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ORIGINAL ARTICLE

Premature Neonatal Pain Assessment Criteria: Comparison of nurses' and physicians' Knowledge in Neonatal Intensive Care Units

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ABSTRACT
One of the most noticeable reasons of why the infant pain is ignored by the medical staffs is the shortness of their knowledge about precise tools of assessing the neonates' pain. The nurses and physicians are responsible for assessing and managing the infant pain properly. The present study was aimed to compare the nurses' and physicians' knowledge of the standard procedures of assessing the neonatal pain. In this descriptive cross-sectional study, 62 nurses and 48 physicians from 5 hospitals located in Tehran, Iran, were selected. Survey instrument was consisted of two sections (demographical characteristics, knowledge of behavioral and physiological symptoms), the scores categorized into three scales, inappropriate (<50%), relatively appropriate (50-70%), and appropriate (> 70%). Cronbach's alpha coefficient was 0.8. SPSS software V. 20 was applied. Descriptive and analytic statistics tests like Man Whitney, Kroskal-valis, and spearman correlation coefficient were used. the average score of nurses' knowledge about the standard assessment criteria of infant pain was higher than the physicians' level of knowledge, except in the issue of physiological changes of an in pain infant. However, the difference was not statistically significant (p = 0.161). There was a significant relationship (p = 0.006) between the nurses' and physicians' knowledge and attending the educational programs. the level of nurses' and physicians' knowledge of infant pain is not satisfactory. Therefore, holding regular educational programs for at service staffs and paying more attention to the issue of neonate pain and its related assessment procedures in the nursing and medical sciences are proposed in this study as ways of enhancing the nurses' and physicians' ability and knowledge.
Keywords*: pain assessment, premature neonates, neonatal intensive care unit*

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INTRODUCTION

As the most vulnerable group of society, neonates are the ones who have been paid less attention, particularly premature ones (1). The neonates who are delivered by 37th week of pregnancy are called as premature neonates. Furthermore, being born prematurely and having lower than normal weight are the factors which increase the rate of death among the neonates (2). More than 12 millions of premature neonates are born annually around the world. There is no valid published statistics about developing countries, In order to take care of them; they have to be put under 300 painful procedures in neonatal intensive care unit (3).

Pain is indeed a complex and multi-dimensional experience that depends on one's sensual and intellectual perception of it. Various aspects of one's life can be affected by experiencing pain, including physical, sensual and social ones.. It was believed for a long time that infants are not able to feel pain due mostly to the prematurity of their neural systems (4). Over the last two decades, a wide range of studies have been conducted on this issue which this claim is now disproved (2). In other words, the growth of neonates' neural system begins at the time of pregnancy (4). the pain is communicated by infants through special and non-verbal communicative abilities like facial changes, physical movements, raising eyebrows, increase of heartbeat and blood pressure, anger, increase of sweating and widening of pupils (5).

However, even by considering these ways of communication, infant pain is not recognized in most of the cases (4).

Neonates, right after their birth, experience pain from various types of treatment procedures. The severity of pain is directly related to the age as well as the types of illnesses in the neonates. Therefore, the vulnerable and premature neonates experience more level of pain, in comparison with the normal ones (6),(7). Applying such painful procedures on these infants can jeopardize their health by changing their threshold of feeling pain (i. e. this effect may last for a life time), and decreasing the immune system of their bodies which could contribute to permanent disabilities (3). Although these neonates experience severe pain, they don't visibly reflect their pain; therefore, it is needed to have access to more indicative assessment tools than the current ones so as to know their reflective mechanisms(8), (9).

Preventing the premature neonates from experiencing severe pain in NICU should be considered as a highly important task, since it is not only a moral duty, but also a reasonable expectation from their parents (3). American pain association ranked pain as the fifth vital sign of life. If the importance of assessing pain be the same as controlling the life vital signs, there is a chance to properly prevent and treat one's pain (8),(10). In order to detect pain in an infant, they should be checked every 4 to 6 hours by applying standard procedures. The pain assessment should be comprehensive, and multi-dimensional. Also, it should include the assessment of related behavioral, physiological, and mental signs (9).

