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ORIGINAL ARTICLE

Pain in hospitalized pediatric patients in a third-level healthcare institution

Dolor en pacientes pediátricos hospitalizados en una institución de salud de tercer nivel

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What do we know about the subject matter of this study?

It may be common that, understanding pain as a communicational and subjective phenomenon, it is not investigated, not treated, or even ignored. Therefore, the child's inability to verbalize it should not hinder her/him the possibility of receiving treatment.

What does this study contribute to what is already known?

Compared with other age groups, there are few published studies on pain in pediatric patients. This study provides information on the characterization and management of pain in children in a hospital setting in a Latin American city.

Abstract

In the hospital setting, pediatric patients can present painful conditions or undergo procedures that generate pain, therefore, recognizing their existence and carrying out a clinical approach to it should be a priority in health care teams. **Objective:** To characterize the pain and its clinical-therapeutic approach in hospitalized patients in the general ward of a tertiary pediatric healthcare institution. **Patients and Method:** An observational, cross-sectional, and descriptive study conducted between August and October 2019. 187 patients were included. Study variables were sex, reason for hospitalization, treating specialty, chronic, current, and in the last 24 hours pain, intensity, maximum cause of pain, and analgesic prescription. The FLACC (Face, Legs, Activity, Cry, Consolability) scale was used in children aged between two months and three years, the revised Faces Pain Scale in children between four and eight years of age, and the self-reported Visual Analogue Scale was used in children from nine years of age onwards. After data analysis with descriptive statistics, differences between groups were calculated with the Chi-square test for qualitative variables, and non-parametric tests for comparison of groups with ordinal variables. **Results:** 10.7% of the patients had chronic pain, without differences according to sex ($p = 0.713$). The prevalence of pain at the time of the evaluation was 38.5%, without differences according to sex ($p = 0.419$). Patients admitted for surgery and trauma had a higher prevalence of pain ($p = 0.034$) and 53.5% of the children had an analgesic prescription. **Conclusion:** the prevalence of pain in the hospitalized pediatric patients is high. Additionally, high use of non-opioid analgesia and a low prescription of opioid analgesics in the pediatric sphere is reported for the usual management of moderate and severe intensity pain.

Keywords:
Pain;
Child;
Pain Management;
Hospitalized Child;
Analgesia

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Introduction

In the neurophysiological process of pain, the activation of nociceptors due to a noxious stimulus generates action potentials at the peripheral sensory receptor level that are transmitted through afferent nerve fibers to the central nervous system, which produces a conscious perception of pain[1].

Studies on the development of the neurobiology of pain[2] have shown that humans have a substantial maturation of peripheral afferent, spinal and supraspinal pain transmission from 26 weeks of gestation[3,4] which can be encoded and responding to tissue damage with autonomic and hormonal factors and signs of metabolic stress[5]. Therefore, pain is considered a universal experience and a global issue[6], mainly in vulnerable populations such as the pediatric one, in which the child's inability to verbally express pain should not deny its existence and the need for relief[7].

In 2010, the Montreal Declaration, published by the International Association for the Study of Pain (IASP) and the World Health Organization (WHO), established that access to pain treatment is a fundamental human right[8].

Pain should be considered as the fifth vital sign[9] and should be evaluated in all patients to favor proper management. Most etiologies of pain can be prevented, treated, or at least reduced using available pharmacological and non-pharmacological therapeutic tools[10]. There are enough means and knowledge to alleviate pain; therefore, recognizing its existence and making a clinical approach should be a priority for health care teams.

In the hospital setting, patients may present with painful conditions or undergo procedures that generate pain, therefore, it is common for clinicians to deal routinely with patients who require pain management. This is particularly true in pediatrics, where untreated pain can have adverse physiological effects[11], delay recovery, and negatively impact both in the short and long term on the physical and emotional health of patients and might reach the point of modifying how the child's nervous system will perceive pain in the future[12,13]. In addition, different consensuses have concluded that aspects such as clinical and cognitive variability should be considered and that treatments should start as soon as possible, adapting them to the specific characteristics of each patient[14,15].

