

Survey of Pain Management Practices in a Tanzanian Emergency Department

by

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Thesis submitted in partial fulfillment of
the requirements for the degree of Master of Science in Global Health
in the Graduate School
of Duke University

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ABSTRACT

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Abstract

Background:

Injury is a leading cause of morbidity and mortality globally, accounting for 11% of global disability-adjusted life years (DALYs) and 6% of global years lived with disability (YDLs). The burden of injury is disproportionately high in low- and middle-income countries (LMICs), including Tanzania. Early and effective pain management for injury patients is essential to ensure proper physical, psychological, and emotional outcomes and recovery, yet few studies have examined emergency department analgesic strategies in Tanzania. This study aimed to analyze the sociodemographic and injury characteristics associated with severe pain of injury patients admitted to the Kilimanjaro Christian Medical Centre (KCMC) emergency department, and qualitatively describe analgesic practices and challenges in the KCMC ED.

Methods:

Self-reported sociodemographic and pain data (score 0-100) data were collected from a prospective trauma registry of adult patients (n=1181) admitted to KCMC ED for acute injury. Injury severity data were determined by the Kampala Trauma Score (KTS). Descriptive statistics were performed and multivariable linear regressions assessed the association between sociodemographic and injury characteristics with severe pain.

KCMC ED physicians and nurses (n=11) were recruited to participate in qualitative interviews aimed at understanding common analgesic practices and challenges in the ED setting.

Results:

Mean pain level decreased across all sociodemographic characteristics between ED admittance and ED discharge. Participants who were either separated or widowed were likely to experience higher reduction in pain level during ED treatments than those who reported living with a partner. Participants who were admitted to the KCMC ED for road traffic injury or fall were more likely to experience lower reduction in pain level than participants with assault injuries. Interviewed KCMC ED physicians and nurses described high usage of pharmacological analgesic methods for traumatic injury patients.

Conclusion:

It is important to understand effective analgesic treatments that can be administered as early as possible post-injury. KCMC ED pain management modalities are generally effective at reducing pain of traumatic injury patients. Adjustments to strategies for road traffic accident and fall injury patients may be made so that higher levels of pain reduction are achieved.

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1. Introduction

1.1 *Global burden of injury*

Injuries are a leading cause of morbidity and mortality globally, accounting for 11% of global disability-adjusted life years (DALYs) and 9% of global deaths annually (1, 2). Each year, traumatic injuries cause nearly 2 times the fatalities caused by HIV/AIDS, tuberculosis, and malaria combined (1).

Injuries disproportionately affect young adults, with road traffic injuries (RTIs) as the estimated leading cause of death for 15-29 year olds worldwide (1). Globally, injury mortality is twice as high among men than among women, affecting families' economic well-being as men are often considered the primary salary earners in their households (3). Low- and middle-income countries (LMICs) experience a disproportionately high burden of injury when compared to global estimates; 90% of global injury fatalities occur in LMICs (1). Sub-Saharan Africa accounts for the highest proportion of injury-related DALYs. For example, it has been estimated that the DALY rates caused by RTI is about 9 times higher in children in sub-Saharan Africa when compared to children in higher income country counterparts (4).

Non-fatal injuries represent a growing public health concern as they are associated with cognitive disability, increased smoking, alcohol, and drug use, unsafe sexual practices, cancer, cardiovascular disease, and functional disabilities (1). Injuries account for 6% of years lived with disability (YLD) globally (1). Untreated pain, in

particular, has been shown to have deleterious effects on injury patients in terms of discomfort, anxiety, and emotional distress (5).

1.2 Importance of Analgesic Treatment

Effective pain management for injury patients is essential to ensure acceptable physical, psychological, and emotional outcomes (6). Early administration of analgesic treatment, both pharmacologic and non-pharmacologic methods, has been shown to improve patient mobility, thus reducing urinary, ileus, and myocardial infarction complications (7). Early pain management has also been found to decrease the intensified hormonal response to injury. Effective analgesic strategies often reduce length of hospital stay, readmission likelihood, increase overall quality of life, and decrease patients' healthcare costs (6).

1.3 Literature Gap

There is a large evidence base evaluating the prevalence of injury globally, with recent research investigating the burden of injury specifically in the Kilimanjaro region of Tanzania. Few studies have assessed analgesic strategies for traumatic injury patients in this geographic region (8).

