model. As all analyses were considered exploratory, no correction for multiple testing was performed. Imputation of missing data was not performed, as missingness was below 10%.

4.5.2 Statistical analysis-study II

Potential covariates (i.e., age, sex, BMI, ASA classification of physical status, contralateral knee pain, preoperative pain intensity, preoperative opioid use, and ketamine use) were tested for inclusion in the univariate logistic analysis based on clinical recommendation and having been previously shown to be associated with chronic postoperative pain (Lewis et al. 2015; Singh, Gabriel, and Lewallen 2008; Fisher et al. 2007; Smith et al. 2017; Zywiel et al. 2011)

Due to collinearity between acute postoperative pain and postoperative opioid intake (tolerance range, 0.32–0.60; variance inflation factor range, 1.66–3.09), two separate logistic regression models were fitted. Model 1 assessed the independent association of daily ratings of worst pain intensity during the early postoperative period with moderate-severe knee pain 12 months after TKA, and model 2 assessed the independent association of daily opioid intake during the early postoperative period with moderate-severe knee pain 12 months after TKA. The potential

covariates that reached statistical significance with p-values <0.05 in the univariate regression models were entered into multivariable logistic regression model 1 and model 2 as confounders.

4.5.3 Statistical analysis-study III

Two steps were used for the analyses. In step 1, a growth mixture model (GMM) was used to identify subgroups of patients based on similarities in their trajectories of acute postoperative pain across five time points (POD1-4, and day of discharge). With this analysis, we identified two distinct trajectories, namely the "rapid postoperative pain relief class" and the "consistently high postoperative pain class". In step 2, the two classes were used as the dependent variable in a multiple logistic regression model to identify possible associations with the pre- and intra-operative variables listed in **Table 2,** which have been shown in the literature to influence acute postoperative pain (Chou et al. 2008; Storesund et al. 2016; Radinovic et al. 2014; Robleda et al. 2014; Yang et al. 2019). Further, we performed separate logistic regression models stratified by cause of injury. To increase the precision of the estimates, we used bias-corrected bootstrapping with 1000 samples.

4.6 Ethical considerations

All three study protocols were reviewed and approved by the ethical review committee: studies I and II were approved by the Regional Committee for Medical Research Ethics - South-East Norway (code number: 2011/1755). Study III was approved by the Institutional Review Boards of Jimma University and St. Paul's Hospital Millennium Medical College (code numbers: JHRPGD/510/2018, JHRPG/1064, and PM23 /406), and the Regional Committee for Medical Research Ethics - South-East Norway (code number: 2017/1609/REK). Moreover, permission to collect data was obtained from two hospitals for study III. The study was conducted according to the principles outlined in the Declaration of Helsinki ('World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects' 2013). Before consenting, all patients received written information regarding the aim of the study, and were informed that participation in the study was voluntary and that they had the right to decline participation at any time without any impact on their treatment. All patients who were approached agreed to participate by signing the written consent form or a witness signature

informed consent form (for illiterate patients) before any data collection. A study code number was used to keep their personal information confidential.

5 Results

This section summarizes the study findings, and more detail is described in each enclosed article. The descriptive statistics of the three studies included in this thesis are summarized in **Table 3**.

Table 3 Patients' characteristics for the samples included in studies I – III.

Characteristics	Studies I and II		Study III	
Pre and perioperative	**n=187**		**n=218**	
Sociodemographic	**Number (%)**	**Mean (SD)**	**Number (%)**	**Mean (SD)**
Age (years)		68 (9)		33.4 (11.6)
Sex (female)	127 (68)		42 (19)	
Education status (college/university)	102 (51)		31 (14.2)	
Clinical				
Number of comorbidities (0-5)		1.2 (1.0)		
Physical status (1-3)		2.0 (0.5)		
Body mass index (kg/m^2, range: 19.9-43.0)		29.0 (4.6)		
Fatigue (LFS score ≥ 5)	34 (18.2)			
Depression (HADS depression score ≥ 8)	21 (11.2)		196 (89.9)	
Anxiety (HADS anxiety score ≥ 8)			128 (58.7)	
Sleep quality (PSQI score ≥ 5), n=172	143 (76.5)			
Pain (BPI worst pain score ≥ 4)	149 (79.7)		161 (73.9)	
Pain catastrophizing (range 0-52)				25.8 (8.5)
Duration of surgery (minutes)				122.4 (57.9)
Previous surgery (yes)			24 (11)	
Anesthesia type, n=215				
General			79 (36.7)	
Spinal			94 (43.7)	
Nerve block			42 (19.3)	
Ketamine use (yes)	28 (15)			
Contralateral knee pain (yes)	55(30.5)			
Opioids use (yes)	17(9.1)			
Cause of injury, n=217				
Traffic accident			114 (52.5)	
Machine/tool injury or conflict			52 (23.9)	
Fall			51 (23.5)	
Life style				
Alcohol (yes)			102 (46.8)	
Khat (yes)			94 (43.1)	
Smoking (yes)			25 (11.5)	
Postoperative pain outcome				
Consistently high postoperative pain after trauma surgery			113 (51.8)	
Postoperative pain 12 months after TKA	74 (39.6)			

Abbreviations: BPI, Brief Pain Inventory; HADS, Hospital Anxiety and Depression Scale; LFS, Lee Fatigue Scale; PSQI, Pittsburgh Sleep Quality Index; TKA, total knee arthroplasty; SD, standard deviation.

5.1 Study I

The purpose of this cohort study was to explore the contributions of co-occurring preoperative symptoms (pain, fatigue, sleep problems, depression) in relation to moderate-severe knee pain 12 months after TKA.

In the multiple logistic regression models, a high level of fatigue was associated with almost three-time higher odds of moderate-severe knee pain 12 months after TKA compared to those with a low level of fatigue. Similarly, patients with moderate-severe preoperative pain had more than four times higher odds of moderate-severe knee pain 12 months after TKA compared to those with no or mild preoperative pain. We did not find any statistically significant associations between the patients' age, sex, depression, or sleep quality prior to surgery in relation to moderate-severe knee pain 12 months after TKA. Thus, these variables were not included in subsequent analyses.

In the final risk matrix model, patients with the co-occurrence of high scores on both the fatigue and the pain measures prior to surgery had a 57% probability of experiencing moderate-severe knee pain 12 months after TKA. Similarly, patients with the co-occurrence of low scores on both the fatigue and the pain measures prior to surgery had a 14% probability of having moderate-severe knee pain 12 months after TKA.

5.2 Study II

The purpose of this cohort study was to explore the associations of daily ratings of worst pain intensity and daily opioid intake during the early postoperative period, with moderate-severe knee pain 12 months after TKA.

In the initial univariate analyses, we examined the associations of each potential covariate with moderate-severe knee pain 12 months after TKA. Two covariates (i.e., higher BMI and moderate-severe preoperative pain) reached the level of statistical significance. In the univariate analysis for worst pain intensity on postoperative days (POD) 0–4, we found that worst pain intensity scores on postoperative days 2 and 3 were significantly associated with moderate-severe knee pain 12 months after TKA. Similarly, we examined opioid intake on POD 0–3 using

univariate analysis, but we found no statistically significant associations between opioid intake on POD 0–3 and moderate-severe knee pain 12 months after TKA.

The collinearity between acute postoperative pain and postoperative opioid intake was high. Thus, separate logistic regression models were fitted to assess the independent associations of acute postoperative pain (Model 1) and postoperative opioid intake (Model 2) with moderate-severe knee pain 12 months after TKA.

In the final model, after adjusting for possible confounders (i.e., BMI and preoperative pain), neither daily rating of worst pain intensity nor daily opioid intake in the early postoperative period was associated with moderate-severe knee pain 12 months after TKA.

5.3 Study III

The purpose of this cohort study was to identify subgroups of patients with distinct acute postoperative pain trajectories, and evaluate the associations between clinical, surgical, psychological and lifestyle factors and acute postoperative pain trajectory subgroups after traumatic fracture surgery.

We identified two subgroups of patients with distinct trajectories of acute postoperative pain over time. Patients in the rapid pain relief class (n=105, 48%) experienced moderate pain intensity on POD1 (mean=5.2, 95% CI [4.9-5.5]), followed by a rapid decline. Patients in the consistently high pain class (n=113, 52%) experienced severe pain intensity on POD1 (mean=8.2, 95% CI [8.0-8.4]), followed by consistently high pain intensity over the five postoperative time points.

Patients' had lower odds of being in the consistently high postoperative pain class if their cause of injury was machine/tool or conflict-related compared to those with traffic-related injuries, they used alcohol compared to those who did not, received a nerve block compared to those who had general anesthesia, or had higher depression scores compared to those who had lower depression scores. Higher preoperative worst pain intensity and longer duration of surgery characterized patients in the consistently high postoperative pain class.

There was an interaction between cause of injury and the other included variables. Thus, separate logistic regression analyses stratified by cause of injury (i.e., machine/tool or conflict-related

(n=52), fall-related (n=50), traffic-related (n=108)) were performed with the following independent variables: alcohol use, preoperative worst pain intensity, duration of surgery, type of anesthesia, and depression. The relationship of selected variables was different depending on level of injury. Higher preoperative pain was a stable risk factor for being in the consistently high postoperative pain class across all injury types. Among patients who had a fall-related injury, longer duration of surgery was a risk factor for consistently high postoperative pain. Among patients with a traffic-related injury, receiving a nerve block compared to general anesthesia was a protective factor.

6 Discussion

6.1 Discussion of main findings

This thesis represents the total findings of the separate studies. The issue of why some patients' experiences intense acute postoperative pain or chronic postoperative pain and some do not is of crucial significance. In this thesis, although certain patients experienced only mild pain intensity after surgery, more than one-third of patients had moderate-severe knee pain 12 months after TKA (studies and I and II), and more than half had a consistently high acute postoperative pain trajectory after traumatic fracture surgery (study III). Collectively, these findings reveal the magnitude of acute and chronic postoperative pain problems in these populations and highlight the necessity to address how much do the biological, psychological and social factors of an individual influence the pain outcomes in orthopedic patients. The biopsychosocial model proposes that there is a multitude of interacting factors, which together constitutes the dynamic interplay of biological, psychological, and social factors of an individual (Gatchel et al. 2007). These factors can be understood as important modulators of pain (Fillingim 2017; Coghill 2010). Pain is the cognitive, emotional, and behavioral response to a given stimuli. The pain someone experiences is influenced by a unique combination of biological, psychological, social, and cultural factors (Fillingim 2017).

Our studies I - III were grounded in findings from previous studies that encompass the biopsychosocial risk factors for acute and chronic postoperative pain after orthopedic surgery. In this context, our study investigated how much a comprehensive list of pre-, intra-, and post-surgical continuum factors (e.g., sociodemographic, clinical, psychological, life style, surgical, and medication) influenced the experience of pain following orthopedic surgery. Our findings suggested that the patient factors of preoperative pain and fatigue and the surgical factors of duration of surgery and type of anesthesia may be important risk factors in determining how orthopedic patients experience moderate-severe postoperative pain over time, and more important than the other factors evaluated in this thesis (**Table 2**).

In this thesis, patients who reported a higher level of preoperative worst pain intensity had a greater likelihood of high postoperative worst pain intensity, both after TKA and traumatic fracture surgery. This finding, in line with prior findings across a range of surgical procedures in

the literature (Yang et al. 2019; Arefayne, Seid Tegegne, et al. 2020; Ashoorion et al. 2022; Lewis et al. 2015), confirms preoperative pain as a consistent risk factor for acute and persistent pain after surgery; however, the mechanisms underlying these relationships remain unclear. Clinically, increasing sensitivity to pain or sensitization induced by noxious inputs may arise during the pre- and perioperative periods and may contribute to central sensitization and postoperative pain (Voscopoulos and Lema 2010). We did not have information on the presence of sensitization in our included traumatic fracture or osteoarthritis patients preoperatively. Thus, future research is warranted in these patient groups to explore the association between preoperative central sensitization and intense acute and persistent pain after surgery. This knowledge may be valuable in order to optimize pain management that includes preventive analgesia, which may be helpful in reducing preoperative central sensitization (Katz and Seltzer 2009).

Our analysis in study I revealed the co-existence of pain and fatigue in OA patients' prior to surgery. Furthermore, our study was able to identify a novel finding that patients with high preoperative levels of both fatigue and pain had a 57% probability of experiencing moderate-severe knee pain 12 months after TKA. Similarly, patients with the co-occurrence of low levels of both fatigue and pain prior to surgery had a 14% probability of having moderate-severe knee pain 12 months after TKA. To the best of our knowledge, the role of preoperative concurrent symptoms on chronic pain after TKA had not yet been evaluated, so there are no prior studies with which to compare our finding. While the reason for this association is unclear, a literature review (Fishbain et al. 2003) suggests that there is an etiological link between pain and fatigue. Clinicians should therefore prioritize the management of OA patients who present with high levels of pain and fatigue prior to TKA, as they may be at higher risk for chronic pain following TKA surgery.

Findings from study II showed that the univariate postoperative daily ratings of worst pain intensity (i.e., POD2 POD3) were significantly associated with moderate-severe knee pain 12 months after TKA. Several studies in patients undergoing TKA have documented similar findings (Buvanendran et al. 2019; Thomazeau et al. 2016; Singh et al. 2019; Puolakka et al. 2010). However, after controlling for BMI and preoperative pain, these associations were no longer significant. Thus, the results from our multivariate analysis contradicted the findings of

the previously mentioned studies. However, our findings are in agreement with previous research in patients undergoing total hip arthroplasty (Clarke et al. 2010; Pagé et al. 2016), which found no link between acute and chronic postoperative pain intensity. The inconsistency between our finding and those of previous studies may be somewhat explained by variations in the design of previous studies, such as the use of a cross-sectional retrospective study design (Puolakka et al. 2010), the timing of pain assessment points at 2 and 8 weeks after TKA as predictor variables (Singh et al. 2019), evaluating pain outcomes six months after TKA (Buvanendran et al. 2019; Thomazeau et al. 2016; Singh et al. 2019), and none of these mentioned studies controlled for preoperative pain.

An additional finding from study II was the non-significant association between opioid intake in the immediate postoperative period and moderate-severe knee pain 12 months after TKA. We were unable to find previous studies that assessed the relationship between early postoperative opioid intake and chronic pain after TKA. However, in cardiac surgery patients (van Gulik et al. 2012), a dose-dependent relationship was found between higher intraoperative opioid doses and increased incidence of pain one year after surgery. This finding contrary to our results may partly be explained by differences in the cardiac surgery study population and use of randomized clinical trial design.

To summarize, the non-significant associations findings of both pain and opioid intake from study II may be explained by several factors. Firstly, all patients were treated with the standard care pathway in this hospital. The pain management was standardized, and all patients received an intensive multimodal pain management regimen, which could reflect the potential opioid-sparing effect (Wardhan and Chelly 2017), so in our study the patients' mean daily opioid intake was relatively low (<20 morphine milligram equivalent). Secondly, in our study, 15% of patients received a low-dose N methyl-D-aspartate receptor-antagonist ketamine infusion as supplemental treatment within the first 48 h after surgery. Evidence from a meta-analysis of randomized controlled studies (Li and Chen 2019) shows that the use of ketamine is effective in reducing cumulative morphine consumption along with decreased pain intensity during the early postoperative period after TKA. Furthermore, although the result was inconclusive from a recent meta-analysis (Carley et al. 2021), ketamine is hypothesized to decrease the probability of acute pain transitioning to chronic pain. Thus, a possible explanation could be that the multimodal

analgesia approach used in this study might have resulted in adequate acute pain management and lower opioid doses.

In study III, we found that in patients with traffic-related injuries, receiving nerve block anesthesia was a protective factor for a consistently high postoperative pain trajectory, compared to receiving general anesthesia. This finding is in line with several studies in a variety of surgical procedures in Ethiopia (Arefayne, Tegegne, et al. 2020; Admassu, Hailekiros, and Abdissa 2016), Tanzania (Ndebea, van den Heuvel, et al. 2020), Brazil (Dias et al. 2020), and France (Aubrun et al. 2008), all reporting the same phenomenon, indicating that patients who received general anesthesia had a higher intensity of postoperative pain compared to those who received regional anesthesia. A recent clinical practice guideline strongly encourages clinicians to consider using local or regional block anesthesia during operative fixation of fractures, as well as part of the postoperative multimodal pain management regimen (Hsu et al. 2019). Thus, clinicians need to pay specific attention to patients with traffic-related injuries and consider their potential need for more intensive multimodal pain management strategies.

Another finding from study III was that among patients who had a fall-related injury, longer duration of surgery was significantly associated with a consistently high postoperative pain trajectory. In agreement with our findings, studies in Ethiopia (Argaw et al. 2019; Kasahun et al. 2022) have shown that longer duration of surgery is an important risk factor for severe acute postoperative pain. Although our analysis does not permit any conclusions about cause and effect, this finding is likely linked to the more complex pathology, with greater tissue trauma or inflammatory process and nerve damage (Katz and Seltzer 2009).

The following limitations should be considered when interpreting our findings. In study I, patients were predominantly older and female, most had sleep disturbance and few had depressive symptoms, which may have limited our ability to detect relationships between these variables and pain after TKA. Additionally, our sample size and under-representation of male patients prohibited an analysis stratified by sex differences with sufficient statistical precision and to describe the potentially sex-specific influence of symptoms on pain outcomes. Although the diverse patient samples for studies I - III were an overall strength, it was a limitation that it was not possible in these studies to measure and statistically account for the influence of all the varying biological and psychosocial factors including patients' social support, beliefs and

expectations on their pain outcomes. Despite our efforts to include relevant confounders, there may have been other important unmeasured factors in the pre-, intra-, and post-surgical continuum that were not included in the analyses.

6.2 Methodological considerations

6.2.1 Design

The studies contained in this thesis applied observational cohort study designs (studies I – III) with repeated assessments of pain intensity (study III), and pain and opioid intake (study II). All three studies contain samples of orthopaedic surgery patients (OA patients in studies I and II and traumatic fracture patients in study III) waiting for elective surgery. Despite some similarities, the samples differed on a number of sociodemographic, clinical, lifestyle, and physiological characteristics. Important strengths of this thesis' design were that we were able to provide evidence of the dynamic nature of patients' pain experiences, we provided information about the associations between pre- and postoperative exposures and both short- and long-term outcomes, and its prospective design limits recall bias (Coggon et al. 2009; Zaniletti et al. 2022).

As with any research study, there are potential sources of bias that may threaten the validity of observational cohort studies. Three types of biases are of particular importance and will be further discussed in this thesis. These include: selection bias that may arise from the sample being unrepresentative of the target population, information bias related to poor measurements, and confounding bias related to the discrepancy effects of other factors on associations with the variables of interest (Coggon et al. 2009; Gray, Grove, and Sutherland 2016).

6.2.2 Information bias

Information bias can occur if the exposure or outcomes of interest are not measured accurately and consistently between participants. Measurement error can be caused be a variety of factors. For example, the interviewers' sociodemographic characteristics (i.e., age, gender, race, education, and socioeconomic status), experience, training, and workload (West and Blom 2017), measurements with poor reliability and validity, language difficulties, and study participants' situational factors can all introduce; it also liable to random error during data processing (Coggon et al. 2009; Gray, Grove, and Sutherland 2016).

In this thesis, the self-reported BPI was used to determine patients' bodily locations of pain and measure the worst pain intensity outcome in studies I and II. This well-known instrument has documented satisfactory reliability and validity in a variety of languages and populations including in Norwegian (Klepstad et al. 2002) and in patients with OA undergoing total hip replacement (Kapstad, Rokne, and Stavem 2010). Also, each of the self-report measurements used to assess the independent variables in study I (i.e., depression, fatigue, sleep quality) has documented satisfactory reliability and validity. Also, the data collection measures were self-administered. As a result of these rigorous methods, we believe the risk of information bias in these studies is minimized.

In study III, efforts were made to select experienced interviewers. The research assistants performing data collection were not employed in the two study hospitals. At both of the two study hospitals, the same structured interview method using closed-ended questions was employed (West and Blom 2017). However, data collection was interviewer-administered in face-to-face interviews, which facilitated inclusion of illiterate participants, but may be susceptible to response bias based on the interaction between the respondents and the interviewers. Moum (1998) found that younger and well-educated respondents were more likely to under-report symptoms of anxiety and depression. Furthermore, younger and male interviewers obtained fewer symptom reports, which may suggest under-reporting, compared to the responses received by other interviewers (Moum 1998).

Additionally, the Ethiopian version of the BPI was used to determine patients' bodily location of pain and measure the worst pain intensity outcome (Anshabo et al. 2017), and the Ethiopian version of the HADS was used to measure anxiety and depression (Reda 2011). For both of these instruments, satisfactory reliability has been documented in the Amharic language. However, no validated versions of the HADS and BPI were available in the Afan Oromo language, and validated versions of the PCS were not available in either the Amharic or the Afan Oromo languages. Therefore, we used a standardized method for translation, and pretested the translated measurements in patients as recommended (Sousa and Rojjanasrirat 2011), and full details are described above in (section 4.4 questionnaires and PCS translation for study III). Moreover, the internal consistency reliability of all instruments included in this study was evaluated using Cronbach's alpha coefficient. Separate analyses were performed in the Amharic and Afan

Oromo languages versions. Cronbach's alpha is a commonly used measure of the internal consistency or reliability of summated rating scales; it is expressed as a number between 0 and 1 (Cronbach 1951). The Cronbach's alpha coefficients of the Amharic language instruments were as follows: anxiety scale = 0.83, depression scale = 0.70 and catastrophizing scale = 0.85. For the Afan Oromo language instruments, Cronbach's alpha coefficients were as follows: anxiety scale = 0.76, depression scale = 0.70 and catastrophizing scale = 0.81. All included instruments in study III demonstrated acceptable internal consistency (Cronbach 1951). Therefore, we expect that the strong psychometric characteristics of the measures used minimized the risk of information bias in this study.

6.2.3 Confounding bias

This type of bias is present when the association between exposure and outcome is distorted by the effect of another factor called a confounder (Coggon et al. 2009). From the biopsychosocial point of view, patients in our three studies had diverse backgrounds with differences on a variety of biological, psychological, and social factors, and it would be practically impossible to account for them all in our analysis. In addition, there may have been some unmeasured confounders that may have explained our study findings, but which we were not able to collect. This is a known issue in all statistical analyses; however, we have used multivariate analysis to adjust for the effects of known confounding factors. For example, preoperative pain and BMI were included as possible confounders in the multivariate models in study II.

6.2.4 External validity

External validity is the generalizability of the study findings from the studied sample to the general population from which the sample was drawn (Lesko et al. 2017). In this context, external validity is the extent to which our findings can be applied to the broader group of TKA or traumatic fracture patients.

In studies I and II, we utilized a secondary analysis of data from a larger longitudinal study. The original data for this study were collected for a research purpose, with a clearly defined study population and inclusion criteria (**Figure 2**). Possible selection bias lies in the study's convenience sample, where patients were recruited consecutively from only one hospital. However, the hospital is the largest centre for TKA surgery in Norway with no geographical

limits within Norway for referral of patients. Thus, the sample included patients from all regions of Norway. Therefore, we believe that the findings are likely to be generalizable to other similar settings in Norway. Furthermore, the retention rate at the 12-month follow-up was 93%, which might suggest that the risk of bias is relatively small.

In study III, which also used convenience sampling, the patients were included based on referrals to the two trauma centers. We invited all patients on the waiting list scheduled for elective surgery for traumatic injuries during specific time periods (2019 to 2021) to participate. However, since we were unable to collect a sample at random from the targeted patient population, natural fluctuations that may be expected in any phenomenon must be anticipated. Furthermore, possible selection bias may be associated with the restriction to the two languages defined in our inclusion criteria (**Figure 3**). Among the approximately 84 Ethiopian languages, Amharic and Afan Oromo are the most widely spoken, as well as being the working languages of the nation. Nonetheless, this study's findings may not generalize to speakers of other Ethiopian languages.

A major strength of study III was that the sample of patients was derived from two major referral hospital's trauma centers in different regions of the multi-ethnic Ethiopia, which may result in cultural, contextual, religious, and psychological differences in the patient populations for the two hospitals. Furthermore, we also included illiterate patients (15.5% reported being illiterate), who are rarely included in research studies, and patients' early postoperative pain course was prospectively followed using repeated assessments. Moreover, the proportion of patients who dropped out of the study was low, and the proportion who had pain ratings on postoperative day (POD) 1, POD2, POD3, POD4 and day of discharge was high: 99.1%, 99.1%, 96.3%, 88.1%, and 99.1%, respectively. Thus, we believe that the findings may apply to the Amharic- and Afan Oromo-speaking traumatic fracture population in Ethiopia.