In Latin America, there are few studies related to pain in pediatric patients in hospital settings. One of them was conducted in the Pediatric Hospital of the Pereira Rossell Hospital Center (HP-CHPR) and other public and private institutions in Montevideo (Uruguay), published in 2016, which reported 15.5% and 35% of pain prevalence in hospitalized children at the time of evaluation and the previous 24 hours, respectively[16]. Another study in the same hospital published in 2018, reports a similar prevalence[17].

The objective of this study was to characterize the etiology, intensity, and clinical-therapeutic approach to pain in hospitalized patients in a pediatric institution of third-level of care.

Patients and Method

Design

An observational, prospective, cross-sectional, and descriptive research was conducted with patients hospitalized in a general ward of a pediatric institution of third-level of care in Manizales, Colombia. The sample was calculated based on a prevalence of 50%, because the real pain prevalence was unknown, and according to the total average of hospital discharges in a calendar month. 187 patients with a stay of at least 24 hours from admission were included. Children under two months of age and patients and/or caregivers who were absent after three attempts to evaluate were excluded.

Instruments

Patient assessment and data collection were carried out using a survey-type instrument and the review of medical records between August and October 2019. Patients and/or caregivers were asked if the patient had experienced any pain since admission to the hospital. It was considered that the patient was in pain when the child, adolescent, and/or caregiver reported that the child was in pain at the time of the assessment or had been in pain in the previous 24 hours. We asked whether they were informed about pain treatment and whether they had consulted a physician for pain relief in the last 24 hours.

Pain assessment was obtained from the patient her/himself through validated scales recommended by the WHO[18]. The FLACC scale (Face, Legs, Activity, Cry, Consolability) was used in children between two months and three years of age[19], the revised face scale in children between four and eight years of age[20,21], and the visual analog pain self-assessment scale from nine years of age[22]. A form designed for the study was used, with which a pilot test was carried out in the hospital facilities during two non-consecutive days, weeks before the study, and adjusted to the defined selection criteria, which allowed us to know the time required by each patient. It was also necessary to make modifications in the terminology used in the form to facilitate understanding by patients and/or caregivers. The survey included the following variables: sex, age, the reason for hospitalization, length of hospital stay, treating specialty, previous and current pain, pain in-

tensity, maximum cause of pain, the record of the presence of pain and quality of the record, current analgesic prescription, and previous request for analgesia. The information obtained from the study is under the confidentiality of the research team, guaranteeing the appropriate and discretionary handling of the data.

Statistical analysis

The information was consolidated in a matrix of the IBM SPSS Statistics 22® software. An initial analysis of the sociodemographic characteristics was carried out with descriptive statistics to summarize the data, with measures of central tendency and dispersion; frequencies and percentages were used for categorical variables. The difference of age means between both sexes was calculated with the t-student test and the chi-square test was used to establish differences between groups of interest with qualitative variables. The nonparametric Mann-Whitney U test was applied to compare two groups with ordinal variables and the Kruskal-Wallis test to compare more than two groups with ordinal variables. In addition, the prevalence of pain was compared according to the treating specialty and the reason for admission with the chi-square test to compare more than two groups, and then recoding was performed in different variables according to the cause of significance. A value $p < 0.05$ was considered significant for all statistical tests.

Ethical Aspects

The project was approved by the ethics committee of the Faculty of Health Sciences of the University of Caldas Act No 008 of 2019 and the research committee of the pediatric institution where it was carried out. Participation was voluntary, after obtaining informed consent from the patient's parents or caregivers. Refusal to participate did not interfere in any way with the care of the patient by the health care team.

