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PREVALENCE OF PAIN AND ADEQUACY OF ANALGESIC PRESCRIPTION AMONG CHILDREN ADMITTED AT TRANS NZOIA COUNTY REFERRAL HOSPITAL, KENYA
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ABSTRACT

***Objective*: To determine the prevalence and severity of pain and adequacy of analgesic prescription among children admitted at Trans-Nzoia County Referral Hospital (TCRH) pediatric wards.**
***Design*: A sequential explanatory mixed method study.**
***Setting*: TCRH pediatric wards.**
***Participants*: Children aged 5-14 years admitted over a period of 6 months. Healthcare providers and managers at TCRH.**
***Interventions*: Pain assessment using the Faces Pain Scale-Revised (FPS-R).**
***Outcome measures*: Prevalence computed by those who reported pain versus the total screened population. Severity computed by levels of pain reported by the sampled population. Adequacy assessed by the dosing and choice of analgesic versus the WHO analgesic ladder.**
***Results*: Out of the 928 children screened, 764 (82.33%) had pain. Among the 384 sampled, severity reported at 35.7% mild, 49.7% moderate and 14.6% severe. Adequacy of prescription in dosing determined at 16.7% with 34.2% of prescriptions being under dose and 49.1% overdose. Adequacy in choice of analgesia as per WHO analgesic ladder was at 42.45%. Pain score was statistically significant in association with prescription adequacy (P-value < 0.001, AOR= 32 moderate pain and 69.8 severe pain, CI=5.175-183.07). Drug availability and knowledge on pediatric pain management were some of the factors determining drug prescription in the facility.**
***Conclusion*: Prevalence of pain among children admitted at TCRH is very high, occurring in 4 out of 5 children. There is low adequacy of analgesic prescription.**

Pain score, drug availability, staffing and pediatric pain management knowledge were the major factors associated with analgesic prescription and administration.

INTRODUCTION

Pain is the primary symptom that is responsible for seeking of healthcare services in hospitals. The primary legal duty of a physician is to alleviate pain and suffering among their patient[1]. Sub Saharan Africa bears a huge burden of disease and proportionately has a high burden of pain among its population[2]. It has been established over the years that pain is undertreated across the world but with a higher burden in sub–Saharan Africa due to: deficiency of culturally acceptable and validated pain assessment tools, lack of pain management education for clinicians, unavailability of opioids due to national drug policies, unreliable drug supply chains, under-prescribing of pain medication and difficulties in accessing healthcare[3].

Management of pain among the pediatric population pauses many challenges to majority of healthcare workers. This population needs close assessment and further research and understanding of the appropriate pain responses to be able to effectively address the analgesic needs of children[4].

The world health organization (WHO) developed an analgesic ladder defining the various levels of pain and the appropriate analgesic agent for the level of pain[5]. For this to be adequately applied, initial step of pain assessment using appropriate validated pain assessment tools has to be done. In majority of healthcare centers in our setup pain assessment is not done resulting in underestimating the level of pain score and consequently pain undertreatment. The findings of this study will inform development of protocols on pain assessment and management to guide adequate analgesic prescription among the pediatric patients.

MATERIALS AND METHODS

Setting: The study was carried out at the pediatric wards of Trans-Nzoia County Referral Hospital (TCRH) which is ranked as a tier 4 health facility by the Ministry of Health. The average pediatric admissions per day are 10 patients translating to approximately 300 patients per month.

Participants Selection

Inclusion criteria: Children aged 5-14 years admitted to pediatric wards at TCRH. The children were alert as per the AVPU pediatric scale on level of consciousness and able to utilize the FPS-R scale. Healthcare providers who were involved in prescription and administration of pain medication to patients. The medical superintendent, nursing officer in charge, pharmacist responsible for ordering drugs and the hospital procurement officer.

Exclusion criteria: Critically ill children with AVPU scale score <A without the ability to assent for the study or utilize the pain scoring tool. Children with sensory neurological deficits without ability to perceive pain.

Sample Size Determination: Prevalence was obtained through a census of all children fulfilling inclusion criteria admitted during the study period and assessed for presence or absence of pain.

