



# Effectiveness of Educational Intervention on Jordanian Nurses' Knowledge and Attitude Regarding Pain Management

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## **Authors' contributions**

*Author MAQ designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author MAK participated in designing the study, collecting data, reading and revising the manuscript. All authors read and approved the final manuscript.*

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## ABSTRACT

**Aim:** Although guidelines and pharmacological interventions exist to manage pain, poor assessment and under-medication are prevalent. It was reported that inadequacy of pain management can be due to nurses' lack of knowledge and training regarding pain management. Therefore, this study conducted to evaluate the impact of education on nurses' knowledge and attitude regarding pain management.

**Study Design:** This study utilized the simple pre-post test design.

**Sample:** Seventy nurses participated in the study using convenience sampling and they were recruited from eleven hospitals in Jordan. The Knowledge and Attitudes Survey regarding pain was used to evaluate the effects of educational intervention on nurses' knowledge and attitudes regarding pain management.

**Place and Duration of Study:** Al Al-Bayat University, between May to June 2012

**Results:** It was found that 54% of the participants were females and the average age was 29.5 (SD 8.4). The most important findings of the study were the following: a) low level of knowledge regarding pain management in the pre-test phase, the mean number of the correct answers was 19.20 (SD 5.4) out of 40 (total score if all items answered correctly; b) nurses' knowledge and attitudes were significantly improved after the course (Wilcoxon matched-pairs exact  $p < .001$ ).

**Conclusion:** This study proved that short pain course could improve nurses' knowledge

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and attitudes regarding pain management. However, the sustainability of the change needs to be further investigated.

*Keywords: Nurses; Jordan; education; pain management; adult; and symptoms management.*

## 1. INTRODUCTION

Pain continues to be one of the most frequently reported symptoms in ill patients [1]. In addition, pain control is a vitally important goal, as neglected pain can cause patients to lose hope, impede their response to treatment and negatively affect their quality of life [2,3]. However, although guidelines and pharmacological interventions exist to manage pain, poor assessment and under-medication are prevalent [4]. Therefore, patients are still suffering and pain is under-medicated. Recent studies indicated that inadequacy of pain management can be due to nurses' lack of knowledge and training regarding pain management [5,6]. For example, nurses hold negative perceptions, attitudes and misconceptions regarding pain [7-9]. Misconceptions include the belief that patients tend to seek attention rather than reporting real pain, opioid administration results in quick addiction, and vital signs are the only way to confirm the presence of pain [5,10,11]. It is believed that education can improve nurses' knowledge and attitude toward pain management [10,12,13], that it eventually improves nursing practice and enhances the pain management provided, including pain assessment, documentation and medication use [5,14,15]. For example, a study used a before and after design to evaluate the effectiveness of pain courses on the practice of Jordanian nurses and their attitudes toward post-operative pain management [10]. They provided nurses with an educational course. The results show a significant improvement in nurses' knowledge and attitudes; in addition, significant improvement in pain documentation was noted, as evidenced by a chart audit after the educational intervention (85% of medical files contained pain documentation)[10]. Furthermore, a randomized clinical trial (RCT) was conducted in Athens to evaluate the impact of pain education on nurses' attitude and knowledge regarding pain management [16]. One-hundred and twelve nurses were divided into treatment and control groups. Educational materials (video tapes and case scenarios) were given to nurses in the treatment group. In order to measure the changes in nurses' knowledge and attitudes, the validated Greek version of the Nurses' Knowledge and Attitudes Survey Regarding Pain was used. It was found that education significantly improved nurses' knowledge in the treatment group, compared to nurses in the control group [16]. Another study was conducted in Italy and used a different teaching method: a course comprising seven sessions on pain management [17]. Nurses' knowledge was evaluated pre- and post-course. In addition, follow-up was conducted after 18 months. It was found that pain courses improved nurses' knowledge of pain management. However, the follow-up showed that nurses required refresher courses to maintain the knowledge they had gained [17].

Overall, a literature review revealed that there was a consensus on the positive impact of pain education, regardless of the method employed (e.g. lectures, video, or pamphlet), combined or not combined with assessment tool implementation [18,22,23]. Also, it has been noted that pain education was commonly combined with implementing a pain assessment tool to enhance the improvement in the total pain management quality, especially in the area of cancer pain [5,14,15]. Further, most studies utilized pre- and post-research design, but a few RCTs were conducted [23]. However, this area has received little attention in the Arab world, and Jordan in particular. Only one study has examined this topic and this study was a single-centre study and focused on post-operative pain management

[10]. In this current study, nurses from different settings were recruited and the education course focused on general pain management to expand its utility and benefits. Thus, this study examined the problem from another perspective and added to what is already known in this field. Also, since pain is a culturally sensitive phenomenon, nurses' education and practice may vary between contexts.