1.4 Study Aims

This mixed-methods study aims to analyze sociodemographic and injury characteristics associated with pain in emergency department (ED) injury patients at the Kilimanjaro Christian Medical Centre (KCMC) in Moshi, Tanzania. This study also aims

to qualitatively describe common analgesic treatment strategies and challenges to such practices in the KCMC ED.

2. Methods

2.1 Ethical Statement

This study was approved by the Duke University Medical Centre Institutional Review Board, the Kilimanjaro Christian Medical Centre Ethics Committee, and the Tanzanian National Institute of Medical Research.

2.2 Study Setting and Population

KCMC is located in Moshi, Tanzania, and serves as a major referral hospital for the Kilimanjaro region. KCMC is the third largest hospital in Tanzania, serving over 15 million people in Northern Tanzania (9). Annually, over 2000 patients are seen at KCMC for traumatic injuries with 59% of such patients admitted for a prolonged stay averaging 10 days (10).

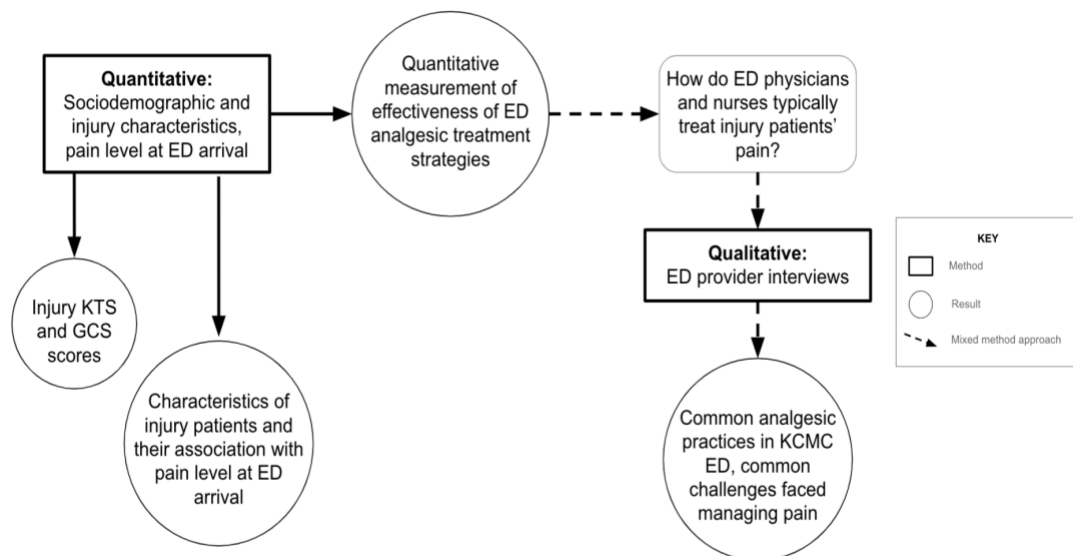


Figure 1: Flow diagram of mixed-method study design.

2.3.1 Quantitative Data Collection

Trained research staff collected data for a registry of acute injury patients admitted to KCMC ED between April 18, 2018 and January 13, 2020. Inclusion criteria for the trauma registry include age (≥ 18 years), and injury occurrence within 24 hours of hospital admittance. A total of 1181 participants met inclusion criteria and were included in this study. Registry questions were developed in English and translated to the local Kiswahili language to be administered to participants by trained research staff. Data were collected on paper and then transferred and stored on an electronic database on REDCap, which is protected behind a Duke University firewall.

2.3.1.1 Sociodemographic and injury characteristics variables

Sociodemographic characteristics including age, sex, education, employment, tribe, marital status, and mechanism of injury were collected through the participant registry as self-report. Pain levels were collected as self-report at two time points: ED admittance and ED discharge (including discharge from KCMC, or transfer to another KCMC department). Participants were asked to rate their level of pain on 0-100 scale. Pain variation was calculated as the difference between pain level at ED discharge and ED admittance. Additional injury characteristics, including mechanism of injury, injury severity, and physical outcomes were also collected. To assess injury severity, the Kampala

Trauma Score (KTS), with scores ranging from 0-10, was used. KTS has been validated as a tool to predict injury outcomes in Tanzania (11). A score between 0-8 is indicative of severe KTS, while mild KTS scores range from 9-10.