Sample size for objective 2 to 4 was based on a study done at Kenyatta National Hospital (KNH) assessing prevalence of pediatric pain, found prescription adequacy at 50%[6].

Based on this study using Fisher's formula.

$$N = \frac{z\alpha^2 pq}{d^2}$$

z =1.96 for 95% confidence interval
p = is 50%
q =1-p
d = is 0.05, the margin error.
= 1.96*1.96*0.5 (1-0.5)/0.05²
n=384.

Study Procedure: Sequential approach used, whereby the quantitative data was collected first followed by qualitative data. We had two focused group discussions, one with clinicians and another with nurses and targeted key informant interviews. Purposive sampling used for qualitative data.

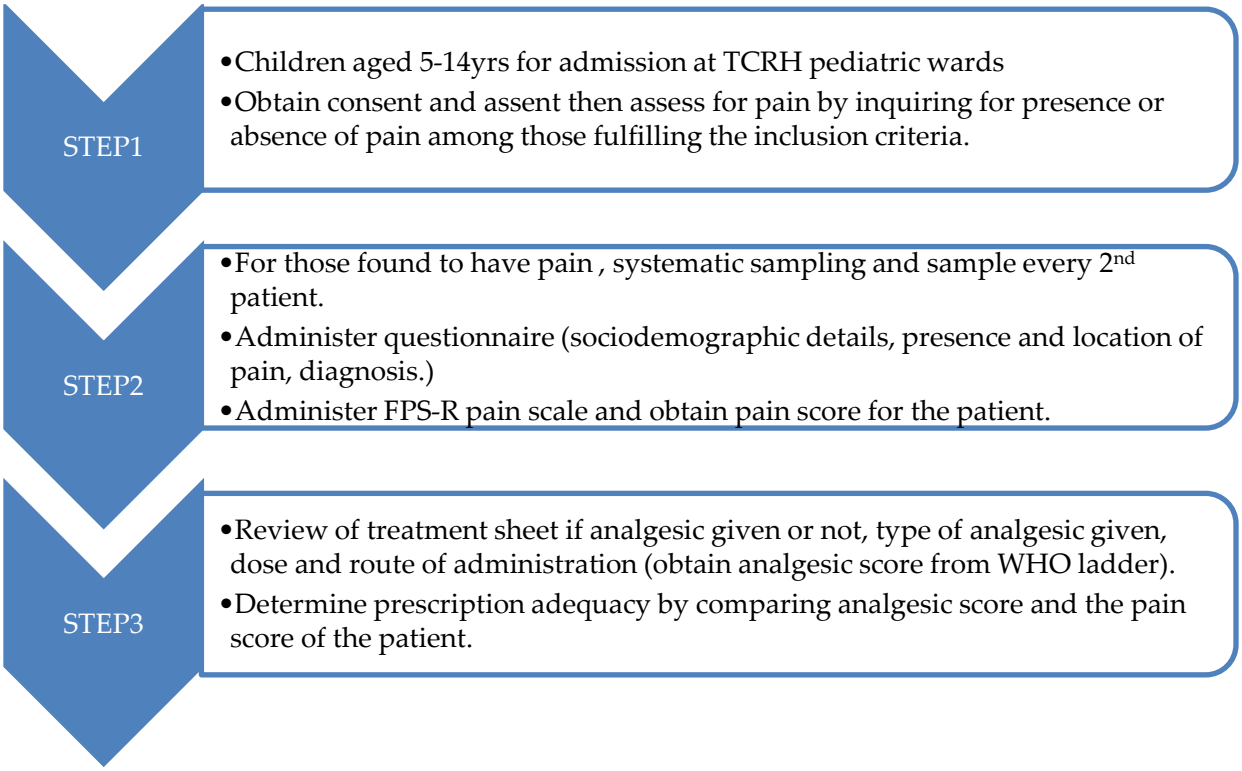

Fig.1: Quantitative data collection procedure

Data Management and Statistical Analysis: Data collected was entered and stored using Microsoft Access database. Data was imported, coded, cleaned and analyzed using STATA version 13 SE. Continuous and categorical variables presented using descriptive statistics; frequency listings and Percentages. Logistic regression used to elicit associations among independent/ dependent variables. Multiple logistic regression: Independent associations with a P≤ 0.05 statistically significant at a 95% CI.
Qualitative data was thematically analyzed using Nvivo 12.