7 Conclusions

This thesis investigated the associations of pre-, intra-, and post-surgical patient and surgical factors with both acute and chronic postoperative pain in orthopedic patients.

The combination of high fatigue and pain scores prior to surgery was a key risk factor for moderate-severe knee pain 12 months after TKA. Neither worst pain intensity nor opioid intake in the early postoperative period was associated with moderate-severe knee pain 12 months after TKA after controlling for relevant confounders.

Furthermore, more than half of traumatic fracture patients in our sample had a consistently high postoperative pain trajectory. Several patient and surgery-related factors (i.e., higher levels of preoperative worst pain intensity and longer surgical duration) were identified as risk factors, and receiving nerve block anesthesia was identified as a protective factor again a consistently high acute postoperative pain trajectory after traumatic fracture surgery.

7.1 Implications for practice in orthopedic units

From a clinical point of view, it is important to assess patients with OA with respect to fatigue and pain prior to planning surgery, and take these into account as risk factors for chronic postoperative knee pain after TKA.

High preoperative pain and longer surgical duration are risk factors associated with significantly higher acute postoperative pain intensity. This knowledge is of great importance for clinicians when evaluating traumatic fracture patients, as it may help to identify patients at increased risk for poor pain outcomes, and to plan preventive pain management strategies for those patients at risk.

Clinicians need to be aware of patients with traffic-related injuries scheduled for operative fixation of fractures and consider using nerve block anesthesia as part of the postoperative multimodal pain management in line with current guidelines.

7.2 Implications for future research

High-quality, large-scale studies that encompass the pre-, intra-, and post-surgical continuum, comprise multiple biopsychosocial factors, and address the limitations of our studies are needed to further advance our understanding of modifiable risk factors for acute postoperative pain after

traumatic fracture surgery, and persistent pain after TKA surgery. Future research studies are also needed to explore the link between fatigue and pain in TKA patients.

In line with findings across a range of surgical procedures in the literature, this thesis has confirmed preoperative pain as a consistent risk factor for a poor postoperative pain outcome. Future research is needed to clarify the mechanisms underlying this finding. Additionally, future experimental studies are needed to investigate the effectiveness of preventive analgesia aimed at modifying preoperative pain in order to optimize pain management in orthopedic patients.

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Study I-III

Appendix

I

Received: 3 October 2020 | Accepted: 7 October 2020

DOI: 10.1002/msc.1522

RESEARCH ARTICLE

WILEY

High levels of preoperative pain and fatigue are red flags for moderate-severe pain 12 months after total knee arthroplasty—A longitudinal cohort study

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Funding information

The South-Easter Regional Health Authority, Grant/Award Number: 2018060; Norwegian Research Council, Grant/Award Number: 287816; The U.S. Norway Fulbright Foundation

Abstract

Background: Moderate/severe pain after total knee arthroplasty (TKA) is a poor surgical outcome. Many studies have identified preoperative risk factors of pain after TKA, but studies of the joint contributions of co-occurring symptoms are lacking.

Methods: Patients undergoing primary TKA ($n = 202$) were enrolled in a longitudinal cohort study. Preoperatively, patients completed questionnaires measuring demographics and symptoms (pain, fatigue, sleep problems and depression). Pain was re-assessed 12 months after TKA. Logistic regression analysis was used to compute the probabilities of moderate-severe pain at 12 months based on preoperative symptom levels, and results were combined into a risk matrix.

Results: More than one-third (40%) of patients ($n = 187$) reported moderate-severe pain after TKA. Among preoperative risk factors included in the logistic regression analyses were age, sex, pain, fatigue, sleep problems and depression. Adjusting for possible confounders, fatigue ($p = 0.02$) and pain ($p = 0.01$) were significant risk factors for moderate-severe pain at 12-months follow-up and were retained in the final risk matrix. The co-occurrence of high-preoperative fatigue and pain scores resulted in 57% estimated probability of moderate-severe pain at 12 months. Similarly, the co-occurrence of low-preoperative fatigue and pain scores resulted in 14% estimated probability of moderate-severe pain 12 months after TKA.

Conclusion: The combination of high fatigue and pain scores prior to surgery was a key risk factor for moderate-severe pain 12 months after TKA. Mapping of these factors could be used preoperatively to identify patients who are at risk to experience a poor outcome of TKA.

KEYWORDS

moderate-severe pain, preoperative fatigue, preoperative pain, risk factors, total knee arthroplasty

1 | INTRODUCTION

Knee osteoarthritis (OA) is associated with pain and functional impairment in patients' normal daily activities (Neogi, 2013). Total knee arthroplasty (TKA) is considered an effective intervention for improving pain and functional outcomes. Thus, the rate of utilization of TKA has increased steadily in developed countries (Pabinger, Lothaller, & Geissler, 2015), such as the United States (Inacio, Paxton, Graves, Namba, & Nemes, 2017) and Korea (Koh, Kim, Chang, Cho, & In, 2013) and the Nordic countries (NAR, 2019). Indeed, TKA has proved to be an effective therapy to lessen pain. However, this is not the case for all patients. A systematic review reported that 10%–34% of patients report chronic pain after TKA (Beswick, Wylde, Gooberman-Hill, Blom, & Dieppe, 2012). Due to this finding, the resolution of pain after TKA has become a major concern. Because pain is a multifactorial experience, the emphasis on identifying modifiable risk factors for pain 12 months after TKA is necessary to develop preventive interventions.

Previous studies have identified female gender, younger age (Singh, Gabriel, & Lewallen, 2008) and higher levels of preoperative pain (Lewis, Rice, McNair, & Kluger, 2015), pain catastrophizing (Edwards, Haythornthwaite, Smith, Klick, & Katz, 2009; Lewis et al., 2015), and anxiety and depression (Brander et al., 2003) as determinants of poor pain outcomes after TKA.

In OA patients, while pain is the predominant symptom, a number of studies have reported that depression (Han & Pae, 2015; Sharma, Kudesia, Shi, & Gandhi, 2016), fatigue (Cross, Lapsley, Barcenilla, Brooks, & March, 2008; Fishbain et al., 2003; Power, Badley, French, Wall, & Hawker, 2008) and sleep disturbances (Haack, Simpson, Sethna, Kaur, & Mullington, 2020; Irwin et al., 2012; Pickering, Chapurlat, Kocher, & Peter-Derex, 2016) are also common. These symptoms frequently occur among patients living with a chronic disease, including OA (Pickering et al., 2016; Power et al., 2008; Sharma et al., 2016). Furthermore, a number of studies have highlighted that each symptom has the potential to intensify the severity of other symptoms (Finan & Smith, 2013; Fishbain et al., 2003; Irwin et al., 2012), and in this way, co-occurring symptoms can exacerbate patients' pain severity (Haack et al., 2020; Irwin et al., 2012; Sharma et al., 2016).

Despite the knowledge that co-occurring symptoms can increase patients' experience of pain prior to surgery, possible associations between preoperative pain, fatigue, sleep problems, depression and postoperative pain after TKA have, to our knowledge, not been explored. Thus, the aim of this study was to test the hypothesis that the co-occurrence of high symptom levels prior to surgery is a risk factor for pain 12 months after TKA. Identification of possible risk factors and building a risk matrix model based on combinations of these symptoms would not only assist clinicians in determining each patient's risk profile and probable TKA pain outcomes, but would also provide critically useful information to patients weighing the potential risks versus rewards of surgery.

2 | METHODS

2.1 | Study design and setting

This study was part of 'a larger longitudinal cohort study at Lovisenberg Diaconal Hospital, Oslo, Norway' (Lindberg et al., 2016).

2.2 | Patient selection and procedures

A total of 245 patients referred from all parts of Norway scheduled for primary TKA, between October 2012 and September 2014 were invited to participate if they met the following eligibility criteria: age 18 years or older, able to understand and sign a Norwegian consent form, and no diagnosis of dementia. Of these, six patients were cancelled for surgery, and 33 patients declined to participate. Among the 206 patients who signed informed consent forms and were enrolled in the study, four patients were excluded, two due to postoperative disorientation, one had revision surgery on the same knee and one died from postoperative complications. The remaining 202 patients were included in the study and completed the baseline data. At the 12-months follow-up, 15 patients were lost (retention rate 93%), leaving a cohort of 187 patients to be included in this analysis.

On the day of admission to hospital, usually the day before surgery, patients completed the baseline questionnaires, which measured preoperative pain, fatigue, sleep problems and depression. Moreover, the demographic and clinical information (i.e., body mass index [BMI], number of comorbidities and American Society of Anesthesiologists physical status classification [ASA] score) were retrieved from their medical records. Twelve months after TKA surgery, patients were mailed the follow-up questionnaire, which measured pain, and returned it in a pre-paid envelope. Patients who did not respond received one reminder.

2.3 | Surgical and pain management procedures

The 'surgical technique, including anaesthesia, pain management and physiotherapy, were standardized' (Lindberg et al., 2016). In brief, all patients received similar posterior cruciate-retaining fixed modular-bearing implants for the TKA. A tourniquet was used in the course of surgery and drainage was placed and removed on postoperative day 1. Neuraxial block with bupivacaine and sedation were the first choice for anaesthesia. Epidural analgesia, with continuous infusion of bupivacaine 1 mg/ml, adrenaline 2 μg/ml and fentanyl 2 μg/ml (5–12 ml/h), was used for postoperative pain management. Patients for whom neuraxial blockade was contraindicated received total intravenous anaesthesia and a continuous femoral nerve block with bupivacaine 2.5 mg/ml (4–10 ml/h) for postoperative pain management. In most cases, the regional blocks were removed on postoperative day 2. Oral acetaminophen 1 g was given every 6 h and

celecoxib 200 mg and controlled-release oxycodone 5–20 mg was given every 12 h unless contraindicated. Supplementary treatment with low dose ketamine 1.5 μg/kg/min was available as a short-term intravenous infusion, usually on the day of surgery. All patients were mobilized out of bed and allowed full weight bearing on the operated knee on postoperative day 1. Patients received physical therapy on a daily basis with walking, flexion and extension of the knee beginning on postoperative day 1.

2.4 | Measurements

The Norwegian version (Klepstad et al., 2002) of the valid and reliable Brief Pain Inventory (BPI; Cleeland, 1985) was used to measure worst pain intensity both at baseline and at follow-up. The BPI consists of four items that measure 'worst', 'least', 'average' and 'now' pain intensity using an 11-point numeric rating scale (NRS) with endpoints of 0 (i.e., no pain) to 10 (i.e., worst imaginable pain), seven items that assess pain interference with function, one item that assesses pain relief, and a body map that assesses pain locations. For the purpose of this study, the 'worst pain intensity' item was used as the outcome (Atkinson et al., 2010). A worst pain intensity score ≥4 is indicative of moderate-severe pain (Atkinson et al., 2010; Gerbershagen, Rothaug, Kalkman, & Meissner, 2011; Kapstad, Hanestad, Langeland, Rustøen, & Stavem, 2008).

The Norwegian version of the Lee Fatigue Scale (LFS) was used to measure preoperative fatigue severity. Patients rated the severity of fatigue on five items on a 0–10 NRS. Higher scores indicate more severe fatigue. For this study, scores ≥5 were considered indicative of severe fatigue. The LFS has adequate psychometric properties (Lerdal, Kottorp, Gay, & Lee, 2013).

The Pittsburgh Sleep Quality Index (PSQI) was used to assess preoperative sleep quality. The 19-item self-rated questionnaire consists of seven sub-scores; each rated equally on a 0–3 scale. The sub-scores are summed to yield a global score that ranges from 0 to 21, with higher scores indicating worse sleep quality. PSQI global scores ≥5 is indicative of impaired sleep quality. The PSQI has been shown to be a reliable and valid tool for assessing sleep quality (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989).

The Norwegian version of the Hospital Anxiety and Depression Scale (HADS) was used to measure preoperative depressive symptoms. The psychometric properties of the HADS were acceptable in a large population-based study in Norway (Mykletun, Stordal, & Dahl, 2001). The depression subscale consists of seven items, rated on a 4-point Likert scale (0–3), then summed to a maximum of 21 points. Scores ≥8 indicate the presence of depressive symptoms (Zigmond & Snaith, 1983).

2.5 | Statistical analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS), version 26 (IBM). Continuous variables were reported as means, standard deviations, medians and ranges and categorical variables as counts and percentages.

Variables were selected for testing in the risk matrix based on both available literature and statistical properties. We assessed crude associations between pairs of categorical variables using chi-square tests. Variables that reached a p-value <0.1 in the univariate analyses were entered into a multivariate model. Risk factors were excluded if they were highly correlated with each other to reduce the risk of multi-collinearity.

Several logistic regression models were fitted and the best model was chosen based on its predictive power and Akaike Information Criterion. The odds of having moderate-severe pain (worst pain intensity score ≥4) 12 months after TKA derived from the logistic regression models were then transformed into probabilities and the results were used to construct a risk matrix. p-values <0.05 were considered statistically significant. As all analyses were considered exploratory, no correction for multiple testing was performed. Imputation of missing data was not performed, as missingness was well below 10% for all variables.

3 | RESULTS

In total, there were 202 patients prior to surgery; with mean (SD) age of 68 (9), two thirds were female, 60% completed higher education, 60% were lived with partner and 64% were not working. Furthermore, the majority were overweight with a median BMI in kg/m^2 of 28 (19–43), mean number of comorbidities 1 (0–5) and a median ASA classification score of 2 (1–3).

Frequencies of the potential preoperative risk factors (i.e., pain, fatigue, depression and sleep disturbance) and the outcome variable (i.e., moderate-severe pain 12 months after TKA) are presented in (Table 1).

The initial multiple logistic regression analysis (Table 2) revealed no statistically significant associations between moderate-severe pain 12 months after TKA and the following baseline variables: age, depression and sleep quality. Thus, these three variables were not

TABLE 1 Frequencies of potential preoperative risk factors and postoperative outcome

Variables	Total	*n*	%
Preoperative symptoms			
Pain (BPI worst pain score ≥4)	202	162	80
Fatigue (LFS score ≥5)	198	38	19
Depression (HADS depression score ≥8)	191	24	13
Sleep disturbance (PSQI score ≥5)	172	153	89
Postoperative outcome (12 months after TKA)			
Pain (BPI worst pain score ≥4)	187	74	40

Abbreviations: BPI, Brief Pain Inventory; HADS, Hospital Anxiety and Depression Scale; LFS, Lee Fatigue Scale; PSQI, Pittsburgh Sleep Quality Index; TKA, total knee arthroplasty.

TABLE 2 Initial multiple logistic regression model of risk factors for moderate-severe pain (worst pain intensity score ≥4) 12 months after TKA

Preoperative predictors	Adjusted OR	95% CI	*p*-value
Pain (BPI worst pain score ≥4)	4.33	1.35–13.85	0.013[a]
Fatigue (LFS score ≥5)	2.93	1.20–7.17	0.018[a]
Depression (HADS depression score ≥8)	1.74	0.53–5.72	0.362
Sleep disturbance (PSQI score ≥5)	1.41	0.51–3.92	0.509
Age at admission, years	1.00	0.97–1.05	0.785
Sex (female)	0.49	0.22–1.10	0.086

Abbreviations: BPI, Brief Pain Inventory; CI, confidence interval; HADS, Hospital Anxiety and Depression Scale; LFS, Lee Fatigue Scale; OR, odds ratio; PSQI, Pittsburgh Sleep Quality Index; TKA, total knee arthroplasty.

[a]denotes statistically significant.

TABLE 3 Preoperative symptom risk factors for moderate-severe pain 12 months after TKA stratified by sex

Sex	Preoperative predictors	Adjusted OR	95% CI	*p*-value
Male	Fatigue (LFS score ≥5)	1.33	0.30–5.93	0.705
	Pain (BPI worst pain score ≥4)	15.94	1.88–134.95	0.011[a]
Female	Fatigue (LFS score ≥5)	2.17	0.99–4.76	0.054
	Pain (BPI worst pain score ≥4)	2.27	0.76–6.83	0.144

Abbreviations: BPI, Brief Pain Inventory; CI, confidence interval; LFS, Lee Fatigue Scale; OR, odds ratio; TKA, total knee arthroplasty.

[a]denotes statistically significant.

retained in the final regression model. Those with a high level of fatigue had almost three times higher odds for moderate-severe postoperative pain compared to those with low levels of fatigue odds ratio (OR) = 2.9 (95% confidence interval [CI] 1.2–7.2). Those with moderate-severe preoperative pain had more than four times higher odds for moderate-severe postoperative pain compared to those with no or mild preoperative pain OR = 4.3 (95% CI 1.4–13.9). Females were half as likely to have moderate-severe pain OR = 0.5 (95% CI 0.2–1.1) compared to males, however this association did not reach the level of statistical significance.

Regarding sex, females were much less likely than males to have moderate-severe pain 12 months after TKA. Thus, to further investigate the possible difference regarding sex, the analysis was stratified by sex and models with preoperative pain and fatigue were fitted separately for males and females (Table 3). For males, those who reported moderate-severe pain preoperatively were 16 times more likely to still experience moderate-severe pain 12 months after TKA OR = 15.9 (95% CI 1.9–134.9). In contrast, females who had severe fatigue preoperatively were two times more likely to experience moderate-severe pain 12 months after TKA OR = 2.2 (95% CI 0.9–4.8).

As displayed in the final multiple logistic regression model in (Table 4), preoperative fatigue and pain remained statistically significant in the model and were used to construct a risk matrix. All combinations of preoperative fatigue and pain levels are presented as probabilities for moderate-severe pain 12 months after TKA in (Table 5).

TABLE 4 Final multiple logistic regression model of risk factors for moderate-severe pain (worst pain intensity score ≥4) 12 months after TKA (n = 187)

Preoperative predictors	Adjusted OR	95% CI	*p*-value
Fatigue (LFS score ≥5)	2.08	1.03–4.19	0.042[a]
Pain (BPI worst pain score ≥4)	4.10	1.59–10.57	0.003[a]
Sex (Female)	0.88	0.44–1.76	0.724

Abbreviations: BPI, Brief Pain Inventory; CI, confidence interval; LFS, Lee Fatigue Scale; OR, odds ratio; TKA, total knee arthroplasty.

[a]denotes statistically significant.

4 | DISCUSSION

This study is the first to use preoperative symptoms to generate a risk matrix estimating probabilities of experiencing moderate-severe pain following TKA. Our findings revealed that higher levels of fatigue and pain prior to surgery are associated with higher odds of moderate—severe pain following TKA. This risk matrix model is a simple tool that can easily be implemented and used in clinical practice. Thus, our model may assist decision-making for clinicians and OA patients when considering knee replacement.

We found that more than one-third (40%) of patients reported moderate-severe pain 12 months after TKA. Our finding is somewhat higher than reported in a systematic review of studies (Beswick et al., 2012), which estimated a range of 10%–34% of patients experiencing the undesirable outcome of long-term pain. This discrepancy might

TABLE 5 Full risk matrix model for moderate-severe pain (worst pain intensity score ≥4) 12 months after TKA by preoperative fatigue and pain levels

Likelihood of moderate-severe pain 12 months after TKA			
		Preoperative pain level	
		Moderate-severe (NRS ≥4)	Mild (NRS <4)
Preoperative fatigue level	High (LFS ≥5)	57.3%	25.0%
	Low (LFS <5)	39.7%	14.1%

Abbreviations: LFS, Lee Fatigue Scale; NRS, 0–10 numeric rating scale; TKA, total knee arthroplasty.

reflect methodological differences across studies. Studies not only differ with respect to their patient populations and the length of their follow-up period, they also vary in how chronic pain is defined. Some studies define chronic pain as a lack of improvement in pain ratings over time, some define it as pain above a certain severity level at the time of follow-up, and still others specify a minimum duration of pain above a certain level (e.g., moderate or severe pain for at least 3 months). This study defined pain as a numerical rating ≥4 (on a 0–10 scale) for the patient's worst pain in the past 24 h. This definition of pain could include patients whose pain was significantly reduced following surgery or who might only be experiencing temporary pain, and thus, we might expect a higher proportion of patients identified as having moderate/severe pain 12 months after TKA compared with other studies that used a stricter definition.

Moreover, this study used ratings of 'worst pain intensity', which tend to be higher than the 'average pain intensity' ratings used in some other studies. However, the worst pain intensity measure was selected because it may capture different elements of pain such as movement-evoked pain. Reduced pain with movement is an important aspect of recovery after TKA. Furthermore, a systematic evaluation of the worst pain intensity rating (Atkinson et al., 2010) concluded that this measure satisfies most key recommendations for clinical trial endpoints, is simple and low demand to use and the cut-point levels were considered reasonable and valid for patient-based studies.

In this study, we did not find any statistically significant associations between moderate-severe pain at 12 months and the following preoperative variables, adjusted for other factors: patient age, depression and sleep quality. The lack of significant associations may reflect a lack of variability on these measures, as most patients in this sample were older, few had depressive symptoms, and most had sleep disturbance. A larger sample with more variation on these measures is needed to fully evaluate potential associations with pain outcomes following TKA.

Despite these negative findings, we did detect a strong association between moderate-severe preoperative pain and moderate-severe pain following TKA OR = 4.1 (95% CI 1.6–10.6), adjusting for other factors. This result is consistent with a meta-analysis focused on pain as an outcome variable (Lewis et al., 2015), which concluded that a high level of pain prior to surgery is often a risk factor for chronic pain across a number of surgical procedures.

Furthermore, we observed novel finding that a high level of preoperative fatigue was strongly associated with moderate-severe pain 12 months after TKA OR = 2.1 (95% CI 1.0–4.2). Because no previously published studies have explored the relationship between this common symptom and chronic pain, there is no existing literature with which to compare our result.

Moreover, we observed a significant sex difference with respect to the symptoms that were associated with pain after TKA. For males, only preoperative pain was statistically significant OR = 15.9 (95% CI 1.9–134.9), but the CI was quite broad. In contrast, for females, it was fatigue that was statistically significant OR = 2.2 (95% CI 1.0–4.8). Thus, this study raises the possibility that a sex difference exists, but we lack the statistical power due to our small sample size and under-representation of male patients, and are therefore unable to model the sex differences with sufficient statistical precision. Further research is needed with a larger sample to describe the potentially sex-specific influence of symptoms on pain outcomes.

Finally, we constructed a risk matrix with two variables, preoperative fatigue and pain. Both were statistically significant risk factors for moderate-severe pain 12 months after TKA and were therefore retained in the final model. When arranged in the risk matrix, our results indicated that patients with the co-occurrence of high scores on both fatigue and pain measures prior to surgery had 57% probability of experiencing moderate-severe pain 12 months after TKA. Similarly, patients with the co-occurrence of low scores on both fatigue and pain prior to surgery had only 14% probability of having moderate-severe pain 12 months after TKA. These results support our hypothesis that the presence of severe symptoms prior to surgery may be associated with significant pain 12 months after TKA.

We acknowledged that the study was conducted at one centre, which may limit the generalizability of the findings. However, the study centre admits patients from all regions of Norway. Furthermore, the relatively small sample size may have limited the statistical precision of the results, especially for analysing gender differences.

5 | CONCLUSION

High preoperative fatigue and pain scores are risk factors for moderate-severe pain 12 months after TKA. It is therefore useful to include these symptoms in preoperative screening for knee replacement therapy. Screening both fatigue and pain prior to surgery and

designing modifications for those patients at risk may reduce the likelihood of patients experiencing moderate-severe pain after TKA.

ACKNOWLEDGEMENTS

The research presented in this study was supported by funding from the Norwegian Research Council of Norway (grant #287816), the South-Easter Regional Health Authority (grant #2018060) and the U.S.–Norway Fulbright Foundation.

CONFLICT OF INTERESTS

The authors declare no potential conflicts of interest with respect to the authorship and/or publication of this article.

ETHICAL STATEMENT

This study was conducted through an inter-university collaboration between Jimma University, Ethiopia, and University of Oslo, Norway. The study was conducted with approval from the Regional Committee for Medical Research Ethics—South-East Norway (2011/1755) and from the Institutional Review Board, Jimma University (JHRPGD/510/2018).

