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Original Article

Nurses' Knowledge and Attitude toward Pediatric Pain Management: A Cross-Sectional Study

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ABSTRACT

Background: Pain in infants and children is often poorly assessed and managed. Although there are many studies on this subject, none have been conducted in the Arab world, including the Kingdom of Saudi Arabia, where nurses are largely expatriates.
Aims: To examine the knowledge and attitudes of nurses working with infants and children in the Kingdom of Saudi Arabia regarding pain management.
Design: Descriptive cross-sectional survey.
Settings: Five government hospitals in Riyadh region of the Kingdom of Saudi Arabia.
Participants/Subjects: Registered nurses caring for infants and children.
Methods: A convenience sample of 410 nurses working at five Saudi Arabian government hospitals was surveyed using the Pediatric Nurses' Knowledge and Attitudes Survey Regarding Pain (PNKAS-Shriners Revision). Data were analyzed using descriptive (frequency, percentage, mean, and standard deviation) and inferential statistics, including Pearson correlation, independent *t* test, and one-way analysis tests.
Results: Poor overall knowledge and attitudes regarding pediatric pain management was evident in this study. The mean correct score achieved by nurses was 18.1 ± 4.0 out of 40 or 45.2% ± 10.0% of a possible score of 100%. A weak but statistically significant correlation was found between years of pediatric nursing experience and total score ($r = -0.129$, $p = .009$).
Conclusions: We concluded that intensive education on pediatric pain and its management is urgently needed for nurses working in the Kingdom of Saudi Arabia.

Pain is a complex, multidimensional, subjective experience that can be challenging for health professionals to assess and manage, particularly in infants and young children (Carter, 2013; James, Nelson, & Ashwill, 2013). Despite the advancements in scientific knowledge and understanding of pain mechanisms and its assessment and management, current evidence suggests that pain in hospitalized infants and children remains poorly assessed and managed (Ramira, Instone, & Clark, 2016; Stevens et al., 2014). The Kingdom of Saudi Arabia (KSA) is a developing country, located in the Middle East, and is one of the Gulf Arab counries. Because of a chronic shortage in the supply of local nurses, the majority of nurses in the KSA are expatriates (67.7%) who are recruited for their professional qualifications and clinical expertise (Almalki, Fitzgerald, & Clark, 2011). The knowledge and attitudes of nurses relating to pain management in infants and children within the KSA health context are not known.

Background

Children often present to hospital with pain for a range of reasons, including illness; disability; and injuries such as bites, cuts, bruises, fractures, and burns (Oakes, 2011; Twycross, Dowden, & Stinson, 2014). During hospitalization, children may also experience inflicted pain when they undergo diagnostic and investigative

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procedures, intravenous and intramuscular therapies, and surgical interventions (Burns et al., 2017; Oakes, 2011).

Assessing and managing pain in hospitalized children is a challenging task compared with adults. Infants and young children, depending on their age and developmental stage, may not have the communication skills or the cognitive development to adequately describe their pain to reveal its nature, location, severity, or intensity (James et al., 2013), and they may not be able to articulate the effects of analgesia and pain relief therapies. The parents of children may help or hinder pain assessment and management in their children, depending on their knowledge, understanding, and beliefs or misbeliefs about pain and its treatment and management (James et al., 2013). It is for these reasons that infants and children may experience unrelieved pain more often than adults as it goes unrecognized, untreated, or poorly managed (James et al., 2013). Effective pain management is every child's right (Olmstead, Scott, & Austin, 2010). Regardless of a person's age, health professionals have a responsibility to alleviate pain and to manage it effectively for all patients under their care (Twycross, Dowden, & Bruce, 2009).

Research has found that the prevelance rates of pain among hospitalized infants and children can be as high as 94% (Birnie et al., 2014). Research also indicates that early pain stimuli and experiences can result in long-term undesirable consequences, not only on the children's perception or sensitivity to pain but also in relation to their stress response, behavior, and learning (Burns et al., 2017; Srouji, Ratnapalan, & Schneeweiss, 2010). Furthermore, studies have found that an infant or a child exposed to frequent pain is more likely to have long-lasting effects associated with perception and behavioral responses to pain; it also affects treatment and hospitalization, as well as the child's ability to cope with pain (Bowden & Greenberg, 2010; Twycross et al., 2009).

Unrelieved and poorly managed pain may lead to hypersensitivity to future pain, delayed recovery and well-being, and alterations in sleep and nutritional patterns (Coyne, Timmins, & Neill, 2010; Twycross et al., 2009). It also may cause chronic pain in adulthood (Brugnoli, 2014; Ismail, 2016). On the other hand, effective pain management has been found to shorten hospital stays; enhance healing and recovery; facilitate early moblilization; reduce suffering, anxiety, and the costs associated with health care; and lead to positive perceptions and experiences about pain relief and hospitalization (Ball, Bindler, Cowen, & Ball, 2015; Burns et al., 2017; Stevens et al., 2014).

