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Research paper

A pilot survey of pain prevalence in schoolchildren

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summary

The present survey analyzed the prevalence of pain and its etiology in a sample of Spanish schoolchildren in relation to age and gender. The survey considered 571 students (57.8% girls) 6 to 15 years of age from two schools. A questionnaire was used to ask children about their present pain, their worst pain experience and the causes of both. Pain prevalence was 27.1% and no gender difference was seen but the younger group had a higher prevalence (32.7%). Most children (72.9%) were able to describe their present pain etiology, which was often related with medical illnesses (79.6%). Almost all children (90.5%) described their worst pain event and statistical differences ($p < 0.001$) were seen between younger (77.6%) and older children (95.6%). These differences by age were observed both in boys ($p < 0.001$) and girls ($p < 0.05$). The cause of the worst pain was significantly related with age ($p < 0.001$), and surgery and trauma events were more frequent in boys ($p < 0.05$). In conclusion, pain is a common everyday experience in children and most of them, even the younger children, were able to remember a painful event. This preliminary study suggests that pain is a common experience for many healthy children and also an early and remembrance experience.

Key words: Pediatric pain; epidemiology; prevalence; schoolchildren.

introduction

Pain is a subjective experience that humans learn of individually early in their life. In spite of this evidence, pediatric pain has been a neglected issue until very recently.[1] As in adults, untreated pain conveys many adverse impressions to the pediatric patients.[2–4] Several authors have shown, both in animals[5] and in humans,[6] that persistent nociceptive stimuli may result in a significant sensitization to later painful events. Therefore, early pain experiences in children are a particularly important issue, as they might contribute significantly to mechanisms of coping with pain problems in the adult.

Epidemiological studies are scarce in pediatric pain patients and most of them have addressed specific pain conditions, but a comprehensive analysis of pain problems in childhood has rarely been performed.[7] These studies are important to gain knowledge of the characteristics of a specific illness, but are less useful in detailing the actual picture of pain in the pediatric population as a whole. To determine which painful events are present in the everyday life of children, surveys on schoolchildren are probably a better option. This epidemiological approach has been followed in several studies in which the goal of the study was to determine the prevalence and the characteristics of a specific illness in a limited area. In the field of pain, most of these studies have been devoted to analyzing a singular clinical picture, such as headache,[8,9] low back pain[10,11] or musculoskeletal pain.[12,13]

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There is a scarcity of epidemiological surveys in the general pediatric population, although some interest on this topic has recently been observed.[14–16] These studies may aid in the better understanding of how pain is experienced in early life and in identifying situations that may have great influence later in life. Additional benefits of these studies may include detailing the developmental pattern of children's understanding of pain.[17] Moreover, schoolchildren offer a good opportunity to study the experiences of healthy children with pain events and its relationship with demographic characteristics.

The main goal of the present survey was to determine the prevalence and etiology of pain in a sample of Spanish schoolchildren, as well as to analyze its relationship with demographic variables. As a secondary objective, the worst painful experience suffered by the children was also analyzed in relation to their age and gender. These data may give some clues concerning the early pain experiences of children and which of them may influence later their attitudes towards painful events.

methods

Study design and background

The survey was a cross-sectional study designed to establish the prevalence of pain in a sample of schoolchildren of Catalonia, a region of almost six million inhabitants in Northeastern Spain. As there was no precedence for such a study, this survey was planned as a pilot study and was therefore performed in only two schools located in the suburban area of Barcelona. The first, *Hermanas Dominicas del Sagrado Corazón* (HDSC) was a catholic school serving a large urban community; the second, *Escola Marinada* (EM), was a non-religious school of a small urban area.

Local school boards approved our project, and in June of 1997 all pupils from both schools who were in 1st to 8th grade were invited to participate in a study about pain in schoolchildren. Children were at least six years old, as it is generally accepted in our society that they can understand the concept of pain and its relationship with illness or trauma. After adequate information was given to the children, they were asked to participate in the study that was to be conducted during normal class time. One of the authors (CB) and the children's teacher were present during the study to help the students in completing the questionnaire. They were specifically questioned about their present pain, their worst pain experience and the causes of both. Age and gender were recorded to investigate if either were related to the specific answers given by the children. Questions about other illness or health-related problems were not included.

Study variables

The survey asked the following four questions. Are you experiencing any pain at this moment? What is the cause of your present pain? Do you remember the worst pain you experienced in the past? What was the cause of this pain? Age, gender, school grade and school were also recorded. The first and second questions were used to establish the incidence of pain and the main painful events at the moment of the interview. The third and fourth questions might give some insights into how painful experiences are remembered by the sample of children and what events were considered as the most painful.