AUTHOR CONTRIBUTIONS

Anners Lerdal, Milada Cvancarova Småstuen, Maren Falch Lindberg, and Mestawet Getachew developed and designed the study. Milada Cvancarova Småstuen and Mestawet Getachew performed the statistical analyses. All authors appraised the data, contributed to the manuscript preparation, and have read and approved the final manuscript.

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How to cite this article: Getachew M, Lerdal A, Småstuen MC, et al. High levels of preoperative pain and fatigue are red flags for moderate-severe pain 12 months after total knee arthroplasty—A longitudinal cohort study. *Musculoskeletal Care*. 2020;1–7. https://doi.org/10.1002/msc.1522

II

Observational Studies

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Worst pain intensity and opioid intake during the early postoperative period were not associated with moderate-severe pain 12 months after total knee arthroplasty – a longitudinal study

https://doi.org/10.1515/sjpain-2022-0007
Received January 3, 2022; accepted July 5, 2022;
published online August 8, 2022

Abstract

Objectives: There are several known predictors of pain after total knee arthroplasty (TKA). However, it is unclear whether acute postoperative pain intensity and postoperative opioid intake are associated with pain 12 months after TKA. Thus, the aim of this study was to assess whether worst pain intensity and opioid intake during the early postoperative period are associated with moderate-severe pain 12 months after TKA.

Methods: A total of 202 patients undergoing primary TKA between October 2012 and September 2014 were prospectively enrolled. Age, sex, contralateral knee pain, BMI, physical status and opioid intake were collected preoperatively. Ketamine and daily opioid intake were collected on postoperative days (POD) 0–3. Using the Brief Pain Inventory, patients' "worst pain intensity" was measured preoperatively, on POD 0–4, and 12 months after TKA. Two logistic regression models evaluated the independent association of early postoperative pain intensity (model 1) and postoperative opioid intake (model 2) with moderate-severe pain 12 months after TKA, adjusting for possible confounders.
Results: In total, 187 patients with data at the 12 month postoperative follow-up were included in this analysis. Pain intensity on POD2 and POD3, as well as preoperative pain and BMI, were significantly associated with pain at 12 months in univariate models. However, in multivariable models adjusted for preoperative pain and BMI, neither pain intensity on POD 0–4 (model 1) nor opioid intake on POD 0–3 (model 2) were associated with pain at 12 months. Preoperative pain was still significant in both models, but BMI remained significant only in model 2.
Conclusions: Worst pain intensity and opioid intake during the early postoperative period were not associated with moderate-severe pain 12 months after TKA when controlling for potential confounders. More research is needed to confirm these findings.

Keywords: acute postoperative pain; associated factors; moderate-severe pain; postoperative opioid analgesic; total knee arthroplasty.

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Introduction

Moderate-severe pain persisting beyond 3 months after total knee arthroplasty (TKA) remains a major issue

affecting 10–34% of patients [1]. A number of preoperative risk factors have been identified as predictors of significant chronic pain following TKA, including psychological factors [2], pain intensity and widespread pain [3], female gender and younger age [4], higher body mass index (BMI) [5], and long-term use of opioids [6, 7]. In addition, patients' acute postoperative pain experiences have been identified as a potential contributor to chronic pain across diverse surgery types [8], including TKA [9–12]. However, prior studies of the association between acute and chronic pain following TKA have not accounted for patients' preoperative pain level, a key potential confounder that is known to predict pain following TKA [3, 13]. Moreover, prior studies have been limited by short follow-up periods (i.e., six months) [9–11], despite a systematic review [14] showing that clinically important improvement occurs in the 6–12 month recovery period. Thus, a 12 month follow-up period would allow for a more reliable determination of chronic pain. Research is therefore needed to determine whether acute pain intensity during the early postoperative period is independently associated with moderate severe pain 12 months after TKA, even when accounting for the potentially confounding effect of preoperative pain.

Opioids are an important component of multimodal perioperative pain management [15], and thus, their association with the development of moderate-severe postoperative pain following TKA also needs to be evaluated. Unfortunately, long-term, and even short-term, opioid administration, as well as high doses may result in patients becoming more sensitive to pain, potentially leading to more severe pain over time [16]. According to one study [17], use of opioids for more than one month prior to surgery was associated with more severe pain at rest and walking during the first six postoperative days after TKA. Long-term use of oral opioid medications for knee pain before surgery increased the risk of chronic pain for up to two years after TKA [6, 7]. These findings suggest that patients' preoperative opioid intake may be a potential risk factor for long-term pain and may be a potential confounder when assessing the relationship between postoperative opioid intake and moderate-severe pain following TKA. To our knowledge, only one study [18] found an association between a higher intraoperative remifentanil dose and severe pain one year after cardiac surgery.

Based on our review of the current evidence on the relationships between early postoperative pain intensity and postoperative opioid intake and chronic postoperative pain, we aimed to test the following hypotheses: (1) high levels of worst pain intensity in the early postoperative period are independently associated with moderate-severe pain 12 months after TKA; and (2) higher opioid intake in the early postoperative period is independently associated with moderate-severe pain 12 months after TKA.

Methods

This preplanned sub-study is part of a larger, prospective longitudinal study at Lovisenberg Diaconal Hospital, Oslo, Norway between October 2012 and September 2014 [19]. Inclusion criteria: primary TKA for osteoarthritis, age ≥18 years, able to read/write in Norwegian. Exclusion criteria: dementia or revision surgery.

Patients received information about the study by mail. Upon admission for TKA, a study nurse screened and formally invited eligible patients to participate. All patients signed a consent form.

All patients received similar posterior cruciate-retaining fixed modular-bearing implants. Unless contraindicated, patients received a neuraxial block with bupivacaine for anesthesia, followed by epidural analgesia with continuous infusions of bupivacaine 1 mg/mL, adrenaline 2 μg/mL, and fentanyl 2 μg/mL (5–12 mL/h), oral acetaminophen 1 g every 6 h, and celecoxib 200 mg plus controlled-release oxycodone 5–20 mg every 12 h. Alternatively, patients received total intravenous anesthesia and a continuous femoral nerve block with bupivacaine 2.5 mg/mL 4–10 mL/h. Ketamine infusion 1.5 μg/kg/min was available during the first 48 postoperative hours. Regional blocks were usually removed on postoperative day (POD)2 [19].

Pre- and postoperative data collection

On the day before surgery, patients completed a questionnaire that assessed demographics (age, sex), and preoperative contralateral knee pain. Pain was assessed pre-surgery, POD0–POD4, and 12 months after TKA. Follow-up questionnaires were returned in sealed, pre-paid envelopes. Preoperative clinical data (BMI, American Society of Anesthesiologists classification of physical status, and preoperative opioid use), and postoperative ketamine and daily opioid intake from POD0 until POD3, were obtained from patients' medical records. Opioid dosages were converted to morphine milligram equivalents using the European Association for Palliative Care recommendations [20].

The validated and reliable Norwegian version of the Brief Pain Inventory (BPI) [21] was used to assess pain severity and to determine the pain location(s) using a body map. We used the "worst pain intensity" item rated on an 11-point numeric rating scale (NRS) ranging from 0 (no pain) to 10 (worst imaginable pain) because it meets the main criteria defined in the FDA draft guidance for patient-reported outcomes in terms of ability to detect a clinically meaningful change [22]. The outcome was moderate-severe knee pain 12 months after TKA, defined as having a worst pain score ≥4 [23] during the last 24 h and a body map that indicated pain in the operated knee.

Table 1: Demographic and clinical characteristics of the sample (n=187).

Variables	Number (%)	Mean (SD)
Age at admission, years (range: 41–90)		68 (9)
Sex (female)	127 (68)	
Body mass index (kg/m2, range: 19.9–43.0)		29.0 (4.6)
ASA classification of physical status		2.0 (0.5)
Preoperative rating of worst pain intensity		5.4 (2.1)
Preoperative opioid use		
Yes	17 (9.1)	
No	170 (90.9)	
Preoperative contralateral knee pain		
Yes	55 (30.5)	
No	125 (69.5)	
Postoperative ketamine use		
Yes	28 (15)	
No	159 (85)	

ASA, American society of anesthesiologists; SD, standard deviation.

Table 2: Univariate logistic regression models assessing the strength of associations between potential covariates and moderate-severe pain 12 months after total knee arthroplasty (n=187).

Variable	OR	95% CI	p-Value
Age at admission, years	0.995	0.976–1.014	0.594
Sex (female)	0.924	0.459–1.858	0.825
Body mass index in kg/m^2	1.092	1.023–1.167	0.008[a]
ASA classification of physical status	1.633	0.822–3.244	0.161
Preoperative contralateral knee pain (yes)	1.067	0.729–1.561	0.739
Postoperative ketamine (yes)	1.241	0.517–2.978	0.629
Preoperative rating of worst pain intensity	1.466	1.235–1.739	<0.001[a]
Preoperative opioid use (yes)	2.366	0.858–6.526	0.096

OR, odds ratio; CI, confidence interval; ASA, American society of anesthesiologists; [a]denotes statistical significance.

Statistical analyses

All variables shown in Table 1 were initially considered as potential covariates. Due to collinearity between acute postoperative pain and postoperative opioid intake (tolerance range, 0.32–0.60; variance inflation factor range, 1.66–3.09), separate logistic regression models were fitted to assess the independent association of acute postoperative pain (Model 1) and postoperative opioid intake (Model 2) with moderate-severe pain 12 months after TKA. Variables that reached statistical significance in the univariate regressions shown in Table 2 were entered into the multivariable logistic regression models as confounders. The results are presented as odds ratios (OR) with 95% confidence intervals (CI). Analyses were performed using Stata/SE version 14.0 (StataCorp LP). p-values <0.05 were considered statistically significant.

Results

The initial study sample included 202 patients. Fifteen patients were excluded due to incomplete follow-up data, leaving 187 patients (93%) for analysis. At 12 months, 40% of patients rated their worst pain intensity in the moderate-severe range (NRS ≥ 4), and their mean worst pain score was 3.2 (SD=2.4). Demographic and clinical data are summarized in Table 1.

As illustrated in Figure 1, patients' mean worst pain intensity on the day of surgery was 4.3, with a peak of 5.9 on postoperative day two (POD2), followed by a decrease to 5.0 on both POD3 and POD4.

As shown in Figure 2, patients' mean daily morphine-equivalent dose of opioids on the day of surgery was 12.4 mg, with a peak of 15.6 mg on POD2 and a decrease to 10.7 mg on POD3.

We examined the univariate associations of the potential covariates with moderate-severe pain 12 months after TKA (see Table 2). Two covariates were significantly associated with moderate-severe pain 12 months after TKA: higher BMI (OR=1.1, 95% CI [1.0–1.2], p=0.03) and higher preoperative pain (OR=1.5, 95% CI [1.2–1.8], p=0.001). The remaining covariates did not reach the level of statistical significance in the univariate analyses and were not entered into the multivariate models.

Table 3 shows the estimates from the univariate and the multivariable logistic regression models for worst pain intensity on POD 0 to 4. The univariate analyses showed that worst pain intensity on POD2 (OR=1.2, [95% CI 1.0–1.3], p=0.027) and POD3 (OR=1.2, [95% CI 1.0–1.3], p=0.05) were significantly associated with moderate-severe pain 12 months after TKA. The multivariable logistic regression model included worst pain intensity on POD 0 to 4 as possible predictive factors and statistically significant covariates from the univariate analyses (i.e., BMI and preoperative pain) as possible confounders. Contrary to our first hypothesis, in the final model, the intensity of worst postoperative pain on days 0–4 was no longer significantly associated with moderate-severe pain 12 months after TKA. However, preoperative pain, but not BMI, remained statistically significant.

Table 4 shows the results from the univariate and multivariable logistic regression models for opioid intake on POD 0 to 3. The univariate analyses showed that postoperative opioid intake on days 0–3 was not significantly associated with moderate-severe pain at 12 months. The

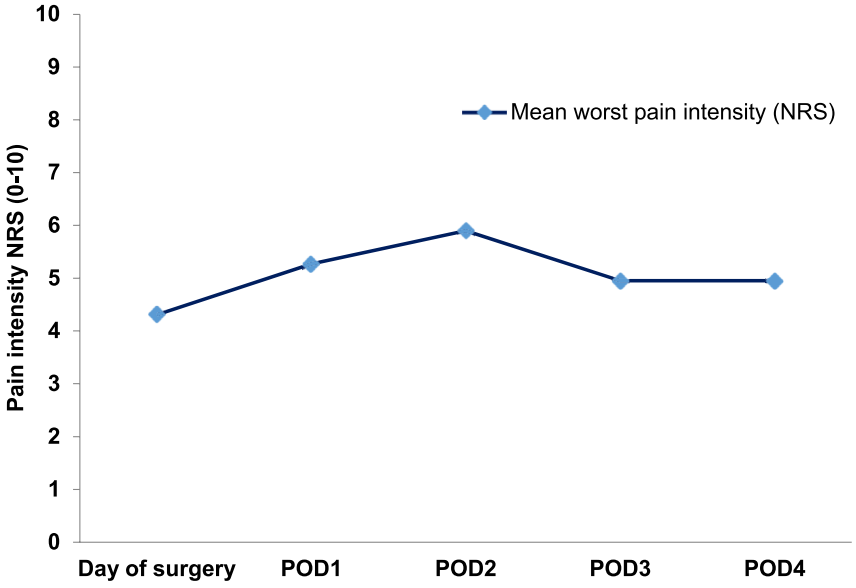

Figure 1: Mean value trajectory for postoperative ratings of worst pain intensity after TKA (n=187).
NRS, numeric rating scale; POD, postoperative day.

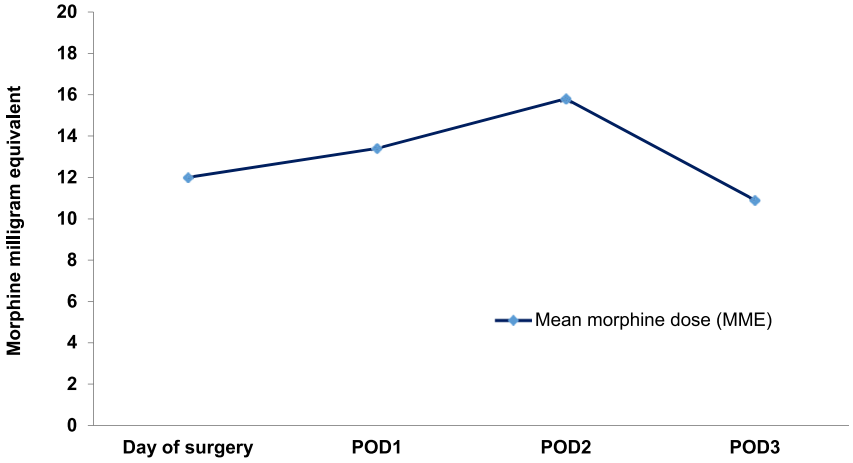

Figure 2: Mean value trajectory for postoperative opioid intake in morphine milligram equivalent (MME) dose after TKA (n=187).
POD, postoperative day.

Table 3: Model 1: univariate and multivariable logistic regression models evaluating the associations of daily ratings of early postoperative worst pain intensity and moderate-severe pain 12 months after total knee arthroplasty (n=187).

Variable	Univariate			Multivariable		
	OR	95% CI	p-Value	OR	95% CI	p-Value
Body mass index in kg/m^2	1.092	1.023–1.167	0.008[a]	1.061	0.976–1.154	0.165
Preoperative rating of worst pain intensity	1.466	1.235–1.739	<0.001[a]	1.455	1.173–1.805	0.001[a]
Early postoperative ratings of worst pain intensity						
POD0 (day of surgery)	1.025	0.928–1.133	0.619	1.008	0.865–1.176	0.914
POD1	1.072	0.952–1.208	0.253	0.999	0.839–1.188	0.994
POD2	1.184	1.019–1.376	0.027[a]	1.102	0.872–1.393	0.413
POD3	1.161	1.000–1.349	0.050[a]	0.912	0.693–1.199	0.509
POD4	1.116	0.973–1.278	0.115	1.091	0.829–1.435	0.532

POD, postoperative day; OR, odds ratio; CI, confidence interval; [a]denotes statistical significance.

Table 4: Model 2: Univariate and multivariable logistic regression models evaluating the associations of daily opioid intake and moderate-severe pain 12 months after total knee arthroplasty (n=187).

Variable	Univariate			Multivariable		
	OR	95% CI	p-Value	OR	95% CI	p-Value
Body mass index in kg/m^2	1.092	1.023–1.167	0.008[a]	1.090	1.015–1.170	0.018[a]
Preoperative rating of worst pain intensity	1.466	1.235–1.739	<0.001[a]	1.456	1.218–1.740	<0.001[a]
Early postoperative opioid intake						
POD0 (day of surgery)	1.011	0.989–1.033	0.336	1.007	0.979–1.035	0.606
POD1	1.014	0.982–1.048	0.384	1.002	0.957–1.050	0.914
POD2	1.019	0.983–1.057	0.308	1.021	0.965–1.081	0.464
POD3	0.994	0.961–1.030	0.777	0.961	0.915–1.011	0.131

POD, postoperative day; OR, odds ratio; CI, confidence interval. [a]Denotes statistical significance.

multivariable logistic regression model included postoperative opioid intake on days 0–3 as possible predictive factors and statistically significant covariates from the univariate analyses (i.e., BMI and preoperative pain) as possible confounders. Contrary to our second hypothesis, postoperative opioid intake on days 0–3 was not independently associated with moderate-severe pain 12 months after TKA in the final model, but both preoperative pain and BMI remained statistically significant.

Discussion

This study builds on prior studies of the relationships of early postoperative worst pain intensity and opioid intake to moderate-severe pain 12 months after TKA. However, a unique contribution of our study is that we controlled for multiple potential confounders, most importantly, preoperative pain, which is a known predictor of postoperative pain. This analysis adds to our understanding of the relationship between acute worst pain intensity and opioid intake trajectories, and moderate-severe pain 12 months after TKA. Contrary to our hypotheses, our study did not reveal any statistically significant associations between either early worst postoperative pain intensity or opioid intake and moderate-severe pain 12 months after TKA, when controlling for the potential confounders including preoperative pain and BMI.

Over the first 3–4 postoperative days, trajectories of patients' worst pain intensity and opioid intake followed a similar pattern, with relatively low intercepts, rising to peaks on POD2, followed by slight declines on POD3. The peak in worst pain intensity on POD2 coincided with the end of regional nerve blocks. As highlighted in a prior review [24], rebound pain after discontinuation of nerve block effects is a well-known issue that may be avoided by using a multimodal pain management regimen tailored to individual patients through systematic pain assessment [25]. In our study, patients' worst pain intensity levels on POD1 and POD2 were 5.3 and 5.9, respectively. These pain levels are comparable to previous studies following TKA [26, 27] or mixed surgical procedures [28, 29], which reported pain intensity levels ranging from 4.0 to 9.0, indicating suboptimal pain management. To optimize and individualize postoperative pain management, it is critical to determine whether pain is a result of poor pain management or modifiable preoperative risk factors for pain.

We hypothesized that greater worst pain intensity during the early postoperative period would be independently associated with moderate-severe pain 12 months after TKA. The univariate associations between some of the postoperative ratings of worst pain intensity (i.e., POD2 and POD3) and pain at 12 months were consistent with findings from four similar studies [9–12] that found acute pain intensity in the days and weeks following surgery increased the risk of moderate-severe postoperative pain in TKA patients. However, these associations did not remain statistically significant once we controlled for body mass index and preoperative pain. Interestingly, none of the previously mentioned studies controlled for preoperative pain, which may explain at least in part why our findings were not in line with previous studies. Furthermore, variation in the design of previous studies, such as using pain assessment scores at 2 and 8 weeks after TKA as predictor variables [11], using a retrospective design [12] or evaluating pain only six months after TKA [9–11], may also have contributed to the differences in findings. Our study's prospective design, earlier postoperative assessment points, and adjustment for key confounders may at least partially explain the differing results across studies. Our results from the multivariable models are consistent with previous research in patients undergoing total hip arthroplasty

surgery (THA) [30, 31], which found no link between acute and chronic postoperative pain intensity. However, hip and knee arthroplasty are not directly comparable, as THA patients are generally characterized by lower acute postoperative pain scores than TKA patients [32].

Postoperative opioid intake on days 0–3 was not independently associated with moderate-severe pain 12 months after TKA in either univariate or multivariable analyses. To our knowledge, no studies have evaluated the relationship between opioid intake in the immediate postoperative period and chronic postoperative pain following TKA. However, a study in cardiac surgery patients [18] found a link between higher intraoperative remifentanil doses and more severe thoracic pain after 12 months, suggesting that there is a dose-dependent relationship between higher intraoperative opioid doses and increased incidence of pain one year after surgery. While this finding contradicts our results, it could be explained by differences in study populations, study designs, and surgical procedures. Furthermore, in our study, patients' mean daily opioid intake was relatively low (<20 morphine milligram equivalent), which could reflect the potential opioid-sparing effect of the relatively complex multimodal analgesia [33]. Despite this, some patients experienced moderate-severe pain and were given a low-dose N methyl-D-aspartate receptor antagonist ketamine infusion as supplemental treatment within the first 48 h after surgery. According to a recent meta-analysis [34], ketamine is effective in reducing postoperative opioid intake in the first 24–48 h, along with decreased pain intensity. Ketamine is also hypothesized to decrease the probability of acute pain transitioning to chronic pain [35]. Neither pain intensity nor opioid intake during the early postoperative period were linked to the development of moderate-severe pain 12 months after TKA. A possible explanation could be the use of a multimodal analgesia approach in this study, which resulted in adequate acute pain management and lower opioid doses [36].

The results of this study are consistent with a systematic review [3] that identified preoperative pain as a risk factor for persistent pain. Moreover, the significant association between higher BMI and moderate-severe pain found in our study is in line with a study by Fisher et al. [5]. However, in another systematic review [37] that evaluated the effect of higher BMI on chronic postoperative pain, only four of the included studies found a significant association, while seven studies found no association, suggesting that this factor warrants more research.

This study's major strengths are its prospective cohort design and low attrition rate. Patients were included from all regions of Norway, which may have increased the generalizability of our findings. Despite our efforts to include all relevant confounders, some factors identified in previous studies, including psychological factors [2] and time spent in severe pain [38], were not measured in this study.

In conclusion, neither worst pain intensity nor opioid intake in the early postoperative period was associated with moderate-severe pain 12 months after TKA after controlling for relevant confounders. More research that addresses the limitations of this and other studies is needed to further advance our understanding of modifiable risk factors for chronic pain after TKA.

Acknowledgments: We would like to thank the Research Council of Norway, the South Eastern Regional Health Authority and the NORHED-SACCADE project.
Research funding: This study was supported by the Research Council of Norway (grant #287816), the South-Eastern Regional Health Authority (grant #2018060), the U.S.–Norway Fulbright foundation, and NORAD (Norwegian Agency for Development Cooperation) under the NORHED-Programme Agreement no. ETH-13/0024.
Author contributions: AL, MCS, MFL, and MG collaborated on the conception and design of the study. MCS and MG performed the statistical analyses. Article drafts were written by MG and critically revised by all authors. All authors have read and approved the final manuscript.
Competing interests: The authors have no conflicts of interest to declare.
Informed consent: All participants signed a written informed consent form prior to receiving the first questionnaire.
Ethical approval: This study was conducted through inter-university collaboration between Jimma University, Ethiopia, and University of Oslo, Norway (i.e., NORHED-SACCADE project). The study was conducted with approval from the Regional Committee for Medical Research Ethics—South-East Norway (2011/1755) and from the Institutional Review Board, Jimma University (JHRPGD/510/2018).

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Getachew *et al.*
Journal of Orthopaedic Surgery and Research (2023) 18:288
https://doi.org/10.1186/s13018-023-03770-0

Journal of Orthopaedic Surgery and Research

RESEARCH ARTICLE

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Modifiable factors associated with a consistently high acute pain trajectory after surgical treatment of traumatic fractures in Ethiopia: a multi-center prospective cohort study

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Abstract

Background In Ethiopia, little is known about postoperative pain trajectories and possible predictive factors associated with them in patients undergoing surgery following traumatic fractures.