As a part of the healthcare team, nurses play an important role in the assessment and management of pain. Importantly, they need evidence-based knowledge with supportive attitudes to ensure effective management for children and infants in pain (Ekim & Ocakcı, 2013; Potts & Mandleco, 2012). However, many studies have found that nurses have poor knowledge and attitudes regarding pain and its management in children. For example, a survey of nurses in India found that 97.6% of nurses (n = 42) did not know oral paracetamol's duration of action and 61.9% believed that their personal judgment of pain intensity was a more valid measure than a child's self-report of pain intensity (Dongara, Shah, Nimbalkar, Phatak, & Nimbalkar, 2015). In a survey of nurses (n = 224) in Turkey, 72.3% of participants did not know the effectiveness of nonpharmacologic interventions for more severe pain, and 74.6% did not believe that children could accurately judge the intensity of their pain and discomfort (Ekim & Ocakcı, 2013). Two surveys of nurses (n = 274 and 295) in the United States revealed that more than 79% did not understand conversions and equivalents relating to opioid and nonopioid analgesics (Manworren, 2000; Rieman & Gordon, 2007).

This paper presents the first contemporary study of the knowledge and attitudes of nurses in the KSA who care for infants and children with pain. In addition to revealing the demographic characteristics of an expatriate workforce, it also highlights the problem of pain in children in the KSA.

Methods

Aims

The aims of the study were to (1) examine the knowledge and attitudes of nurses working in the KSA relating to pain management in infants and children and (2) investigate knowledge and attitude according to nurses' demographic characteristics.

Design

This study is one part of a two-phase mixed-methods study addressing nurses' knowledge and attitudes toward pain management in infants and children in the KSA. This paper presents the results of the quantitative phase, which used a descriptive cross-sectional survey design.

Setting

The study was conducted at five government hospitals, three tertiary (>350 bed) and two secondary (>100 bed), in Riyadh, the capital city of the KSA and its surrounding regions. These hospitals are homogeneous, provide a range of child health care services, and represent the health care sector, particularly in the central region of the KSA. They are under the administration of the Saudi Ministry of Health, the largest government agency, providing 60% of the total public health care services (Aldossary, While, & Barriball, 2008; Almalki et al., 2011).

Sample

A power analysis was performed to estimate the sample size required for this study. We estimated an effect size of 0.3 as Cohen's d, (standardized mean difference) in knowledge and attitudes for two group comparisons using a *t* test (gender, nationality, ethnicity, education level). With a 5% significance level and 80% power level (Munro, 2005), 175 nurses per group were needed (a total of 350 nurses). For other comparisons involving multiple groups using the same sample size (350 nurses), the detectable difference by Cohen's f increased from 0.15 (two-group case) to 0.19 (six-group case) for analyses using analysis of variance (ANOVA). Previous local studies suggested a response rate of 50% (Abudari, Zahreddine, Hazeim, Assi, & Emara, 2014; Al-Ahmadi, 2009). To achieve the desired sample size, we distributed questionnaires to 750 participants who met the inclusion criteria across the five participating hospitals to ensure an adequate return. The approach used was convenience sampling. The inclusion criteria were (a) Saudi and non-Saudi registered nurses working in the study venues, (b) providing direct healthcare for infants and children, (c) able to read and speak English, and (d) not under any training, orientation, or preceptorship program.

Instrument

The PNKAS-Shriners Revision

The instrument used in this study consisted of two sections. The first section sought the participants' demographic information, including age, gender, nationality, religion, ethnicity, level of education, work experience, clinical area of practice, and attendance at any pain-related course and the nurses' self-evaluation of their knowledge of pain management (Table 1). The second section was the Pediatric Nurses' Knowledge and Attitudes Survey Regarding Pain (PNKAS—Shriners Revision) (Manworren, 2001), which is a

Table 1
Demographic Characteristics of the Participants (n = 410)