Ethical Considerations: Proposal approval was sought from IREC (Moi University- MTRH) and permission to proceed with study granted by Trans Nzoia County Ministry of Health and TCRH management. There were no incentives or coercion done for study participants and

information gathered during the research was kept highly confidential.

RESULTS

The quantitative data was obtained from children admitted to Trans Nzoia County Referral Hospital aged 5 to 14 years over a period of six months. The participants for qualitative data were the clinicians and nurses who were involved in drug prescription and administration during the 6-month data collection period, hospital managers and in-charges. The findings are presented below:

Prevalence of Pain. There were 928 children who were screened for pain, of which 764(82.3%) reported to be in pain and thus constituted the study population where 384 patients were sampled and included in the assessment of severity and adequacy of analgesic prescription.

Table1

Characteristics of the study participants

Characteristics	**N= 384**	**%**
Age in Years		
Mean SD	8.8(3.0)	
5-7 years	161	42
8-14years	223	58
Gender		
Male	224	58.3
Female	160	41.7
Clinical Diagnosis		
Severe malaria	105	27%
Surgical conditions	88	23%
Respiratory tract infections	70	18%
Meningitis	30	8%
Sickle cell disease	25	7%
Gastroenteritis	21	5%
Other non-infectious diseases	39	10%
Oncology conditions	6	2%
Children Reporting Pain		
Mild pain	137	35.7%
Moderate pain	191	49.7%
Severe pain	56	14.6%

Severity of pain among the sampled population (N=384)

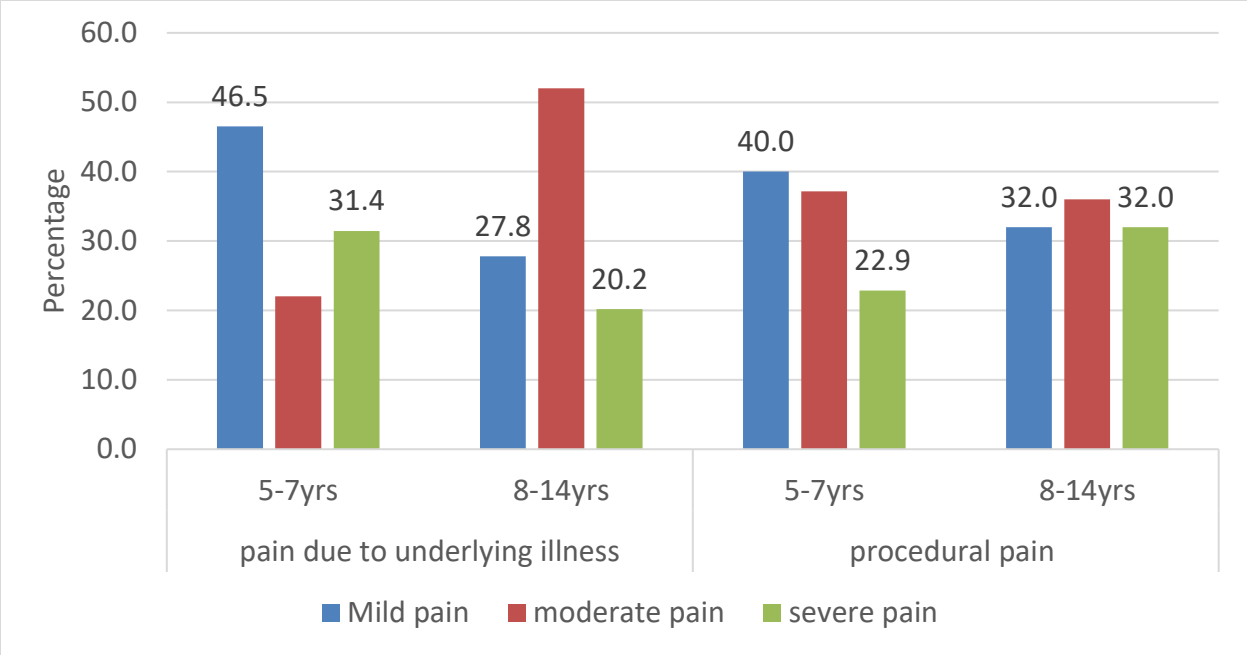

Fig. 2. Severity ranges for pain reported

Majority of the younger patients (5-7yrs) reported mild pain for both procedural pain and pain due to underlying illness. In contrast, the older children mostly reported moderate pain for both.