Methods This multi-center prospective observational cohort study included surgical candidates for traumatic fractures ($n=218$). Worst pain intensity was measured with an 11-point numeric rating scale on the first 4 postoperative days and day of hospital discharge. Growth mixture modeling was used to identify subgroups of patients based on their pain trajectories, and logistic regression models to quantify associations between pain trajectories and demographic, clinical, psychological, and life style factors.

Results Two postoperative pain trajectory subgroups were identified: rapid pain relief (48% of included individuals) and consistently high pain (52% of included individuals). Sub-analysis stratified by cause of injury demonstrated that higher preoperative pain was an independent risk factor for consistently high postoperative pain regardless of the patient's injury type: traffic accident (OR = 1.48, 95% CI 1.23–1.79), machine/tool injury or conflict (OR = 1.58, 95% CI 1.11–2.26), or fall (OR = 1.47, 95% CI 1.08–1.99). Moreover, longer surgical time was a risk factor for consistently high postoperative pain among patients who had a fall-related injury (OR = 1.02, 95% CI 1.00–1.03). In contrast, among patients with a traffic-related injury, receiving a nerve block was a protective factor (OR = 0.19, 95% CI 0.04–0.87) compared with general anesthesia.

Conclusion Higher preoperative pain and longer surgical time were associated with a consistently high acute postoperative pain trajectory. Clinicians may use these potentially modifiable factors to identify patients at risk for consistently high pain during the early postoperative period.

Keywords Traumatic fracture, Growth mixture modeling, Acute postoperative pain, Trajectories, Risk factor

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Background

While several modalities are available for effective management of postoperative pain [1, 2], moderate or severe acute pain following orthopedic surgery is still a significant issue for a considerable proportion of surgical patients in both developed and developing countries [3–7]. In studies of patients undergoing a variety of surgical procedures in Ethiopia, 47–91% of patients experienced moderate to severe acute postoperative pain [8–13].

Previously, pain was expected to be proportional to the extent of tissue damage. However, the biopsychosocial model of pain proposes that patients' pain experience is a result of extensive modulation of the pain signal through a complex interplay of biological, psychological and social factors, which are unique to each individual [14]. In a meta-analysis that mainly included studies from Western countries, the following preoperative predictors for poor acute postoperative pain control in multiple surgical specialties were identified: pain catastrophizing [15], younger age, female sex, smoking, presence of preoperative pain, history of anxiety and depressive symptoms, sleep difficulties, and higher body mass index [16]. Similarly, in studies of a variety of surgeries in developing countries including Ethiopia, previous surgery [13], lower educational status [11], younger age [11, 17], female sex [17], longer duration of surgery [9, 13], presence of preoperative pain and anxiety [13, 18], general anesthesia, peripheral nerve block [12, 18, 19] were identified as risk factors for moderate to severe pain.

Not surprisingly, the current state of knowledge on acute pain is based mainly on studies from western countries, and their findings cannot necessarily be generalized to populations in developing countries like Ethiopia with less available resources for pain management and different health systems, settings, patient education levels and lifestyles. Furthermore, among the studies conducted in developed and developing countries, different surgical procedures were included but there is a lack of studies within pain after traumatic fracture surgery. Thus, research on the extent of acute postoperative pain and associated risk factors among traumatic fractures surgical populations is of particular importance, primarily given the high frequency of traumatic fractures, in Ethiopia [20], as well as globally [21]. Besides, large variation exist in the severity of immediate postoperative pain i.e., two-fold higher in orthopedic surgery compared with laparotomy surgery [22]. Moreover, none of the abovementioned studies evaluated pain trajectories. Assessment of intensity of pain at a single time point may be too simplistic because it does not take into account that resolution over time is a key feature of postoperative pain [23]. Evaluating patients' acute pain trajectories over time may provide more clinically relevant information and a deeper understanding of patients' individual differences [24]. Therefore, this study aimed to identify subgroups of patients with distinct acute pain trajectories, and determine the associations of pre and intraoperative factors with acute pain trajectory subgroups, in a cohort of Ethiopian patients who underwent surgery for traumatic fractures.

Methods and materials

Design and setting

This multi-center prospective observational cohort study included surgical candidates for traumatic fractures at two University teaching Hospitals in Ethiopia (i.e., Jimma Medical Center (JMC); Addis Ababa Burn Emergency and Trauma (AaBET) hospital). AeBET hospital is one of the largest government hospital in the country dedicated to emergency and trauma care, located in Addis Ababa, Ethiopia. Annually, this hospital has ~ 20,000 to 30,000 emergency visits. It is a 129-bed institution with a 52-bed orthopedic ward. The JMC is located in the city of Jimma in southwest Ethiopia. It provides services with a catchment population of over 20 million people. It has a total of 800 beds with 21 clinical service units. The surgery department has about 286 beds; including a 50-bed orthopedic ward.

Sample size

We estimated that a sample of 200 patients would provide adequate power to estimate regression coefficients with sufficient precision with a model including 10 possible predictive factors. To allow for an estimated 10% attrition rate, we aimed to include a sample of 220 patients. With a final sample size of 220, our study had sufficient statistical power to evaluate these potentially predictive factors.

Patient eligibility and recruitment

Patients scheduled to undergo elective surgery at one of the two study sites from 31 January 2019 through 07 October 2021 were consecutively approached by trained research assistants, who are bilingual speakers of Amharic and Afan Oromo. Patients were approached on the day before their planned surgery and were invited to participate if they met the following inclusion criteria: age 18 years or older, had an upper and/or lower extremity fracture related to injury, fully conscious with no cognitive impairment, and able to communicate in either Amharic or Afan Oromo language. As shown in Fig. 1, among the 253 patients screened for inclusion, 220 were considered eligible and a total of 218 were included in this analysis.

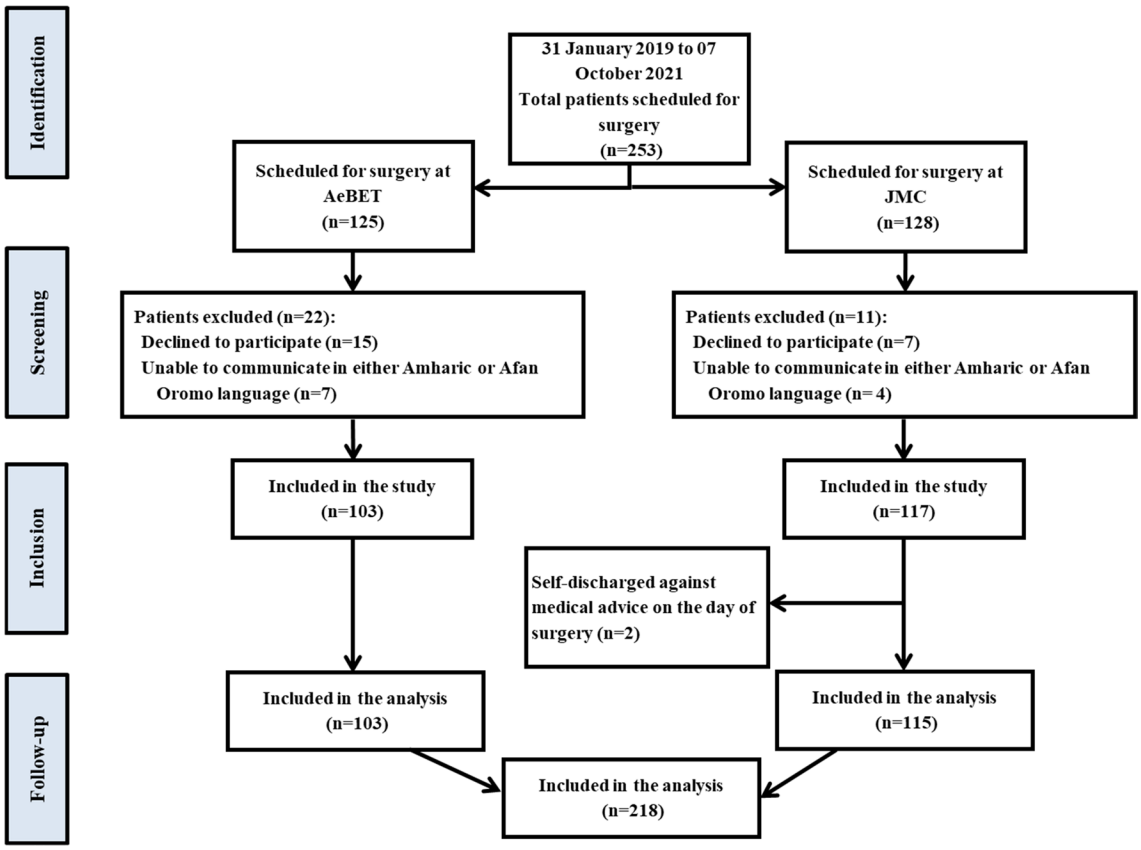

Fig. 1 Flowchart of patient inclusion and exclusion

Data collection procedures

Data were collected through patient chart review (i.e., age, sex, type of injury, location of injury, duration of surgery and, types of anesthesia) and by administering a questionnaire. The adult literacy rate of 51% reported in Ethiopia UNESCO Institute for Statistics, July 2017, many patients could not complete the questionnaire without help. Therefore, we used a face-to-face interviewer-administered questionnaire for all patients (i.e., the research assistant read the questions out loud and marked the patients' responses in the questionnaire). The questionnaire was prepared in the two local languages (Amahric and Afan Oromo) that are predominantly spoken in the study's settings.

On the day before surgery, the following preoperative information was obtained: patient age, sex, education, residence, life style variables (i.e., smoking, alcohol, khat), previous surgery, type of injury, and location of injury, as well as preoperative pain, anxiety, depression, and catastrophizing.

Intraoperative data, including duration of surgery and types of anesthesia, were collected from the patient's medical chart on POD1.

Postoperatively, ratings of worst pain intensity at the surgical site over the last 24 h were collected on postoperative day (POD) 1, POD2, POD3, POD4, and the day of discharge. These pain ratings were the outcome and were used to determine patients' acute postoperative pain trajectories.

Measures

Anxiety and depression were assessed with the Hospital Anxiety and Depression Scale (HADS), a 14-item scale, scored on a 4-point Likert scale (0–3), ranging from "not at all" to "most of the time". Seven items measuring anxiety and seven measuring depression over the last week yield a total score between 0 and 21 for each subscale [25]. The validated Ethiopian version of the HADS was used, with Cronbach's alpha coefficients of 0.78, 0.76 and 0.87 for the anxiety and depression subscales and the full scale, respectively [26].

Patients' level of pain catastrophizing was assessed with the Pain Catastrophizing Scale (PCS). The original PCS was developed by Sullivan et al. [27]. It contains 13 items with a 5-point Likert scale (0–4) ranging from "not at all" to "all the time". The PCS yields a total score with a range

of 0–52, with higher scores representing more catastrophizing. Since no Ethiopian version of the PCS existed at the time of the study, for the purpose of this study it was translated and adapted to Amharic and Afan Oromo, the two most widely spoken languages in the study settings. Translation of the original English version of the PCS was conducted according to a five-step process recommended for translating, adapting and validating instruments for cross cultural health care research [28].

Patients were asked to rate their level of pain at the surgical site over the last 24 h using the "worst pain" item of the Brief Pain Inventory short form (BPI), which has an 11-point numeric rating scale (NRS) with the end points 0 (no pain) and 10 (pain as bad as you can imagine). The BPI was originally developed as the Wisconsin Brief Pain Questionnaire to assess pain occurrence, intensity, interference with function, pain relief, and pain localization [29]. For this study, we used a validated Ethiopian version of the BPI [30].

Statistical analyses

Categorical variables are reported as counts and percentages, and continuous variables as means and standard deviations. Differences between patients admitted at the two hospitals are assessed using *t*-tests for continuous variables and Chi-square tests for categorical variables.

The data were analyzed in two steps. In step 1, a growth mixture model (GMM) was fitted to identify subgroups of patients based on similarities in their trajectories of acute postoperative pain across five time points (POD1-4, day of discharge). We identified two distinct trajectories, namely the rapid postoperative pain relief class and the consistently high postoperative pain class. In step 2, the two classes were used as the dependent variable and we fitted a multiple logistic regression model to identify possible associations with pre- and intra-operative factors (i.e., those that have been previously shown to influence acute postoperative pain). Further, we stratified our data by cause of injury and fitted separate logistic regression models. The results are presented as odds ratios (OR) with 95% confidence intervals (CI) and *p* values was considered significant when $p < 0.05$. To increase precision of the estimates, we used bias-corrected bootstrapping with 1000 samples. All analyses were considered exploratory, so no correction for multiple testing was performed. Data analyses were performed using the Statistical Package for Social Science (SPSS) version 26 and Stata version 17.

Results

Study population

Initially, 220 patients were included and completed the baseline data. Two patients were excluded after self-discharging against medical advice on the day of surgery. Postoperative pain scores were assessed for 218 patients with a retention rate of 99.1% at POD1. Of these, 99.1%, 96.3%, 88.1%, and 99.1% also had pain ratings for POD2, POD3, POD4 and day of discharge, respectively.

Patient characteristics

The demographic, lifestyle, clinical and psychological characteristics of the patients at each hospital are summarized in Table 1. Several preoperative differences were found between patients admitted to the two hospitals (i.e., history of alcohol and khat use, duration of surgery, preoperative pain intensity, anxiety, depression).

Acute postoperative worst pain intensity trajectories

The GMM model based on patients' pain ratings at five time points during the acute postoperative period identified two classes of patients with distinct pain trajectories. As shown in Fig. 2, patients in class 1 ($n = 105$, 48.2%) experienced moderate pain intensity (mean = 5.2, 95% CI 4.9–5.5) on POD1, followed by a rapid decline. Patients in class 2 ($n = 113$, 51.8%) experienced severe pain intensity (mean = 8.2, 95% CI 8.0–8.4) on POD1, followed by consistently high pain intensity over the five postoperative time points. To reflect the pattern of the trajectories, we labeled class 1, "rapid postoperative pain relief" and labeled class 2 "consistently high postoperative pain".

Factors associated with consistently high postoperative pain

Possible predictive factors for membership in the consistently high postoperative pain class are listed in Table 2. Of the sociodemographic variables, neither age, sex, type of residence nor level of education were significantly associated with type of pain trajectory. However, those who suffered machine/tool-related injuries or were involved in conflict were almost 80% less likely to be in the consistently high postoperative pain class compared to those with traffic-related injuries (OR = 0.19, 95% CI 0.06–0.63).

With respect to life style, use of khat was associated with reduced likelihood of belonging to the consistently high postoperative pain class; however, this association did not reach the level of statistical significance. Moreover, alcohol users were about 70% less likely to be in the consistently high postoperative pain class compared to non-users.

Regarding clinical characteristics, preoperative worst pain intensity was significantly associated with being in the consistently high postoperative pain class. For each unit increase on the preoperative pain intensity scale, the odds of being in the consistently high postoperative pain class increased by 38% (OR = 1.38, 95% CI 1.16–1.64). Duration of surgery was significantly associated

Table 1 Patient characteristics by hospital

Characteristic	Patients at JMC hospital $n=115$	Patients at AaBET hospital $n=103$	P value
	mean (SD)	mean (SD)	
Age (years)	33.3 (11.6)	33.5 (11.7)	0.89
	n (%)	*n* (%)	
Sex (Male)	92 (80)	84 (81.6)	0.77
Education status			
Primary	43 (46.2)	45 (49.5)	0.90
Secondary	34 (36.6)	31 (34.1)	
Diploma and higher	16 (17.2)	15 (16.5)	
Residence			
Urban	63 (54.8)	49 (47.6)	0.29
Rural	52 (45.2)	54 (52.4)	
Cause of injury			
Traffic accident	56 (48.7)	58 (56.9)	0.22
Machine/tool injury or conflict	33 (28.7)	19 (18.6)	
Fall	26 (22.6)	25 (24.5)	
Location of injury			
Upper extremities	52 (45.2)	34 (33.0)	0.18
Lower extremities	58 (50.4)	64 (62.1)	
Both upper and lower extremities	5 (4.3)	5 (4.9)	
Lifestyle variables			
Alcohol (yes)	63 (54.8)	39 (37.9)	0.012
Khat (yes)	60 (52.2)	34 (33.0)	0.004
Smoking (yes)	16 (13.9)	9 (8.7)	0.23
Anesthesia type			
General	41 (35.7)	38 (38.0)	0.47
Spinal	48 (41.7)	46 (46.0)	
Nerve block	26 (22.6)	16 (16.0)	
Clinical variables			
Previous surgery (Yes)	16 (13.9)	8 (7.8)	0.15
Consistently high postoperative pain (Yes)	26 (22.6)	87 (84.5)	< 0.001
	mean (SD)	mean (SD)	
Preoperative worst pain intensity (range 0–10)	4.2 (2.5)	7.1 (2.5)	< 0.001
Duration of surgery (minutes)	99.2 (46.6)	147.6 (58.8)	< 0.001
Psychological variables			
Anxiety (range 0–21)	7.5 (4.1)	9.6 (4.3)	< 0.001
Depression (range 0–21)	13.1 (3.2)	10.8 (3.5)	< 0.001
Pain catastrophizing (range 0–52)	25.8 (9.1)	25.8 (7.9)	0.99

JMC = Jimma Medical Center; AaBET = Addis Ababa Burn Emergency and Trauma

P-values < *.05* were considered statistically significant

with higher odds for being in the consistently high postoperative pain. Furthermore, for type of anesthesia, patients with nerve block anesthesia had about 80% lower odds than those who had general anesthesia of being in the consistently high postoperative pain class (OR = 0.21, 95% CI 0.05–0.79). Of the psychological factors, only depression remained independently associated with type of pain trajectory. The higher the depression score, the lower the odds of being in the consistently high postoperative pain class (OR = 0.80, 95% CI 0.69–0.93).

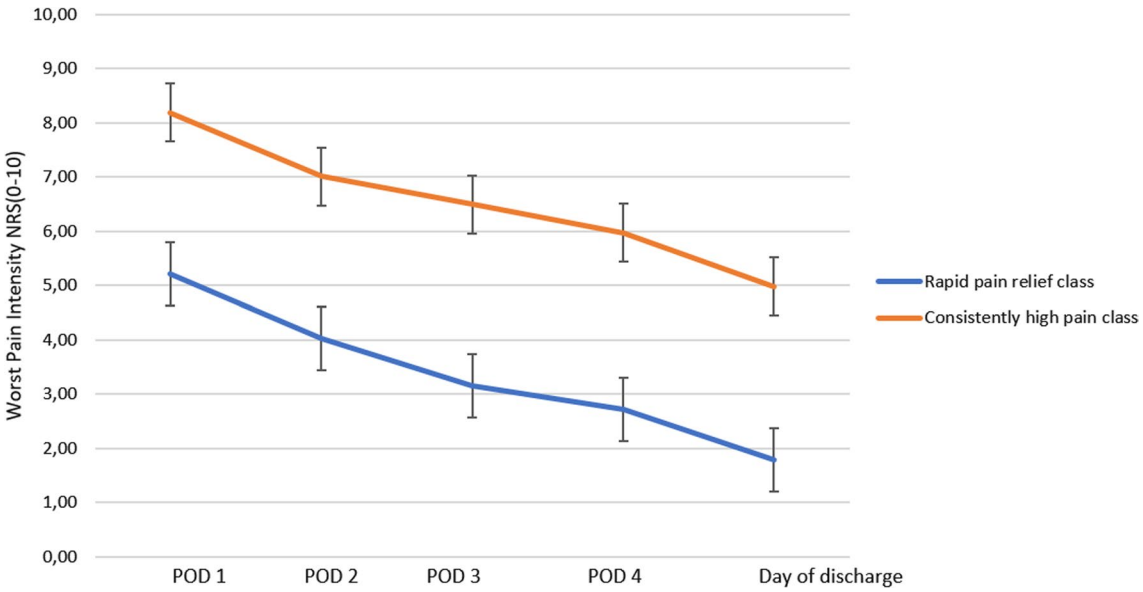

Fig. 2 Mean postoperative pain intensity score and 95% confidence intervals for 2 trajectory classes: rapid postoperative pain relief ($n = 105$) and consistently high postoperative pain ($n = 113$)

Factors associated with consistently high postoperative pain by cause of injury

Predictive factors for membership in the consistently high postoperative pain class stratified by cause of injury are shown in Table 3. Preoperative worst pain intensity remained an independent predictive factor for being in the consistently high postoperative pain class for all causes of injury. A 1-point increase in preoperative worst pain intensity was associated with about a 50% increase in the odds of being in the consistently high postoperative pain class.

Type of anesthesia (i.e., nerve block vs general anesthesia) remained associated with the consistently high postoperative pain class only for those with a traffic-related injury (OR = 0.19, 95% CI 0.04–0.87).

Duration of surgery was significantly associated with the consistently high postoperative pain class only for those who had fall-related injuries (OR = 1.02, 95% CI 1.00–1.03). For each 10 min increase in the duration of the surgery the odds of being in the consistently high postoperative pain class increased by 22%.

Discussion

To our knowledge, this is the first multi-center study on acute pain trajectories in a cohort of Ethiopian patients who underwent surgery for traumatic fractures. We identified two subgroups of patients with distinct trajectories of acute pain: the "rapid postoperative pain relief class" and the "consistently high postoperative pain class" based on five daily pain ratings during the early postoperative period.

More than half of the patients in this study were classified as having consistently high postoperative pain, which suggests that acute postoperative pain is a major problem for patients with traumatic fractures in Ethiopia. Postoperative pain management may be a particular challenge in a developing country. Several barriers to postoperative pain management have been identified in previous studies in Ethiopia [31, 32], such as lack of health personnel trained in pain management, lack of access to analgesics and adjuvant analgesics, lack of pain treatment protocols, fear of patient addiction to pain-relieving drugs, misjudgment of patients' pain severity, and strict drug regulations.

Patients who had an injury caused by machine/tool use or conflict had an 80% decrease in the odds of having a consistently high postoperative pain trajectory, compared to those with injuries caused by a traffic accident. According to Hu et al. [33], patients experience extensive bodily pain beginning in the immediate upshot of motor vehicle collisions, which does not remit, but can instead go on to a gradual extension of pain from localized to widespread over time, suggesting that these patients may also be at risk for developing persistent pain conditions. Thus, the non-improvement of pain in patients who had a traffic-related injury may suggest that they had more complex injuries, leading to more severe acute pain that may warrant a multimodal and more invasive approach to pain management.

Table 2 Multivariable logistic regression of factors associated with consistently high postoperative pain class membership

Variables	Full		
	OR	**95% CI**	***P value***
Socio-demographic			
Age, years	1.03	0.99–1.07	0.17
Female sex (Ref: male)	0.48	0.13–1.78	0.27
Education status			
Secondary (Ref: primary)	2.10	0.34–12.80	0.42
Higher (Ref: primary)	0.17	0.02–1.44	0.16
Residence			
Rural (Ref: urban)	3.42	0.61–19.30	0.16
Cause of injury			
Machine/tool injury or conflict (Ref: traffic accident)	0.19	0.06–0.63	0.006
Fall (Ref: traffic accident)	0.32	0.02–1.22	0.07
Lifestyle			
Khat (Ref: never used)	0.38	0.14–1.02	0.054
Smoking (Ref: never smoked)	2.70	0.68–10.74	0.16
Alcohol (Ref: never used)	0.36	0.14–0.91	0.03
Clinical			
Preoperative worst pain intensity (range: 0–10)	1.38	1.16–1.64	< 0.001
Duration of surgery (in minutes)	1.01	1.00–1.02	0.02
Previous surgery (Ref: No previous surgery)	1.34	0.31–5.85	0.69
Anesthesia type			
Spinal (Ref: general anesthesia)	0.44	0.16–1.19	0.10
Nerve block (Ref: general anesthesia)	0.21	0.05–0.79	0.02
Psychological			
Anxiety (range 0–21)	1.06	0.94–1.19	0.38
Depression (range 0–21)	0.80	0.69–0.93	0.003
Pain catastrophizing (range 0–52)	1.04	0.98–1.12	0.19

Rapid postoperative pain relief class as reference

OR = odds ratio; CI = confidence interval

P-values < *.05* were considered statistically significant, Ref = reference

The subgroup analysis revealed that for patients with traffic-related injuries, receiving nerve block anesthesia was protective against a consistently high postoperative pain trajectory, compared to general anesthesia. This is likely due to the advantage of nerve block anesthesia for postoperative pain management. Several other studies done in Ethiopia [12, 18], Tanzania [19], Brazil [34], and France [35] reported the same phenomenon, indicating that patients who had general anesthesia had a higher intensity of postoperative pain when compared to regional anesthesia. Moreover, a clinical practice guideline strongly acknowledged clinicians to consider local or regional block anesthesia during operative fixation of fractures and as part of postoperative multimodal pain management [36]. Thus, clinicians need to pay attention to those with traffic-related injuries.