Results

187 patients were included, 77 female and 110 male; the mean age was 96 months (IQR 34-165 months), with no significant differences according to sex ($p = 0.169$) and with a mean hospital stay of 2.89 (2.20;3.57) days. The main reason for hospital admission was non-infectious pathology in 30.5% of patients, with no differences according to sex ($p = 0.128$) (Table 1).

Regarding pain, 10.7% of the patients presented chronic pain, defined as pain lasting three months or more before hospital admission, with no statistically significant differences between sexes ($p = 0.713$), and abdominal pain was the most frequent cause of chronic pain in 40% of the patients. At the time of evaluation, 38.5% of patients were in pain, with no differences according to sex ($p = 0.419$) and the reason for admission did not generate significant differences in the intensity of current pain ($p = 0.093$) (Table 2).

Furthermore, during the evaluation, patients with a history of chronic pain ($p = 0.002$) had a higher prevalence of pain, with 70% of pain incidence, compared with patients without a history of chronic pain who had a 34.7% incidence. The FLACC scale was used in 16 patients, the Faces Pain Scale-Revised (FPS-R) in 12 patients, and the visual analog scale in 44 patients, finding no statistically significant differences in pain intensity according to age group and/or scale used ($p = 0.000$).

Patients managed by the orthopedics team presented a higher prevalence of pain ($p = 0.005$), but without significant differences in intensity ($p = 0.11$) compared with the other specialties; also, patients admitted for surgery and trauma presented a higher prevalence of pain at the time of evaluation ($p = 0.034$) (Table 3).

It was observed that 59.9% of the patients were in pain in the 24 hours before the evaluation, with no differences according to sex ($p = 0.972$) or reason for hospital admission ($p = 0.168$). Of the patients with history of pain, 54.5% presented mild intensity and 12.5% presented severe pain. In addition, 13.9% of the 187 patients and/or caregivers had requested some additional measure from the healthcare personnel to help relieve pain in the 24 hours before the evaluation. At the same time, 26.7% reported not having experienced pain at any time during the hospital stay, compared with the 73.3% of patients who had experienced pain at some time during hospitalization, whose cause of maximum pain was needle puncture (Table 4).

On the other hand, 78.1% of the patients and/or caregivers reported that a member of the health care staff had asked about the patient's pain in the 24 hours before the evaluation and 71.1% of the patients had registered in their clinical records whether or not they were in pain in this same period (Table 4).

Regarding analgesic prescription, 53.5% had an analgesic prescription of some type (Table 5). Of these, 98% were treated with non-opioid analgesics and the remaining 2% with a weak opioid (tramadol) and a strong one (morphine), respectively, both in combination with a non-opioid drug (acetaminophen).

The most used medication was acetaminophen, indicated in 78% of the patients and accounted for 54.9% of the prescriptions, and opioids were used in 1.4% of the prescriptions and indicated in only 2% of the patients (Table 5).

Among non-steroidal anti-inflammatory drugs (NSAIDs), the most used were ibuprofen (50%), diclofenac (25%), and naproxen and nimesulide (12.5%

each). Among patients on analgesic monotherapy, 65.6% received acetaminophen and 34.4% metamizole. Of those with two prescribed medications, 52.8% received acetaminophen-metamizole, and those patients with three analgesic medications, 100% received acetaminophen, metamizole, and bupivacaine. Four patients required rescue analgesia in the 24 hours before evaluation, of which 50% received hydromorphone.

Regarding the route of administration, in 81% of the patients the oral route was used, followed by the peripheral parenteral route in 52%, epidural 6%, and only 1% of the patients the intramuscular route was indicated. It should be added that of the total of pharmacological analgesia prescriptions, 9.15% were prescribed for administration without a schedule and/or on patient demand.