Table 2

Severity of pain as per diagnosis

Clinical diagnosis	**Pain score**			**Total N=384**
	Mild pain n (%) N=137	**Moderate pain n (%) N=191**	**Severe pain n (%) N=56**	
Severe malaria	57(54.3)	45(42.9)	3(2.8)	105
Surgical conditions	2(2.3)	57(64.8)	29(32.9)	88
Respiratory tract infections	40(57.1)	27(38.6)	3(4.3)	70
Meningitis	2(6.7)	21(70.0)	7(23.3)	30
Sickle cell disease	3(12.0)	11(44.0)	11(44.0)	25
Gastroenteritis	10(47.6)	10(47.6)	1(4.8)	21
Other non-infectious diseases	21(53.8)	16(41.0)	2(5.1)	39
Oncology conditions	2(33.3)	4(66.7)	0(0)	6

Sickle cell disease, surgical cases and meningitis had higher proportions of patients with severe pain reported by 44 % (n=11), 33 % (n=29) and 23.3% (n=7) respectively. Malaria, respiratory tract infections and other infectious diseases mostly reported mild pain.

Prescription Adequacy

a) Adequacy by dosing-57(16.7%) had adequate dosing in all the drugs with 168(49.1%) being over-dose and 117(34.2%) under-dose in one or all the drugs. Most 163(47.9%) of the prescriptions were written by clinical officer

interns, followed by medical officer interns 75(22.1%) and medical officers 71(20.9%).

b) Adequacy by choice of analgesic as per WHO ladder- Comparing the pain score and the analgesic score, only 163(42.5%) had adequate prescription whereas most 211(55%) were under prescribed and 10(2.6%) were over prescribed.

Factors Associated with Prescription Adequacy

Table 3

Factors associated with prescription adequacy on choice of drug

	Adequate prescription n (%) N =163	**Inadequate Prescription n (%) N=221**	**Bivariate analysis**		**Multi-variate analysis**	**P value**
Category			OR (95% CI)	p-value	Odds ratio (95% CI)	
Age						
5 -7 years	72(44.7)	89(55.3)	1		1	
8 – 14 years	91(40.8)	132(59.2)	1.17 (0.77 – 1.76)	0.444	0.962(0.787-1.175)	0.709
Gender						
Female	68(42.5)	92(57.5)	1		1	
Male	95(42.4)	129(57.6)	1.00(0.66 – 1.51)	0.989	0.861(0.279-2.651)	0.794
Pain Score						
Mild pain	112(81.8)	25(18.2)	1		1	
Moderate pain	37(19.4)	154(80.6)	18.64(10.62 - 32.73)	<0.001	32.097(5.163-199.512)	<0.001
Severe pain	14(25)	42(75)	13.44(6.38 – 28.28)	<0.001	69.898(7.417-658.667)	<0.001
Cadre of Staff						
Clinical officer intern	75(46)	88(54)	1			
Clinical officer	13(48.1)	14(51.9)	0.91 (0.40 – 2.07)	0.837		
Medical officer intern	34(45.3)	41(54.7)	1.02 (0.59 – 1.77)	0.922		
Medical officer	35(49.3)	36(50.7)	0.87(0.50 – 1.53)	0.644		
Procedure						
Peripheral IV-line insertion	26(49.1)	27(50.9)	0.34 (0.14 – 0.84	0.020	0.519(0.133-2.025)	0.345
Blood sample collection	18(46.2)	21(53.8)	0.58 (0.25 – 1.35)	0.212		
I.V/ I.M Injection	5(50)	5(50)	0.59 (0.15 – 2.22)	0.441		