The sub-analysis regression model stratified by cause of injury is unique to this study. Our main finding is that higher preoperative pain was a stable risk factor for having consistently high postoperative pain across all injury types. This finding is consistent with a recent systematic review and meta-analysis, which identified that the presence of preoperative pain is a known predictor for poor acute postoperative pain control [16]. Furthermore, among patients who had a fall-related injury, longer duration of surgery was significantly associated with consistently high postoperative pain in our study. This finding is in accordance with previous published research [9, 13]. Prolonged surgical duration is associated with greater surgical stress to the body and likely greater tissue trauma. Thus, clinicians working in trauma centers can use this information to better assess which patients may require additional pain control.

This study has several strengths and limitations that need to be considered. The strengths of this study are: prospective multi-center design, the low attrition rate,

Table 3 Multivariable logistic regression models of factors associated with consistently high postoperative pain class membership[§] by cause of injury

Variables	Traffic-related injury ($n = 108$)			Machine/tool-related injury or conflict ($n = 52$)			Fall-related injury ($n = 50$)		
	OR	95% CI	*P value*	OR	95% CI	*P value*	OR	95% CI	*P value*
Lifestyle									
Alcohol (Ref: never used)	0.65	0.25–1.65	0.36	0.43	0.08–2.45	0.34	0.30	0.06–1.58	0.16
Clinical characteristics									
Preoperative worst pain intensity (range: 0–10)	1.48	1.23–1.79	< 0.001	1.58	1.11–2.26	0.01	1.47	1.08–1.99	0.01
Duration of surgery (minutes)	1.00	0.99–1.01	0.26	1.01	0.99–1.04	0.08	1.02	1.00–1.03	0.04
Types of anesthesia									
Spinal (Ref: general)	0.58	0.21–1.65	0.31	0.34	0.05–2.34	0.27	1.30	0.23–7.38	0.76
Nerve block (Ref: general)	0.19	0.04–0.87	0.03	0.12	0.01–1.56	0.10	0.47	0.05–4.29	0.51
Psychological									
Depression (range: 0–21)	0.88	0.77–1.02	0.08	0.84	0.64–1.12	0.24	0.96	0.77–1.19	0.70

[§] Rapid postoperative pain relief class as reference; Abbreviations: OR = odds ratio; CI = confidence interval

P-values < *.05* were considered statistically significant; Ref = reference

a relatively representative population that included patients from one of the largest trauma centers and one teaching and referral hospital in Ethiopia, a relatively large sample size and the advanced statistical analysis. Our study has some limitations that should be considered when interpreting the results. The results only apply to patients undergoing surgery for traumatic fractures and do not control for potentially confounding factors such as perioperative administration of analgesia. In addition, several differences were found between the two hospitals with respect to lifestyle-related (history of alcohol and khat use), clinical (preoperative pain, length of surgery) and psychological (anxiety, depression) factors. The patients admitted to the two hospitals live in different regions of the multi-ethnic Ethiopia, which may result in cultural, contextual, religious, and psychological differences in the patient populations for the two hospitals. While these differences resulted in a more heterogeneous sample, our decision to include patients from two hospitals in two different regions of Ethiopia may have resulted in more generalizable findings.

Conclusions

The present study shows two classes of patients based on their acute postoperative pain trajectories, and more than half of patients were classified in the consistently high pain trajectory class. Higher levels of preoperative worst pain intensity and longer surgical duration were significant factors related to the consistently high acute postoperative pain trajectory. Clinicians working at trauma centers should be aware of these factors to identify patients at risk of the consistently high acute postoperative pain trajectory and take measures to minimize early postoperative pain. Nerve block anesthesia was associated with lower risk of a more severe pain trajectory in patients with traffic-related injuries. Clinicians need to be aware of patients with traffic-related injuries scheduled for operative fixation of fractures and consider using a multimodal pain management regiment in line with current guidelines.

Abbreviations

JMC	Jimma Medical Center
AaBET	Addis Ababa Burn Emergency and Trauma
UNESCO	United Nations Educational, Scientific and Cultural Organization
GMM	Growth Mixture Model
POD	Postoperative day
HADS	Hospital Anxiety and Depression Scale
PCS	Pain Catastrophizing Scale
BPI	Brief Pain Inventory short form
NRS	Numeric Rating sSale

Acknowledgements

We would like to thank the NORHED-SACCADE project. Our deepest gratitude goes to Jimma Medical Center hospital and Addis Ababa Burn Emergency and Trauma hospital for their assistance in conducting this research. We thank the data collectors for their enthusiastic and energetic contributions. Finally, the authors extend their gratitude to the study participants who spent their time responding to questionnaires.

Author contributions

MG, AL, and MFL collaborated on the conception and design the study. MG contributed to the collection of the data. MG and MCS performed the statistical analysis. MG drafted the manuscript. MG, AL, MCS, MTE, TD, and MFL participated in interpretation of the data, read, gave input to and approved the final manuscript. All authors read and approved the final manuscript.

Funding

Open access funding provided by University of Oslo (incl Oslo University Hospital). The study was funded for the doctoral degree of Mestawet Getachew by the NORAD (Norwegian Agency for Development Cooperation) under the

NORHED-Program Agreement no. ETH-13/0024 and the paper will be part of her thesis at the University of Oslo. The funder has no role in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript. Dr Lindberg was funded by the Southern and Eastern Norway Regional Health Authority (grant#2022007) and the Norwegian Nurses Association Special interest group for Orthopaedics. Dr Lerdal was funded by the Research Council of Norway (grant# 287816).

Availability of data and materials
The datasets used and/or analyzed on this study are available from the first author (Mestawet Getachew) on reasonable request.

Declarations

Ethics approval and consent to participate
This study received ethical approval from the Institutional Review Boards of Jimma University (JHRPGD/510/2018), St. Paul's Hospital Millennium Medical College (PM23/406), and the Regional Committee for Medical Research Ethics—South-East Norway (2017/1609/REK). Written informed consent forms were obtained from all patients. For patients who were unable to read and/or write, informed consent including a witness signature was obtained. The study was performed in accordance with the Declarations of Helsinki.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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Received: 16 March 2023 Accepted: 31 March 2023
Published online: 10 April 2023

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Publisher's Note

ANNEX 1:1 Patient information sheet and informed consent English

UiO : Universitetet i Oslo

Invitation to participate in a research project

Pre-operative clinical and psychological predictors of acute pain trajectories and quality of life in orthopaedic surgery patients at Jimma University Medical Center and Addis Ababa Burn Emergency and Trauma hospital, Ethiopia.

This is an invitation to participate in a research project to investigate acute pain in orthopedic trauma patients. The purpose of the study is to assess risk factors for severe trajectories of acute pain and health-related quality of life in orthopedic trauma patients during hospitalization for surgery at Jimma University Medical Center and Addis Ababa Burn Emergency and Trauma hospital. We expect the study to generate new knowledge and to increase the awareness on pain management among healthcare professionals involved in surgical wards. You have been selected as a possible participator in this study because; you are an adult and admitted to Jimma University Medical Center or Addis Ababa Burn Emergency and Trauma hospital to undergo surgery for a fracture. Jimma University, Ethiopia, and University of Oslo, Norway, are responsible for the study.

What is the study about?

The study will collect and record personal information about you about pain, previous and current illnesses, mood, and perceived health. If you participate in the study, you will be interviewed prior to surgery, after surgery and one month after discharged from hospital. Data on comorbidity, assessment and treatment related to your pain experiences registered in the medical record will also be included in the study. Participation in the study will not affect your treatment in any way.

Possible benefits and expected disadvantages of taking part

Participation in this study will not pose any risks on you. The interviews will take a while to complete, may therefore perceive you as a burden. The interview may also help you to gain new insight in your situation. You will have a full right to stop the interview at any time, or to skip any question you do not want to answer.

Voluntary participation and the possibility to withdraw consent (Opt-out)

Participation in the study is voluntary. If you wish to take part, you will need to sign the declaration of consent on the last page. You can, at any given time and without reason withdraw your consent. This will not have any consequences for any future treatment. If you decide to withdraw participation in the project, you can demand that your personal health data be deleted. If you at a later point wish to withdraw consent or have questions regarding the project, you can contact Mestawet Getachew, Cell Phone: +251911076564 or email address (nattimosis@gmail.com).

What will happen to your health information?

The information that is recorded about you will only be used as described in the purpose of the study. You have the right to access which information is recorded about you and the right to stipulate that any error in the information that is recorded as corrected.

All information will be processed and used without your name or personal identification number, or any other information that is directly identifiable to you.

The Project Manager has the responsibility for the daily operations/running of the Research Project and that any information about you will be handled in a secure manner. Information about you will be anonymised or deleted a maximum of 5 years after the project has ended.

I am willing to participate in the research project

Use this if literate

City/Town and date _____ Participant's Signature

Participant's Name (in BLOCK LETTERS)

I confirm that I have given information about the research project

Place and date _____ Signature

Role in the research project

Use this if illiterate

Pre-operative

I confirm that I have witnessed the patient received all the above information and consented willingly to be part of the study about the research project

City/Town and date

Wittiness's Signature

Wittiness's (in BLOCK LETTERS)

City/Town and date

Participants' finger print

Participants' name (in BLOCK LETTERS)

I confirm that I have given information about the research project

Place and date

Signature

Role in the research project

Pre-operative

PATIENT'S PERSONAL INFORMATION(S)

Date _____

Code number _____

Patient Name _____

Patient's phone number_____

Patient's care giver phone number_____

Patient's Bed number_____

Patient's Card number_____

Patient's Address_____

Pre-operative

ANNEX 2:1 Data collection questionnaire in English

Code number _____

Part I: Socio-demographic information

Mark "X" in the Boxes if necessary.

1. **Age (yrs):_____**
2. **Sex:** Male ☐ Female ☐
3. Admission Date?_____
4. Causes of injury? _____
5. Location of injury(s)? Upper extremities ☐ Lower extrimites ☐ Both ☐ Specify the body region (site) of the injury? _____
6. Pre-operative analgesia ordered/prescribed by physician? Yes ☐ No ☐
7. If '**Yes'** to question **Number 6**; use the following table to fill the information?

No	Types of analgesia	Route of administration	Dose	Frequency	Duration
1					
2					
3					
4					
5					

8. Laboratory tests results.
   - ✓ Renal function test: BUN_____ Creatinine_____
   - ✓ Liver function test: SGOT_____ SGPT_____
   - ✓ Platlete_____ PT_____ APTT_____INR_____
9. **Residence:** Urban ☐ Rural ☐
10. **Religion:** Orthodox ☐ Protestant ☐ Muslim ☐ Catholic ☐
    If other, specify_____
11. Are you educated? Yes ☐ No ☐
12. If '**Yes'** to question **Number 11,** choose the grade
    a) 1-4 grade ☐ b) 5-8 grade ☐

c) 9-10 grade ☐
d) 10 $^{+2}$ ☐
e) 11-12 grade ☐
f) Diploma ☐
g) Degree ☐
h) Other specify_____

13. **Job/Occupation:**

a) Gov't employee ☐
b) Private employee ☐
c) House wife ☐
d) Farm worker ☐
e) Merchant ☐
f) Retired ☐
g) Student ☐
h) Unemployed ☐
i) Day laborer ☐

Part: II- Behavioral Measurements

14. Have you ever smoked cigarettes? Yes ☐ No ☐
15. If '**Yes'** to question **Number 14;** Do you now smoke cigarettes? Yes ☐ No ☐
16. If '**Yes'** to question **Number 15;** how many cigarette(s) per day? _____and per week_____
17. Have you ever consumed alcohoic drink? Yes ☐ No ☐
18. If '**Yes'** to question **Number 17;** Do you now drink alcohol? Yes ☐ No ☐
19. If '**Yes'** to question **Number 18**; How many times a week?
    - **a)** Daily ☐
    - **b)** 5-6 days/week ☐
    - **c)** 1-4 days/week ☐
    - **d)** Others specify_____
20. Have you ever chewed khat? Yes ☐ No ☐
21. If '**Yes'** to question **Number 20**; Do you now chew khat? Yes ☐ No ☐
22. If '**Yes'** to question **Number 21;** how frequently per week? _____
    - **a)** Daily ☐
    - **b)** 5-6 days/week ☐
    - **c)** 1-4 days/week ☐
    - **d)** Others specify_____
23. Have you ever drunk coffee? Yes ☐ No ☐
24. If '**Yes'** to question **Number 23**; Do you now drink coffee? Yes ☐ No ☐
25. If '**Yes'** to question **Number 24;** How often do you drink coffee per day_____how many cup / on each of the session? _____

Part: III Disease characteristics

26. Previous surgery? Yes ☐ No ☐ Specify type of surgery_____
27. Have you ever been told by a health professional that you have any chronic illnesses(such as diabetics, hypertension etc…) that need follow up? Yes ☐ No ☐
28. If ''**Yes''** to question **number 27**, specify the diseases and the respective medication used?

Pre-operative

No	Types of diseases	Medication	Dose	Frequency	Duration
1					
2					
3					
4					
5					
6					

29. For the last 24 hours, do you used pain killer (analgesia) to manage your pain?

Yes ☐ No ☐

30. If ‘’**Yes’’** to question **number 29;** mention in the following table with their respective dosage form, dose, and frequency?

No	Types of analgesia	Route of administration	Dose	Frequency
1				
2				
3				
4				
5				

31. Adverse effects of analgesic agents: Yes ☐ No ☐

32. If ‘**Yes’** to question number **31** , describe the problems_____

ANNEX 3:1 English version BPI short form

Date:_____ Time:_____

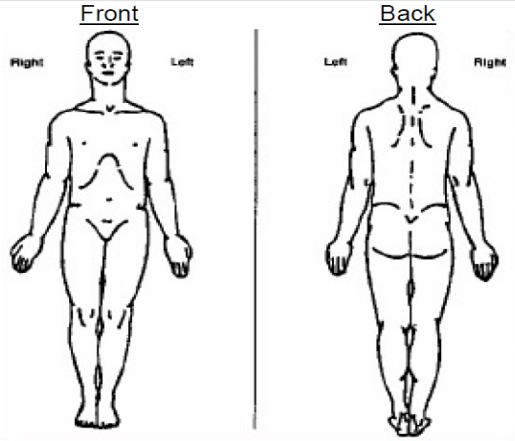
Instructions: Tick the box.

Brief Pain Inventory (Short Form)

1. Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain other than these everyday kinds of pain today?

☐ Yes ☐ No

2. On the diagram, shade in the areas where you feel pain. Put an X on the area that hurts the most.



3. Please rate your pain by marking the box beside the number that best describes your pain at its worst in the last 24 hours.

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

No Pain — Pain As Bad As You Can Imagine

4. Please rate your pain by marking the box beside the number that best describes your pain at its least in the last 24 hours.

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

No Pain — Pain As Bad As You Can Imagine

5. Please rate your pain by marking the box beside the number that best describes your pain on the average.

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

No Pain — Pain As Bad As You Can Imagine

6. Please rate your pain by marking the box beside the number that tells how much pain you have right now.

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

No Pain — Pain As Bad As You Can Imagine

Page 1 of 2

7. What treatments or medications are you receiving for your pain?

8. In the last 24 hours, how much relief have pain treatments or medications provided? Please mark the box below the percentage that most shows how much relief you have received.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
☐ No Relief	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐ Complete Relief

9. Mark the box beside the number that describes how, during the past 24 hours, pain has interfered with your:

A. General Activity

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

B. Mood

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

C. Walking ability

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

D. Normal Work (includes both work outside the home and housework)

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

E. Relations with other people

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

F. Sleep

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

G. Enjoyment of life

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

ANNEX 4:1 English version Hospital Anxiety and Depression Scale (HADS)

Instructions: Tick the box beside the reply that is closest to how you have been feeling in the past week.

D	A		D	A	
		I feel tense or 'wound up':			**I feel as if I am slowed down:**
	3	Most of the time	**3**		Nearly all the time
	2	A lot of the time	**2**		Very often
	1	From time to time, occasionally	**1**		Sometimes
	0	Not at all	**0**		Not at all
		I still enjoy the things I used to enjoy:			**I get a sort of frightened feeling like 'butterflies' in the stomach:**
0		Definitely as much		**0**	Not at all
1		Not quite so much		**1**	Occasionally
2		Only a little		**2**	Quite Often
3		Hardly at all		**3**	Very Often
		I get a sort of frightened feeling as if something awful is about to happen:			**I have lost interest in my appearance:**
	3	Very definitely and quite badly	**3**		Definitely
	2	Yes, but not too badly	**2**		I don't take as much care as I should
	1	A little, but it doesn't worry me	**1**		I may not take quite as much care
	0	Not at all	**0**		I take just as much care as ever
		I can laugh and see the funny side of things:			**I feel restless as I have to be on the move:**
0		As much as I always could		**3**	Very much indeed
1		Not quite so much now		**2**	Quite a lot
2		Definitely not so much now		**1**	Not very much
3		Not at all		**0**	Not at all
		Worrying thoughts go through my mind:			**I look forward with enjoyment to things:**
	3	A great deal of the time	**0**		As much as I ever did
	2	A lot of the time	**1**		Rather less than I used to

	1	From time to time, but not too often	**2**		Definitely less than I used to
	0	Only occasionally	**3**		Hardly at all
		I feel cheerful:			**I get sudden feelings of panic:**
3		Not at all		**3**	Very often indeed
2		Not often		**2**	Quite often
1		Sometimes		**1**	Not very often
0		Most of the time		**0**	Not at all
		I can sit at ease and feel relaxed:			**I can enjoy a good book or radio or TV program:**
	0	Definitely	**0**		Often
	1	Usually	**1**		Sometimes
	2	Not Often	**2**		Not often
	3	Not at all	**3**		Very seldom

ANNEX 5: 1 English version Pain catastrophizing Scale

Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery

Instructions: Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please circle the degree to which you have these thoughts and feelings when you are experiencing pain.

Rating	0	1	2	3	4
meaning	Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

When I'm in pain ….

1. I worry all the time about whether the pain will end.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

2. I feel I cannot go on.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

3. It's terrible and I think it's never going to get any better

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

4. It is awful and I feel that it overwhelms me.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

5. I feel I cannot stand it anymore.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

6. I become afraid that the pain will get worse.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

7. I keep thinking of other painful events

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

8. I anxiously want the pain to go away.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

9. I cannot seem to keep it out of my mind.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

10. I keep thinking about how much it hurts.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

11. I keep thinking about how badly I want the pain to stop.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

12. There’s nothing I can do to reduce the intensity of the pain.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

13. I wonder whether something serious may happen.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

ANNEX 6:1 English version EuroQol-5 (EQ-5D) measurement tool

Under each heading, please tick the ONE box that best describes your health TODAY

MOBILITY

I have no problems in walking about ☐
I have slight problems in walking about ☐
I have moderate problems in walking about ☐
I have severe problems in walking about ☐
I am unable to walk about ☐

SELF-CARE

I have no problems washing or dressing myself ☐
I have slight problems washing or dressing myself ☐
I have moderate problems washing or dressing myself ☐
I have severe problems washing or dressing myself ☐
I am unable to wash or dress myself ☐

USUAL ACTIVITIES (e.g. work, study, housework, family or leisure activities)

I have no problems doing my usual activities ☐
I have slight problems doing my usual activities ☐
I have moderate problems doing my usual activities ☐
I have severe problems doing my usual activities ☐
I am unable to do my usual activities ☐

PAIN / DISCOMFORT

I have no pain or discomfort ☐
I have slight pain or discomfort ☐
I have moderate pain or discomfort ☐
I have severe pain or discomfort ☐
I have extreme pain or discomfort ☐

ANXIETY / DEPRESSION

I am not anxious or depressed ☐
I am slightly anxious or depressed ☐
I am moderately anxious or depressed ☐
I am severely anxious or depressed ☐
I am extremely anxious or depressed ☐

We would like to know how good or bad your health is TODAY.
This scale is numbered from 0 to 100.

Pre-operative

1. 100 means the best health you can imagine.
2. 0 means the worst health you can imagine.

Mark an X on the scale to indicate how your health is TODAY.
Now, please write the number you marked on the scale in the box below.

YOUR HEALTH TODAY =□

Name of Data collector (s)_____

Post-operative Day- **One**

PATIENT'S PERSONAL INFORMATION(S)

Code number _____

Patient Name _____

Patient's Bed number_____

Patient's Card number_____

Post-operative Day- **One**

ANNEX 3:1 English version BPI short form

Code number _____

Date:_____ Time:_____

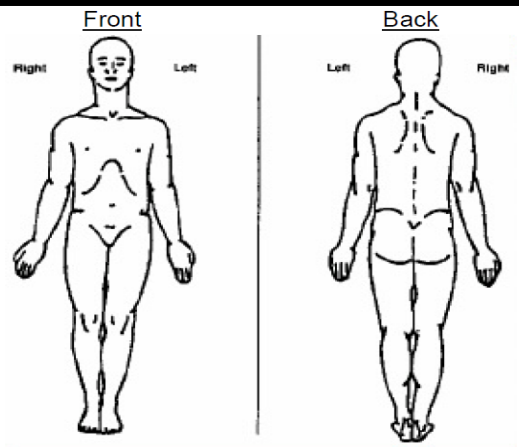
Instructions: Tick the box.

Brief Pain Inventory (Short Form)

1. Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain other than these everyday kinds of pain today?

☐ Yes ☐ No

2. On the diagram, shade in the areas where you feel pain. Put an X on the area that hurts the most.



3. Please rate your pain by marking the box beside the number that best describes your pain at its worst in the last 24 hours.

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

No Pain — Pain As Bad As You Can Imagine

4. Please rate your pain by marking the box beside the number that best describes your pain at its least in the last 24 hours.

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

No Pain — Pain As Bad As You Can Imagine

5. Please rate your pain by marking the box beside the number that best describes your pain on the average.

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

No Pain — Pain As Bad As You Can Imagine

6. Please rate your pain by marking the box beside the number that tells how much pain you have right now.

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

No Pain — Pain As Bad As You Can Imagine

Page 1 of 2

Post-operative Day- **One**

7. What treatments or medications are you receiving for your pain?

8. In the last 24 hours, how much relief have pain treatments or medications provided? Please mark the box below the percentage that most shows how much relief you have received.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
☐ No Relief	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐ Complete Relief

9. Mark the box beside the number that describes how, during the past 24 hours, pain has interfered with your:

A. General Activity

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

B. Mood

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

C. Walking ability

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

D. Normal Work (includes both work outside the home and housework)

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

E. Relations with other people

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

F. Sleep

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

G. Enjoyment of life

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

Page 2 of 2

Post-operative Day- **One**

1. For the last 24 hours (after surgery), do you used pain killer (analgesia) to manage your pain? Yes ☐ No ☐
2. If ‘’**Yes’’** to question **number 1;** mention in the following table with their respective dosage form, dose, and frequency?

No	Types of analgesia	Route of administration	Dose	Frequency
1				
2				
3				
4				
5				

3. Adverse effects of analgesic agents: Yes ☐ No ☐
4. If ‘**Yes’** to question **Number 3** , describe the problems_____
5. Post -operative analgesia ordered/prescribed by physician? Yes ☐ No ☐
6. If ‘**Yes’** to question **Number 5**; use the following table to fill the information?

No	Types of analgesia	Route of administration	Dose	Frequency
1				
2				
3				
4				
5				

7. Medication used during intraoperative period including anesthesia medication with their respective dosage form, dose, and frequency?

No	Medication and anesthesia medication	Route of administration	Dose	Frequency
1				
2				
3				

Post-operative Day- **One**

4				
5				
6				

8. Types of the surgical procedure(s)? _____
9. Length of surgery? _____minute.
10. Types of anesthesia? General ☐ Spinal ☐ Nerve block ☐

Name of Data collector (s)_____

ከቀዶ ጥገና በፊት

Dablee 1.2: Guca ibsaa hirmaatotaa fi eeyyama hirmaana qorannoo Afaan Oromoo tiin

Ibasa qorannoo fi Eeyyam Hirmaannaa

Afeerraa qorannoorratti hirmaachuu

Yaala baqaqsanii yaaluun dura, waantota yaalii fi xinsammuun wal-qabaatanii haala deemsa yookiin jijjirama dhukkubbii fi *guutummaa jireenyaa* fayyaan wal –qabate murteessan kutaa lafee baqaqsanii yaaluu giddu gala yaala Yunivarsitii Jimmaatti fi AaBET Hospital argamuutti qorachuu ta'a.