Statistical analysis

Data were analyzed using the SPSS/PC+ (Statistical Package for Social Sciences) software. For the purpose of statistical analysis, the subjects were divided into three age groups, roughly corresponding to three Piagetian

development stages following the suggestions of Gaffney and Dunne.[18] Thereby, three age groups were considered: those of 6 and 7 years, those from 8 to 10 years and those older than 10. Results were expressed as absolute numbers, percentages and means. The comparison of the variables was done using the χ^2 test. Mean ages were compared using the *t*-test; *p* values lower than 0.05 were considered as statistically significant.

results

General characteristics of the sample

Five hundred and seventy five schoolchildren were asked to participate and all of them accepted by filling out the questionnaire. Four of them were ruled out because of incomplete data and therefore only 571 were finally included (241 boys and 330 girls). Table I describes the characteristics of the sample by school, age and gender. There were some differences between both schools. First, a higher number of children from HDSC were included, most of them girls. By contrast, a smaller number of children from EM were recruited. This may be a consequence of the different size of population attending each school. Differences were also observed when considering the number of boys and girls. The proportion by gender was almost equal in EM, whereas in HDSC the number of girls was almost 1.5 higher than boys. This difference may be explained by the tradition of HDSC to teach only girls in the past; the acceptance of boys into the school is a recent change. As no significant differences were observed between the two schools in the prevalence or etiology of pain, data from both schools were analyzed together.

Pain prevalence and etiology

Table II summarizes the pain prevalence at the moment of the interview. The overall prevalence was 27.1% (155 out of 571) and no statistical differences were observed between girls and boys (27.6% *versus* 26.6%, respectively; χ^2, $p = 0.8839$). When analyzed by age groups, a steady decrease in prevalence was observed when age increased: prevalence was the highest in the younger group (32.7%) and the lowest in the older (23.7%), although statistical differences were not reached (χ^2, $p = 0.1884$). When analysis was performed considering age and sex, girls showed a higher prevalence in the 6–7 age group (36.1%) and boys in the 8–10 age (29.8%). Mean age of schoolchildren with pain was lower (9.6 ± 2.3) than mean age of children without pain (10.0 ± 2.5), but these differences were not significant (*t*-test, $p = 0.1146$).

Table I.
Demographic characteristics of the sample

Age intervals (years)	HDSC Boys *n* (%)	HDSC Girls *n* (%)	HDSC Subtotal *n* (%)	EM Boys *n* (%)	EM Girls *n* (%)	EM Subtotal *n* (%)	TOTAL *n* (%)
6–7	28 (16.4)	49 (18.3)	77 (17.5)	18 (25.7)	12 (19.3)	30 (22.7)	107 (18.7)
8–10	71 (41.5)	91 (33.9)	162 (36.9)	23 (32.9)	30 (48.4)	53 (40.2)	215 (37.7)
11–15	72 (42.1)	128 (47.8)	200 (45.6)	29 (41.4)	20 (32.3)	49 (37.1)	249 (43.6)
TOTAL	171 (39.0)	268 (61.0)	439 (76.9)	70 (53.0)	62 (47.0)	132 (23.1)	571

HDSC: School '*Hermanas Dominicas del Sagrado Corazón*'; EM: School '*Escola Marinada*'. Values are expressed as number of schoolchildren and percentages are calculated by columns or, specifically for the Total of the first column, by gender in each school. Percentages in cursive are calculated over the total sample. From the total 575 questionnaires, 571 were finally included in the study: 241 boys (42.2%) and 330 girls (57.8%).

Table II.
Pain prevalence at the moment of the interview

Age intervals (years)	Boys *n* (%)	Girls *n* (%)	TOTAL *n* (%)
6–7	13 (28.3)	22 (36.1)	35 (32.7)
8–10	28 (29.8)	33 (27.3)	61 (28.4)
11–15	23 (22.8)	36 (24.3)	59 (23.7)
TOTAL	64 (26.6)	91 (27.6)	155 (27.1)

Values are expressed as number of schoolchildren and percentage (incidence), calculated for each group. No statistically significant differences were found in pain prevalence either by gender or by age intervals. HA slight tendency to increase the prevalence in the youngest groups was observed (χ^2, $p = 0.1884$).

Table III.
Etiology of pain reported at the moment of the interview

Age intervals (years)	MI *n* (%)	S&T *n* (%)	Other *n* (%)	TOTAL *n* (%)
6–7	16 (80.0)	0	4 (20.0)	20 (*57.1*)
8–10	36 (76.6)	4 (8.5)	7 (14.9)	47 (*77.0*)
11–15	38 (82.6)	4 (8.7)	4 (8.7)	46 (*78.0*)
Gender				
Boys	34 (73.9)	5 (10.9)	7 (15.2)	46 (*71.9*)
Girls	56 (83.6)	3 (4.5)	8 (11.9)	67 (*73.6*)
TOTAL	90 (79.6)	8 (7.1)	15 (13.3)	113 (*72.9*)

MI: medical illness; S&T: surgery and trauma (for the meaning of these labels and 'Other', see Results section). Values are expressed as number of schoolchildren and percentages are calculated by rows, but in the Total column percentages in italics are calculated for each group as children with pain at the time of interview who could define the origin of their pain. No statistically significant differences were found in pain etiologies either by age intervals or by gender.