Clinical Diagnosis						
Malaria	56(53.3)	49(46.7)	0.54 (0.34 – 0.85)	0.009	1.624(0.267-9.865)	0.598
Surgical conditions	29(33)	59(67)	1.68 (1.02 – 2.77)	0.041	0.289(0.055-1.518)	0.143
Respiratory infections	33(47.1)	37(52.9)	0.79 (0.47 – 1.33)	0.380		
Meningitis	5(16.7)	25(83.3)	4.03 (1.50 -10.76)	0.005	1.414(0.120-16.554)	0.783
Sickle cell Disease	13(52)	12(48)	0.66 (0.29 – 1.49)	0.320		
Gastroenteritis	11(52.4)	10(47.6)	0.65 (0.27 – 1.58)	0.347		
Non-infectious disease	16(41)	23(59)	1.03(0.32 – 3.31)	0.956		

On factors associated with prescription adequacy, at bivariate level, pain score, procedure (peripheral line insertion), malaria, surgical conditions and meningitis demonstrated statistical significance with P values less than 0.05. These factors were subjected to multivariate analysis, only pain score maintained statistical significance with the odds of having inadequate analgesia increasing exponentially if a patient had moderate pain (AOR=32) and severe pain (AOR=69).

Themes from Qualitative Analysis.

Challenges Faced in Provision of Adequate Analgesia.

Unavailability of analgesics.

'*we only have paracetamol in the facility, for a child in severe pain we lack the appropriate analgesics to give so we just give what is available'* clinical officer.

'I try to push for the supplies as fast as I can but the process is long and this leads to delays, we can request with stock for 3 months but still that time elapses before we get the supplies.' procurement officer.

Inadequate knowledge on pediatric pain management.

'we have heard numerous stories in the media on children dying as a result of morphine overdose, sometimes we are not comfortable to prescribe such drugs for fear of the side effects unless the ward consultant prescribes it, we may not even know what the right dose is so we avoid it' clinical officer.

The two themes explain the findings in table 4, where the odds of having inadequate analgesia are very high if one has moderate to severe pain compared to those with mild pain.

Understaffing.

'*we are overwhelmed, a child or caregiver may report of pain to a nurse on duty but because of a lot of work the nurse ends up forgetting and not giving the required analgesia or alerting the clinician on duty'* nurse.

Determinants of Choice of Analgesic

Age of the patient- '*younger children are feared to have more side effects compared to older children and hence less likely to have opioid analgesics prescribed* 'reported a medical officer.

Drug availability- '*we first consider what is available in the hospital then choose from the options that we have'.* clinical officer.

Severity of pain '*in the likelihood of adequate options of analgesia available, the level of pain will*

determine the choice of analgesia with those with severe pain getting the opioid analgesics and mild pain getting the non-opioid analgesia.' medical officer.

Underlying comorbidities for the patient. *'other underlying comorbidities that may have some drug contraindications'* reported a medical officer intern.

DISCUSSION

The prevalence was high with 4 out of 5 children presenting with complaints of pain. The findings are similar to Kenyatta National Hospital study with a prevalence of 4 out of 5 children[6]. Internationally, the prevalence in a Canadian study among pediatric inpatients found a prevalence of 9 in 10 patients, with almost all surgical patients reporting pain than medical patients at two thirds[7]. This is consistent with our findings where almost all of surgical patients reported pain and two thirds of medical patients reported pain.

The prevalence was higher in a USA study that reported 94% of pediatric inpatients experienced some level of pain in the course of the admission[8]. This study differed from our study in that; it was a prospective study that screened admitted patients for pain four hourly until discharge hence it was able to document all sources of pain (procedural and medical) explaining the high prevalence.

The overall severity of pain associated with admission diagnosis for our study was determined to be a third, half and a quarter for mild, moderate and severe pain respectively. The severity of pain as a result of procedures done at admission, mild, moderate and severe pain reported similar proportion of patients. This differs slightly to the KNH study that had an overall severity of two thirds with moderate pain and 1 in 20 reported severe pain[6]. However, the findings on higher prevalence of mild pain in the younger age group were similar to our study. The ranges for procedural pain were reported at a quarter, a third and none for mild, moderate and severe respectively. The methodological differences in the two studies were on the recruitment period and the age of the study population. KNH study gave an allowance of 24 hours after admission, this could give room for more ward procedures to be done hence had a higher sample for procedural pain (n=212) as opposed to our study (n=85). This study also included the 0-12 years using both the FLACC scale and FPS-R scale and this can explain the differences noted in the severity ranges.