Kun affeerraa hirmaannaa qorannoo waa'ee dhukkubbii miidhaa lafee irra gaheen dhufu qorachuu ilaala. Dhimmi qorannichas, dhukkubsattoota kutaa lafee baqaqsanii yaaluu giddu gala yaala Yunivarsitii Jimmaatti fi AaBET argamuutti ciisanii yaalii argataa jiran irraattii waantota jijjirama dhukkubbii fi guutummaa jireenyaa fayyaan wal –qabate murteessan qorachuu ta'a. Qoraannoon kun oogessoota fayyaa kutaa lafee baqaqsanii yaaluu keessaa hojjaataniif akka oodeefanno haaraa fi hubannoo yaala dhukkubbii baqaqsanii yaaluun wal-qabaatu uumuu akka danada'u ni abdanna. Bu'aan qorannicha irraa argamuus haala to'annoo dhukkubbii baqaqsanii yaaluun wal-qabaatu mijessuu, akkasumas bu'aa yaalii kanas foyyessuun wal-qabatee; dhiphina dhukkubsataa hambisuu, rakkiina cimaa dhufu ittisuu, uumamu dhukkubbii yeroo dheeraa hambisuu, dabalataanis baasii hin barbaachisne xiqqeessuu irraattii ni gargaara. Dhuma irrattis, bu'aa qorrannichaa, qaamni seera tumuu qajeelcha yaala dhukkubbii miidhaa lafee irra gaheen dhufu akka qopheesanuuf ni gargaara. Kutaa lafee baqaqsanii yaaluu giddu gala yaala Yunivarsitii Jimmaa keessa ciistanii waan jirtaniif, akkasumas gaheesa waan taataniif akka qorannoo kana keessatti hirmaattan filatamtaniittu. iddu galli yaala Yunivarsitii Jimmaa fi Yunivarsiitii Osiloo, Noorway qorannichaaf itti gaafatamtoota dha.

Waa'een qorannichaa maali?

Qorannichi odeefannoo waa'ee dhukkubbii, seenaa dhukkubaa darbee fi ammaa, miiraa fi hubannaa fayyaa isin qabdan sassabuu fi galmeessuu dha.

Yoo qorannicha irratti hirmaattan, gaaffiiwwan afaanii yaala baqaqsanii yaaluun dura, booda fi erga hospitaala baatanii ji'a tokko booda ni gaafatamtu. Waa'ee dhukkuboota biroo, yaalii dhkkubbiii keessaniin wal-qabatee ni galmeessina. Qorannicha irratti hirmaachun gama kamiinu walaan'sa keessan irratti dhiibbaa hin fidu.

Bu'aa fi miidhaa qorannicha irraattii hirmaachun qabu

Qorannicha irratti hirmachuun miidhaa isiniirraan gahu hin qabu. Gaaffiin gaafatamtan xiqqoo yeroo fudhata, kun immoo yaalamtoota tokko tokkoo akka dhiibbaa tti fudhatamuu ni mala. Gaaffiin gaafatamtan, waa'ee dhukkubbii keessanii ilaalcha haaraa akka qabattanis ni gargaara. Yeroo barbaddanitti gaafatamuu dhiisuuf gaaffii hin feene bira darbuu yk deebisuu dhiisuuf mirga guutuu qabdu.

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Fedhii hirmaannaa fi walii-galtee addaan kutuu

Qorannicha irratti hirmaachuun fedhii keessan irraatti kan hundaa'e dha. Yoo hirmachuuf fedhii qabattan, guca ykn unkaa walii-galtee hirmaannaa armaan gadiitti argamuus irratti mallatteesuu qabdu. Yeroo barbaaddan haal-duree tokko malee walii-galtee keessan addaa kutuu dandeessuu. Kunis walaan'sa keessan irraatti dhiibbaa hin uumu.

Yoo qoraannicha irratti hirmaachuu addaan kutuu murteesitan, odeefannoo dhuunfaa fi waa'ee fayyaa keessanii akka isinii haqamu gaafachuu ni dandeessu. Kunis osoo hin haanccefamiini fi hin maxxafamin dura ta'u qaba. Dhuma irraatti, yoo addaan kutuu ykn qoraannicha irratti gaaffi qabaattan karaa teessoo armaan gadii qorattuu biyya keessaa Mastaawut Getaachoo karaa bilbila (+251911076564 fi imeelii: nattimosis@gmail.com) gaafachuu dandeessu.

Odeefannoo fayyaa keessanii irratti maaltu ta'a?

Odeefannoo isinirraa fudhatamuu, akkuma kaayyoo qorannicha keessatti ibsame qofaatti fayyada. Odeefannoo keessan kamiyyuu akka galmaa'ee ilaaluuf mirga qabdu. Yoo odeefannoon dogoggoraa jiraate akka sirreefamuu gochuu dandeessuu. Odeefannoo hunduu osoo maqaa keessan, lakkofsi galmee dhuunfaa ykn wanta addan batanii akka beekamtan godhu hin qabaatiin hacceefama. Itti gaafatamtan qorannichaa hojjiiwwan guyyaa guyyaan qorannicha keessatti taasifamuuf itti gaafatamaa dha, kanaafuu odeefannoon keessan icciitiin isaa haalaan eegamee qabama. Odeefannoon keessan haala eenyummaa keessan hin ibsineen qabama ykn waggaa shanii booda gutummaa guutuutti ni haqama.

Qorannicha irraatti hirmaachuuf fedhan qaba

1. **Dubbissuu dandeessuu ?** **Eyyee** ☐ **Lakkiii** ☐

Maqaa Mallattoo hirmaata/ttu **Guyyaa**

2. **Yoo kan hin baranne ta'e kana fayyadami**

Akka odeefannoo gahaa waa'ee qorannichaa argatanii fi fedhiidhan akka keessatti hirmachuu fedhan nan mirkaneessaa

Maqaa fi Mallattoo ragootaa **Guyyaa**

Maqaa hirmaata Asharraa qubaa hirmaata **Guyyaa**

Waa'ee qorannichaa odeefannoo kennuu koo nan mirkanneessa

Gahee qorannicha keessatti **Mallattoo**

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Code number----------

Guyyaa----------

Maqaa_____

Lakkoofsa bilbilaa yaalamaa_____

Lakkoofsa bilbilaa Kaan maatii_____

Lakkoofsa siree (አልጋ ቁጥር)----------

Lakkoofsa kaardii:_____

Tessoo ----------

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Code number ----------

Dabalee 2:2 Gaaffiiwwan odeefannoo funaanuf fayyadan

Mallattoo "X" saanduqa keessa kaahuun deebii deebisaa

1. Umrii (waggaadhan):_____
2. Korniyaa/saalaa: Dhiira ☐ Dhalaa ☐
3. Guyyaa hospitaala seenee/te? _____
4. Sabab miidhamaa? _____
5. Iddoo/bakka miidhama? Mudhiitii ol ☐ Mudhiitii gadi ☐ Lachuu ☐ Iddoo miidhamaa addaan baasii himi? _____
6. Baqaqisanii hodhuun dura qorichi farra dhukkubbii, dhukubbii toac'achuuf hakimiidhaan ajajameeruu jira? Eyyee ☐ Lakkii ☐
7. Yoo gaaffii 6^{ffaa} deebiin keessan '**Eeyyee**' ta'e armaan gadii keessatti guutaa

.Lakk	Gosa qoricha farra dhukkubbii	Karaa ittiin kenname	Hamma	Guyyaaatti Si'a meeqaf	Guyyaa meeqaaf
1					
2					
3					
4					
5					

8. Bu'aa qorannoo laboraatoorii.
   - ✓ Qorannoo kalee: BUN_____Creatinin_____
   - ✓ Qorannoo Tiruu: SGOT_____SGPT_____
   - ✓ Qorannoo dhiigaa guutuu

     Platlete_____PT_____APTT_____INR_____
9. Tessoo: Magaala ☐ Baadiyaa ☐
10. Amantaa:

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Ortoodoksii ☐ Protestaantii ☐ Isilaama ☐ kaatolikii ☐

Kan biraa, Ibsi_____

11. Barnootaa **:** Kan barataan ☐ Kan hin barannee ☐

12. Gaafii **11ffaa** yoo kan barataan ta'ee

a. Kutaa 1-4 ☐
b. Kutaa 5-8 ☐
c. Kutaa 9-10 ☐
d. 10 + 2
e. Kutaa 11-12 ☐
f. Dipilomaa ☐
g. Digrii ☐
h. sanaa ol----------

13. Hojii/dalagaa:

a) Hojjetaa/ttu mootummaa ☐
b) Hojetaa/ttu miti mootummaa ☐
c) Hadhaa manaa ☐
d) Qotee bulaa ☐
e) Daladalaa ☐
f. Soorama kan bahee ☐
g. Barataa ☐
h. Hoji- dhabessa ☐
i. Hojetaa/tuu humnaa ☐

14. Sigaaraa xuuxxanii beektuu? Eeyyee ☐ Lakkii ☐

15. Yoo deebiin **14ffaa** '**Eeyyee**' ta'e ammoo ni xuuxxuu? Eeyyee ☐ Lakkii ☐

16. Yoo gaaffii **15 ffaa** deebiin keessan '**Eeyyee**' ta'e sigaaraa meeqa xuuxxu?

Guyyaatti_____fi toorbeetti_____

17. Dhuugaatii alkoolii qaban dhugdanii beektuu? Eeyyee ☐ Lakkii ☐

18. Yoo deebiin **17ffaa** '**Eeyyee**' ta'e ammoo ni dhugduu? Eeyyee ☐ Lakkii ☐

19. Yoo gaaffii **18ffaa** deebiin keessan **'Eeyyee'** ta'e , toorbeetti ammam dhugdu?

a) Guyya guyyaan ☐
b) Toorbeetti guyyaa 5-6 ☐
c) Toorbeetti guyyaa 1-4 ☐
d) Kan biraa, ibsaa_____

20. Jimaa qamaamtanii beektuu? Eeyyee ☐ Lakkii ☐

21. Yoo gaaffii **20ffaa** deebiin keessan '**Eeyyee**' ta'e ammoo ni qaamtuu? Eeyyee ☐ Lakkii ☐

22. Yoo gaaffii **21ffaa** deebiin keessan **'Eeyyee'** ta'e , toorbeetti ammam qaamtuu ?

a) Guyya guyyaan ☐
b) Toorbeetti guyyaa 5-6 ☐

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c) Toorbeetti guyyaa 1-4 ☐

d) Kan biraa, ibsaa_____

23. Buna dhugdanii beektuu? Eeyyee ☐ Lakkii ☐

24. Yoo gaaffii **23ffaa** deebiin keessan '**Eeyyee'** ta'e**;** Yeroo amma buna ni dhugdaa?

Eeyyee ☐ Lakkii ☐

25. Yoo gaaffii **24ffaa** deebiin keessan '**Eeyyee**' ta'e**;** guyyaatti si'a meeqa_____takkaatti shinii meeqa? _____

26. Kanaan dura yaalii baqaqsanii hodhuun isiniif hojjetamee beeka? Eeyyee ☐ Lakkii ☐ yoo jiraate gosa isaa heeraa _____

27. Kanaan dura ogeessa fayyaadhaan dhukuba yeroo dheeraa kan hordooffi yaala barbaadu (fkn dhibee sukkaaraa, dhiibaa dhigaa fi kkf) akka qabdan isinitti himamee beeka?

Eyyee ☐ Lakkii ☐

28. Yoo gaaffii **27ffaa** deebiin keessan '**Eeyyee**' ta'e, gosa dhukubaa fi qoricha fudhachaa jirtan ibsaa?

Lakk	Gosa dhukubaa	Qoricha	Hamma qorichaa	Si'a meeqa	Turtii yeroo (hammamiif)
1					
2					
3					
4					

29. **Saatii 24 keessatti** qoricha farra dhukkubbii, dhukubbii toac'achuuf **isinii kennamee** hamma, si'a meeqaf isinii kenname? Eyyee ☐ Lakkii ☐

30. Yoo gaaffii **29faaf** deebiin keessan '**Eeyyee'** ta'e armaan gadii keessatti ibsaa

.Lakk	Gosa qoricha farra dhukkubbii	Karaa ittiin kenname	Hamma	Guyyaaatti Si'a meeqaf
1				
2				
3				

31. Miidhaa hin barbaachisne qorchi dhukkubii to'achuuf kenname isin irraan gahe jira?

Eeyyee ☐ Lakkii ☐

32. Yoo gaaffii **31ffaaf** deebiin keessan '**Eeyyee'** ta'e, ibsi _____

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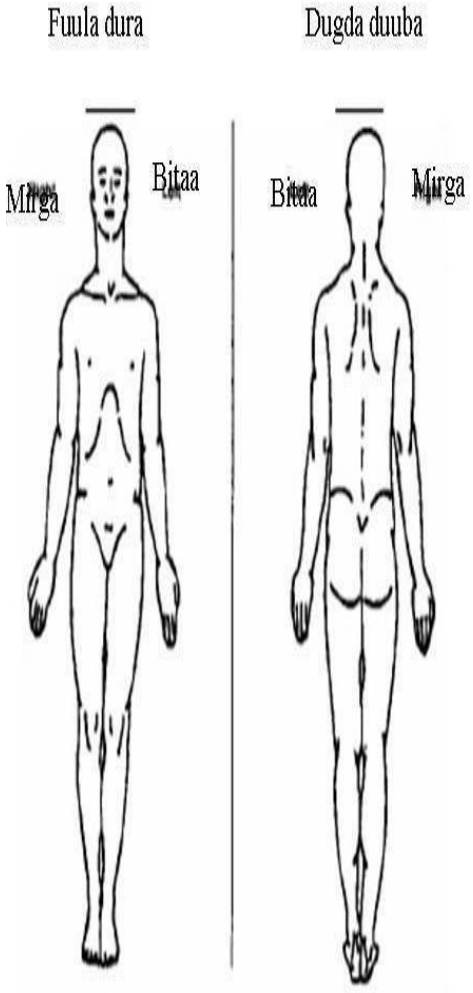
Dabalee 3:3 Guca Gaaffii dhukkubii gabaabaa (BPI)

Guyyaa:_____Sa'aatii:_____

Qajeelfama : Saanduqa keessa mallattoo (□) kana kaa'i

<u>Galmeessa dhukkubbii gabaabinaan</u>

1. Jireenya keenya keessatti baay'een keenya yeroodha yerootti dhukkubsannee beekna (kan akka mataa booyuu, meeluufi ilkaan dhukkubbii). Kanneeniin ala har'aan kana/amma waan isisn dhukkubu jiraa. Eeyyee ☐ Lakki ☐
2. Fakkii armaan gadii irratti naannoo dhukkubbiin sitti dhagaahamu agarsiisi, iddo irra chaalaa si dhukkubu malattoo "X" itti gochuun agarsiisi



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3. Mee saa'atii 24 dabran keessatti dhukkubbii **baayee cimaa** si mudatee lakkoofsa sirriitti ibsuu danda'urratti saanduqa lakkoofsa cinaa jiru keessatti malattoo gochuun argisiisi.

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Dhukkubbii malee Dhukkubbii akka malee cimaa

4. Mee saa'atii 24 dabran keessatti dhukkubbii **salphaa** si mudatee lakkoofsa sirriitti ibsuu danda'urratti saanduqa lakkoofsa cinaa jiru keessatti malattoo gochuun argisiisi.

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Dhukkubbii malee Dhukkubbii akka malee cimaa

5. Mee sa'aatii 24 dabran keessatti dhukkubbii **gidduu galeessaa** si mudate lakkoofsa sirriitti ibsuu danda'urratti saanduqa lakkoofsa bukkee jiru keessatti malattoo gochuun argisiisi.

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Dhukkubbii malee Dhukkubbii akka malee cimaa

6. Mee dhukkubbii yeroo **ammaan kana** sitti dhagaayamu lakkoofsa sirriitti ibsuu danda'urratti saanduqa lakkoofsa cinaa jiru keessatti malattoo gochuun argisiisi.

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Dhukkubbii malee Dhukkubbii akka malee cimaa

7. Dhukkubbii kanaaf yaalii ykn qoricha akkamii fudhatteettaa?

_____

8. Mee **saa'atii 24 dabran keessatti**, qoricha ykn yaalii ati argatte hangama **dhukkubbii sitti fure**? Saanduqa armaan gadii keessatti hamma sitti fure dhibbeentaan argisiisuu dandeessaa?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Homaa natti hinfurree Gutummaan natti fureera

9. Sa'aatii 24 gidduutti dhukkubbiin karaa kamiifi hagam jireenya kee akka jeeqe lakkoofsa saanduqa cinaa jiru filuun agrsiisi

A. Gochaalee waliigalaa

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Waan takka nan jeeqne Guutummaatti na jeeqe

B. Miiraa

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Waan takka nan jeeqne Guutummaatti na jeeqe

C. Dandeettii deemsaa

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

D. Hojii Idilee (hojii manaa alaafi hojii mana keessaa hammata)

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

E. Hariiroo Namoota waliin qabdu

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

F. Hirriba

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

G. Jireenya gammachuu

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

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Sadarkeessaa dhipinaafi mukaahuu hospitaalaa (DHMH)

Qajeelfamoota: TORBEE DABRE KEESSA haala isinitti dhagaayamaa ture filannoo ibsu cinaa bakka duwwaa jiru irratti mallattoo (□) godhaa.

Lakk.	D	A	
1.			**Dhiphinni ykn natti hammaachuun natti dhagahama**
		3	Yeroo hundaa
		2	Yeroo baayyee
		1	Yeroodha yerootti, darbee darbee
		0	Gonkumaa
2.			**Waantoota dur itti gammadaa ture ammallee ittan gammada**
	0		Sirriitti akkuma durii
	1		Hangas mara miti
	2		Baayyee xiqqoo
	3		Hinjiru jechuu nan dandaa'a
3.			**Akka waan badaan ta'uuf jiruutti sodaan natti dhagahama**
		3	Haalaan sirriitti, akka malee badaa
		2	Eeyyee, garuu badaa miti
		1	xiqquma, garuu nan dhiphisu
		0	Gonkumaa
4.			**Kolfuu nan dandaa'a; akkasumas haalla gammachiisaa wantoota nan arga**
	0		Amma danda'amee akkuma kanaan duraa
	1		Amma hagas maraa miti
	2		Sirritti hagas mara miti
	3		Gonkumaa
5.			**Yaadni dhiphinaa sammuu koo keessa deddeebi'a:**
		3	Yeroo mara
		2	Yeroo hedduu
		1	Yeroo tokko tokko , garuu hangas mara miti
		0	Dabree dabree
6.			**Gammachuutu natti dagaahama:**
	3		Gonkumaa
	2		Hangas mara miti
	1		Yeroo tokko tokko
	0		Yeroo baay'ee
7.			**Haala salphaatti taa'uu fi aara galfachuu/ nan danda'a**
		0	Sirriitti
		1	Yeroo baayyee
		2	Hagas mara miti
		3	Gonkumaa

8.			**Waan hundaan suuuta jechuun natti dhagahama**
	3		Yeroo hunda jechuu nan dandaa'a
	2		Yeroo baay'ee
	1		Yeroo tokko tokko
	0		Gonkumaa
9.			**Sodaan natti dhagahama (garaan koo birbir na jedha/na rifata)**
		0	Gonkumaa
		1	Darbee darbee
		2	Yeroo muraasa
		3	Yeroo baayyee
10.			**Waa'ee midhaginkoo dhimma hinqabu ykn dhissera**
	3		Sirriitti
	2		Hagan of qabuu maluu of hin qabne
	1		Hagas mara of hin qabu
	0		Akkuma kanan duraattin of qaba
11.			**Akka nama deemuutti tasgabbii dhabuun natti dhagaahama**
		3	Eeyyee haalan sirritti
		2	halaan danuu
		1	Hagas mara miti
		0	Gonkumaa
12.			**Wantoota ija gammachuutiin nan ilaala**
	0		Akkuman duraan godhaa ture
	1		Akkan duraan godhaa turee gaditti
	2		Baay'ee akkan duraan godhaa turee gaditti
	3		Hingodhu jechuun ni dandaa'ama
13.			**Miirri jeequmsa/soda akka tasa natti dhagahama**
		3	Haalaan sirriidha
		2	Yeroo baay'ee
		1	Hangas mara miti
		0	Gonkumaa
14.			**Kitaabni gaariin ykn sagantaan raadiyoo ykn TV nagammachiisa:**
	0		Yeroo baayyee
	1		Darbee darbee
	2		Hagas mara miti
	3		Baayyee darbee darbee

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Sadarkeessaa hammeenya dhukkubbii

Qajeelfama: Himootni kudha-sadan armaan gaditti tarreeffaman kanneen yaadaafi miireffannaa dhukkuba waliin hidhata qaban kan ibsanidha. Iskeelota armaan gadii fayyadamiitii, yaadaafi miireffannaa yeroo isin dhukkubaa ture kan gitu mee itti maraa.

Sadarkeessuu /hiika	0	1	2	3	4
Gaaffii	Gonku maa	Hamma muraasa	Gidduu galeessa	Cimi naan	Yeroo mara
1. **Yeroo na dhukkubu sanitti ….** Yeroo mara dukkubichi na dhiisaa laata jedheen dhiphadha					
2. **Yeroo na dhukkubu sanitti ….** Akkan akkasitti itti fufuu hin dandeenyetu natti dhagaahama.					
3. **Yeroo na dhukkubu sanitti ….** Akka malee hamaadha kanarra waan natti fooyya'u miti jedheen yaada.					
4. **Yeroo na dhukkubu sanitti ….** Jibbisisaa fi yeroo mara akka sammuun koo kanaan dhunfatameetti natti dhagahama					
5. **Yeroo na dhukkubu sanitti ….** Akkan kana caalaa obsuu hindandeenyetu natti dhagaayama.					
6. **Yeroo na dhukkubu sanitti ….** Dhukkubichi natti hammaata jedheen sodaan qaba					
7. **Yeroo na dhukkubu sanitti ….** Waa'ee taateewwan dhukkubaa biroo yaada					
8. **Yeroo na dhukkubu sanitti ….** Dhukkubichi akka na dhiisun dhiphadha					
9. **Yeroo na dhukkubu sanitti ….** Sammuu koo keessaa akkanni baduu waanan gochuu danda'uu natti hin fakkaatu					
10. **Yeroo na dhukkubu sanitti ….** Yeroo maraa hagam akka inni nama miidhuun yaada					
11. **Yeroo na dhukkubu sanitti ….** Dhukkubichi akka na dhiisu hagam akkan barbaadun yaada.					
12. **Yeroo na dhukkubu sanitti ….** Hammeenya dhukkubichaa hir'isuuf waanan gochuu danda'u tokko hinjiru nan jedha					
13. **Yeroo na dhukkubu sanitti ….** Wanti kanarra hamaa ta'es dhufuu dandaa'a jedheen yaada.					