A further analysis was performed to ascertain the etiology of pain in each group and gender (Table III). As a high number of different causes were obtained, they were divided into three groups. The first was labeled as Medical Illness (MI) to include all the common medical situations that cause pain but were unrelated to trauma or surgery. Among them, the most frequent were headache, backache, pain in the extremities, toothache, abdominal spasms, flatulence, and a myriad of symptoms from systemic illness (i.e. chicken pox, influenza, upper respiratory tract infections, tonsillitis). The second group was labeled as Surgery and Trauma (S&T), and included all children who described their pain as being a consequence of a traumatic event (i.e. falls, car or bike accidents, sprains) and surgical operations or medical procedures that were secondary to traumatic events (such as stitches, cast dressings, burn care). The third group, labeled as Other, considered painful events that were difficult to classify in the former groups, such as vaccination or bee sting. The cause of present pain was reported by 113 out 155 (72.9%) schoolchildren and was more frequently described by girls (73.6%) than boys (71.9%). By age, older children were able more frequently to report the cause of their pain than younger ones. As Table III also shows, MI (mainly *general body* soreness, sore throat, headache and stomach ache) was reported more frequently (79.6%) than S&T (7.1%, mainly pain in knees, limbs or arms) as the pain that children were suffering from the moment of the interview. No statistical differences were seen either by age or gender.

Pain in the past: the worst pain experience and cause

The majority of children (90.5%) were able to describe the worst pain they had experienced in the past. The mean age of those who reported the worst pain was significantly higher that those who did not report it (10.1 ± 2.4 *versus* 8.2 ± 2.4; *t*-test, $p < 0.001$). As Table IV shows, the experience of pain increased as age increased and ranged from 77.6% in the younger group to 95.6% in the older group (χ^2, $p < 0.001$). This progression was seen regardless of gender considered, but it was more significant in boys (χ^2, $p < 0.001$) than in girls (χ^2, $p < 0.05$). However, when age groups were considered, some differences arose. Girls aged from 6–7 years more frequently described their worst pain than boys, whereas the opposite was seen in the older group. When asked about the cause of their worst pain (Table V), most children's answers fell under the category of S&T events (47.3%). Causes of the worst pain reported by the schoolchildren were significantly related with age groups (χ^2, $p < 0.001$). First, MI was predominant in 6–7 years old group (50.6%), whereas S&T reached the highest percentages in the 8–10 years old group (52.3%) and in 11–15 years old (50.4%). On the other hand, mean age of schoolchildren was higher in those who reported S&T events than MI causes of worst pain (10.4 ± 2.3

Table IV.
Frequency of children who reported the worst pain they have suffered in the past

Age intervals (years)	Boys *n* (%)	Girls *n* (%)	TOTAL *n* (%)
6–7	33 (71.7)	50 (82.0)	83 (77.6)
8–10	87 (92.5)	109 (90.1)	196 (91.2)
11–15	99 (98.0)	139 (93.9)	238 (95.6)
TOTAL	219 (90.9)	298 (90.3)	517 (90.5)

Values are expressed as number of schoolchildren who described the previous worst pain and the corresponding percentage in each group. The relationship between the worst pain description ability and age was statistically significant in boys and girls all together (χ^2, $p < 0.001$), and the percentage increased with the age. These differences were more stressed in boys (χ^2, $p < 0.001$) than in girls (χ^2, $p < 0.05$). No statistically significant differences were found in the worst pain description by gender (χ^2, $p = 0.8839$).

Table V.
Etiology of the worst pain that children reported that they have suffered in the past

Age intervals (years)	MI *n* (%)	S&T *n* (%)	Other *n* (%)	TOTAL *n* (%)
6–7	41 (50.6)	21 (25.9)	19 (23.5)	81 (15.9)
8–10	80 (41.0)	102 (52.3)	13 (6.7)	195 (37.9)
11–15	87 (36.6)	120 (50.4)	31(13.0)	238 (46.2)
Gender				
Boys	75 (34.7)	114 (52.8)	27 (12.5)	216 (42.0)
Girls	133 (44.6)	129 (43.3)	36 (12.1)	298 (58.0)
TOTAL	208 (40.4)	243 (47.3)	63 (12.3)	514

MI: medical illness; S&T: surgery and trauma (for the meaning of these labels and 'Other', see Results section). Values are expressed as number of schoolchildren and percentages are calculated by rows, or by columns for the Total column. Only three children with worst pain experience were not able to describe any etiology. Causes of the worst pain attributed by schoolchildren were significantly related with age (χ^2, $p < 0.001$). Mean age differences between MI and S&T groups were also significant (9.8 ± 2.4 *versus* 10.4 ± 2.3 years respectively; *t*-test $p < 0.01$). Comparing MI and S&T data of the table, statistically significant differences were also found in the worst pain causes by gender (χ^2, $p < 0.05$).

versus 9.8 ± 2.4 respectively; *t*-test $p < 0.01$). As shown in Table V, statistically significant differences were also found when comparing MI and S&T by gender (χ^2, $p < 0.05$); boys had more frequently S&T events (52.8%) whereas MI episodes were more frequent in girls (44.6%).

discussion

The present study shows that pain prevalence is high among schoolchildren, as more than a quarter of an otherwise healthy population is describing some kind of pain when interviewed. This prevalence is even higher in the smaller children, thereby suggesting that pain is an early and common experience in young children, a finding that agrees with results already published.[15] Moreover, we found that even the younger children were able to adequately describe their pain, confirming early suggestions related to this topic.[19–21] Although this was a pilot study and a reduced number of children were surveyed, the results suggest that a significant number of children suffer from pain of various etiologies. This finding should be confirmed by subsequent studies performed with larger populations.