Participant's alcohol status upon arrival at ED was also collected, either through self-report or through physical exam conducted by research nurses. The Patient Health Questionnaire-9 (PHQ-9) is a depression measure that has been validated in Tanzania (12). Two PHQ-9 questions were combined to create a score that would indicate the presence of depression symptoms in participants. This score was created to delineate the known comorbidity between depression and pain (13). Glasgow coma score (GCS), a measure of consciousness, was used as a predictor of injury outcome. GCS scores of 1-12 are indicative of poor outcome, while scores ranging from 13-15 are indicative of good outcome.

2.3.2 Qualitative Data Collection

To supplement data from this registry, a series of qualitative interviews were conducted with KCMC ED physicians and nurses. Provider participants were approached on August 20, 2019 and August 21, 2019 in the KCMC ED and verbally consented to participating in these interviews. Interviews were conducted in English by author MCM and were audio-recorded after informed consent. Audio-recordings were

stored in an electronic database on Box behind a university firewall. A total of 11 providers (5 physicians and 6 nurses) participated in this aspect of the study.

2.3.2.1 Qualitative variables

Table 1: Guide for qualitative interviews with KCMC ED physicians and nurses.

1. What aspects of patient care do you think most greatly impact an injury patient's outcome?
2a. How do you know that an injury patient is suffering from pain? 2b. What about the patient indicates that they are in need of pain management?
3a. How do you treat an injury suffering from pain? 3b. Do you ever make use of non-pharmacological treatments for pain? 3c. What about the patient's condition helps you determine the best pain management strategy?
4a. How do you know what medications are available for pain treatment? 4b. What doses of some of the most common medications do you use?
5. What challenges do you encounter when managing trauma patients' pain?

Physicians and nurses were asked five open-ended questions (Table 1) to assess provider approach to pain management treatment and challenges encountered while treating trauma patients' pain.

2.4 Data Analysis

2.4.1 Quantitative Data Analysis

Data analysis was performed in RStudio for Statistical Computing (14).

Descriptive statistics, such as means, dispersions, and frequencies, were determined for sociodemographic characteristics. Multivariable linear regression models were used to analyze the relationships between sociodemographic and injury characteristics and change in pain level from ED admittance and ED discharge.

2.4.2 Qualitative Data Analysis

Audio-recordings of qualitative interviews were transcribed by a single reviewer.

Interviews were analyzed using a thematic content analysis approach. Interview data were transcribed into a spreadsheet and organized by questions. Two main themes were observed through this process: 1) common analgesic practices at KCMC ED and 2) challenges to analgesic practices at KCMC ED. Parent and child codes were then analyzed within these two themes.