Discussion

Given the importance of pain recognition in pediatrics, often underdiagnosed in hospitalized patients, this study shows a 38.5% prevalence of pain at the time of evaluation, without significant differences between sexes (p = 0.419). When comparing this prevalence with studies in other Latin American countries, it is similar to that reported by Lopez-Guzman et al. in a study conducted in Mexico in 2013 that reported a 35.3% prevalence[23]. The prevalence of this study was higher than that reported by Zunino et al in Uruguay between 2016 and 2018 accounting for 15.5% and 15.8%, respectively[16,17], which could be related to the difference in the research design.

Current pain is more frequent in those patients admitted due to trauma and surgery (p = 0.03), with a prevalence of 55.6% and 55.3%, respectively. This could be related to the type of tissue injury generated by the trauma or surgical pathology associated with noxious stimuli, inflammatory response, and greater nociception, compared with other reasons for hospital admission[24,25].

On the other hand, the study reports a 10.7% prevalence of chronic pain, without statistically significant differences between sexes (p = 0.713). It should be considered that this type of pain is not an exclusive problem of the adult population. In pediatric patients, it has increased and become a common health condition in the young population, with a mean prevalence from 11% according to the location of pain to 38% as described by Liossi C. et al.[26].

It is important to highlight that 59.9% of the patients had experienced some type of pain in the 24 hours before the evaluation, in contrast to the 76% that was reported by Friedrichsdorf et al. in the United States in 2015[27]. In that same publication, the worst

Table 1. Sociodemographic characteristics and the reason for admission of the patients

Variable	Frequency n = 187	Percentage %	p
Sex			
Female	77	41.2	
Male	110	58.8	
Age			0.169*
3-11 month	13	7.0	
12-23 month	21	11.2	
24-71 month	44	23.5	
72-144 month	41	21.9	
144-215 month	68	36.4	
Reason for admission			0.128**
Non-infectious pathology	57	30.5	
Infectious pathology	45	24.1	
Surgery or postoperative	38	20.3	
Medical tests and procedures	24	12.8	
Trauma	18	9.6	
Burns	5	2.7	

*The difference by sex was estimated with student t test for independent samples. **For qualitative variables the difference between sex was estimated with Chi-square test of homogeneity. Source: self made.

Table 2. Prevalence. location. and intensity of pain during the evaluation

Variables	Frequency n = 187	Percentage %	p
Current pain			
Yes	72	38.5	
No	115	61.5	
Current pain by sex			0.419*
Female			
yes current pain	27	35.1	
no current pain	50	64.9	
Male			
yes current pain	45	40.9	
no current pain	65	59.1	
Pain intensity			0.244**
Mild	44	61.1	
Moderate	21	29.2	
Severe	7	9.7	
Location of Current pain			0.365*
Abdomen	24	33.3	
Head	10	13.9	
Lower limb	10	13.9	
Oropharyngeal	6	8.3	
Genitals	5	6.9	
Upper limbs	5	6.9	
Chest	4	5.6	
Shoulder girdle	3	4.2	
Ears	2	2.8	
Hips	2	2.8	
Lower back	1	1.4	

*The difference according to sex was estimated with Chi-square test of homogeneity. **Mann-Whitney U test was used to compare two groups with ordinal variable. Source: self made.

Table 3. Prevalence of pain according to the treating specialty and the reason for admission

Variable	Current pain				p
	Yes		No		
	n	%	n	%	
The treating specialty					0.005*
Pediatrics	19	25.7	55	74.3	
Pediatric surgery	20	42.6	27	57.4	
Pediatrics and other specialty	11	40.7	16	59.3	
Orthopedics	14	73.7	5	26.3	
Pediatric surgery and other specialty	3	33.3	6	66.7	
Pediatrics and pediatric surgery	2	33.3	4	66.4	
Orthopedics and other specialty	2	100	0	0	
Pediatrics and orthopedics	1	50	1	50	
Plastic surgery	0	0	1	100	
The reason for admission					0.034*
Non-infectious pathology	18	31.6	39	68.4	
Infectious pathology	14	31.1	31	68.9	
Surgery or postoperative	21	55.3	17	44.7	
Medical tests and procedures	9	37.5	15	62.5	
Trauma	10	55.6	8	44.4	
Burns	0	0.0	5	100.0	

*The difference in the prevalence of pain according to medical specialty or according to reason for admission was estimated with Chi-square test of homogeneity. Source: self made.