Although a myriad causes should be expected when the etiology of pain is investigated, our study showed that they might be reasonably grouped into two categories, i.e. surgery and trauma events, and medical illnesses, as otherwise the classification of complaints into many categories greatly complicates the analysis. Surgery and trauma, and medical events were described by half of all children with pain at the interview and no significant differences were observed by gender. However, medical illnesses were reported as the reason for pain in one out of every two pains described by children. Given the exploratory nature of our study, no specific analysis was done to consider specific etiologies. However, headaches and sore throat were the ailments more often described, a fact that agrees with the general acceptance of these ailments as a frequent cause of consultation in pediatric surveys[7] and also in schoolchildren studies.[7,22,23] Nevertheless, their prevalence was lower than that which had been described by other authors.[11,15,16] This is perhaps due to differences in the type of questioning, as some studies have asked for 'frequent pain',[11] 'usual pain'[15] or 'recent symptoms'[16] rather than for 'present' pain. This discrepancy reveals the fact that one must carefully consider the type of questions asked when comparing such kinds of epidemiological studies. Children also described other problems, such as sore throat, that are not considered as a frequent cause of pediatric pain. Again, the small sample does not permit us to reach outstanding conclusions but the results suggest that children might consider the severity of their painful events differently from their parents.[24] However, our study cannot draw conclusions in this way, as a parent report was not analyzed.

Data on the worst pain suffered merits further commentaries. As expected, pain is a *learned* experience as the significant prevalence differences between the younger and older children shows. However, it is remarkable that most six and seven year olds were able to remember their worst painful experience. In the older group, almost all were able to describe a painful experience in the past. The significance of these findings must be considered carefully in several ways. First, pain experiences are an early experience for many children, as even younger children were able to adequately describe such an experience. Our data confirms that of Gaffney and Dunne[18] who have detailed the ability of younger children to describe pain verbally. Second, painful events in early life may produce sustained changes that might influence later development, behavior and social learning.[8] Third, health education in pain issues is feasible in young children as they may already

have the cognitive elements to understand pain by experience. The medical and psychological consequences of these conjectures are important and merit further exploration.

A difference was observed between the causes of the worst pain and those of the present pain. However, the largest category of responses was similar to that Ross and Ross have reported.[19] Unfortunately, these authors did not perform an analysis by age, and no further comparisons can be done. Events related to medical illness were the most frequent causes of the worst pain experienced in younger children, whereas in older children trauma and surgery etiologies were considered to be the most painful experiences. The reasons for such a change remains speculative but several explanations may be suggested. Older children have more experience with common illnesses and have learned to expect the discomforts associated with them. Additionally, the possibility of severe trauma is probably higher in this age group as a consequence of practicing more dangerous activities, such as sports, biking or risky games. In fact, musculoskeletal pain in Spanish pediatric patients is often attributable to trauma and overuse syndromes linked to sports.[25] Therefore, analgesic treatment following trauma and surgery should be considered as a first line priority in these children. Our data confirms the evidence obtained by other authors[17] that children are able to describe past pain events and it refutes the old assumption that these children retain no memories of pain.[26] Recently, Zonneveld *et al.*[27] have described that children 5–16 years of age are able to accurately recall the intensity of past painful events.

Finally, as was stated earlier, some caution is needed when taking into account the results of our study. First, the survey was done with a small sample of children of a restricted area and this limitation must be considered to avoid careless extrapolation of our data to other populations. As the title says, this is a pilot study and therefore it should be read under this condition. However, we think that some data are straightforward and may be useful when planning future studies in the same topic, given the lack of studies considering pain in the pediatric general population. In this respect, surveys in schoolchildren should be considered as a possibility when prevalence of pediatric pain in otherwise healthy children is investigated. Second, the severity and extent of pain were not measured and these qualities are often as important as the prevalence of pain.[7] Again, our study was the first step in understanding the general characteristics of pain in schoolchildren. Subsequent studies should address these important issues using the data obtained with the present survey.

conclusions

As in adults, pain is a common everyday experience in children. The data show that many painful events are related with medical illnesses and this fact reinforces the need for a correct treatment of pain-associated diseases. Many children, even the youngest of our sample, were able to remember and describe their worst painful event. This finding suggests that knowledge of their own pain is an early experience and should be considered when asking about pain severity to all pediatric patients.

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A survey of postoperative pain treatment in children of 3-14 years. *European Journal of Pain* 1999; 3:275-282.

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A survey of postoperative pain treatment in children of 3–14 years

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There is a lack of information concerning the characteristics of pediatric postoperative pain in Southern European countries. The aim of this study was to document how postoperative pain in children was managed routinely at Spanish surgical wards.