3. Results

3.1 Quantitative Results

3.1.1 Comparison of Pain Levels at ED Arrival and ED Discharge

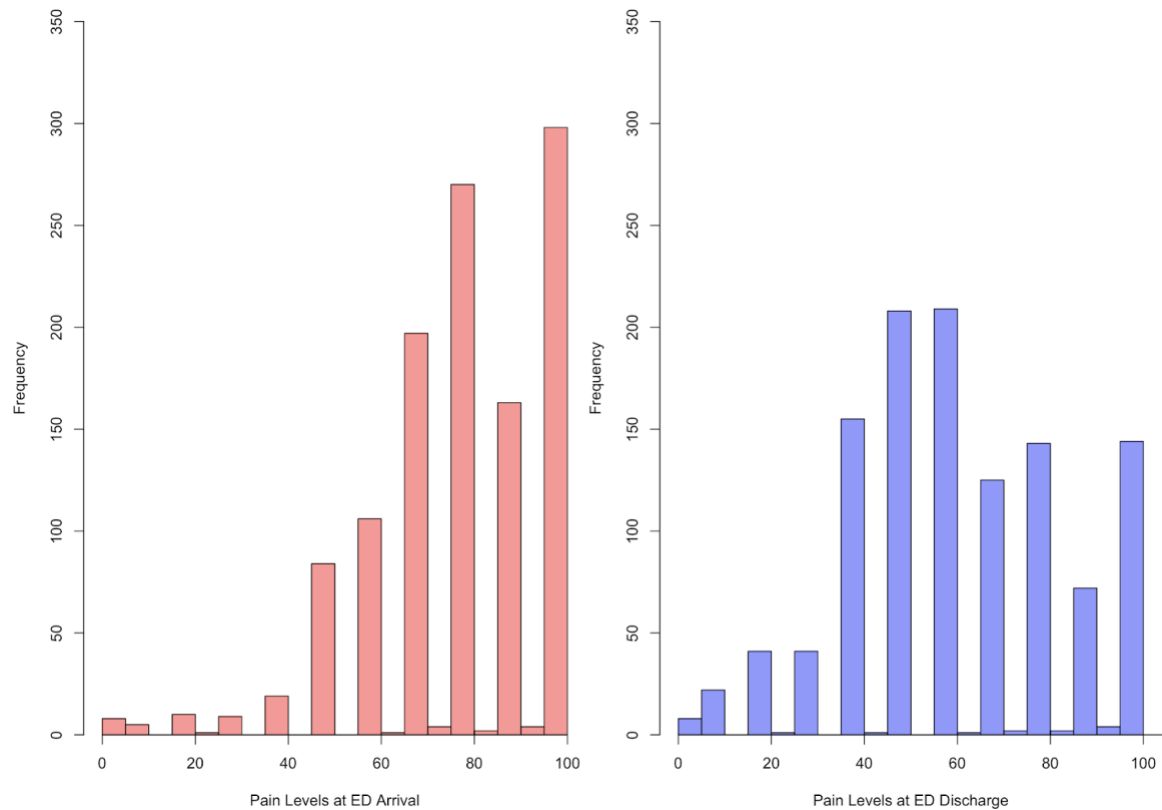


Figure 2: Distribution of pain levels at ED arrival and ED discharge

The mean level of pain across all participants at ED admittance was 78.1 (SD 19.2). At ED discharge, the mean pain response for all participants decreased to 61.9 (SD 23.8). A paired-sample t-test was conducted to compare mean pain levels at these two time points. A significant difference in the mean pain responses was found through this test (p-value <0.01). Distributions of pain responses can be viewed in Figure 2.

3.1.2 Sociodemographic Characteristics and Participant Population

Table 2: Sociodemographic characteristics.

Sociodemographic Characteristics	Participants n= 1181	Pain Level at ED Arrival Mean (SD)	Pain Level at ED Discharge Mean (SD)	Change in Pain Mean (SD)
Male n (%)	967 (81.9%)	78.4 (18.8)	61.9 (23.2)	-16.1 (17.3)
Age mean (SD)	38.4 (16.2)	--	--	--
18-29	450 (38.1%)	76.7 (19.9)	59.9 (23.6)	-16.7 (18.6)
30-49	468 (39.6%)	79.0 (19.0)	63.4 (23.2)	-15.6 (18.0)
50-64	161 (13.6%)	81.1 (16.9)	63.5 (23.4)	-17.7 (16.3)
65+	102 (8.6%)	79.6 (20.6)	66.6 (25.3)	-13.0 (15.2)
Years of education mean (SD)	8.4 (3.3)	--	--	--
Marital status n (%)				
Living with a partner	670 (56.7%)	80.0 (18.19)	64.5 (23.0)	-15.5 (16.9)
Single	418 (35.4%)	75.9 (20.4)	60.5 (23.7)	-15.3 (17.8)
Separated, divorced, or widowed	93 (7.9%)	78.4 (20.3)	55.1 (25.9)	-23.3 (21.8)
Tribe n (%)				
Chagga	624 (52.8%)	78.1 (19.7)	62.0 (23.8)	-16.2 (17.4)
Saamba	53 (4.5%)	80.3 (17.7)	65.7 (21.8)	-14.6 (15.3)
Maasai	42 (3.6%)	79.2 (19.2)	64.1 (25.9)	-15.1 (17.1)
Pare	175 (14.8%)	76.3 (18.4)	60.3 (24.7)	-16.0 (20.1)
Other	287 (24.3%)	78.5 (19.2)	61.9 (23.2)	-16.5 (17.1)
Employment n (%)				
Professional	119 (10.1%)	78.6 (18.5)	62.7 (23.5)	-15.9 (18.0)
Skilled employment	165 (14.0%)	78.0 (19.8)	63.0 (27.3)	-15.01 (20.7)

Self-employed	441 (37.3%)	78.2 (18.8)	61.4 (21.8)	-16.8 (16.1)
Farmer	327 (27.7%)	76.8 (20.2)	59.4 (23.4)	-17.5 (16.7)
Student	39 (3.3%)	73.3 (18.8)	55.1 (22.5)	-18.2 (19.2)
Unemployed	43 (3.6%)	86.7 (14.8)	80.1 (26.4)	-6.6 (22.1)
Other	47 (4.0%)	80.64 (18.2)	68.6 (23.0)	-12.0 (16.8)
Mechanism of Injury n (%)				
Assault	163 (13.8%)	81.2 (16.7)	60.0 (22.7)	-21.3 (17.7)
Road traffic injury	747 (63.2%)	77.7 (19.0)	62.6 (23.3)	-15.1 (16.8)
Fall	204 (17.3%)	77.0 (20.9)	61.6 (25.8)	-15.4 (18.4)
Other	67 (5.7%)	77.5 (21.7)	60.2 (25.6)	-17.2 (21.9)