A Canadian study reported a severity of a quarter for moderate to severe pain at admission and 4 in 5 in the course of admission[9]. This study is different from our study as it was a prospective study that followed the admitted children up to discharge hence had the opportunity to get the varied intensities of pain in the course of admission. However, there were reported similarities in the severity among various admission diagnoses where surgical conditions, meningitis and sickle cell disease had the highest levels of severe pain.

Internationally there is consensus that pain among children has been perennially undertreated. This has been demonstrated in a number of studies focused in pain management in children. Our study sought to find research-based evidence for this in our set up. Our study reports the adequacy in dosing to be at a fifth with 4 fifths having either overdose or underdose in one or both of the analgesics. Adequacy in terms of choice of analgesia versus the level of severity was determined at two fifths with more than half being under prescribed and a very small proportion being over prescribed.

These findings are similar to Mate at KNH[6] who reported prescription adequacy at half based on WHO analgesic ladder but did not report adequacy in terms of the dosage prescribed. A study done at MTRH assessing pain in both adults and children reported adequacy among the pediatric population to be about two fifths[10]. This study had a sample size of 110 children versus our study with 384 children; this can explain the difference in the adequacy of prescription. A study among children with cancer in South Africa reported adequacy at 4 fifths with a fifth having suboptimal analgesia[11], the higher level of adequacy can be explained by the study population being mainly cancer patients whose palliative care mainly involves pain control hence the likelihood of being adequately managed. Among children requiring morphine in an analysis by Groenewald et al[12], only a third had access to it.

From the quantitative analysis only pain score and underlying diagnosis showed statistical significance in determining prescription adequacy. The odds of having inadequate analgesics increased by 30 folds among those with moderate to severe pain, compared to those with mild pain. This was qualitatively explained by the unavailability of analgesics whereby the facility only had paracetamol regularly available hence those with mild pain would get the recommended analgesia but those with moderate to severe pain would still get the paracetamol which is inadequate.

These findings are similar to an analysis by Pomerleau et al[13] that set out to determine factors affecting opioid analgesic prescription decisions: underlying diagnosis, provider's concern about unsafe use of the medication, patient's history of substance abuse/ dependence. This is similar to our study where underlying diagnosis e.g. sickle cell disease was more likely to get opioid prescription and fear of side effects could hinder opioid prescription in other instances.

On drug unavailability, similar findings were reported in an assessment of pediatric analgesia challenges in sub-Saharan Africa and reported that unavailability of drugs especially the opioids greatly hindered analgesia care among children with moderate to severe pain[3]. Inadequate healthcare financing and corrupt procurement systems were also determined as the major challenges ailing sub–Saharan Africa. From our qualitative analysis, this came out as a strong theme that affects analgesia care among children in pain at TCRH. In the United Kingdom, Becket et al[14] reported that poor healthcare financing leads to limited supply of analgesics especially opioids indicating that drug unavailability is a universal concern and not a challenge limited to sub-Saharan Africa.

Knowledge of the healthcare workers is a key determinant of the choice of analgesic that a clinician will prescribe. This finding was similar to Orzalesi who reported that majority of healthcare providers especially in sub–Saharan Africa are inadequately trained in pain management[15]. Majority of the participants in our study reported not to have had any training on pediatric pain management.

CONCLUSION

The prevalence of pain among children admitted to TCRH pediatric wards is very high with 4 out of 5 children presenting with pain symptom. Majority of the children reported moderate pain with surgical patients having higher prevalence of severe pain compared to medical patients. The adequacy of prescription by dosing is very low at TCRH, with an

average adequacy in choice of analgesia as per the WHO analgesic ladder. Pain score, drug availability, understaffing and knowledge of healthcare providers on pediatric pain management were the major factors associated with analgesic prescription and administration at TCRH.

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