The study was carried out in three hospitals on the first postoperative day. Children were divided in four groups according to their age (years): Group I (3–5), II (6–8), III (9–11) and IV (12–14). The parameters evaluated were: analgesia characteristics (type of prescription, drug used and route of administration, prescribed dose and whether the drug was or was not administered, need of non-prescribed analgesics) and the postoperative pain intensity. The results were analysed using descriptive statistics. U-Mann Whitney, χ^2, ANOVA, Kruskall–Wallis and Student's *t*-test were also used.

A total of 348 children ranging from 3 to 14 years were studied. The average age (± SD) was 8.2 ± 3.3 and the majority were male (74%). Urologic surgery was the most frequent type of operation, with age (p <0.05) and hospital differences (p<0.001). The majority of the patients (52%) were prescribed an analgesic, but only 26% of them had an analgesia order at fixed dosage intervals. Differences among the hospitals were observed (p<0.001). The most commonly used analgesics were metamizol, propyphenazone, paracetamol and codeine. Differences in choice of drug in relation to age and hospital were significant (p < 0.001). Rectal was the preferred route of drug administration. Patient's age was unrelated with the prescribed analgesic dose. An average of 68% of prescriptions were given and half of the patients without scheduled analgesia needed to have analgesics administered. Around 20% of patients had high pain scores.

Few paediatric patients are given analgesics at fixed dose intervals to treat postoperative pain. Pain relief therapy for children differs notably to that of adults, in respect to the drugs prescribed and the administered route.

KEYWORDS: postoperative paediatric pain, paediatric analgesia, analgesic use, epidemiology.

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INTRODUCTION

Until recently, the effective control of postoperative pain has been a difficult problem, and one that has been overlooked, especially in paediatric care (Commission on The Provision of

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Surgical Services, 1990; Acute Pain Management Guideline Panel, 1992; Baños & Bosch, 1996). Some studies demonstrate that control of paediatric pain is also a substantial problem in some specialized areas of hospital care, like emergency departments and oncological units (Miser *et al.*, 1987; Cummings *et al.*, 1996; Petrack *et al.*, 1997).

To date, the majority of studies that compare postoperative pain practices of adults to children confirm that the selection of analgesics and dosage forms differ significantly, with children receiving less than optimal analgesic dosages (Eland & Anderson, 1977; Beyer *et al.*, 1983; Mather & Mackie, 1983; Schechter *et al.*, 1986; Petrack *et al.*, 1997). Others have also replicated their results by concluding that prescribing is not the only problem as, in addition, reductions in the administered doses by nursing staff are also likely to contribute to the administration of inadequate analgesia (Eland & Anderson, 1977; Mather & Mackie, 1983; Schechter *et al.*, 1986). More recently, Johnston *et al.* (1992) observed a marked improvement in the administration of analgesics by nurses, but still one-half of paediatric patients experienced unacceptably high levels of pain following surgical procedures.

Most investigations of paediatric postoperative pain have been conducted in Anglo-Saxon countries, and the information in Southern Europe is scarce. Therefore, the specific aim of this survey was to document postoperative pain management practices in children on surgical wards in three Spanish hospitals.

MATERIALS AND METHODS

Study design

A prospective, descriptive, cross-sectional and multicentre study was conducted to determine postoperative pain management among children in the first 24 h after surgery.

Study population

Criteria for subject eligibility included: (a) age range from 3 to 14 years; (b) type of surgery (General, Urological, Gastrointestinal or Traumatological and Orthopaedic surgery); (c) good mental development as determined by the investigator; (d) an interest in participating in the study; and (e) oral consent to participate by parents. The exclusion criteria were: (a) family disruption or evidence of social problems (divorced or separated parents, alcoholism, drug abuse); (b) chronic illness in close relatives; and (c) serious illness of the child. The study sample was divided into four age groups for the purpose of evaluating the potential effect of age on postoperative pain and its treatment: Group I (3–5 years), Group II (6–8 years), Group III (9–11 years) and Group IV (12–14 years). All eligible children were recruited over a period of 6 months until a sample of at least 30 patients by group and centre was obtained. Patients who did not meet the eligibility criteria were excluded from the final analysis.

Procedure used

The study was carried out over 1 year (April 1992 to March 1993) in institutions which differed with respect to geographic location, socio-demographic and levels of specialization. The following hospitals participated: Hospital de Sabadell (SB), a teaching district general hospital serving a mainly urban population; Hospital Materno-Infantil of Badajoz (BA), a teaching hospital that services a mainly rural population, and Hospital Marqués de Valdecilla of Santander (SA), which is associated with the Medical School of the University of Santander and is a referral hospital for both rural and urban populations.