## **2. MATERIALS AND METHODS**

### **2.1 Study Aim**

This study aims to evaluate the impact of pain education (intervention) on Jordanian nurses' knowledge and attitudes regarding pain management.

### **2.2 Design**

This study utilized a simple pre- and post-test design. A baseline estimation of nurses' knowledge regarding pain management was measured prior to embarking on the one-day course, then after two weeks a post-course test was conducted.

### **2.3 Sample**

100 working nurses were invited to attend an education course on pain management. The nursing administrations of 11 hospitals were asked to nominate interested registered nurses to participate and attend this event. These hospitals represent the Jordanian health sectors (governmental, royal medical services, university, and private hospitals). The authors had no control over the selection of participants, who were only required to be registered nurses with at least six months' clinical experience. However, only 70 of the 100 nurses invited attended the course, which was held in the premises of Al Al-Bayat University.

### **2.4 Procedure**

The researchers obtained ethical approval from the university ethical committees prior to sending invitations to nursing administrations within the 11 hospitals. Included with the invitation was a brief description of the course and the planned study. This included the study purpose, protocol and participant role. The preliminary list of participants was received by fax. On the day of the course, the study purpose, protocol and participant role were presented again, then nurses who confirmed their participation were asked to sign the consent form and complete the study questionnaire prior to the workshop (baseline data). Two weeks after the course, participants completed the post-course questionnaire.

### **2.5 Intervention**

The intervention in this study was providing nurses with a six-hour pain education course. It was developed by the researchers based on the previous literature [25]. The objective of the course was to provide nurses with an understanding of basic pain concepts, assessment, and principles of management. There were three teaching sessions, each of them two hours long, on pain assessment and management. The three sessions were given on a single day and covered the following topics.

A) Session One:

- Defining pain
- Types of pain
- Aetiologies of pain
- Prevalence of pain
- Importance of pain assessment

B) Session Two:

- Myths and Misconceptions about Pain
- Pain Assessment
- How to use Pain Assessment Tools

C) Session Three:

- Overview of Pain Management Interventions
- Pharmacological Interventions
- Non-Pharmacological Interventions
- Nursing Role in Pain Management
- Barriers to pain Management

The first session gave an introduction about pain, including definitions and prevalence rates in different groups of patients identified from the literature, such as cancer patients or patients with low back pain. Emphasis was placed on the importance of pain assessment as a prerequisite of effective pain management. In the second session, more in-depth information was provided, myths of pain management were discussed, and how to assess pain effectively was explained. At the end of the session, the nurses were instructed in how to use pain assessment tools such as the brief pain inventory, Visual Analogue Scale (VAS) and numerical rating scale. In the final session, available pain treatment was presented and discussed (mainly pharmacological treatment mentioned in the literature). Patient-related, worker-related and family caregivers' barriers to cancer pain management were also addressed. This course utilized classic lecturing style, open discussion, and participants were also given the opportunity to use one of the explained pain assessment tools.

## **2.6 Instruments**

### **2.6.1 The demographical data sheet (DDS)**

The DDS includes questions designed to elicit information about participants' (nurses') demographic characteristics such as sex, age, education level, previous post-registration pain education, area and duration of clinical experience.

### **2.6.2 The knowledge and attitudes survey regarding pain (KAS)**

KAS is a 40-item questionnaire to assess nurses' knowledge and attitudes toward pain management [25]. It consists of 22 "True" or "False" questions and 18 multiple-choice questions. Howell acknowledges that the KAS is the only available instrument to measure nurses' knowledge and attitudes about pain management [26]. It has an established content, validated by a panel of pain experts. The KAS content was based on the American Pain Society, the World Health Organization, and the Agency for Health Care Policy and

Research pain management guidelines. The KAS Cronbach's alpha is 0.70 and test-retest reliability is greater than 0.80 [26, 27]. It has been extensively used in research that aimed to evaluate healthcare professionals' knowledge and attitudes regarding pain management [6, 28, 29]. In addition, this tool is easy to comprehend by non-native English speakers, and it measures the basic knowledge of pain management that is needed for nurses to assess and manage pain effectively. However, the names of drugs mentioned in the questionnaire were checked for availability and use in Jordanian hospitals, since this tool was developed and used in USA and Europe. It was found that all medications are available and used in Jordan under the same names except for the drug Vicodin (hydrocodone 5mg + acetaminophen 500 mg). This drug is known as Revacod, and Acetaminophen is known as Paracetamol. Thus these names were changed wherever they occurred in the questionnaire. In the questionnaire was in the English language, since nurses are able to understand and answer questions in English, as nursing education and examinations in Jordan are conducted using English.