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EuroQol-5 (EQ-5D) measurement tool

Mata duree tokko tokkoo isaa jalatti, mee saanduqa haala fayyaa kee **har'aa** ibsuu danda'u keessaa tokko mallattoo (√) godhi

Sochii

Deemsarratti rakkoo tokkoyyuu hinqabu	☐
Deemsarratti rakkoo xiqqoon qaba	☐
Deemsarratti rakkoo jidduu galeessadha	☐
Deemsarratti rakkoo cimaadha	☐
Waan tokkoyyuu deemuu hin danda'uu	☐

Of kunuunsuu

Qaama koo ofiin dhiqachuu ykn huccuu uffachuu irratti rakkoo hin qabu	☐
Qaama koo ofiin dhiqachuu ykn huccuu ufachuu irratti rakkoo xiqqoon qaba	☐
Qaama koo ofiin dhiqachuu ykn huccuu ufachuu irratti rakkoon koo gidduu galeessadha	☐
Qaama koo ofiin dhiqachuu ykn huccuu ufachuu irratti rakkoon koo cimaadha	☐
Qaama koo ofiin dhiqachuu ykn huccuu ufachuu hin danda'uu	☐

Gochaalee guyya guyyaa (fkn jiruu, dubbisuu, dalgaa manaa, maatii wallin ykn gochalee bashananaa)

Gochaalee guyya guyyaa hojjechuu irratti rakkoo tokkuyyuu hin qabau	☐
Gochaalee guyya guyyaa hojjechuu irratti rakkoo xiqqoon qaba	☐
Gochaalee guyya guyyaa hojjechuu irratti rakkoo gidduu galeessaan qaba	☐
Gochaalee guyya guyyaa hojjechuu irratti rakkoo cimaan qaba	☐
Gonkumaa gochaalee guyya guyyaa hojjechuu hin danda'uu	☐

Dhukkubbii /haala namatti hin tolle

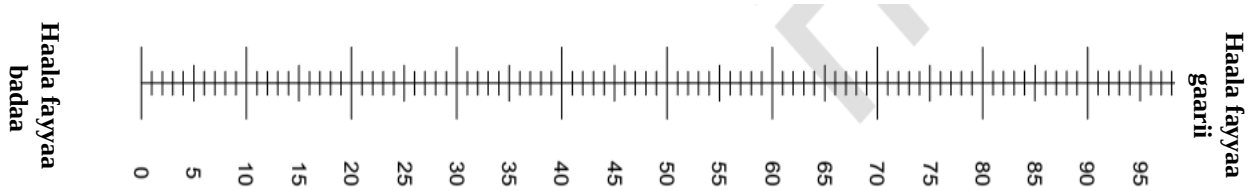
Dhukkubbii ykn haala namatti hin tollee hin qabu	☐
Dhukkubbii ykn haala namatti hin tollee xiqqoon qaba	☐
Dhukkubbii ykn haala namatti hin tollee gidduu galeessaan qaba	☐
Dhukkubbii ykn haala namtati hin tollee cimaan qaba	☐
Dhukkubbii ykn haala namatti hin tollee akka malee cimaa ta'en qaba	☐

Dhiphina /Mukaahuu

Hin dhiphadhu ykn hin mukaahuu	☐
Xiqqoo naan dhiphadha ykn nan mukaaha	☐
Dhiphina ykn mukaahina gidduu galeessaan qaba	☐
Dhiphina ykn mukaahina cimaan qaba	☐
Dhiphina ykn mukaahuu akkamalee ciminaan qaba	☐

ከቀዶ ጥገና በፊት

Har’a haalli fayyaa kee gaarii ykn badaa ta’uusaa baruu barbaanneerra. Sadarkeessii kun lakkooofsa 0 irraa hanga 100 kan qabudha.



1. 100 jechuun haala fayyaa gaarii ta’e kan ibsudha.
2. 0 jechuun haala fayyaa akka malee gadhee ta’e kan ibsudha.

Haala fayyaa kee guyyaa har’aa sadarkeessa argisiisuurra mallattoo (X) godhi.
Mee amma immoo, saanduqa armaan gadii keessatti lakkoofsa argisiiste sana barreessi.
FAYYAAN KEE HARRA’AA KANA = □

_____

Maqaa odeefannoo sassabaa/duu_____

Post-operative Day- <u>One</u>

Code number

Guyyaa----------

Maqaa_____

Lakkoofsa siree (አልጋ ቁጥር)----------

Lakkoofsa kaardii:_____

Post-operative Day- <u>One</u>

Code number ----------

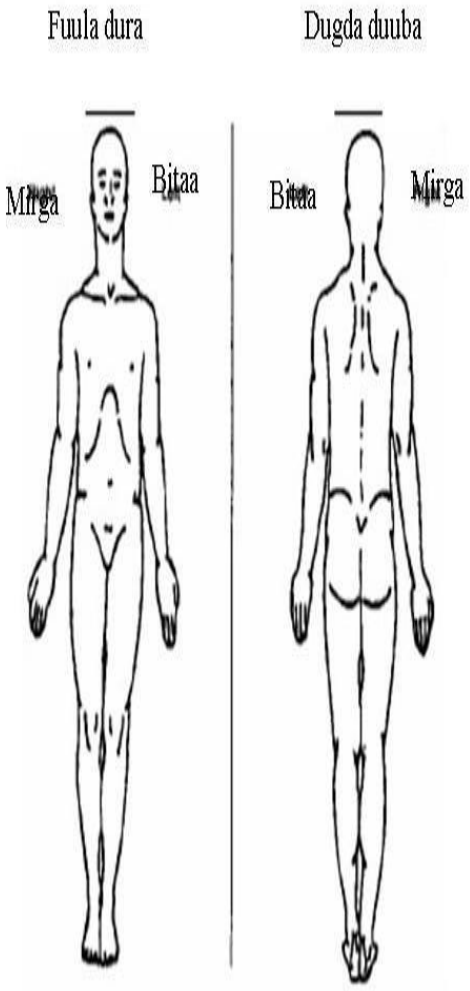
Dabalee 3:3 Guca Gaaffii dhukkubii gabaabaa (BPI)
Guyyaa:_____Sa'aatii:_____

Qajeelfama : Saanduqa keessa mallattoo (✓) kana kaa'i

<u>Galmeessa dhukkubbii gabaabinaan</u>

1. Jireenya keenya keessatti baay'een keenya yeroodha yerootti dhukkubsannee beekna (kan akka mataa booyuu, meeluufi ilkaan dhukkubbii). Kanneeniin ala har'aan kana/amma waan isisn dhukkubu jiraa. Eeyyee ☐ Lakki ☐

2. Fakkii armaan gadii irratti naannoo dhukkubbiin sitti dhagaahamu agarsiisi, iddo irra chaalaa si dhukkubu malattoo "X" itti gochuun agarsiisi



Post-operative Day- **One**

3. Mee saa'atii 24 dabran keessatti dhukkubbii **baayee cimaa** si mudatee lakkoofsa sirriitti ibsuu danda'urratti saanduqa lakkoofsa cinaa jiru keessatti malattoo gochuun argisiisi.

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Dhukkubbii malee Dhukkubbii akka malee cimaa

4. Mee saa'atii 24 dabran keessatti dhukkubbii **salphaa** si mudatee lakkoofsa sirriitti ibsuu danda'urratti saanduqa lakkoofsa cinaa jiru keessatti malattoo gochuun argisiisi.

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Dhukkubbii malee Dhukkubbii akka malee cimaa

5. Mee sa'aatii 24 dabran keessatti dhukkubbii **gidduu galeessaa** si mudate lakkoofsa sirriitti ibsuu danda'urratti saanduqa lakkoofsa bukkee jiru keessatti malattoo gochuun argisiisi.

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Dhukkubbii malee Dhukkubbii akka malee cimaa

6. Mee dhukkubbii yeroo **ammaan kana** sitti dhagaayamu lakkoofsa sirriitti ibsuu danda'urratti saanduqa lakkoofsa cinaa jiru keessatti malattoo gochuun argisiisi.

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Dhukkubbii malee Dhukkubbii akka malee cimaa

7. Dhukkubbii kanaaf yaalii ykn qoricha akkamii fudhatteettaa?

_____

8. Mee **saa'atii 24 dabran keessatti**, qoricha ykn yaalii ati argatte hangama **dhukkubbii sitti fure**? Saanduqa armaan gadii keessatti hamma sitti fure dhibbeentaan argisiisuu dandeessaa?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Homaa natti hinfurree Gutummaan natti fureera

9. Sa'aatii 24 gidduutti dhukkubbiin karaa kamiifi hagam jireenya kee akka jeeqe lakkoofsa saanduqa cinaa jiru filuun agrsiisi

A. Gochaalee waliigalaa

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Waan takka nan jeeqne Guutummaatti na jeeqe

B. Miiraa

☐**0** ☐**1** ☐**2** ☐**3** ☐**4** ☐**5** ☐**6** ☐**7** ☐**8** ☐**9** ☐**10**

Waan takka nan jeeqne Guutummaatti na jeeqe

Post-operative Day- **One**

C. Dandeettii deemsaa

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

D. Hojii Idilee (hojii manaa alaafi hojii mana keessaa hammata)

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

E. Hariiroo Namoota waliin qabdu

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

F. Hirriba

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

G. Jireenya gammachuu

☐ **0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10**

Waan takka nan jeeqne Guutummaatti na jeeqe

Post-operative Day- <u>One</u>

1. Saatii 24 keessatti qoricha farra dhukkubbii, dhukubbii toac'achuuf **isinii kennameerraa**?

   Eeyyee ☐ Lakkii ☐

2. Yoo gaaffii 1**faaf** deebiin keessan '**Eeyyee'** ta'e armaan gadii keessatti ibsaa

.Lakk	Gosa qoricha farra dhukkubbii	Karaa ittiin kenname	Hamma	Guyyaaatti Si'a meeqaf
1				
2				
3				

3. Miidhaa hin barbaachisne qorchi dhukkubii to'achuuf kenname isin irraan gahe jira?

   Eeyyee ☐ Lakkii ☐

4. Yoo gaaffii **3ffaa** deebiin keessan '**Eeyyee'** ta'e, ibsi _____

5. Baqaqisanii hodhuun booda qorichi farra dhukkubbii, dhukubbii toac'achuuf **hakimiidhaan ajajameeruu jira**? Eeyyee ☐ Lakkii ☐

6. Yoo gaaffii **5ffaa** deebiin keessan '**Eeyyee**' ta'e armaan gadii keessatti guutaa

.Lakk	Gosa qoricha farra dhukkubbii	Karaa ittiin kenname	Hamma	Guyyaaatti Si'a meeqaf
1				
2				
3				
4				

7. Yeroo baqaqsanii hodhan **qoricha kennamee kan hadoochu dabalatee**, hamma, si'a meeqa,?

lakk	Qoricha kennamee fi qoricha hadoochuu	Karaa itti kenname	Hamma	Si'a meeqa
1				
2				
3				
4				

8. Gosa baqqsanii yaaluu raawatamee? _____

9. Yeroo baqaqsanii hodhuun fudhate? _____daqiiqaa

10. Gosa hadoochuu fayyadamamee? Qaama guutuu ☐ wiirtuu narvii (ispaayinaalii) ☐ Narvii cufuu ☐

Maqaa odeefannoo sassabaa/duu_____

(ከቀዶ ጥገና በፊት)

ቅፅ 1: 3 የጥናቱ መግለጫና የፍቃደኝነት ስምምነት

የጥናቱ ፕሮጀክት፡ ከቀዶ ጥገና በፊት ያሉ የህመም ሂደት እና የህይወት ጥራትን ሊተነብዩ የሚችሉ ክሊኒካልና ስነ ልቦናዊ ሁኔታዎችን፤ስለማጥናት ሲሆን

የጥናቱ ፕሮጀክት ላይ እንዲሳተፉ ስለመጋበዝ

ይህ በአጥንት ስብራት ላይ በሚደረገዉ የቀዶ ጥገና ላይ ያለዉን የህመም ማገገም ሂደት ላይ በሚደረግ ጥናት ላይ እንዲሳተፉ የተደረገሎት ግብዣ ነዉ።

የጥናቱ ዓላማ በጅማ ዩኒቨርስቲ ህክምና ማዕከል የቀዶ ህክምና ክፍልና አዲስ አበባ አቤት ሆስፒታል ለመታከም የገቡ ታካሚዎች የህመም ማገገምና የኑሮ ጥራትን ሊተነበዩ የሚችሉ ነገሮችን መመርመር ነዉ።ጥናቱ የቀዶ ጥገና ክፍል ዉስጥ ለሚሰሩ የጤና ባለሙያዎች እንደመረጃና የህመም መቆጣጠሪያ ግንዛቤ ማስገንዘብያ ሊያገለግል ይችላል። የዚህ ጥናት ዉጤት የህመም ቁጥጥር አሰራርን ለማሻሻል ይረዳል፤ ይህም የታካሚዎችን ህመም ማስታገስ፤ አሳሳቢ ጉዳቶችን ማስወገድ፤ ሥር የሰደደ ህመም እና ለረጅም ጊዜ የጤና እንክብካቤ ለማድረግ የሚወጣ ወጪን መቀነስ፡ በመጨረሻም የዚህ ጥናት ግኝት በህመም ቁጥጥር ፖሊሲ ላይ የሚሰሩትን ያግዛል። እርሶ አዋቂ ስለሆኑና የተሰበረ አጥንቶህን በቀዶ ህክምና ለመታከም በጂማ ዩኒቨርሲቲ የህክምና ማዕከል በቀዶ ጥገና ህሙማን መኝታ ክፍል ወይም አዲስ አበባ አቤት ሆስፒታል ስለተገኙ በጥናቱ ላይ እንዲሳተፉ ተመርጠዋል። ለዚህም ጥናት በኢትዮጵያ የጂማ ዩኒቨርሲቲ እና በኖርዌይ የኦስሎ ዩኒቨርሲቲ ሃላፊዎች ናቸዉ።

የጥናቱ ምንነት?

ጥናቱ ስለህመም፤ ያለፈዉና የአሁኑ የበሽታ ታሪክ፤ የስሜትና የጤንነት አረዳዶ ላይ መረጃ ይወስዳል። በዚህ ጥናት ላይ ከተሳተፉ የቀዶ ጥገና ህክምና ሳይሰራ በፊትና ከተሰራሎት በኃላ እንዲሁም ከሆስፒታል ከወጡ ከአንድ ወር በኃላ ቃለመጠይቅ ይደረግሎታል። በተጨማሪም ለጥናቱ የሚያስፈልጉ ከህመሞ ጋር የተያያዙ የህክምና መረጃዎች ከመዝገብ ላይ ይወሰዳሉ። ጥናቱ በምንም መንገድ የህክምና ሂደቶ ላይ ተፅዕኖ አያደርስም።

ጥናቱ ላይ የመሳተፍ ጉዳትና ጥቅም

በዚህ ጥናት መሳተፍ የሚያደርስቦት ምንም ዓይነት ጉዳት የለም። ነገር ግን ቃለ መጠይቁ ትንሽ ጊዜ ይወስዳል ይህ ደግሞ በአንድ አንድ ታካሚዎች እንደተፅኖ ሊወሰድ ይችላል። የሚጠየቁት ጥያቄ ስለህመሞዎ ግንዛቤ እንዲኖሮዎት ይረዳዎታል። በቃለ መጠይቁ ወቅት በማንኛውም ጊዜ ያለመጠየቅ ወይም ለመመለስ የማይፈልጉትን ማንኛውም ጥያቄ ያለመመለስ ሙሉ መብት አሎት።

የተሳትፎ ፈቃደኝነት እና የማቋረጥ ስምምነት (መምረጥ)

ጥናቱ ላይ መሳተፍ ሙሉ በሙሉ በፍቃደኝነት የተመሰረተ ነዉ። ለመሳተፍ ከፈለጉ ከታች ያለዉን የፊቃደኝነት ተሳትፎ ስምምነትን መፈረም ይጠበቅቦታል። በመሃል ግን ተሳትፎዎን ማቋረጥ ከፈለጉ ያለምንም ቅደመ ሁነታ የተሳትፎ ስምምነቱን ማቋረጥ ይችላሉ። በጥናት ፕሮጀክቱ ላይ ያሎት ተሳትፎ እንዲቋረጥ ከወሰኑ ከመታተሙ በፊት ያለዉን የግል እና የጤና መረጃዎ እንዲሰረዝሎት መጠየቅ ይችላሉ። በመጨረሻም ተሳትፎትን ለማቆም ወይንም በጥናቱ ላይ ጥያቄ ካሎት ተማራማሪ መስታወት ጌታቸዉ በዚህ አድራሻ +251911076564 (nattimosis@gmail.com) መጠየቅ ይችላሉ።

በጤና መረጃዎ ላይ ምን ይደረጋል?

(ከቀዶ ጥገና በፊት)

ከእርሶ የሚወሰደዉ መረጃ ለጥናቱ ዓላማ በተገለጸው መሰረት ብቻ ለአገልግሎት ይዉላል። እርሶን በተመለከት የተመዘገበዉን መረጃ የማየት መብት አሎት። የተሳሳተ መረጃ ካለ እንዲስተካከል የማድረግ መብት አሎት። ሁሉም መረጃ የእርሶን ማንነት የሚያሳይ ማንኛዉንም ነገር ሳይዝ ይተነተናል። የፕሮጀክቱ ሃላፊ በየቀኑ በጥናቱ ዉስጥ ለሚደረጉት ስራዎች ተጠያቂ ነዉ። ስለዚህ የግል መረጃዎ ሚስጥርነቱ በደንብ ተጠብቆ ይያዛል። ከእርሶ የተወሰደ መረጃ የእርሶን ማንነት በማያሳይ መልኩ ይቀመጣል እንዲሁም ፕሮጀክቱ ካለቀ ከአምስት ዓመት በኃላ ይሰረዛል።

በጥናቱ ዉስጥ ለመሳተፊ ፈቃደኛ ነኝ

1. **ማንበብ ይችላሉ?**

አዎ ☐ **አልችልም** ☐

2. **የተማሩ ከሆነ ይህን ይጠቀሙ**

የተሳታፊ ስምና ፊርማ ቀን

3. **ያልታማሩ ከሆነ ይህን ይጠቀሙ**

የተሳታፊ ስምና የጣት አሻራ **ቀን**

ታዛቢ ስለጥናቱ በቂ መረጃ እንዳገኙና በፈቃደኝነት ለመሳተፍ እንደወሰኑ አረጋግጣለሁኝ

የታዛቢ ስምና ፊርማ **ቀን**

ስለጥናቱ በቂ መረጃ መስጠቱን አረጋግጣለሁኝ

በጥናቱ ያለዉ ድርሻ **ፊርማ**

(ከቀዶ ጥገና በፊት)

የህመምተኛው የግል መረጃ መሰብሰቢያ

Code number_____

ቀን----------

የህመምተኛው ስም ፡ ----------

የህመምተኛው ስልክ ቁጥር----------

የዘመድ ስልክ ቁጥር----------

የህመምተኛው አልጋ ቁጥር----------

የካርድ ቁጥር:_____

የህመምተኛው አድራሻ----------

(ከቀዶ ጥገና በፊት)

Code number _____

ቅፅ 1 የመረጃ መሰብሰቢያ ጥያቄዎች

የ “x” ምልክት በማድረግ ይመልሱ

1. **ዕድሜ፡** (በዓመት):_____
2. **ፆታ**፡ ወንድ ☐ ሴት ☐
3. **እዚህ የገቡበት ቀን**?_____
4. **የጉዳት ምክንያት**? _____
5. የጉዳት ቦታ? ከወገብ በላይ ☐ ከወገብ በታች ☐ ሁለቱም ☐

   የተጎዳዉን ቦታ ይግለፁ? _____

6. ከቀዶ ጥገና በፊት ሕመምን ለማስታገስ **በሀኪም የታዘዘ የህመም ማስታገሻ** መድሃኒት አለ?

   አዎ ☐ አይደለም ☐

7. **ለ6ኛ** ጥያቄ **አዎ** ካሉ በሚቀጥለው ሰንጠረዥ ይሙሉ

ተ.ቁ	የህመም ማስታገሻ መድሃኒት ስም	የተሰጠበት መንገድ	መጠን	በቀን ስንት ጊዜ
1				
2				
3				
4				
5				

8. የላቦራቶሪ ምርመራ ዉጤት
   - ✓ የኩላሊት ምርመራ፡ BUN_____ Creatinin_____
   - ✓ የጉበት ምርመራ፡ SGOT_____ SGPT_____
   - ✓ የደም ቆጠራ

     Platlete_____ PT_____ aPTT_____INR_____

9. **አድራሻ**፡ ከተማ ☐ ገጠር ☐
10. **ሀይማኖት**:

    ኦርቶዶክስ ☐ ፕሮቲስታንት ☐ ሙስሊም ☐ ካቶሊክ ☐

(ከቀዶ ጥገና በፊት)

ሌላ ,ይግለፁ_____

11. **ትምህርት ተምረዋል፡** አዎ ☐ አይደለም ☐

12. ለ**11ኛ** ጥያቄ **አዎ** ካሉ የክፍል ደረጃ

ሀ. ከ1-4 ክፍል ☐
ለ. ከ5-8 ክፍል ☐
ሐ. ከ9-10 ክፍል ☐
መ. **10** $^{+2}$ ☐
ሠ. ከ11-12 ክፍል ☐
ረ. ዲፕሎማ ☐
ሰ. ዲግሪ ☐
ሸ. ከዲግሪ በላይ ይግለፁ_____

13. **ስራዎ ምንድ ነው**

ሀ. የመንግስት ሰራተኛ ☐
ለ. የግል ድርጅት ☐
ሐ. የቤት አመቤት ☐
መ. አርሶ አደር ☐
ሠ. ነጋዴ ☐
ረ. ጡረተኛ ☐
ሰ. ተማሪ ☐
ሸ. ሥራ አጥ ☐
ቀ. የቀን ሰራተኛ☐

14. ሲጋራ አጭሰው ያውቃሉ? አዎ ☐ አይደለም ☐

15. ለ**14ኛ** ጥያቄ **አዎ** ካሉ አሁንስ ያጨሳሉ? አዎ ☐ አይደለም ☐

16. ለ**15ኛ** ጥያቄ **አዎ** ካሉ ? በቀን ስንት? _____እና በሳምንት ስንት ሲጋራ? _____

17. አልኮልነት ያላቸዉ መጠጦች ጠጥተዉ ያወቃሉ? አዎ ☐ አይደለም ☐

18. ለ**17ኛ** ጥያቄ **አዎ** ካሉ አሁንስ ይጠጣሉ? አዎ ☐ አይደለም ☐

19. ለ**18ኛ** ጥያቄ **አዎ** ካሉ በሣምንት ምን ያህል ቀን ይጠጣሉ?

ሀ) ቀን በቀን ☐
ለ) በሳምንት ከ 5-6 ቀን ☐
ሐ) በሳምንት ከ 1-4 ቀን ☐
መ) ሌላ ካለ ይግለፁ_____

20. ጫት ቅመው ያወቃሉ? አዎ ☐ አይደለም ☐

21. ለ**20ኛ** ጥያቄ **አዎ** ካሉ አሁንስ ይቅማሉ? አዎ ☐ አይደለም ☐

22. ለ**21ኛ** ጥያቄ **አዎ** ካሉ በሳምንት ምን ያህል ጊዜ ይቅማሉ?

ሀ) ቀን በቀን ☐
ለ) በሳምንት ከ 5-6 ቀን ☐

(ከቀዶ ጥገና በፊት)

ሐ) በሳምንት ከ 1-4 ቀን ☐
መ) ሌላ ካለ ይግለፁ_____

23. ቡና ጠጥተው ያወቃሉ? አዎ ☐ አይደለም ☐

24. ለ**23ኛ** ጥያቄ **አዎ** ካሉ አሁንስ ይጠጣሉ? አዎ ☐ አይደለም ☐

25. ለ**24ኛ** ጥያቄ **አዎ** ካሉ በቀን ስንት ጊዜ?_____**በአንድ ጊዜ** ስንት ስኒ ይጠጣሉ? _____

26. ከዚህ በፊት የቀዶ ጥገና ህክምና ተሰርቶሎት ያዉቃል? አዎ ☐ አይደለም ☐

ካለ ምን አይነት _____

27. ከዚህ በፊት በጤና ባለሙያ ከትትል የሚያስፈልገው በሽታ(ለምሳሌ የስኪር ፣ የደም ግፊት የመሳሰሉት)

እንዳለቦት ተነግሮት ያዉቃል? አዎ ☐ አይደለም ☐

28. ለ**27ኛ** ጥያቄ **አዎ** ካሉ የበሽታዉን ዓይነትና የሚወስዱትን መድሃኒት ይግለፁ?

ተ.ቁ	የበሽታው ዓይነት	መድሃኒት	የመድሃኒቱ መጠን	በቀን ስንት ጊዜ	ለምን ያህል ጊዜ
1					
2					
3					
4					

29. ባለፉት 24ሰአታት ህመሞዎን ለመቆጣጠር የተሰጠዎት ወይም የወሰዱት የህመም ማስታገሻ መድሃኒት አለ?