Instruments

Patterns of analgesic utilization and pain intensity were evaluated. Analgesic utilization was assessed with a form that included type of analgesic prescription, drug (s), route of administration, prescribed dose, whether the prescription was administered (if patient received at least one of the prescribed doses) and the need for supplementary analgesics. The type of analgesic

prescribed was further classified at fixed dose intervals (as prescribed in the medical orders), PRN (when it was requested or when there was no interval of administration), or absent (if no postoperative analgesic was prescribed). Not all analgesic therapy required a prescription by a physician. Some medications were administered without a written order and were recorded as non-prescribed analgesia. The level of pain intensity experienced by the children was determined by self-report instruments that were validated for the child's age. A pain thermometer was used for Group I, a red and white scale (Maunuksela *et al.*, 1987) for Group II, and a visual-analogue scale for Groups III and IV. Such scales have been extensively used in the evaluation of paediatric pain and have demonstrated acceptable reliability and validity when used with age-specific populations (McGrath, 1987; Mathews *et al.*, 1993; Champion *et al.*, 1998). The scales have been also validated in Spanish patients (Baños *et al.*, 1994).

Statistical analysis

Data were analysed using the statistical programme SPSS/PC + (Statistical Package for Social Sciences). Descriptive statistics were used to report measures of central tendencies for quantitative variables. Student's *t*-test for independent groups and the U-Mann-Whitney test were used to determine differences between groups. Analysis of variance (ANOVA) and the non-parametric Kruskall–Wallis test were applied to complex comparisons involving more than two categories. Categoric variables were expressed as percentages and frequencies, and compared using the Chi-square (χ^2) analysis.

RESULTS

General characteristics of the sample

The study sample included 348 patients between the ages of 3 and 14 years. Less than 5% of total number of patients who were considered to be included were rejected because they presented any of the exclusion criteria. Sample characteristics are shown in Table 1. The distribution of subjects by hospital centres was: SB, n = 119 (34.2%); SA, n = 106 (30.5%); and BA, n = 123 (35.3%). Urological procedures comprised the most common type of interventions (41%) which included subjects who underwent circumcision (n = 75), inguinal hernia repair (n = 49), orcniopexy for undescended testes (n = 34); appendectomy (n = 18), hydrocele repair (n = 15) and adenoidectomy (n = 13). Other procedures included orthopaedic (17.8%) and gastrointestinal (17.5%) as outlined in Table 2. The type of surgical operation was not stated in case report forms for five patients. A comparative analysis of surgical procedures revealed a statistically significant difference in relation to age (p <0.05) and centre (p <0.001).

Characteristics of the analgesic treatment

One-half of subjects did not receive analgesics at fixed-dose intervals, while the remainder of subjects could be grouped into those with scheduled analgesia (26.4%) and those with PRN (25.5%) dosing schedules (Table 3). Table 4 shows the distribution of analgesic drugs according to age group. The most frequently administered drugs were metamizol (31.8%), propyphenazone (30%), paracetamol (20.6%) and codeine (11.8%). Out of the total, 178 patients (51.1%) received no treatment whatsoever. Significantly, both propyphenazone and paracetamol were the most commonly used drugs for Group I, and the consumption of propyphenazone decreased with age. Differences in preferences for analgesics were also noted for each centre. Propyphenazone (57.7%) and metamizol (41%) were most often prescribed by physicians in the BA centre, while

TABLE 1. Characteristics of the patient sample

Group	*n* (%)	Mean age (SD)	Gender (M/F)
I	93 (26.7)	4.1 (0.8)	69/24
II	96 (27.6)	7.0 (0.8)	72/24
III	84 (24.1)	10.0 (0.8)	65/19
IV	75 (21.6)	12.8 (0.8)	51/24
Total	348	8.2 (3.3)	257/91

TABLE 2. Distribution of surgical operations according to age group (% of each group in parentheses)

Group	Urology	Orthopaedics	Gastrointestinal surgery	Other	Total
I	41 (45.6)	9 (10.0)	14 (15.6)	26 (28.9)	90
II	41 (43.2)	18 (18.9)	16 (16.8)	20 (21.1)	95
III	37 (44.0)	13 (15.5)	21 (25.0)	13 (15.5)	84
IV	22 (29.7)	21 (28.4)	9 (12.2)	22 (29.7)	74
Total	141 (41.1)	61 (17.8)	60 (17.5)	81 (23.6)	343 (100)

Significant differences were observed when an overall χ^2 test was applied ($p < 0.05$).

TABLE 3. Characteristics of the prescribed analgesia according to age group (% of each group in parentheses)

Group	Without analgesia	With analgesia		Total
		Fixed-dose interval	PRN	
I	44 (50.0)	27 (30.7)	17 (19.3)	88
II	41 (48.8)	18 (21.4)	25 (29.8)	84
III	38 (46.3)	24 (29.3)	20 (24.4)	82
IV	30 (46.9)	15 (24.2)	19 (29.7)	64
Total	153 (48.1)	84 (26.4)	81 (25.5)	318 (100)

TABLE 4. Analgesic drugs used in each age group (% of each group in parentheses)

Group	Metamizol	Propyphenazone	Paracetamol	Codeine	Others	Total
I	6 (14.0)	17 (39.5)	13 (30.2)	6 (14.0)	1 (2.3)	43
II	13 (27.7)	16 (34.0)	10 (21.3)	6 (17.0)	0	47
III	16 (35.6)	15 (33.3)	7 (15.6)	4 (8.9)	3 (6.7)	45
IV	19 (54.3)	3 (8.6)	5 (14.3)	2 (5.7)	6 (17.1)	35
Total	54 (31.8)	51 (30.0)	35 (20.6)	20 (11.8)	10 (5.9)	170 (100)