## **2.7 Data Analysis**

Data were entered into the Statistical Package for the Social Sciences (SPSS) (version 17). Descriptive statistics such as means, percentages and frequencies were used to describe the sample characteristics and responses to the questionnaire. In addition, the Wilcoxon test was used to examine the differences in the correct answers distribution before and after attending the educational course and the MacNemar test was used to compare the percentage of correct answers before and after the intervention. Further, the Mann-Whitney test was used to compare the mean of ranks of the total score among two groups variables (gender and received previous pain education or not) and the Kurskal-Wallis test was used to test the scores distribution among variables with more than two groups (working area and education level). The Kurskal-Wallis is denoted by H that refers to the chi-squared value in the SPSS output.

## **3. RESULTS AND DISCUSSION**

### **3.1 Results**

#### **3.1.1 Sample characteristics**

A total of 70 nurses completed and returned the study questionnaire. As shown in Table -1, 54% of participants were females and the average age was 29.5 (SD 8.4). Most nurses had a bachelor's degree (77%), and were working in medical and surgical wards. Sixty-four percent of nurses reported no previous pain education in the past five years. These data were recorded in the study questionnaire; therefore, no data were available for the nurses who did not attend the study, thus avoiding the opportunity of evaluating the occurrence of possible selection biases.

#### **3.1.2 Nurses' knowledge and attitudes regarding pain management**

Data were collected over two time points, pre- and post-course (after a two-week interval) and all the 70 participants completed both questionnaires. However, baseline data shows that the mean number of correct answers was 19.20 (SD 5.4) out of 40 (total score if all items answered correctly), and the rate of correct answers ranged from 10% (item 19) to 86% (item 16). It was found that items with the lowest percentage of correct answers (10-

16%) were items 19, 36 and 38, while the items with the highest number of correct answers (80-86%) were items 15, 31, and 16. Table 2 shows the number and percentage of correct answers before and after the course.

After the introduction of the course, the total mean of the correctly answered questions in the questionnaire increased to 24.34 (SD 4.8); the percentage of correct answers ranged from 19% (items 8, 9) to 87% (items 25, 31, 34). In addition, there was a significant difference in the number of nurses' total correct answers pre- and post-course (Wilcoxon matched-pairs exact  $p < .001$ ). The percentage and the number of correct answers improved for almost all questionnaire items (see table 2) and 18 out of 40 answers showed a significant increase.

**Table 1. Demographic and professional characteristics of nurses**

<b>Characteristic</b>	<b>Mean (SD)</b>	<b>N (%)</b>
<b>Age</b>	29.5 (8.4)	
<b>Nursing experience (yrs)</b>	10.0 (7.1)	
<b>Gender</b>		
Male		32 (46%)
Female		38 (54%)
<b>Education level</b>		
Diploma		7 (10)
Bachelors		54 (77)
Masters		9 (13)
<b>Previous Pain Education</b>		
Yes		25 (36)
No		45 (64)
<b>Working area</b>		
Medical units		14 (20)
Surgical units		13 (19)
Intensive care units		14 (20)
Gynecology		8 (11)
Oncology		10 (14)
Missing		11 (16)

The results of the study indicated a large improvement in nurses' answers to most of the questions except for questions 9 and 33. Pre-course, only 24% knew that morphine has no dose ceiling (item 11) and this percentage increased to 69% after the course. Furthermore, only 12 nurses believed that mouth is the preferred route for morphine administration and this number increased to 39 after education. Similar examples can be seen in items 26, 28 and 35. However, although improvement was noticed, some items showed only small increments, such as items 4, 5, 8, 19 and 38. These items were about knowledge of pain management medications, its pharmacokinetics, prescribing the correct dose, fear of addiction, and accepting patients' pain reports. Also, some items (9, 21 and 33) showed a decrease in the number of correct answers. The first two questions are related to the knowledge of adjuvant pain medications and question number 33 asked about the possibility of developing addiction among patients with an alcohol and drug history.