Table 4. Cause of maximum pain during hospitalization and recording of pain in the electronic medical record

Variable	Frequency n	Percentage %
Cause of maximum pain		
Needle puncture	46	33.6
Postoperative - surgical wound	44	32.1
Mobilization - physical therapy	25	18.2
Eating-odynophagia	9	6.6
Diagnostic procedures	6	4.4
Defecate and / or urinate	6	4.4
Cough	1	0.7
Recording of pain		
Yes	133	71.1
No	54	28.9
Healthcare personnel recording pain		
Nursing	26	19.5
Physician	26	19.5
Physician and nursing	81	60.9
Quality of the record		
Complete	99	74.4
Incomplete	34	25.6

Source: self made.

pain reported was caused by needle puncture in 40% of patients[27], similar to what was found in our study, in which the most frequent reason for maximum pain was also needle puncture for paraclinical and/or drug administration in 33.6% of patients. In addition, in both publications, more than 50% of patients were in pain before the evaluation.

At the same time, it was established that 13.9% of patients had asked the health care personnel for some additional measure to help alleviate pain in the 24 hours before the evaluation and that 26.7% of patients had not experienced any pain during their hospital stay. This could be related to those medical situations that require painless in-hospital management, in addition to elements that make pain an individual experience, modulated by multiple factors, from individual to collective ones, that allow the patient to express their pain[28,29].

Evaluating pain in children in order to recognize it and provide a clinical approach is of great importance from any point of view due to the well-known adverse psychological and physiological effects that pain can generate during the acute phase[11]. In relation to the above, in this study, 78.1% of patients and/or caregivers reported that a member of the health care staff had asked about the patient's pain in the last 24 hours and 71.1% of patients had registered in their clinical records whether or not they were in pain in the same

period. Although recording the evaluation of pain is not mandatory, it is part of the clinical history format of the institution. These findings were similar to those published by Zhu et al. in Canada in 2012, who described that 63% of patients had at least one registered evaluation of pain in the last 24 hours[30].

For the management of pain in children, health teams must know the tools for pain evaluation and be able to choose a safe and effective therapeutic approach[31]. Of the total number of patients, 53.5% had analgesic prescriptions, 94% of them received pharmacological prescriptions and 6% received pharmacological and non-pharmacological prescriptions. This evidences the low use of non-pharmacological therapeutic strategies (physical and immobilization techniques) or complementary therapies for pain management in patients of any age group, which have been demonstrated to be effective in reducing pain, anguish, and anxiety that can be generated in the in-hospital setting through a comprehensive approach to pain relief adapted to patients according to age and stage of development[25,32].

Likewise, it was observed that 23.5% of the patients and/or caregivers did not know if they had any analgesic prescription, which highlights the role of the health care staff in explaining the therapeutic approach and the right of each patient to be informed about it. At the same time, there was a similarity between the percentage of patients who believed they were receiving some type of analgesia and patients who actually had an analgesic prescription, which was 54% and 53.5%, respectively.

Similarly, 61% of the patients who had analgesic prescriptions received monotherapy and only 3% had three analgesic medications indicated, with acetaminophen as the most used medication (78%), followed by metamizole (48%), representing 33.8% of the total prescriptions. This evidences the wide use of metamizole, a drug that has been restricted in many countries such as the USA and part of the member countries of the EU, based on serious adverse effects attributed to the drug, such as agranulocytosis, which generates controversy regarding its use. In relation to this situation, a systematic review of the literature by Andrade et al. on the safety of metamizole and its potential adverse effects, especially agranulocytosis, intestinal bleeding, and hepatotoxicity, found that most studies that evaluated agranulocytosis demonstrated an increased risk associated with metamizole, with differences in the estimates of relative risk (RR) ranging from 1.5 (95% CI, 0.8-2.7) to 40.2 (95% CI, 14.7-113.3) and support the need for further research to better quantify the potential risks associated with the drug in relation to dose, duration of therapy, route of administration or previous therapy, and if there were risks[33].