Significant differences were observed among the groups when an overall χ^2-test was applied ($p < 0.001$).

codeine (31.3%), metamizol (26.6%) and paracetamol (20.3%) were the drugs of choice for the SB hospital. On the other hand, paracetamol (78.6%) was clearly favoured by practitioners of the SA centre. Table 4 outlines other analgesics (5.9%) that were infrequently prescribed. These included diclofenac (0.6%), Topicaina™ (1.2%), morphine (0.6%), pethidine (0.6%), fentanyl (1.2%) and paracetamol + codeine combination (1.8%). Topicaina™ is a combination of local anaesthetics (butacaine, benzocaine and tetracaine) and antiseptics (benzalkonium, butoformium and cetrimonium).

The route of administration was closely linked to the patient's age (Table 5). Routes of drug delivery varied with age and by hospital. Overall, there was a trend for rectal administration (70.1%) in younger children with an inverse relationship noted between rectal use of analgesics and age. The use of intravenous administration was far more likely in older children. Significant preferences ($p < 0.001$) for routes of administration were found by centre ($p < 0.001$). For example, rectal administration was the most common

TABLE 5. Administration routes used according to age group (% of each group in parentheses).

Group	Rectal	Intravenous	Oral	Total
I	32 (84.2)	4 (10.5)	2 (5.3)	38
II	31 (81.6)	7 (18.4)	0	38
III	25 (65.8)	9 (23.7)	4 (10.5)	38
IV	15 (45.5)	13 (39.4)	5 (15.2)	33
Total	103 (70.1)	33 (22.4)	11 (7.5)	147 (100)

Significant differences were observed among the groups after applying an overall χ^2-test ($p < 0.01$).

TABLE 6. Mean daily prescribed dose (mg) of the main drugs in each group (standard deviation in parentheses and number of patients in square brackets)

Group	Propyphenazone	Metamizol	Paracetamol	Codeine
I	601.3 (255.8) [15]	1760.7 (1913.4) [6]	855.0 (354.0) [10]	73.8 (20.7) [4]
II	385.0 (260.3) [16]	1663.3 (1011.1) [11]	950.0 (576.7) [3]	54.9 (39.0) [8]
III	572.0 (297.5) [15]	1992.7 (1649.0) [14]	1270.0 (819.6) [3]	50.8 (46.4) [4]
IV	220.0 (0) [3]	3468.7 (2590.4) [16]	1083.3 (721.7) [3]	26.5 (3.5) [2]
Total	498.4 (283.2) [49]	2388.5 (2051.2) [47]	971.6 (506.6) [19]	55.0 (35.6) [18]

TABLE 7. Drug administration by age group according to type of prescription [In parentheses, % of patients that received analgesia without having it prescribed (Not prescribed columns) or that did not receive it despite having it prescribed (Prescribed columns)]

	Not prescribed			Prescribed			
Group	Not administered	Administered	Total	Not administered	Administered	Total	Overall total
I	27	15 (35.7)	42	19 (44.0)	24	43	85
II	24	17 (41.5)	41	12 (27.9)	31	43	84
III	12	25 (67.6)	37	10 (22.7)	34	44	81
IV	17	13 (43.3)	30	12 (35.3)	22	34	64
Total	80	70 (46.7)	150	53 (32.3)	111	164	314

Significant differences were observed when an overall χ^2 test was applied (p <0.001).

route of administration for both the SB centre (78%) and the BA centre (67.9%). The SA centre favoured oral administration (66.7%), while the BA centre neither prescribed nor administered oral analgesics. The highest percent of intravenous analgesics administered to children with pain was observed among subjects hospitalized in the BA centre (32.1%).

It was expected that increased age would be associated with increased doses, however, this was not the case. There were no appreciable relationships noted for amounts prescribed and the subject's age; this was especially true for doses of codeine (Table 6). The results according to the administration on a fixed dose interval analgesia are reported in Table 7. Of 150 subjects who had no analgesic prescribed, 70 (46.7%) of them received it in the immediate hours following surgery. Approximately 33% of subjects who did not have analgesics prescribed by fixed dosing intervals never received any analgesic therapy in the postoperative period. When comparing medical prescription dosages with drug administration patterns, there were significant differences among the centres (p <0.001).

Pain intensity

Table 8 summarizes the pain intensity described by patients using one or two measurement scales. About 40% of children in each group reported mild pain (less than 25% maximum value), but up to 20% described it as severe or very severe (from 50 to 100% maximum value).

DISCUSSION

Pain is an expected and predictable outcome of surgery. Despite this fact, only one-half of children in this study had some form of analgesia prescribed in their postoperative plans of care. This is strikingly different from most Spanish studies of adults, which report that practically all them had some kind of analgesia ordered in the immediate postoperative period (Zavala *et al.*, 1996; Aguilera *et al.*, 1997). Both past research by Mather and Mackie (1983) and more current investigations by Kart *et al.* (1996) continue to document the predominance of PRN prescribing of postoperative analgesics for paediatric patients in insufficient amounts.