One of the important factors upon which the infant pain can be assessed is the knowledge of pain physiology. Physiological, behavioral, and chemical responses are three known means which reflect the infant pain. Nurses and physicians who work in NICU can consider these responses so as to assess the presence of pain in a neonate (5). Based on studies, There are several standard methods of assessing pain, including premature infant pain profile (PIPP), neonatal facial coding system (NFCS), neonatal infant pain scale (NIPS), crying the requirement for oxygen supplementation increase in heart rate facial expression and sleepless (CRIES). Physiological and behavioral indicators included within these methods are pregnancy age, behavioral conditions, heartbeat, oxygen saturation level, raised eyebrow, hatched lips and nose, shutting and pressuring eyes, chin vibration, insomnia, cry, breathing patterns and facial moods (5), (9), (3), (11)and(12).

Nurses and physicians play an important role and responsibility to assess, prevent, and manage the infant pain. When a patient pain is recognized, physician prescribes a proper sedative with appropriate dosage along with the times of delivering that to the patient; then, it is the nurse who decides whether or not to deliver the prescribed drug. Making reasonable decisions and controlling the pain effectively depend on conducting precise and accurate pain assessment (9), (13), and (14). Although the pain assessment of patients is one of the vital parts of taking care of them, care providers, nurses in particular, do not pay enough attention to this part (8). Based on the result of a previously conducted study, the nurses who took care of the infants did not have proper and enough knowledge of either medication or non-medication ways of managing the infant pain. The care providers are not familiar with proper procedures of pain assessment; in fact, this is one of the main reasons of why they are not able to properly identify the infant pain (5), (15)and (16).

Therefore, it is necessary to assess the ability of nurses and physicians in recognition of behavioral and physiological reflexes of infants to pain (5). In a study conducted by Brown, it was reported that among the nurses only 27% of them were applying the pain assessment procedures and 33% of them did not use any of those procedures (5). There has been a wide range of studies around the world on infant pains and non-medication ways of handling and controlling it. The familiarity of Iranian nurses and physicians with the newly developed methods of assessing neonatal pain is limited. Therefore, the present study aims to compare the nurses' and physicians' knowledge of the standard procedures of pain assessment in premature neonates.

MATERIALS AND METHODS

In this descriptive cross-sectional study, 62 nurses and 48 physicians (110 individuals) from the general hospitals (Shariati, Vali-Asr, Mirza Kuchak Khan and Bahrami Hospitals and children medical center) located in Tehran, Iran, were selected based on census method in 2012.

Inclusion criteria for nurses were to have a related undergraduate degree or higher one (e.g. master, PhD) and being employed as a registered nurse in chosen hospitals and have at least 1 year experience in pediatric or neonatal caring, Also, being a pediatric resident who currently involved in caring of neonates was the factor for selecting the physicians.

Instrument

Survey instrument was a researcher made questionnaire which was developed and applied to collect the needed data. It was consisted of two sections; the first one was included with the questions about demographical characteristics of the physicians and nurses (9 questions about sex, age, marital status,

education, work experience, training courses experience, number of children). For the second part, the questions were designed in a way to assess their knowledge of behavioral and physiological symptoms, facial changes, and tone and body movement of in pain infants (14 questions about heart rate, respiratory rate, respiration quality, blood pressure, pupil changes, skin color, voice changes etc); these factors were based on behavioral and physiological indicators applied in standard procedures of pain assessment, namely, NFCS, PIPP, NIPS, and CRIES. It is noteworthy that the included questions in the questionnaire were designed based on a comprehensive study of related researches (i. e. published articles and books) which have been conducted recently (5)-(7) -(8)-(10) -(17). The answers were multiple choices and more than one answer was possible. there was no golden standard for scoring of this questionnaire so the individuals' knowledge of the related issue was quantified and categorized into three scales, namely, inappropriate (<50%), relatively appropriate (50-70%), and appropriate (> 70%).