Characteristic	N	%
Gender		
Male	35	8.5
Female	375	91.5
Age (M = 32.37; SD = 7.23; range 20-60 years)		
20-25	43	10.5
26-30	165	40.2
31-35	105	25.6
36-40	48	11.7
≥41	49	12.0
Religion		
Islam	105	25.6
Hindu	30	7.3
Christian	275	67.1
Nationality		
Saudi	75	18.3
Non-Saudi	335	81.7
Ethnicity		
Arab	79	19.3
Asian	331	80.7
Education level		
Diploma	131	32.0
Bachelor	279	68.0
Years of nursing experience (M = 8.94; SD = 6.330; range 1-36 years)		
1-5	143	34.9
6-10	153	37.3
11-15	63	15.4
16-20	30	7.3
≥21	21	5.1
Years of pediatric nursing experience (M = 6.37; SD = 5.022; range 1-25 years)		
1-5	207	50.5
6-10	136	33.2
11-15	43	10.5
16-20	15	3.7
≥21	9	2.2
Attended pain-related courses		
Yes	183	44.6
No	227	55.4
Self-evaluation of knowledge of pain management		
Excellent	67	16.3
Good	243	59.3
Fair	96	23.4
Poor	4	1.0
Working clinical area		
Outpatient department	10	2.4
Emergency department	29	7.1
Pediatric intensive care unit	164	40.0
Pediatric ward	67	16.3
Pediatric medical ward	93	22.7
Pediatric surgical ward	47	11.5

M = mean; SD = standard deviation.

self-administered questionnaire with 40 items: 24 true/false statements, 12 multiple-choice questions, and 2 patient case studies with 2 multiple-choice questions for each (Table 2). These items were designed to assess both knowledge and attitudes regarding pediatric pain assessment and management, including pharmacologic and nonpharmacologic interventions.

This survey has an acceptable level of stability with a test-retest reliability of 0.67 (Manworren, 2001) and an acceptable level of internal consistency with a Cronbach's α of .72-.82 (Manworren, 2001; Stanley & Pollard, 2013). Content validity was established by a panel of five nurse experts in pediatric pain, which was based on standards and guidelines by the Agency for Healthcare Policy and Research, the American Pain Society, and the World Health Organization (Manworren, 2001; Rieman, Gordon, & Marvin, 2007).

The PNKAS—Shriners Revision has not previously been administered in the KSA. Four international experts from Singapore (n = 1), the KSA (n = 2), and Australia (n = 1), with extensive experience in pediatric pain management established its content validity for this study. Based on the comments of these experts, some items were reworded and/or rearranged. The overall content validity index was 0.97. The revised version of the survey was then completed at two times (test-retest) within 2 weeks by 25 registered nurses working in pediatric units of the five participating hospitals, who were later excluded from the main study. The Cronbach's α based on this test was .72. The test-retest correlation value was r = 0.73, $p < .001$, demonstrating that the PNKAS—Shriners Revision has acceptable validity and reliability for use in the KSA. The survey in its original English language format was used and distributed.

For the purpose of this paper, knowledge and attitudes were undifferentiated concepts analyzed in accordance with the original authors' approach (Ferrell & McCafferey, 2008). Correctly scored items were assigned a score of one (1), whereas incorrect or unanswered items were scored with zero (0). Correct scores for each participant were added for a total knowledge and attitude score (range = 0-40), which was then converted to a percentage and expressed as a percentage of correct answers. A minimum of 70% was considered as a satisfactory passing score for this study.

Procedure

Ethical approvals to conduct the study were obtained from the Ministry of Health in the KSA (H-01-R-012) and the Human Research Ethics Committee at the University of Newcastle, Australia (H-2015-0466). To facilitate the recruitment process, the nature of the study and recruitment plan were first discussed with nursing directors and head nurses of pediatric units in each of the participating hospitals. Recruitment flyers with details about the study and its aims were posted on each pediatric unit's notice board. Information sessions involving an explanation of participation requirements and addressing enquiries related to the study were conducted for prospective participants at staff meetings.

Packages were distributed to the participants who met the inclusion criteria across the participating hospitals. Each package contained an information sheet, the PNKAS—Shriners Revision, and the sociodemographic sheet. The participants were given 2 months to respond, from April 2016 to May 2016. They returned the questionnaires to a locked box located in each nursing education department to ensure security and confidentiality. Consent was implied by the completion and return of the questionnaire. Of the 750 packages distributed, 430 questionnaires were returned, providing an acceptable response rate of 57.3%. After removing the incomplete questionnaires (n = 20, 2.6%), 410 questionnaires were analyzed, representing a valid response of 54.7%.

Data Analysis

The IBM Statistics Package for Social Sciences (SPSS) Version 23 for Windows (IBM Corp., Armonk, NY) was used to analyze the data. Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were used to describe and summarize the data. Because the data were normally distributed, parametric inferential statistics—Pearson correlation, independent *t* test and one-way ANOVA tests—were also used whenever appropriate to analyze the data. A $p < .05$ was considered to be statistically significant.