In regard to the participants characteristics, the Mann-Whitney show a significant difference in the mean rank of the pre-course questionnaires scores between nurses who have had received previous pain education (Mean Rank = 45.5) and who had not (Mean = 26.2) ( $U=212.50$ ,  $z = -3.98$ ,  $P < .001$ ). In addition, no significant difference in the mean total score in

regard to gender ( $U = 539.50$ ,  $z = -0.77$ ,  $P = .44$ ), and in regard to working area ( $H(5) = 8.87$ ,  $P = .12$ ), and education level ( $H = 7.67$ , degree of freedom (df) = 2,  $P = 0.14$ ) as evident by the result of the Kurskal-Wallis test. In addition, the correlation between participant age and years of experience and the total questionnaire score were tested using the Spearman's rho test. The result show no significant correlation were found with age ( $r = 0.279$ ,  $P = .07$ ) or years of experience ( $r = 0.279$ ,  $P = .07$ ).

**Table 2. Correctly Answered Items in the Questionnaire before and after the educational intervention for pain management and P values of the MacNemar Test**

No.	Item Content	Correct Responses		P-value
		Pre N (%)	Post N (%)	
<b>True or false questions</b>				
1	Vital signs are always reliable indicators of the intensity of a patient's pain. (F)	42 (60)	54 (77)	.004
2	Because their nervous system is underdeveloped, children under two years of age have decreased pain sensitivity and limited memory of painful experiences. (F)	38 (54)	42 (60)	.56
3	Patients who can be distracted from pain usually do not have severe pain. (F)	39 (56)	42 (60)	.66
4	Patients may sleep in spite of severe pain. (T)	24 (34)	28 (40)	.30
5	Aspirin and other nonsteroidal anti-inflammatory agents are NOT effective analgesics for painful bone metastases. (F)	23 (33)	26 (37)	.70
6	Respiratory depression rarely occurs in patients who have been receiving stable doses of opioids over a period of months. (T)	47 (67)	54 (77)	.10
7	Combining analgesics that work by different mechanisms (e.g., combining an opioid with an NSAID) may result in better pain control with fewer side effects than using a single analgesic agent. (T)	42 (60)	54 (77)	.009
8	The usual duration of analgesia of 1-2 mg morphine IV is 4-5 hours. (F)	10 (14)	13 (19)	.60
9	Research shows that promethazine (Phenergan) and hydroxyzine (Vistaril) are reliable potentiators of opioid analgesics. (F)	15 (21)	13 (19)	.77
10	Opioids should not be used in patients with a history of substance abuse.(F)	36 (51)	51 (73)	$p < .001$
11	Morphine has a dose ceiling (i.e., a dose above which no greater pain relief can be obtained). (F)	17 (24)	48 (69)	$p < .001$
12	Elderly patients cannot tolerate opioids for pain relief. (F)	42 (60)	50 (71)	.15
13	Patients should be encouraged to endure as much pain as possible before using an opioid. (F)	25 (36)	39 (56)	.001
14	Children less than 11 years old cannot reliably report pain so nurses should rely solely on the parent's assessment of the child's pain intensity. (F)	50 (71)	52 (74)	.69
15	Patients' spiritual beliefs may lead them to think pain and suffering are necessary. (T)	56 (80)	57 (81)	.45
16	After an initial dose of opioid analgesic is given, subsequent doses should be adjusted in accordance with the individual patient's response. (T)	60 (86)	60 (86)	.51
17	Giving patients sterile water by injection (placebo) is a	28 (40)	47 (67)	$p < .001$