Of the 1181 participants included in this study, the majority were male (81.9%) with a mean age of 38.4 years, living with a partner (56.7%), members of the Chagga tribe (52.8%), and were injured through road traffic accident (63.2%) (Table 2). For each sociodemographic characteristic, there was a decrease in mean pain from ED admittance to discharge. Participants who reported being either separated, or widowed and participants who were injured through an assault incident experienced the largest decrease in pain between the two time points, at -23.3 (SD 21.8) and -21.3 (SD 17.7), respectively. Participants who reported being unemployed experienced the smallest decrease in pain between the two time points, at -6.6 (SD 22.1).

3.1.3 Multivariable Linear Regression Results

Table 3: Multivariable linear regression model analyzing the relationship between sociodemographic and injury characteristics and change in pain level.

Characteristic	β (95% Confidence Interval)
Age	0.1 (0.0, 0.2)
Male	0.9 (-2.2, 3.9)
Years of Education	-0.1 (-0.4, 0.4)
Marital Status	
Living with partner	REF
Single	0.7 (-2.0, -3.5)
Separated, divorced, or widowed	-9.0 (-13.3, -4.7)
Tribe	
Chagga	REF
Maasai	-0.4 (-6.5, 5.8)
Pare	-1.1 (-4.3, 2.2)
Saamba	0.0 (-5.4, 5.4)
Other	-1.9 (-4.6, 0.8)
Employment	
Professional	REF
Self-employed	-2.0 (-6.2, 2.2)

Skilled employment	1.1 (-3.6, 5.8)
Farmer	-1.7 (-6.3, 2.8)
Student	-0.7 (-7.7, 6.2)
Unemployed	6.3 (-0.5, 13.1)
Other	2.8 (-4.2, 9.9)
Mechanism of Injury	
Assault	REF
Road Traffic Injury	5.9 (2.7, 9.0)
Fall	5.4 (0.7, 8.8)
Other	3.6 (-2.3, 9.4)
Injury Severity	
Mild KTS	REF
Severe KTS	-1.6 (-4.9-1.7)
Injury Outcome	
Good GCS	REF
Poor GCS	2.7 (-2.3-7.7)
Alcohol Status at ED Arrival	
Positive status	0.7 (-1.9, 3.2)
PHQ2	0.2 (-1.4, 1.8)

Adjusted R² = 0.03

*Model adjusted for all sociodemographic characteristics, KTS score, GCS, alcohol status upon ED arrival, and PHQ score

**Italicized results indicate significance at $\alpha=0.05$

Table 4: Multivariable linear regression analyzing the relationship between sociodemographic and injury characteristics and pain level at ED discharge.

Characteristic	β (95% Confidence Interval)
Pain at ED Arrival	<i>0.8 (0.8, 0.9)</i>
Age	0.1 (0.0, 0.2)
Male	0.8 (-2.2, 3.8)
Years of Education	-0.1 (-0.5, 0.2)
Marital Status	
Living with partner	REF
Single	0.1 (-2.6, 2.9)
Separated, divorced, or widowed	-9.6 (-13.8, -5.4)
Tribe	
Chagga	REF
Maasai	0.3 (-5.7, 6.3)
Pare	-1.4 (-4.6, 1.7)
Saamba	0.5 (-4.8, 5.8)
Other	-1.7 (-4.3, 1.0)

Employment	
Professional	REF
Self-employed	-2.3 (-6.5, 1.8)
Skilled employment	0.8 (-3.8, 5.4)
Farmer	-2.4 (-6.9, 2.0)
Student	-1.1 (-7.9, 5.8)
Unemployed	7.8 (1.2, 14.5)
Other	-9.6 (-3.5, 10.2)
Mechanism of Injury	
Assault	REF
Road Traffic Injury	5.2 (2.0, 8.3)
Fall	3.8 (-0.2, 7.8)
Other	3.3 (-2.4, 9.0)
Injury Severity	
Mild KTS	REF
Severe KTS	-2.1 (-5.3, 1.1)
Injury Outcome	
Good GCS	REF
Poor GCS	4.0 (-0.9, 8.9)