Results

Table 1 presents the participants' demographic characteristics. The majority of participants were women (91.5%) and non-Saudi

Table 2
Items Answered Correctly by Nurses (n = 410)

Item	Correct	
	n	%
21. After the initial recommended dose of opioid analgesic, subsequent doses should be adjusted in accordance with the individual patient's response. *(True)*	359	87.6
26. The recommended route of administration of opioid analgesics to infants/children with brief, severe pain of sudden onset (e.g., trauma or postoperative pain) is: *(intravenous)*	356	86.8
24. Opioid/narcotic addiction is defined as a chronic neurobiological disease, characterized by impaired control over drug use, compulsive use, continued used despite harm, and craving. It may occur with or without the physiological changes of tolerance to analgesia and physical dependence (withdrawal). *(True)*	342	83.4
29. Analgesics for postoperative pain should initially be given: *(around the clock on a fixed schedule)*	311	75.9
10. Combining analgesics and nondrug therapies that work by different mechanisms (e.g., using acetaminophen, topical anesthetics, sucrose, and non-nutritive sucking) may result in better pain control with fewer side effects than using a single analgesic agent. *(True)*	306	74.6
27. Of the following analgesic medications, which is considered the drug of choice for the treatment of prolonged moderate to severe pain for children: *(Morphine)*	305	74.4
8. Infants/children who will require repeated painful procedures (i.e., blood draws) should receive maximum treatment for the pain and anxiety of the first procedure to minimize the development of anticipatory anxiety before subsequent procedures. *(True)*	297	72.4
5. Comparable stimuli in different people produce the same intensity of pain. *(True)*	278	67.8
13. Parents should not be present during painful procedures. *(False)*	265	64.6
16. Young infants, less than 6 months of age, cannot tolerate opioids for pain relief. *(False)*	264	64.4
9. Respiratory depression rarely occurs in infants/children who have been receiving stable doses of opioids over a period of months. *(True)*	262	63.9
17. The child with pain should be encouraged to endure as much pain as possible before resorting to a pain relief measure. *(False)*	259	63.2
6. Ibuprofen and other nonsteroidal anti-inflammatory agents are NOT effective analgesics for bone pain. *(False)*	254	62.0
32. The most likely explanation for why a child with pain would request increased doses of pain medication is: *(the child is experiencing increased pain)*	235	57.3
31. Analgesia for background (continuous, persistent) pain should be given: *(around the clock on a fixed schedule)*	224	54.6
18. Children less than 8 years cannot reliably report pain intensity and therefore the nurse should rely on the parents' assessment of the child's pain intensity. *(False)*	223	54.4
2. Because of an underdeveloped neurological system, children under 2 years of age have decreased pain sensitivity and limited memory of painful experiences. *(False)*	219	53.4
15. Beyond a certain dosage of morphine, increases in dosage will NOT provide increased pain relief. *(False)*	219	53.4
19. Based on one's cultural/spiritual beliefs, a child may think that pain and suffering is necessary. *(True)*	197	48.0
23. Giving infants/children sterile water by injection (placebo) is often a useful test to determine if the pain is real. *(False)*	189	46.1
28. Which of the following IV doses of morphine administered would be equivalent to 10 mg of oral morphine: *(Morphine 3 mg IV)*	186	45.4
12. Benzodiazepines do not reliably potentiate the analgesia of opioids unless the pain is related to muscle spasms. *(False)*	181	44.1
34. The most accurate judge of the intensity of the child's pain is: *(the child)*	172	42.0
14. Infants/children with a history of opioid therapy should not be given opioids for pain because they are at high risk for addiction occurrence. *(False)*	167	40.7
3. If the infant/child can be distracted from his pain, this usually means that he is not experiencing a high level of pain. *(False)*	162	39.5
35. Which of the following describes the best approach for cultural considerations in caring for children in pain: *(Children should be individually assessed to determine cultural influences on pain)*	162	39.5
11. The usual duration of analgesia of morphine IV is 4-5 hours. *(False)*	150	36.6
20. Anxiolytics, sedatives, and barbiturates are appropriate medications for the relief of pain during painful procedures. *(False)*	114	27.8
30. A child with background (continuous, persistent) pain has been receiving daily opioid analgesics for 2 months. The doses increased during this time period. Yesterday the child was receiving morphine 5 mg/hour intravenously. Today he has been receiving 10 mg/hour intravenously for 3 hours. The likelihood of the child developing clinically significant respiratory depression is: *(1%-10%)*	106	25.9
22. The child should be advised to use nondrug techniques alone rather than concurrently with pain medications. *(False)*	100	24.4
7. Nondrug interventions (e.g., guided imagery, biofeedback, transcutaneous electrical nerve stimulation [TENS], etc.) are very effective for mild-moderate pain control but are not helpful for more severe pain. *(False)*	98	23.9
38-B. Your assessment, above, is made 2 hours after he received morphine 2 mg IV. After he received the morphine, his pain ratings every half hour ranged from 6 to 8 and he had no clinically significant respiratory depression, sedation, or other untoward side effects. He has identified 2 as an acceptable level of pain relief. His physician's orders for analgesia is "morphine IV 1-3 mg q2 h PRN pain relief." Check the action you will take at this time: *(Administer morphine 3 mg IV now)*	90	22.0
4. Infants/children may sleep in spite of severe pain. *(True)*	86	21.0
36. What do you think is the percentage of children who over-report the amount of pain they have? *(0%-10%)*	72	17.6
25. The recommended route of administration of opioid analgesics to infants/children with background (continuous, persistent) pain is: *(oral)*	64	15.6
37-B. Your assessment, above, is made 2 hours after he received morphine 2 mg IV. After he received the morphine, his pain ratings every half hour ranged from 6 to 8 and he had no clinically significant respiratory depression, sedation, or other untoward side effects. He has identified 2 as an acceptable level of pain relief. His physician's order for analgesia is "morphine IV 1-3 mg q2 h PRN pain relief." Check the action you will take at this time: *(Administer morphine 3 mg IV now)*	55	13.4
1. Observable changes in vital signs must be relied upon to verify a child's statement that he has severe pain. *(False)*	53	12.9
38-A. Patient B: Robert is 8 years old and this is his first day following abdominal surgery. As you enter his room, he is lying quietly in bed and grimaces as he turns in bed. Your assessment reveals the following information: BP = 105/65; HR = 80; R = 20; on a scale of 0 to 10 (0 = no pain/discomfort, 10 = worst pain/discomfort) he rates his pain as 8. On the patient's record you must mark his pain on the scale below. Choose the number that represents your assessment of Robert's pain: *(8)*	24	5.9
37-A. Patient A: Andrew is 8 years old and this is his first day following abdominal surgery. As you enter his room, he smiles at you and continues talking and joking with his visitor. Your assessment reveals the following information: BP = 105/65; HR = 80; R = 20; on a scale of 0 to 10 (0 = no pain/discomfort, 10 = worst pain/discomfort), he rates his pain as 8. On the patient's record you must mark his pain on the scale below. Choose the number that represents your assessment of Andrew's pain: *(8)*	10	2.4
33. Which of the following drugs are useful for treatment of pain in children: *(All of the above)*	2	0.5