	useful test to determine if the pain is real. (F)			
18	Revacod (hydrocodone 5 mg + acetaminophen 500 mg) PO is approximately equal to 5-10 mg of morphine PO. (T)	27 (39)	30 (43)	.54
19	If the source of the patient's pain is unknown, opioids should not be used during the pain evaluation period, as this could mask the ability to correctly diagnose the cause of pain. (F)	7 (10)	13 (19)	.15
20	Anticonvulsant drugs such as gabapentin (Neurontin) produce optimal pain relief after a single dose. (F)	48 (69)	50 (71)	.70
21	Benzodiazepines are not effective pain relievers unless the pain is due to muscle spasm. (T)	48 (69)	42 (60)	.52
22	<u>Narcotic/opioid addiction</u> is defined as a chronic neurobiologic disease, characterized by behaviors that include one or more of the following: impaired control over drug use, compulsive use, continued use despite harm, and craving (T)	55 (79)	58 (83)	.12
<hr/>				
Multiple Choice Question				
23	The recommended route of administration of opioid analgesics for patients with <u>persistent cancer-related pain</u> is: (oral)	12 (17)	39 (56)	$p < .001$
24	The recommended route administration of opioid analgesics for patients with brief, <u>severe pain of sudden onset</u> such as trauma or postoperative pain is: (intravenous)	26 (37)	42 (60)	$p < .001$
25	Which of the following analgesic medications is considered the drug of choice for the treatment of <u>prolonged moderate to severe pain</u> for cancer patients? (morphine)	49 (70)	61 (87)	.003
26	Which of the following IV doses of morphine administered over a 4 hour period would be equivalent to 30 mg of oral morphine given q 4 hours.(Morphin 10 mg IV)	23 (33)	45 (64)	$p < .001$
27	Analgesics for post-operative pain should initially be given: (around the clock on fixed schedule .)	43 (61)	52 (74)	.03
28	A patient with persistent cancer pain has been receiving daily opioid analgesics for 2 months. Yesterday the patient was receiving morphine 200 mg/hour intravenously. Today he has been receiving 250 mg/hour intravenously. The likelihood of the patient developing clinically significant respiratory depression in the absence of new co-morbidity is: (Less than 1%)	14 (20)	38 (54)	$p < .001$
29	The <u>most likely</u> reason a patient with pain would request increased doses of pain medication is ( the patients is experiencing increased pain)	48 (69)	56 (80)	.04
30	Which of the following is useful for treatment of cancer pain? (all of the above)	39 (56)	52 (74)	.004
31	The most accurate judge of the intensity of the patient's pain is (the patient)	57 (81)	61 (87)	.18
32	Which of the following describes the best approach for cultural considerations in caring for patients in pain: (patient should be individually assessed to determine cultural influence)	52 (74)	53 (83)	.06
33	How likely is it that patient who develops pain already have an alcohol and/or drug abuse problem? (5-15%)	30 (43)	22 (31)	.31
34	The time to peak effect for morphine given IV is (15 min)	55 (79)	61 (87)	.09
35	The time to peak effect for morphine given orally is:( 1-2hrs)	23 (33)	57 (81)	$p < .001$
36	Following abrupt discontinuation of an opioid, physical dependence is manifested by the following: (sweating, yawning, diarrhoea and agitation with patients when the opioid is abruptly discontinued)	8 (11)	17 (24)	.004



37	<u>Patient A:</u> Andrew is 25 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 = 120/80; HR = 80; R = 18; 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. Circle the number that represents your assessment of Andrew's pain. (8)	22 (31)	40 (57)	$p < .001$
38	Your assessment, above, is made two hours after he received morphine 2 mg IV. Half hourly pain ratings following the injection ranged from 6 to 8 and he had no clinically significant respiratory depression, sedation, or other untoward side effects. He has identified 2/10 as an acceptable level of pain relief. His physician's order for analgesia is "morphine IV 1-3 mg q1h PRN pain relief." Check the action you will take at this time.(Administer morphine 3mg IV now)	11 (16)	15 (21)	.39
39	<u>Patient B:</u> Robert is 25 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 = 120/80; HR = 80; R = 18; 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. Circle the number that represents your assessment of Robert's pain: (8)	34 (49)	52 (74)	$p < .001$
40	Your assessment, above, is made two hours after he received morphine 2 mg IV. Half hourly pain ratings following the injection ranged from 6 to 8 and he had no clinically significant respiratory depression, sedation, or other untoward side effects. He has identified 2/10 as an acceptable level of pain relief. His physician's order for analgesia is "morphine IV 1-3 mg q1h PRN pain relief." Check the action you will take at this time:(Administer morphine 3mg IV now)	19 (27)	18 (26)	.56

### 3.2 Discussion

This study evaluated the effectiveness of a six-hour educational course on nurses' knowledge and attitudes regarding pain management. The most important findings of the study were the following: a) nurses' low level of knowledge regarding pain management in the pre-test phase; b) the significant improvement in nurses' knowledge and attitudes after the course; and c) although there was an improvement in the number of correct answers on all items, knowledge of pain medications, prescription, dosing, and side effects were only slightly improved.

This study reported limited nurses' knowledge of pain management before the introduction of the course, which is consistent with previous studies [10, 16, 17]. This can be explained by the fact that nurses may receive limited pain education in their undergraduate programmes, and few nurses received post-graduate continuous education. For example, only 24 nurses reported attending an educational session on pain management in the last five years, and the duration and content of such sessions is unknown.