Alcohol Status at ED Arrival	
Positive status	0.7 (-1.8, 3.2)
PHQ2	0.4 (-1.2, 2.0)

Adjusted R² = 0.5

*Model adjusted for all sociodemographic characteristics, KTS score, GCS, alcohol status upon ED arrival, and PHQ score

**Italicized results indicate significance at $\alpha=0.05$

A multivariable linear regression model was performed to analyze the relationship between sociodemographic and injury characteristics and change in pain between ED admittance and ED discharge (Table 3). Participants who were either separated, divorced, or widowed had significantly higher reduction in pain when compared to participants living with a partner. Additionally, participants injured through a road traffic accident or a fall had significantly lower reduction in pain when compared to participants injured through assault.

Another multivariable linear regression was performed to analyze the relationship between sociodemographic and injury characteristics with pain level at ED discharge (Table 4). An increase in pain level at ED arrival was associated with higher pain level at ED discharge. Similarly, participants who reported being unemployed and suffering injury through road traffic accident were also likely to express higher pain levels at ED discharge when compared to professionally employed and assault injury participants, respectively.

3.2 Qualitative Results

Table 5: Coding scheme developed through thematic content analysis of qualitative interviews with KCMC ED physicians and nurses.

THEMES	CODES	
COMMON ANALGESIC PRACTICES AT KCMC ED	Patient verbally expresses level of pain	
	Provider uses patient's facial expression/body position to determine level of pain	
	Link between vitals (pulse, heart rate, and blood pressure) and pain	If patient is unconscious, vitals are used to determine whether patient is suffering from pain
		Vitals are often used to determine which medication should be prescribed
	Trauma injuries are known to be associated with pain	
	Begin pain management treatment with low-grade analgesics, then move to high-grade opioids if necessary	
	Reliance on pharmacological analgesic methods	Ice packs and heat are not available in KCMC ED
		Verbal reassurance/counsel provided sometimes
		Joint stabilization sometimes provided as analgesic method

	Availability of medications	Most medications always in stock
		Morphine and paracetamol are not always in stock
		KCMC pharmacy usually has access to medications if ED runs out
	Common medications	Paracetamol (acetaminophen)
		Diclofenac (NSAID)
		Tramadol (synthetic opioid)
		Pethidine (opioid)
		Morphine (opioid)
		Ketamine (anesthetic)
	CHALLENGES TO ANALGESIC PRACTICES AT KCMC ED	Patient doesn't respond to pain treatment
Patient might need higher-grade analgesic		
Even high-grade analgesics may not be effective due to resistance		
Addiction to common analgesics		

	Difficulty accessing analgesic medications	Patient's inability to pay may cause delay in analgesic care being administered
		Lack of availability of certain medications
	Patient's condition	Patient has been drinking and is not responding to analgesic medications
		Vital signs (ie low blood pressure) limit which analgesic medications can be prescribed
		Unconscious patients with unknown medical history
		Patient may have allergies to needed analgesic medications

3.2.2 Emerging Themes and Related Quotations

3.2.2.1 Common analgesic practice in KCMC ED

Interviews were coded in a way to better understand how pain is assessed and treated by KCMC ED physicians and nurses (Table 5). It was most commonly noted by participants that they rely heavily on patients verbally expressing the presence of pain.

“They usually tell... if it's not common for them to be in pain, they will just tell you that they are

in pain." Another participant said that *"if the patient is unconscious, for an injury patient we expect that they will be in pain, pulse rate is high and even blood pressure is usually high. That's how we know this patient, their body is responding to the pain."* Many participants also described how they can *"usually see"* that a patient is suffering from pain because they are *"either crying or crouching in a certain position."* Participants noted that traumatic injury patients in particular are known to generally suffer from pain, that they can assess *"by type of injury, that I think this one is very painful and supposed to need anti-pain."*

Many participants described the common practice of starting analgesic treatment with lower level anti-pain medications, then moving to higher grade opioids if necessary. *"You can start with paracetamol, going up to opioids, which includes morphine, pethidine, tramadol. Good thing we have them here in the ED."* For patients suffering from severe pain, it is common to skip low level anti-pain and immediately administer tramadol, morphine, or pethidine.