In order to determine the validity of the questionnaire, facial and content validity method was applied. In other words, the prepared questionnaire was sent to 10 nurse, 10 physicians and 10 faculty members of nursing sciences and midwifery department of Tehran University of Medical Sciences who were professional about neonatal care to applying their ideas in order to improvement of the questionnaire. Furthermore, the internal reliability of the questionnaire was tested by applying Cronbach's alpha coefficient which was calculated to be 0.8.

Procedure

The necessary ethical approval and permissions were received from research ethical committees of Tehran University of Medical Sciences, nursing and midwifery faculty and all 5 hospitals. The researcher referred to NICU of hospitals on different days and after giving the nurses and physicians information about the study and obtaining a written consent, each one has this opportunity to decline participation, the questionnaires were given to them at the beginning of their shifts and collected at the end. In fact, in this way which was purposefully chosen, the participants' access to data bases and getting any consultation was prevented.

SPSS software V. 20 was applied for data analysis. Descriptive and analytic statistics tests like Man Whitney, Kroskal-valis, and spearman correlation coefficient were used. In the present study, $p < 0.05$ was pointed as the significance level of the correlations among the factors.

Furthermore, the following moral codes were taken into account which all participants documents will keep confidential and their email address was received to send them the resukts of study, if they willing to.

RESULTS

Considering the demographical characteristics of the study group, the average age of the nurses and physicians were respectively 32.36 (± 6.03), and 33.89 (± 5.71) years. Also, the average amount of the nurses' and physicians' clinical experience was 7.80 (±5.93) and 6.85 (± 5.89) years, respectively. Furthermore, the nurses' and physicians' experience, on average, in delivering medical services in NICU was respectively 4.47 (± 4.73) and 1.91 (± 3.66) years. It should also be mentioned that the selected nurses and physicians, on average, had respectively 0.65 (± 0.81) and 0.66 (± 0.96) children. The rest of the demographical information is shown in Table 1.

The nurses' and physicians' knowledge of the physiological indicators of pain assessment criteria was showed that the average scale of nurses' and physicians' knowledge of physiological changes of the infants was respectively 48.75 and 65.54. In other words, the physicians were more familiar with the physiological indicators than the nurses were. Also, statistical analysis showed a significant difference ($p<0.008$) between the level of nurses' and physicians' knowledge of the issue, which is shown in Table 2. However, the averages scale of the nurses' and physicians' knowledge of the facial changes of in pain infants (i. e. corresponding to the behavioral indicators of pain assessment criteria) were 62.73 and 45.81, respectively. It shows that the nurses' level of knowledge in this issue is significantly ($p<0.004$) higher than the physicians'. In addition, there was a significant difference ($p<0.033$) between the nurses' and physicians' knowledge of the changes in the voice of in pain infants. The average scale of the nurses' and physicians' knowledge in this issue was 60.76 and 48.45, respectively. Although the average scale of nurses' knowledge about the physical movement of an in pain infant was 60.14, which is higher than 49.28 of the physicians', the analysis did not show a significant difference ($p= 0.065$) between their scales; the result is also shown in Table 3. In consideration with the first aim of this study, the results showed that the nurses' knowledge about physiological and behavioral indicators of pain assessment criteria is 59.16, which is also higher than 50.60 of the physicians'. However, as it is shown in Figure 1, this difference was not found to be significant ($p = 0.161$).

In relation with the second aim of the present study (i. e. assessing the relationship of the nurses' and physicians' demographical characteristics with their level of knowledge about aforementioned issues) the

results showed that the level of female nurses' knowledge was 32.27, which is higher than 8.50 of the male nurses'. However, a significant difference was not found between their level of knowledge ($p = 0.068$). On the other hand, there was a significant difference ($p = 0.011$) between the male and female physicians' knowledge. In fact, it was found that the average scale of male physicians' knowledge 29.92 is higher than 18.87 of the females'.

There was also a significant difference ($p = 0.006$) in the level of nurses' and physicians' knowledge who attended the related educational training before starting their career in NICU with the ones who did not have that experience. Unsurprisingly, the former ones had more required knowledge of the infant pain. The results also showed a relatively significant relationship between the level of nurses' knowledge and the age ($r = 0.012$), the experience in delivering medical services ($r = 0.048$), and the years of working in NICU ($r = 0.028$). However, the relationship between the physicians' level of knowledge and the age ($r = 0.293$), the experience in delivering medical services ($r = 0.264$), and the years of working in NICU ($r = 0.378$) was found to be poor.