This study also demonstrated that the educational course on pain management was effective in improving nurses' knowledge and enhancing positive attitudes toward pain management. The average number of correct answers on the questions significantly improved after the course, concurrent with the findings of previous studies [10,23,30]. Therefore, this important result suggests the need for integrating a comprehensive pain education within the undergraduate curriculum of nursing students. Furthermore, continuous education on pain issues would enhance nurses' ability and skills to assess and manage pain. Guardini et al. [17] followed nurses' knowledge level regarding post-operative pain management and concluded that the knowledge can be lost if it is not augmented by continuous educational sessions. In addition, continuous education was found to improve nurses' knowledge, attitudes, and clinical skills [30,31].

Despite general improvement in the average number of correct answers in all questions after the test, some items showed only marginal improvement, which was also found by [10] in Jordan. For instance, 60% of nurses still erroneously believed that patients could not sleep when in pain (item 8). Another example is item 8, where the number of correct answers was increased by only 5% after attending the course. For item 19, 81% of nurses still believed that pain medication should not be used before recognizing the cause of pain or the medical diagnosis. This was an interesting but disappointing result, one explanation for which could be the fact that changing people's attitudes and beliefs needs a longer time than expected, and may need the use of one of the change theories, such as innovation theory [32] or change theory [33]. This is one of the study's limitations. Another explanation could be that nurses under-use what they learnt from the course to change their misconceptions and practice, which could be interpreted as a form of change resistance, as reported by [10]. People may resist change because of the fear of new knowledge, or inability to carry out the new practice [32]. This would be a justification for the mandate to use one of the change theories or knowledge translation into practice as a conceptual framework to enhance the likelihood of adopting the proposed change. In addition, it seems that nurses are unable to memorize exact names of adjuvant drugs and percentages, such as in questions 9, 21 and 33. Thus, more focus might be needed on these matters in future studies and nurses' educators need to emphasise the content related to pharmacological pain management. This could positively affect the decision-making process in pain management, toward more prescriptions for pain medications [16].

This study's limitations include the fact that no control group was used in the study, which limits the validity of the results (internal and external) compared to some previous studies [10,23,30]. However, two follow-up data collection phases are planned to enhance the utility of the results (external validity). Secondly, although the sample was chosen to represent the Jordanian healthcare sector, its relatively small size and its heterogeneity could limit the external validity of the findings; other studies reported the use of larger sample sizes [16, 30]. To reduce sample heterogeneity, random sample selection is recommended in prospective studies. Thirdly, this study utilized a pre-post test design, which would impact nurses' answers on the post-course test and may affect the study's internal validity. A delay of two weeks for the post-course evaluation was intended to minimize this threat. Fourthly, researchers collected no information about the content of any previous pain education, so they were not able to judge its quality and possible impact on nurses' knowledge and attitudes regarding pain management. In addition, little information was collected other than the knowledge assessment scores, and the small sample size limited the use of prediction analysis tests such as regression analysis which may affect the study's internal and external validity. Finally, using the English version of the questionnaire could hinder nurses'

understanding of some items which might affect internal validity, hence using an Arabic version is recommended for any future work in the field.

Based on the study results, it is recommended to provide nurses in hospitals with regular courses on pain management and research updates in the field. This would allow continuous improvement in nurses' practice and knowledge. In addition, such education needs to be integrated within nursing curricula by increasing the number of contact teaching hours on pain management provided to undergraduate students. Because nurses show low and superficial knowledge regarding pain management, it is recommended to increase the width and depth of teaching courses to cover pain pathophysiology, assessment approaches, management, and barriers to optimal pain management. Finally, these education courses on pain management might need to be generalized to other health disciplines to create a culture that appreciates pain management and implements its principles in daily practice.

#### **4. CONCLUSION**

The findings of the study show that nurses have a low level of knowledge regarding pain management. In addition, this study shows that short courses could improve nurses' knowledge and attitudes regarding pain management. However, the sustainability of the change needs to be further investigated. Furthermore, regular teaching sessions within clinical settings would also hone pain management skill and knowledge.

#### **CONSENT**

On the day of the course, the study purpose, protocol and participants role were presented, then nurses who confirmed their participation were asked to sign the consent form. In addition, all participants were informed that their participation in this study is voluntary and they are allowed to withdraw at any time. Further, they assured that their identities will not be revealed; only aggregate data was reported.

#### **ETHICAL APPROVAL**

All authors hereby declare that this study has been examined and approved by the appropriate ethics committees and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki."

#### **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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