Participants noted that pharmacological treatments for pain relief are most commonly used in the KCMC ED. *"Heat or ice can relieve pain... but here in the emergency room we don't have things like that to relieve pain. Here in the emergency department, we usually just [treat] by injection to relieve pain."* Another participant described that *"most of the time, stabilization is the first line pain control for trauma patients,"* which was echoed by a participant relating that *"when a patient comes with dislocation, we immobilize and that relieves pain."* Additionally, some participants described the importance of verbal

reassurance as an analgesic tool. *“Sometimes we do counsel with the patient, ‘just calm down,’ the way you counsel and talk to the patients in a calm way, that’s a non-pharmacological pain treatment.”*

Many participants described how the best analgesic treatment strategy is determined based on their patient’s specific condition. For example, one participant noted that *“[analgesic treatment], most of the time it’s very subjective to the individual patient. You have to head-to-toe the patient and then decide from there if to give or not anti-pain.”*

3.2.2.2 Challenges to analgesic practices in KCMC ED

Four common themes were observed when providers were asked about the challenges they often face when trying to effectively manage trauma patients’ pain levels: 1) patient not responding to treatment; 2) addiction to common analgesics; 3) difficulty accessing medications; 4) patient’s physical condition (Table 5).

Multiple participants mentioned the challenge of providing effective pain management for patients who have been drinking prior to injury. For example, one participants said that when patients *“are not responding to the anti-pain, and we are not sure... whether the anti-pain was not effective, that is always a challenge, especially for people who have been drinking, because some have been drinking so much that somehow their sensitivity to the anti-pain is reduced.”* Another participant echoed that *“the pain medication wears off really fast”* when given to patients who have been drinking.

Other participants described the growing challenge of patients becoming addicted to high-grade analgesic medications. It has become somewhat common for *“patients [to] scream for pain, and they don’t have pain.”* One participant described how *“when a patient comes in already in pain, and we give tramadol, and we give them 20-30 minutes, you are expecting that the pain will subside. But some patients say they still have pain, so... maybe the patient is not really in pain.”* Another participant recounted how some patients come into the ED asking for specific analgesic medications, that they *“tell you ‘just give me pethidine. I need pethidine. Just give me pethidine.’ So we need to counsel. They are addicted and it’s not good.”*

Participants also noted how certain aspects of the patient’s condition make it difficult to administer analgesic medications for pain relief. Most commonly, participants described how the patient’s vital signs may contraindicate certain opioids. *“If the blood pressure of the patient is very low, and they come in with pain, then we may not be able to give anti-pain.”* Another participant similarly said that *“when blood pressure is low, and we give opioid it reduces blood pressure. If they are already hypotensive we don’t want to give, so we give fluids until blood pressure comes up.”* Similarly, a participant noted that certain medications cannot be given to patients with bleeding injuries, so *“we give anti-pain after looking at the signs and symptoms, by looking at the bleeding or by looking at the blood pressure.”* Other participants mentioned that *“sometimes patients might have allergies for some medications, now when you look at the stock of the hospitals you may find that the*

medications that are available are the ones that the patients have allergies.” Another participant described how it is difficult to treat unconscious patients who are brought in by “the police with no relatives... we don’t know the name of the patient, we don’t know if the patient will have reaction to the medicine... we fail to get proper history of the patient.”

Some participants described difficulties accessing medications, either due to the patient’s inability to pay for analgesics or due to medication stock issues. One participant described how *“the biggest challenge is payment.”* It should be noted, however, that *“even if [the patient] can’t pay, we still give them anti-pain because they need it.”* Another participant said that *“the other challenge, sometimes... maybe you will find that we don’t have let’s say morphine in stock, or in the pharmacist.”*

3. Discussion

3.1 Overview of Results

Mean pain level decreased across all measured sociodemographic characteristics between ED admittance and ED discharge highlighting the effectiveness of KCMC ED analgesic practices. Participants who reported “other” marital status (either separated or widowed) were likely to experience higher reduction in pain during their stay in the ED when compared to participants living with a partner. Alternatively, participants with road traffic and fall injuries were likely to experience lower reduction in pain between the two time points when compared to participants with assault injuries. Such knowledge is useful for physicians to better understand and prepare for the analgesic care and challenges associated with these particular injury characteristics. Interviewed KCMC ED providers reported a reliance on pharmacological analgesic methods, including use of high-grade opioid medications, for analgesic treatment of traumatic injury patients. Providers described a number of challenges to analgesic provision of care, including patients not responding to pharmacologic methods, prevalence of opioid addiction, access to medications, and limitations to care options due to the patient’s physical condition.