IV = intravenous; PRN = as needed; BP = blood pressure; HR = heart rate; R = respiration.
Note: correct answers are in bold and italic.

nurses (81.7%), mainly from India and the Philippines. The average age was 32.3 (range 20-60) years. Most of the participants were Christians (67.1%), followed by Muslims (25.6%) and Hindus (7.3%). The participants of Asian ethnicity (80.7%) made up the largest proportion of participants. The highest level of education attained by the participants was a bachelor's degree in nursing (68.0%). Participants had an average 8.9 (range 1-36) years of nursing experience and 6.3 (range 1-25) years of pediatric nursing experience. More than half the participants (56.3%) had not attended any form of pain education in the past 2 years. The majority (75.6%) rated themselves as having excellent or good knowledge on pediatric pain management. The majority (40%) worked in a pediatric intensive care unit.

Table 2 presents the survey items, arranged from the highest to lowest percentage of correct answers. In general, the results indicated low knowledge and attitudes scores on the PNKAS—Shriners Revision. The mean total score of correctly answered items for the entire scale was 18.1 (standard deviation = 4.0, range = 9-34) out of 40 or 45.2% (standard deviation = 10.0, range = 22.5%-85%) out of 100%. None of the nurses achieved 100% correct answers. Items that received a high percentage of correct answers (>75%) related to adjustment of opioid analgesic dosage (item 21), the recommended opioid administration route for severe acute pain (item 26), the definition of opioid/narcotic addiction (item 24), and the analgesics schedule for postoperative pain (item 29). Many items received a low percentage of correct answers (<50%); however, the lowest items were related to useful drugs to manage children's pain (item 33), changes in vital signs (item 1), the recommended opioid administration route for prolonged pain (item 25), over-reporting pain (item 36), whether a child can be distracted from pain if is not severe (item 3), whether children may sleep in spite of severe pain (item 4), the effectiveness of nondrug interventions for severe pain (item 7), advising a child to use nondrug techniques alone (item 22), the likelihood of opioid respiratory depression (item 30), and clinical judgments relating to pain assessment and management (patient case scenarios A and B in items 37 and 38).