አዎ ☐ አይደለም ☐

30. **ለ29ኛ** ጥያቄ መልስ **አዎ** ከሆነ በሚቀጥለው ሰንጠረዥ ይገለፅ

ተ.ቁ	የህመም ማስታገሻ መድሃኒት ስም	የተሰጠበት መንገድ	መጠን	በቀን ስንት ጊዜ
1				
2				
3				

(ከቀዶ ጥገና በፊት)

31. ህመም ለመቆጣጠር የተሰጠዎት መድሃኒት ያደረሰቦት ጉዳት አለ? አዎ ☐ አይደለም ☐

32. ለ**31ኛ** ጥያቄ **አዎ** ካሉ ጉዳቱን (ችግሩን)ይግለፁ_____

(ከቀዶ ጥገና በፊት)

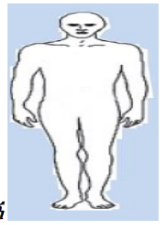
አጭር የህመም መለኪያ ዝርዝር

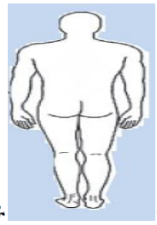
ቀን---------- ሰዐት----------

1) መቼም በህይወታችን ውስጥ፣ አብዛኞቻችን የተለያዩ ህመሞች ከጊዜ ወደ ጊዜ ያጋጥሙናል (ለምሳሌ የራስ ምታት፣ ወለምታ፣ የጥርስ ህመም)። እርስዎ **ከነዚህ በየቀኑ ሊያጋጥሙ ከሚችሉ ህመሞች የተለየ ህመም ዛሬ አጋጥሞታል?**

1) አዎ 2) አይደለም

2) ቀጥሎ በተመለከተው ምስል ላይ ህመም የሚሰማዎት ቦታ ላይ ያጥቁ። በጣም ህመም በሚሰማዎት ቦታ ላይ የ X ምልክት ያድርጉ።





3) ባለፉት 24 ሰአታት ውስጥ ካጋጠሞት ህመም **<u>እጅግ ሀይለኛ</u>** ነበር የሚሉትን የሚገልጸውን ቁጥር እባክዎን ያክብቡ።

0	1	2	3	4	5	6	7	8	9	10
ምንም ህመም										ማሰብ ከምችለው በላይ ከባድ ህመም
አልነበረም										

4) ባለፉት 24 ሰአታት ውስጥ ካጋጠሞት ህመም **<u>እጅግ ቀላል</u>** ነበር የሚሉትን የሚገልጸውን ቁጥር እባክዎን ያክብቡ።

0	1	2	3	4	5	6	7	8	9	10
ምንም ህመም										ማሰብ ከምችለው በላይ ከባድ ህመም
አልነበረም										

5) በ**<u>አማካይ</u>** የሚሰማዎትን ህመም ሊገልጽ የሚችለውን ቁጥር እባክዎን ያክብቡ።

0	1	2	3	4	5	6	7	8	9	10
ምንም ህመም										ማሰብ ከምችለው በላይ ከባድ ህመም
አልነበረም										

(ከቀዶ ጥገና በፊት)

6) <u>በአሁኑ ቅጽበት</u> የሚሰማዎትን ህመም ሊገልጽ የሚችለውን ቁጥር እባክዎን ያክብቡ፡፡

0	1	2	3	4	5	6	7	8	9	10
ምንም ህመም አልነበረም										ማሰብ ከምችለው በላይ ከባድ ህመም

7) ለህመምዎ የሚከታተሉት ህክምና ወይንም የሚወሰዱት መድሀኒት ምንድን ነው?

_____

8) የሚከታተሉት የህመም ህክምና ወይንም የሚወስዱት መድሀኒት <u>ባለፉት 24 ሰአታት ውስጥ የሰጥዎት እፎይታ</u> ምን ያህል ነው? እባክዎን ያገኙትን እፎይታ መጠን ሊገልጽ የሚችለውን ፐርሰንት ያክብቡ፡፡

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
ምንም እፎይታ አላገኘሁም										ሙሉ እፎይታ

9) ባለፉት 24 ሰአታት ውስጥ የህመም ስሜቶ ቀጥሎ የተዘረዘሩት ነገሮች ላይ ምን ያህል <u>ተጽዕኖ እንደፈጠረ የሚገልጸውን</u> ቁጥር እባክዎን ያክብቡ፡፡

ሀ) ጠቅላላ እንቅስቃሴ

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ለ) ስሜት

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ሐ) የመረመድ ችሎታ

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

(ከቀዶ ጥገና በፊት)

መ) የለት ተለት ስራ (የቤት ውስጥ እንዲሁም ከቤት ውጭ ስራን ያካትታል)

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ሠ) ከሌሎች ሰዎች ጋር የሚኖረን ግንኙነት

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ረ) እንቅልፍ

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ሰ) በህይወት የመደሰት ሁኔትን

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

(ከቀዶ ጥገና በፊት)

የጭንቀት እና የቁዘማ (ሀዘን) መገምገሚያ መጠይቅ

ባለፈው ሣምንት የተሰማዎን ትክክለኛ ስሜት መሠረት በማድረግ የጤና ባለሙያዉ ቀጥሎ ለሚጠይቁዎት ጥያቄ ተገቢውን መልስ ይስጡ::

በተቻለ መጠን ሲመልሱ ብዙ ጊዜ አይዉሰዱ፣ ምናልባትም እንደተጠየቁ ወዲያውኑ የመጣልዎት መልስ ትክክለኛ ስሜትዎን ሊገልፅ ይችላል::

1 የመጨነቅ ወይም የመወጠር ስሜት ምን ያህል ይሰማዎታል?

በጣም ብዙ ጊዜ	3
ብዙ ጊዜ	2
አልፎ አልፎ	1
ምንም አይሰማኝም	0

2 ቀደም ሲል ያስደስቱም የነበሩ ነገሮች አሁን ምን ያህል ያስደስቱዎታል?

አሁንም እንደድሮው ያስደስቱኛል	0
ከድሮው ትንሽ ቀንሷል	1
በጥቂቱ ያስደስቱኛል	2
ጭራሽ አያስደስቱኝም	3

3 አንድ መጥፎ ነገር ሊያጋጥምዎ የተቃረበ የሚመስል የፍርሀት ስሜት ይሰማዎተል?

እጅግ በጣም ይሠማኛል	3
በጣም ይሠማኛል	2
በጥቂቱ ይሠማኛል	1
ምንም አይሠማኝም	0

4 መሳቅና የነገሮችን አስቂኝ ጎን ማየት ይችላሉ?

አብዛኛውን ጊዜ እችላለሁ	0
እንደድሮው ባይሆንም እችላለሁ	1
በጥቂቱ እችላለሁ	2
ምንም አልችልም	3

5 ጭንቀትን የሚያጭሩ ሀሳቦች በአእምሮዎ ምን ያህል ጊዜ ይመላለሳሉ?

በጣም ብዙ ጊዜ	3
ብዙ ጊዜ	2
አብዛኛውን ጊዜ ባይሆንም አልፎ አልፎ	1
አንዳንዴ ብቻ	0

6 ደስተኛ ነዎት?

ምንም ደስተኛ አይደለሁም	3
ብዙ ጊዜ ደስተኛ አይደለሁም	2
ብዙም ባይሆን ደስተኛ ነኝ	1
አብዛኛውን ጊዜ ደስተኛ ነኝ	0

7 ተረጋግተው መቀመጥ እና ዘና ማለት ይችላሉ?

ሁሌም እችላለሁ	0
አብዛኛውን ጊዜ እችላለሁ	1
ብዙውን ጊዜ አልችልም	2
ምንም አልችልም	3

(ከቀዶ ጥገና በፊት)

8 ስራዎን ሲያከናውኑ ወዘተ ፍጥነትዎ ምን ያህል የቀነሰ ይመስልዎታል?

እጅግ በጣም ብዙ ጊዜ	3
በጣም ብዙ ጊዜ	2
አልፎ አልፎ	1
ምንም አልቀነሰም	0

9 ሆድ አካባቢ የሚሰማ የመደንገጥ ወይም የመሸበር ስሜት ይሰማዎታል?

ምንም አይሰማኝም	0
አልፎ አልፎ	1
ብዙ ጊዜ	2
በጣም ብዙ ጊዜ	3

10 ለአለባበስዎ ትኩረትን መስጠት አቁመዋል?

አዎን ምንም ትኩረት አየሠጠሁ አይደለም	3
የምፈልገውን ያህል ትኩረት አየሰጠሁ አይደለም	2
ድሮ ከምሰጠው ትኩረት በጥቂቱ ያነሰ ትኩረትን እሰጣለሁ	1
ሁሌም የምሰጠውን ትኩረት እሰጣለሁ	0

11 አንድ ቦታ መሄድ ያለብዎ ይመስል ተረጋግቶ መቀመጥ ይቸገርዎታል?

በጣም ብዙ ጊዜ ይቸግረኛል	3
ብዙ ጊዜ ይቸግረኛል	2
ብዙም አይቸግረኝም	1
ምንም አይቸግረኝም	0

12 መጪ ነገሮችን በደስታ ይጠብቃሉ?

አዎ ሁሌም በተለመደው ወይም በድሮው መጠን እጠብቃለሁ	0
ከድሮው ወይም ከተለመደው በጥቂቱ ባነሰ መጠን እጠብቃለሁ	1
ከድሮው ወይመ ከተለመደዉ ባነሰ መጠን እጠብቃለሁ	2
ምንም በደስታ አልፎበቅም	3

13 በድንገት የመደንገጥ ወይም የመሸበር ስሜት ይሰማዎታል?

በጣም ብዙ ጊዜ ይሰማኛል	3
ብዙ ጊዜ ይሰማኛል	2
አልፎ አልፎ ይሰማኛል	1
ምንም አይሰማኝም	0

14 በራዲዮ ወይም የቴሌቪዥን ፕሮግራሞች ራስዎን ያስደስታሉ?

አዎን ብዙ ጊዜ	0
ብዙም ባይሆን አዎ	1
አልፎ አልፎ	2
በጣም አልፎ አልፎ	3

(ከቀዶ ጥገና በፊት)

Amharic version Pain catastrophizing Scale

ከዚህ በታች አስራ ሶስት የተለያዩ ህመምን ሊገልፁ የሚችሉ **አስተሳሰቦችና ስሜቶች** ተዘርዝረዋል ከዚህ በታች በተገለጸው መስፈሪያ መሰረት እርስዎ በህመም ውስጥ ሲሆኑ የተሰማዎትን ስሜት የሚገልጸውን መስፈሪያ በመምረጥ ስሜትዎን ይግለፁ።

መስፈሪያ	**0**	**1**	**2**	**3**	**4**
መግለጫ	ምንም	አንዳንዴ	አልፎ አልፎ	ብዙ ጊዜ	ሁል ጊዜ

መስፈሪያ /መግለጫ	**0** **ምንም**	**1** **አንዳንዴ**	**2** **አልፎ አልፎ**	**3** **ብዙ ጊዜ**	**4** **ሁል ጊዜ**
1. ህመም እየተሰማኝ እያለ...ህመሙ ይተወኝ ይሆን እያልኩኝ በጣም ነው የምጨነቀው					
2. ህመም እየተሰማኝ እያለ...የምኖር አይመስለኝም					
3. ህመም እየተሰማኝ እያለ...የአሁኑስ በጣም አስከፊ ስለሆነ ከዚህ በኃላ መቼም የሚሻለኝ አይመስለኝም እላለሁ					
4. ህመም እየተሰማኝ እያለ...በጣም መጥፎ እንደሆነና ሁለመናዬን እንደጎዳው ይሰማኛል					
5. ህመም እየተሰማኝ እያለ...ከእንግዲህ የምቋቋመው አይመስለኝም					
6. ህመም እየተሰማኝ እያለ...ህመሙ ከዚ በላይ ይብሳል ብዬ እፈራለሁ					
7. ህመም እየተሰማኝ እያለ...ሌሎች ሊከሰቱ የሚችሉ የህመም ስሜቶች ይታሰቡኛል					
8. ህመም እየተሰማኝ እያለ...ህመሙ እንዲሄድልኝ በጣም እጓአጓለሁ					
9. ህመም እየተሰማኝ እያለ...ህመሙ በፍጹም ከአይምሮዬ ላወጣው አይቻለኝም					
10. ህመም እየተሰማኝ እያለ...ህመሙ ምን ያህል እየጎዳኝ እንዳለ ነው የማስበው					
11. ህመም እየተሰማኝ እያለ...ህመሙ የሚያበቃበት ጊዜ ይናፍቀኛል					
12. ህመም እየተሰማኝ እያለ...የህመሙን ስቃይ ለመቀነስ ምንም ላደርግ አልችልም እላለሁ					
13. ህመም እየተሰማኝ እያለ...ከዚ የከፋ ነገር ያጋጥመኝ ይሆን እንዴ እላለሁ					

(ከቀዶ ጥገና በፊት)

Amharic version EuroQol-5 (EQ-5D) measurement tool

በእያንዳንዱ ርዕስ ስር፣ እባክዎ **ዛሬ** ያለዎትን ጤንነት በተሻለ ሁኔታ የሚገልጸው **አንድ** ሳጥን ላይ ምልክት ያድርጉ።።

እንቅስቃሴ

የመራመድ ችግር የለብኝም	❑
አነስተኛ የሆነ የመራመድ ችግር አለብኝ	❑
መጠነኛ የሆነ የመራመድ ችግር አለብኝ	❑
ከባድ የሆነ የመራመድ ችግር አለብኝ	❑
ምንም መራመድ አልችልም	❑

ራስን መንከባከብ

ለመታጠብም ሆነ ለመልበስ ምንም ችግር የለብኝም	❑
ለመታጠብም ሆነ ለመልበስ አነስተኛ የሆነ ችግር አለብኝ	❑
ለመታጠብም ሆነ ለመልበስ መጠነኛ ችግር አለብኝ	❑
ለመታጠብም ሆነ ለመልበስ ከፍተኛ የሆነ ችግር አለብኝ	❑
ራሴ ልታጠብም ሆነ ልለብስ አልችልም	❑

መደበኛ ተግባራት *(ለምሳሌ፦ ስራ፣ ትምህርት፣ የቤት ውስጥ ስራ፣ ቤተሰባዊ ወይም የአረፍት ጊዜ ተግባራት)*

መደበኛ ተግባራቶቼን ያለ ምንም ችግር አከናውናለሁ	❑
መደበኛ ተግባራቶቼን ለማከናወን አነስተኛ ችግር አለብኝ	❑
መደበኛ ተግባራቶቼን ለማከናወን መጠነኛ ችግር አለብኝ	❑
መደበኛ ተግባራቶቼን ለማከናወን ከፍተኛ ችግር አለብኝ	❑
መደበኛ ተግባራቶቼን ለማከናወን አልችልም	❑

የሕመም ስሜት/ምቾት ማጣት

የሕመም ስሜትም ሆነ የምቾት ማጣት ስሜት የለኝም	❑
አነስተኛ የሕመም ስሜት ወይም የምቾት ማጣት ስሜት አለኝ	❑
መጠነኛ የሕመም ስሜት ወይም የምቾት ማጣት ስሜት አለኝ	❑
ከባድ የሕመም ስሜት ወይም የምቾት ማጣት ስሜት አለኝ	❑
የከፋ የሕመም ስሜት ወይም የምቾት ማጣት ስሜት አለኝ	❑

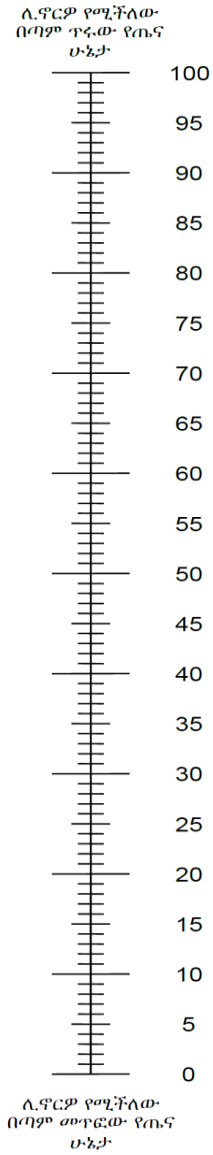
ጭንቀት/ድብርት

ጭንቀትም ሆነ ድብርት የለብኝም	❑
አነስተኛ ጭንቀት ወይም ድብርት አለብኝ	❑
መጠነኛ ጭንቀት ወይም ድብርት አለብኝ	❑
ከባድ ጭንቀት ወይም ድብርት አለብኝ	❑
እጅግ ከባድ ጭንቀት ወይም ድብርት አለብኝ	❑

(ከቀዶ ጥገና በፊት)

- ዛሬ የጤና ሁኔታዎ ምን ያህል ጥሩ ወይም መጥፎ መሆኑን ለማወቅ እንፈልጋለን፡፡
- መለኪያው ከ0 እስከ 100 ድረስ ቁጥሮች አሉት፡፡
- 100 ማለት ሊኖርዎ የሚችለው በጣም ጥሩው የጤና ሁኔታ ነው።
  0 ማለት ሊኖርዎ የሚችለው በጣም መጥፎው የጤና ሁኔታ ነው።
- በመለኪያው ላይ ዛሬ ጤንነትዎ ያለበትን ሁኔታ ለማሳየት የ X ምልክት ያድርጉ፡፡
- አሁን፣ከስር ባለው ሳጥን ውስጥ በለመኪያው ላይ ምልክት ያደረጉበትን ቁጥር ይጻፉ፡፡

የዛሬ ጤንነትዎ = ☐



Name of Data collector (s)_____

Post-operative Day- <u>One</u>

<u>የህመምተኛው የግል መረጃ መሰብሰቢያ</u>

Code number

የህመምተኛው ስም ፡ ----------

የህመምተኛው አልጋ ቁጥር----------

የካርድ ቁጥር:_____

Post-operative Day- **One**

Code number _____

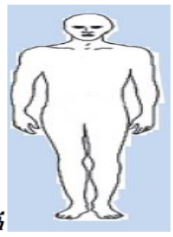
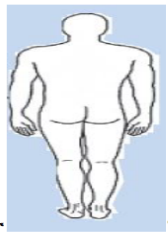
አጭር የህመም መለኪያ ዝርዝር

ቀን፡ _____ ሰዐት_____

1) *መ*ቼም በህይወታችን ውስጥ፣ አብዛኞቻችን የተለያዩ ህ*መ*ሞች ከጊዜ ወደ ጊዜ ያጋጥ*መ*ናል (ለምሳሌ የራስ ምታት፣ ወለምታ፣ የጥርስ ህ*መ*ም)፡፡ እርስዎ **ከነዚህ በየቀኑ ሊያጋጥሙ ከሚችሉ ህመሞች የተለየ ህመም ዛሬ ኢጋጥሞታል?**

1) አዎ 2) አይደለም

2) ቀጥሎ በተ*መ*ለከተው ምስል ላይ ህ*መ*ም የሚሰማዎት ቦታ ላይ ያጥቁ፡፡ በጣም ህ*መ*ም በሚሰማዎት ቦታ ላይ የ X ምልክት ያድርጉ፡፡

ቀኝ **ግራ** **ግራ** **ቀኝ**

3) ባለፉት 24 ሰአታት ውስጥ ካጋጠሞት ህ*መ*ም **<u>እጅግ ህይለኛ</u>** ነበር የሚሉትን የሚገልጸውን ቁጥር እባክዎን ያክብቡ፡፡

0	1	2	3	4	5	6	7	8	9	10
ምንም ህመም										ማሰብ ከምችለው በላይ ከባድ ህመም
አልነበረም										

4) ባለፉት 24 ሰአታት ውስጥ ካጋጠሞት ህ*መ*ም **<u>እጅግ ቀላል</u>** ነበር የሚሉትን የሚገልጸውን ቁጥር እባክዎን ያክብቡ፡፡

0	1	2	3	4	5	6	7	8	9	10
ምንም ህመም										ማሰብ ከምችለው በላይ ከባድ ህመም
አልነበረም										

5) በ**<u>አማካይ</u>** የሚሰማዎትን ህ*መ*ም ሊገልጽ የሚችለውን ቁጥር እባክዎን ያክብቡ፡፡

0	1	2	3	4	5	6	7	8	9	10
ምንም ህመም										ማሰብ ከምችለው በላይ ከባድ ህመም
አልነበረም										

Post-operative Day- **One**

6) **<u>በአሁኑ ቅጽበት</u>** የሚሰማዎትን ህመም ሊገልጽ የሚችለውን ቁጥር እባክዎን ያክብቡ፡፡

0	1	2	3	4	5	6	7	8	9	10
ምንም ህመም አልነበረም										ማሰብ ከምችለው በላይ ከባድ ህመም

7) ለህመምዎ የሚከታሉት ህክምና ወይንም የሚወሰዱት መድሀኒት ምንድን ነው?

_____

8) የሚከታሉት የህመም ህክምና ወይንም የሚወስዱት መድሀኒት **<u>ባለፉት 24 ሰአታት ውስጥ የሰጥዎት እፎይታ</u>** ምን ያህል ነው? እባክዎን ያገኙትን እፎይታ መጠን ሊገልጽ የሚችለውን ፐርሰንት ያክብቡ፡፡

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
ምንም እፎይታ አላገኘሁም										ሙሉ እፎይታ

9) ባለፉት 24 ሰአታት ውስጥ የህመም ስሜቶ ቀጥሎ የተዘረዘሩት ነገሮች ላይ ምን ያህል **<u>ተጽዕኖ እንደፈጠረ የሚገልጸውን</u>** ቁጥር እባክዎን ያክብቡ፡፡

ሀ) ጠቅላላ እንቅስቃሴ

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ለ) ስሜት

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ሐ) የመራመድ ችሎታ

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

Post-operative Day- **One**

መ) የለት ተለት ስራ (የቤት ውስጥ እንዲሁም ከቤት ውጭ ስራን ያካትታል)

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ሠ) ከሌሎች ሰዎች ጋር የሚኖረን ግንኙነት

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ረ) እንቅልፍ

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

ሰ) በህይወት የመደሰት ሁኔትን

0	1	2	3	4	5	6	7	8	9	10
ምንም ተጽዕኖ አልፈጠረም										ሙሉ በሙሉ ተጽዕኖ ፈጥሯል

Post-operative Day- **One**

1. ባለፉት 24ሰአታት ህመሞዎን ለመቆጣጠር **የተሰጠዎት ወይም የወሰዱት** የህመም ማስታገሻ አለ?

   አዎ ☐ አይደለም☐

2. **ለ1ኛ** ጥያቄ መልስ **አዎ** ከሆነ በሚቀጥለው ሰንጠረዥ ይገለፅ

ተ.ቁ	የህመም ማስታገሻ መድሃኒት አይነት	የተሰጠበት መንገድ	መጠን	በቀን ስንት ጊዜ
1				
2				
3				

3. ህመም ለመቆጣጠር የተሰጠዎት መድሃኒት ያደረሰቦት ጉዳት አለ? አዎ ☐ አይደለም ☐

4. ለ3**ኛ** ጥያቄ **አዎ** ካሉ ጉዳቱን (ችግሩን) ይግለፁ_____

5. ከቀዶ ጥገና በኃላ ሕመምን ለማስታገስ **በሀኪም የታዘዘ** የህመም ማስታገሻ መድሃኒት አለ?

   አዎ ☐ አይደለም ☐

6. **ለ5ኛ** ጥያቄ **አዎ** ካሉ በሚቀጥለው ሰንጠረዥ ይሙሉ

ተ.ቁ	የህመም ማስታገሻ መድሃኒት ስም	የተሰጠበት መንገድ	መጠን	በቀን ስንት ጊዜ
1				
2				
3				
4				
5				

7. በቀዶ ጥገና ጊዜ **የተሰጡ መድሃኒቶች** እንዲሁም **የማደንዘዣ መድሃኒት ስም**፤ የተሰጠበት መንገድ፤ መጠኑ፤ ስንት ጊዜ፤?

ተ.ቁ	መድሃኒትና፤ የማደንዘዣ መድሃኒት ስም	የተሰጠበት መንገድ	መጠን	ስንት ጊዜ
1				
2				
3				
4				
5				

Post-operative Day- **One**

6				

8. የተሰራው የቀዶ ጥገና ዓይነት? _____

9. ቀዶ ጥገናዉ የወሰደው ጊዜ? _____በደቂቃ

10. የማደንዘዣ ዓይነት? ሙሉ ☐ ህብረሰረሰር (ስፓይናል ነሪቭ) ☐ ነርቭን መዝጋት ☐

Name of Data collector (s)_____