DISCUSSION

The present study was aimed to compare and assess the level of nurses' and physicians' knowledge of standard procedures of assessing pain in premature neonates. The participants were selected from the NICU of educational hospitals of Tehran University of Medical Sciences in 2012. Based on the results, the nurses' knowledge of the standard assessment criteria of infant pain, on average, was higher than the physicians'; except in the issue of physiological changes of in pain infants. However, the difference was not statistically significant.

It should be mentioned that 71% of the nurses and 50% of the physicians were members of research units in their related fields of work. The results showed that their level of knowledge of the standard assessment criteria of an in pain premature infant was relatively acceptable. In a study conducted by Schultz et al., only 33% of the Australian medical students had enough knowledge about the medical instructions of managing infant pain, which is lower than the level of physicians' knowledge recorded and shown in the present study (18).

As it is mentioned before, the nurses had lower knowledge about the physiological signs of infant pain, in comparison with the physicians' knowledge. According to a study conducted by Choules, the most common signs of infant pain, from the nurses and physicians point of view, were reported to be facial changes followed by cry, instability, and the increase of heartbeat and oxygen saturation level of blood (19). The reason of why the nurses in most of the studies have low level of knowledge about the physiological signs of infant pain is probably related to the fact that they do not have educational training after graduation. In other words, they are likely to forget the related scientific facts and methods of their works if they only spend their times in the hospitals and do not have periodical training. Therefore, it is certainly useful for them to have such programs which can keep them up to date. Based on the results of a conducted study by Coffman, the increase of heartbeat and respiration rate, behavioral indicators, irritability, instability, and cry are concluded to be the most common signs applied by the nurses to identify the infant pain (20). Also, Coffman reported that the nurses' level of knowledge about the physiological signs is higher than their knowledge of behavioral symptoms, which is in contrast with the results of the present study.

Based on the results, the nurses and physicians who had educational training were found to have high level of knowledge. Also, a poor relationship was found between the nurses' and physicians' knowledge and their age, marital status, experience of delivering medical services, experience from working in NICU, time of work on daily basis. The studies showed the ability of nurses to identify infant pain increases by aging, gaining experience from medical services and working in NICU. It is also reported in this study that having children is a positive factor because it helps them identify the infant pain (5).

Another factor which was found to have positive role in the increase of nurses' and physicians' knowledge of the behavioral and physiological symptoms of infant pain was the experience of attending related educational training. Therefore, the increase of such training programs in order for the nurses and physicians to gain more knowledge should be taken into account. In a study conducted by Mathew et al., on 81 nurses who were delivering medical services in NICU, it is reported that almost half of the nurses believed that infants feel lesser pain, in comparison with its level felt by the adults. On the other hand, those who had educational training of pain control had more knowledge about the infant pain and its criteria. It is also mentioned that none of the research units of the studied hospitals applied proper tools and/or procedures to assess and categorize pain (21).

The result of a conducted study by Chiang et al., showed that including the students of nursing sciences in specific educational training improves the level of knowledge, approach and proficiency of them in managing infant pain. Based on this result, the authors suggest that the nursing sciences faculties should

add related issues of infant pain assessment to their main curriculum (15). In another study conducted by Chiang on 243 students of nursing science in Taiwan, the usefulness of educational programs of pain control in the improvement of the students' knowledge, approach, and proficiency in controlling infant pain is concluded (15).