Table 3 presents significant differences and correlations in the mean total score on the PNKAS—Shriners Revision according to demographic characteristics. Nurses who had a bachelor's degree had significantly higher scores than nurses who had a diploma qualification ($t = -3.71$; $p < .001$). A weak but statistically significant correlation was found between the mean total scores and years of pediatric nursing experience ($r = -0.129$, $p = .009$). ANOVA showed that there was a statistically significant difference in the mean total score of nurses working in different clinical areas ($F = 2.601$; $p < .025$). Nurses who worked in the emergency department scored significantly higher than nurses who worked in any of the other five clinical areas.

Discussion

The primary purpose of the present study was to examine the knowledge and attitudes of nurses working in the KSA in relation to pain management in infants and children. Most participants believed that they had good knowledge regarding pain in children and its management. However, the overall mean percentage of correct scores was low at 45.2%, which is consistent with the studies conducted in Turkey (Ekim & Ocakcı, 2013), India (Dongara et al., 2015), and Mongolia (Lunsford, 2015). The present study also had a low correct answer rate compared with several studies from the United States: 66%, 74%, and 76%, respectively (Manworren, 2000; Rieman & Gordon, 2007; Vincent, 2005).

The findings of this study suggest that nurses working in the KSA had poor overall knowledge of and attitudes about pain management in infants and children, which is also consistent with nurses in other countries around the world. The majority of nurses (87.6%, n = 359) responded correctly to the pharmacologic item assessing adjustment of opioid analgesic doses according to the patient's response to pain. However, the findings of the two case studies revealed marked differences in knowledge when nurses responded to a clinical practice scenario. This was also evidenced by the incorrect responses to other pharmacologic items. For example, 99.5% of the participants (n = 408) provided an incorrect response to the “useful drugs for pain treatment in children” item and 63.4% (n = 260) incorrectly responded to the item concerning the usual duration of action of morphine. Only 15.6% (n = 64) correctly selected “oral” as the recommended route to administer opioids for chronic pain. Of great concern is that these results concur with research conducted over the past decades by Ekim and Ocakcı (2013), Manworren (2000), and Rieman and Gordon (2007), and yet nurses continue to have poor pharmacologic knowledge. This indicates that they were not well equipped with the necessary knowledge about basic pharmacology. The scant focus given to this area in textbooks and education for nurses may be a possible reason to explain this (Ferrell, Virani, Grant, Vallerand, & McCaffery, 2000).

In addition to poor knowledge and attitudes relating to pharmacologic management, our study revealed that nurses have poor knowledge of nonpharmacologic approaches to manage pain, such as distraction, massage, and positioning. Only 24.4% (n = 100) of participants correctly believed that a child should not use nonpharmacologic interventions alone and that some children's pain cannot be managed effectively with such interventions. In addition, only 23.9% (n = 98) knew the limitations of nonpharmacologic interventions for acute severe pain. These results are similar to those previously reported (Lui, So, & Fong, 2008; Matthews & Malcolm, 2007). Poor knowledge about pain mechanisms, analgesics, and the effect of complementary or alternative therapies may explain why nurses do not prefer to use pharmacologic and nonpharmacologic therapies together.

Previous studies have reported that nurses are concerned about the side effects of opioids, particularly respiratory depression and addiction (Dongara et al., 2015; Ekim & Ocakcı, 2013; Vincent, 2005). In our study, nurses were also concerned about these aspects, with the majority of nurses (59.3%, n = 243) preferring not to administer opioids to infants or children with a history of opioid therapy. The majority (74.1%, n = 304) also overestimated the incidence of respiratory depression associated with opioids. This suggests that despite the evidence that indicates opioids are generally well tolerated and effective when used as prescribed (Jo, 2014; Walco & Goldschneider, 2008), nurses continue to lack knowledge and understanding about the uses, actions, dosing regimens, and side effects of opioids. It also suggests that nurses do not understand the precursors of opioid addiction or the notion of dependence. These concerns emphasize the need for ongoing education about opioid therapy.