TABLE 8. Pain intensity in the first 24 h of the postoperative period by age group, expressed as a percentage of the maximum value of each scale

Groups	Scales used	Percentage values of the maximum (100%) of each scale			
		0–24%	25–49%	50–74%	75–100%
I (n = 92)	Pain thermometer	56.5	19.6	9.8	14.1
II (n = 92)	Pain thermometer	44.5	35.8	13.9	5.8
	Red & white scale	47.7	32.4	15.4	4.5
III (n = 82)	Red & white scale	47.6	31.7	17.0	3.7
	Visual analogue scale	50.6	30.1	13.3	6.0
IV (n = 73)	Visual analogue scale	45.2	37.0	13.7	4.1

Although the prescription of potent opioids is unusual among Spanish adults (Zavala *et al.*, 1996; Aguilera *et al.*, 1997), it is even less prevalent in children (Pontes *et al.*, 1996). Our findings support this observation, as only four subjects in our study had received morphine, fentanyl or pethidine. Overall, administration of opioids for postoperative pain is higher in other countries, such as Canada (Johnston *et al.*, 1992) and USA (Tesler *et al.*, 1994), where more than one-half of patients studied received major opioids. Even in serious clinical situations where severe postoperative pain is common, for instance cardiac surgery, children receive less potent analgesic opioids than adults (Beyer *et al.*, 1983) and often lower doses as well (Schechter & Allen, 1986; Melzack, 1990).

Together, NSAIDs and paracetamol accounted for more than 80% of prescribed analgesics. For Group I patients, metamizol and propyphenazone were analgesics of choice. Their widespread use can probably be explained by their availability in rectal dosage forms, and their traditional use as antipyretics offers greater familiarity with their use.

It is also important to consider the preferential routes of administration for paediatric pain. With younger children, we found rectal administration to be more popular. Efforts to avoid intramuscular injections in children are justified, specifically because injections are painful and disliked by children. Other authors have also documented that rectal administration accounts for the majority of paediatric analgesic administrations in Spanish hospitals (Pontes *et al.*, 1996). This pattern is clearly different from that observed in other countries, like USA, where intravenous and intramuscular injections are used more frequently (Tesler *et al.*, 1994). Rectal administration is recommended when drugs cannot be administered orally, or when intravenous therapy is not appropriate or possible (Radde, 1985). Analgesic options for pain therapy by rectal administration are clearly limited by the availability of preparations and their strengths for rectal use.

No substantial differences were observed in the average daily doses of various analgesics according to different age groups. This could perhaps be explained by the use of longer administration intervals in older children, or simply by the use of standard drug forms (that is, at the same dosage) to treat pain regardless of the patient's age and level of pain. Because suppositories were commonly prescribed, the ability to adjust doses was dependent upon commercially available dosage forms.

The lack of fixed dosage interval orders for paediatric analgesics in the postoperative period is frequently justified by the argument that children do not experience much pain. This study contradicts this assumption by revealing that one-half of subjects who did not have a fixed dosing interval prescribed required drugs in the postoperative period for pain treatment. In almost one-third of cases, practitioners did not adhere to the prescribed dosing regimen documented in the patient record. Bush *et al.* (1989) made a similar observation, as they found marked discrepancies between what was prescribed and what was actually administered. This suggests that the majority of prescriptions were actually PRN, which would explain the low level of administration. Although patient-controlled

analgesia (PCA) is considered the optimal treatment of postoperative pain (Anonymous, 1995), in many hospital it is not available for all paediatric patients. The best alternative to PCA is fixed intervals regimes, which are considered a better option than PRN, both in Europe (Maunuksela & Olkkola, 1991; Anonymous, 1995) and USA (Acute Pain Management Guideline Panel, 1992). However, PRN do not exclude the need for careful pain evaluation to confirm its effectiveness and to avoid side-effects.

One-half of children experienced a moderate-to-unbearable level of pain (>25% maximum value), and in 20% of these cases the pain was severe-to-unbearable (>50% maximum value). These results are similar to those previously published (Mather & Mackie, 1983; Commission on The Provision of Surgical Services, 1990; Johnston *et al.*, 1992). These figures are similar to findings from adults, and show that postoperative pain in children deserves, at least, the same attention. This is especially important in young children, who are likely to develop negative attitudes towards medical interventions, a feeling which may remain with them long after their experience (Fitzgerald *et al.*, 1989; Taddio *et al.*, 1997).

There are several limitations to this study. First, survey research is an observational method of study that does not attempt to examine hypotheses, but instead describes characteristics of a specific population. Second, sample selection was limited to certain patient populations; although the investigators believe that these results might be representative of paediatric pain practices in the health care setting which were studied, caution should be used when interpreting these results and generalizing to other populations. Third, the existence of a limited database for paediatric pain practices in Spain hampers our ability to support findings with previous studies. After considering these limitations, most of the conclusions that the study has reached agree with the previously published work in other countries and documents the overall inadequacies of postoperative analgesic regimens. Postoperative pain management, as in other countries, might be inadequate in Spain.

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