3.2 Analgesic Treatment for Patients with Altered Neurological Status

Results from this study highlight the need to better understand analgesic practices directed towards patients with altered neurological status. Improvements in acute trauma care globally have led to an increase in the number of patients able to survive severe brain injury, thus causing an influx of patients with neurological disability in need of palliative and analgesic care (15). It is often difficult to detect the presence of and assess the severity of pain in these patients due to their inability to express symptoms verbally, so physicians often rely on reading the patients' facial grimaces or using signs of tachycardia and hypertension as clues that pain may be present (15). These challenges and strategies were described by KCMC ED providers with particular difficulty treating unconscious patients and patients who had been drinking prior to injury occurrence. Development of pain evaluation scales for these patient populations are necessary for physicians to better assess and monitor pain.

3.3 Importance of Research on Analgesic Treatment in this Setting

Research investigating analgesic strategies is timely and of particular interest given the status of the opioid epidemic globally. While opioid pharmaceuticals play an important and necessary role in medical care, particularly analgesic care, the potential for opioid dependence is high. As the prescribed medication's strength increases and the duration of use lengthens, the risk for future dependence only rises (16). The global

burden of opioid dependence increased by 73% between 1990 and 2010, and has continued to rise since then (17). Long-term exposure to opioids has been shown to create permanent changes to the user's brain regions associated with impulse, reward, and motivation (18). There is a known association between medical opioid use and injection drug use--in the United States, it is estimated that 80% of current heroin users reported that their misuse began with prescribed opioids for pain relief (18). This relationship is especially concerning for opioid users in sub-Saharan Africa as the continent's east coast is a popular route of illegal heroin trade (19). Studies have shown that there are currently at least 32,000 heroin users in Tanzania alone, while Africa at large has seen the greatest global increase in heroin users in recent years (20). Injection drug use, in addition to the negative effects of addiction, is associated with increased risk of HIV infection--globally, up to 10% of HIV infections are the result of injection drug use (19). Given the increasing burden of non-prescription opioid abuse within sub-Saharan Africa, studies are needed to focus on the medical use of opioids and investigate alternative analgesic strategies in this region.

3.4 Limitations

This single-site study was limited to participants who were able to seek care at the KCMC ED for a non-fatal injury within 24 hours of injury occurrence. Such eligibility requirements and the lack of pre-hospital emergency care system in the region likely led to the exclusion of more severe injuries from this study cohort. Additionally,

participants with severely altered mental status may not have been physically able to report pain levels and thus may not have been included in this analysis.

This study was also limited by the use of a 0-100 point scale to measure the pain intensity of participants. Studies examining the accuracy and ability of numeric pain rating scales to screen patients for clinically significant pain show mixed results (21). As pain is a multidimensional and complex sensation, numeric measurements can be limiting for patients who find it difficult to quantify their experience (21). Additionally, the wording of pain screening numeric rating questions may lead to biases--some patients may not describe their experience as painful, but instead as 'uncomfortable' or 'distressing' (21).

3.5 Future Studies

Future studies on this topic are recommended to further stratify the effectiveness of ED analgesic practices for specific types of injuries, including long bone fractures and traumatic brain injury (TBI). More studies are needed to further understand why patients admitted due to road traffic and fall injuries were found to be less responsive to analgesic treatments than those admitted with assault injuries. Additionally, further research is needed to better assess, monitor, and treat the pain of patients with altered mental status.

4. Conclusion

Understanding effective analgesic practices for traumatic injury patients is the foundation of establishing pain management strategies aimed at improving physical, mental, and emotional outcomes. This mixed-methods study sought to analyze the association between sociodemographic and injury characteristics and change in pain throughout ED treatment. This study also examined the common analgesic practices in the KCMC ED and challenges faced by ED providers to such practices. We found KCMC ED analgesic practices to be effective at reducing pain levels of traumatic injury across all surveyed sociodemographic characteristics. We found that participants who were admitted to the ED due to road traffic injury or fall were likely to experience lower pain level reduction when compared to participants admitted with an assault injury. KCMC ED physicians and nurses described that they face difficulties providing effective analgesic treatments to patients with altered neurological status, including those with alcohol use prior to injury. Ultimately, more studies are needed to determine why certain injuries characteristics appear to be less responsive to traditional pain management strategies. Additionally, studies should examine new and alternative analgesic treatments that are viable in low-and middle-income settings, such as Tanzania.

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