There was also a high percentage of incorrect answers relating to pain assessment and evaluation. For example, more than half the participants (53.9%, n = 221) believed that the use of a sterile water injection as a placebo was an acceptable approach for testing the reality of the reported pain, similar to other studies (Kheshti, Namazi, Mehrabi, & Firouzabadi, 2016; Ying Ge et al., 2013). Although a placebo can be used in some conditions, it is widely regarded as an unethical practice, particularly with children, because it involves deception, misinformation, and dishonesty (Clayton, Stock, & Cooper, 2017; Kisaalita, Staud, Hurley, & Robinson, 2014; Oakes, 2011; Yaqoob & Nasaif, 2015). In addition, more than three quarters of the participants (87.1%, n = 357) in the present study incorrectly believed that changes in vital signs indicate increasing pain intensity in children. Physiologic changes have been found to correlate poorly with the intensity of pain and

Table 3
Significant Differences and Correlations in the Mean Total Score According to Demographic Characteristics (n = 410)

Characteristic	Mean (SD)	Test Values	*df*	*p*
Nursing education level		*t* (−3.71)	408	<.001*
Diploma	17.03 (3.49)			
Bachelor	18.58 (4.13)			
Years of pediatric nursing experience		r (−0.129)		.009†
Working clinical area		F = 2.601	5/404	.025‡
Outpatient department	14.50 (2.37)			
Emergency department	18.89 (2.96)			
Pediatric intensive care unit	18.52 (3.77)			
Pediatric ward	17.92 (3.35)			
Pediatric medical ward	17.58 (5.00)			
Pediatric surgical ward	18.12 (3.88)			

SD = standard deviation; *t* = *t* test; *df* = degrees of freedom; r = Pearson's test; F = one-way analysis of variance.
* Significant at .001.
† Significant at .01.
‡ Significant at .05.

therefore were not supported to be used alone in detecting pain (Arbour & Ge;linas, 2010; Lord & Woollard, 2011). This also reflects a lack of understanding among nurses about reliable pain indicators and the use of evidence in practice when responding to child pain.

Evidence suggests that children as young as age 3 years have been found to reliably use self-report tools (Herr, Coyne, McCaffery, Manworren, & Merkel, 2011), which is regarded as central to pain assessment and the single most reliable indicator of pain and its intensity (Browne, Flanigan, McComiskey, & Pieper, 2008; Potter, Perry, Stockert, & Hall, 2017). However, more than half the participants in this study (58%, n = 238) incorrectly answered the item "The most accurate judge of the intensity of the child's pain is the child." This result is consistent with those of Ekim and Ocakcı (2013), suggesting that a child's self-reported pain is not trusted or accepted by nurses as reliable during assessment practices.

The results also indicate that many nurses (60.5%, n = 248) incorrectly believe that if a child can be distracted from pain it is not severe. In addition, 79% (n = 324) erroneously believe that children with severe pain will not be able to sleep, which is also consistent with previous studies (Dongara et al., 2015; Ekim & Ocakcı, 2013; Stanley & Pollard, 2013). A small percentage of nurses (8.3%, n = 34) acknowledged the presence of pain in children who grimace or smile, suggesting that facial expressions may not elicit a response from the nurse for pain assessment or relief. These findings are similar to those reported by Ortiz et al. (2015), where overt behavioral manifestations of pain, such as grimacing, scored higher than a child who was smiling or sleeping. This suggests that nurses have limited understanding of childhood behaviors and responses to pain. The findings also suggest that nurses continue to believe that distraction is unlikely to mediate pain despite research indicating that children in pain engage with distraction, as in play, or they may sleep even though they are in pain (Bowden & Greenberg, 2010; Potts & Mandleco, 2012). This also indicates that nurses do not understand the mechanisms of the pain response: pain physiology and pain pathways (James et al., 2013). In addition, it reinforces that nurses expect overt behavioral manifestations of pain, such as crying, in children.

This study found that age and years of nursing experience did not correlate with the mean correct score. There was a significant negative correlation between nurses' mean total score and years of pediatric nursing experience, though the correlation was weak. This result contradicts those reported in other studies (Ekim & Ocakcı, 2013; Manworren, 2000). We consider that this difference may arise from the different sampling methods, sample sizes, settings, and participants' characteristics.

The present study also found that nurses with a bachelor's degree had a statistically significant higher score than diploma-prepared nurses. This suggests that the level of education influences the knowledge, beliefs, and attitudes of nurses. Nurses who worked in the emergency department scored significantly higher than those who worked in other clinical areas in the study settings. This difference was also reported by Ekim and Ocakcı (2013) and Manworren (2000) and may relate to a number of factors, including the self-learning opportunities and knowledge acquisition in the fast-paced emergency department environment. Accordingly, it is an area in need of further study.

There may be several possible reasons for the poor pain management knowledge and attitudes of participating nurses. One reason is the lack of or limited content on pain and its management in nursing curricula (Mackintosh-Franklin, 2017; Twycross & Roderique, 2013; Watt-Watson et al., 2009). The other reason in the KSA context is the limited access to ongoing education and up-to-date information and knowledge relating to pain management (Eid, Manias, Bucknall, & Almazrooa, 2014; Samarkandi, 2018). This is further supported by the results of this study, which found that more than half of participants (55.4%) had not attended any pain-related courses at their workplace. Nevertheless, the low total score in this study is comparable with those reported in other studies conducted in the KSA (Alqahtani & Jones, 2015; Eid et al., 2014) and elsewhere in the Middle East (Al Qadire & Al Khalaileh, 2014; Yaqoob & Nasaif, 2015).