Previous studies show a wide geographic variation in the incidence of metamizole-induced agranulocytosis[34] which may be explained in part by differences in metamizole use patterns regarding dosage, duration, and concomitant medications[35]. A Latin American study[36] reported an overall incidence of agranulocytosis of 0.38 cases per 1 million inhabitants per year and concludes that drug-induced agranulocytosis is too low to be considered a public health problem.

Likewise, Moreno D. et al. conclude that the incidence of agranulocytosis is variable but probably infrequent and report an overall mortality of 0.5 per million inhabitants per year[37]. In short, metamizole is widely used in Colombia for pain relief[38] and has a current registration granted by the National Institute for Drug and Food Surveillance (INVIMA) for its use.

Therefore, medical interventions must be safe and guided by the patient's own conditions and environment in order to relieve pain, using analgesia with a stepwise approach according to the intensity of pain, starting with non-opioid analgesics and escalating to opioids and adjuvant analgesics with increasing analgesic effect[32]. Furthermore, for the approach of moderate to severe pain, non-opioid drugs are associated with opioid drugs providing multimodal analgesia to improve analgesic efficacy, minimize drug doses, and

Table 5. Percepción y tipo de prescripción analgésica

Variable	Frequency n	Percentage %
Perception of analgesic prescription		
They believe to have analgesic prescription	101	54,0
They don't know if they have analgesic prescription	44	23,5
They claim not to have analgesic prescription	42	22,5
Analgesic prescription		
Yes	100	53,5
No	87	46,5
Type of prescription		
Pharmacological	94	94
Pharmacological and non-pharmacological	6	6
Number of analgesic drugs		
One medication	61	61
Two medications	36	36
Three medications	3	3
Number of prescriptions by type of medication		
Acetaminophen	78	54,9
Metamizole	48	33,8
NSAIDs	8	5,6
Bupivacaine	6	4,2
Opioids	2	1,4

Source: self made.

reduce adverse effects, with opioids as the drugs of choice for the treatment of moderate to severe pain in both adults and children[39,40].

Intravenous opioids are reserved for the relief of severe pain through dose titration. Morphine and fentanyl are the most used in the pediatric population[32]. In the study, severe pain was observed in 9.7% of patients in pain at the time of the evaluation and in 12.5% of patients who had experienced pain in the 24 hours before evaluation, associated with low use of opioid medications, considering that only 2% of patients had a prescription.

Finally, the WHO recommends the oral route as the best way to administer drugs to children as far as possible[18]. This route was used in 81% of the patients with analgesic prescriptions, however, the peripheral parenteral route stands out accounting for 52%; therefore, it is necessary to analyze in detail the prescription processes in the institution. In addition, 9.15% of the pharmacological analgesia prescriptions were for unscheduled administration and/or on patient demand, contrary to what is proposed by the WHO. Lastly, we recommend the implementation of strategies and protocols related to the prevention, evaluation, and treatment of pain in health institutions for providing a comprehensive approach to pediatric patients.

In conclusion, it is essential to identify and properly manage pain in pediatric patients, since, in general, it has a high prevalence in the hospitalized pediatric population and is more frequent in patients admitted due to trauma and/or surgery. In addition, there was a low prescription of opioid analgesics in the pediatric setting for the routine management of moderate and severe pain intensity, which was preferably indicated as rescue analgesia. Likewise, the frequent use of metamizole as an analgesic was observed despite its controversial use in different countries around the world, so more studies are needed in this regard.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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