Strengths and Limitations of the Study

This is the first study of its kind in the Gulf Arab region, where an expatriate workforce predominates. The study provides important information about the poor knowledge and attitudes of nurses relating to pain assessment and management in infants and children and is consistent with the findings of many international studies. The findings reveal the magnitude of unrelieved pain in hospitalized children and their suffering. These findings should be responded to with urgency and used to guide hospital policymakers, health leaders, academics, educators, and clinicians. The large sample size meant there was adequate power to support the importance of the findings, which may be transferable to other contexts in the KSA and other countries where expatriate nurses, who were most representative in this study, provide care to infants and children. For this reason, careful consideration must be paid when comparing, generalizing or considering the transferability of the study results to Saudi-born nurses. A study focused on Saudi-born nurses might reveal different results. Understandings of pain and its management are likely to vary across the nurses working in the Middle Eastern health contexts. Thus further research is needed to explore these differences to provide further information and understanding.

Although this study provided important information, both knowledge and attitudes toward pain were measured as undifferentiated concepts as recommended by the survey originators (Ferrell & McCafferey, 2008). Ideally, knowledge should be separated and measured independently from attitudes (Vincent & Denyes, 2004). If knowledge and attitudes are not measured separately, this means that these study domains may not be captured adequately and addressed for improvement or change. A further limitation of this study is that it focused on examining the knowledge and attitudes of nurses relating to pain management in infants and children. Future research strategies should use observations of nurses' practices, along with an examination of their knowledge and attitudes, to gain a more complete and accurate view of how nurses care for infants and children who experience pain in health settings.

Implications

The study findings have important implications for policy, education, practice, and research. The health curriculum needs to focus on pediatric pain management. The health policy should mandate the prioritization of pediatric pain and its management and the implementation of evidence-based guidelines on this subject into routine care and practice. In-service education should be held regularly for nurses and other health staff involved in children's pain care. An emphasis should be placed on the manifestations of pain in children, pain physiology and its mechanisms, and the assessment and management of pain using both pharmacologic and nonpharmacologic approaches. Cultural awareness, knowledge, and sensitivities relating to pain and pain expressions in population groups should also be a part of the education process. Importantly, nursing leaders and managers in practice should grasp opportunities to establish strategies, such as encouraging self-directed learning to improve nurses' knowledge and attitudes in relation to pediatric pain. Families of children also need to be educated about pain management, including demystifying the use of opioids and the family's role in assisting with pain relief for their child. Attention also needs to be given to interdisciplinary communications, coordination, and collaboration in the management of pain in children.

Culture has been highlighted as an important factor in relation to pain management (Chen, Miaskowski, Dodd, & Pantilat, 2008; Narayan, 2010). As noted in this paper, expatriate nurses constitute a large proportion of the total nursing workforce in the KSA. These nurses are culturally different from their patients, which may affect the overall quality of pain management in children. For example, Saudis and Filipinos are more likely to verbalize their pain compared with people of other nationalities, such as Indians (Gerdin, 2017; Lovering, 2006). Additionally, beliefs such as witchcraft, evil eye, and the power of ancestors are common among Saudis, Filipinos, and some Asians as causes of pain (Lovering, 2006). Moreover, Indians who are Hindus believe that pain must be tolerated as part of the preparation for a better life in the next life cycle (Weber & Kelley, 2010). In terms of the treatment of pain, traditional and faith healers are found in Filipino, Asian, and Saudi cultures; however, religious healing is more prominent in the Saudi culture compared with the others. Future research therefore needs to explore cultural effects on the management of pediatric pain in the KSA to identify opportunities through which education and improvements in pain management can be achieved.

Conclusions

Overall the findings revealed that the knowledge and attitudes of nurses working in the KSA were generally poor in areas such as pharmacology, nonpharmacologic approaches to pain management, and pain assessment. This study suggests that all nurses working in the KSA urgently need education on pain and its management in infants and children. In the light of the large expatriate population of nurses, education strategies need to be provided and supported by Saudi hospitals as in-service. In addition, improvements to undergraduate and postgraduate education in the KSA, the use of evidence-based guidelines, and changes to institutional and health policies to promote the judicious management of children's pain may help to redress the problem of poor pain knowledge and attitudes.

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