Based on the results of a study conducted by Malviya et al., the complexity of identifying pain, the lack of proper tools to assess and identify it, poor reports given by the nurses and physicians about the occurrence of pain, and the shortness of the nurses' and physicians' knowledge are introduced as the main factors impeding the ways of identifying and managing pain in the infants who suffer from cognitive impairment. In this study, it was also showed that the best interventions for enhancing the pain management in the infants with cognitive impairment and high risk groups of population can be the development of proper and efficient medical tools of pain assessment, and related educational training programs (22). Schultz reported that the physicians who had more than one year of experience with the infants had better ability to identify and assess the infant pain. Presenting the medical students with the related educational programs is proposed in this study as a way to enhance their understanding and knowledge of the infant pain (18). In a study conducted by Gudarzi, attending educational training after graduation is found to have positive effects on the enhancement of nurses' knowledge, understanding and performance in NICU. In fact, this shows that the main step towards the enhancement of health and treatment services quality in societies is to develop educational programs for at service nurses and physicians (17). As it can be inferred from the results of the three aforementioned studies, education plays an important role in enhancing the knowledge, understanding, and effectiveness of pain assessment. This is also in line with the main result of the present study.

Table.1. Absolute and relative frequency of sex, marital status, shift status, educational program experience, having children in nurses and physicians of NICU

Physicians		Nurses			**population / frequency**
Percentage	number	percentage	number		**demographic profile**
50	24	3.2	60	female	sex
50	24	96.8	2	male	
100	48	100	62	sum	
33.3	16	29	18	single	Marital status
66.7	32	69.4	43	married	
0	0	1.6	1	divorced	
0	0	0	0	Widow	
100	48	100	62	sum	
31.8	14	21	13	morning	Shift status
0	0	1.6	1	evening	
0	0	1.6	1	night	
68.2	30	75.8	47	rotation	
100	44	100	62	sun	
60.1	26	68	40	yes	Experience of participation in training program
39.9	18	32	19	No	
100	44	100	59	Sum	
40.4	19	45	28	yes	Having children
59.6	28	55	34	no	
100	47	100	62	sum	

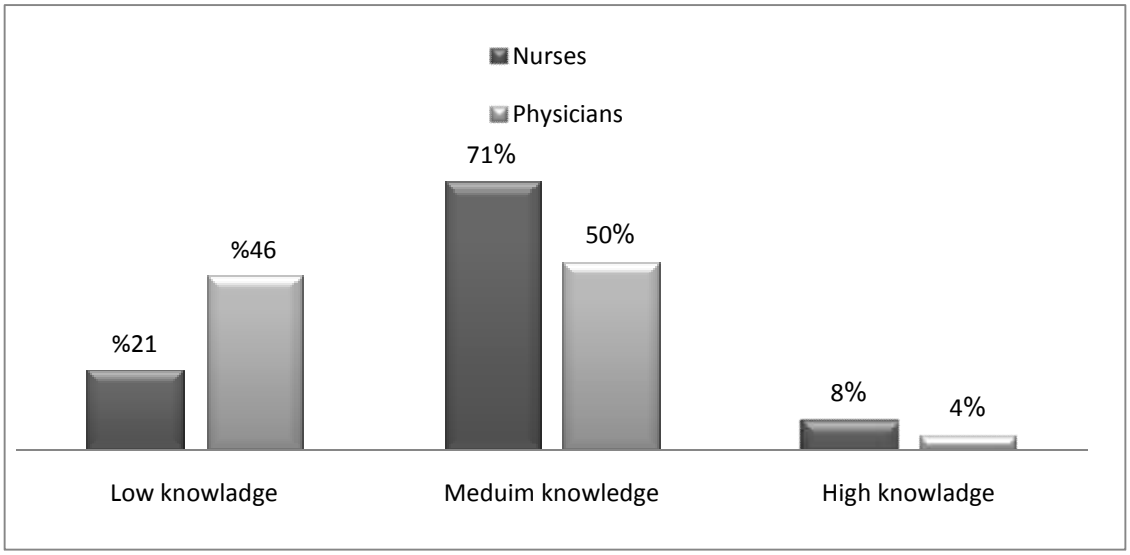
Table2. Absolute and relative frequency of NICU nurses and physicians knowledge

Test result	Physicians		Nurses		**population** **Frequency** **Physiological knowledge**
	Percentage	**Number**	**Percentage**	**Number**	
Mann – Whitney 2/660 Z= - 0/008 P= The different is significant	8.5	4	7.9	5	(50) Low %
	87.2	41	90.5	57	Medium %) 50-70
	4.3	2	1.6	1	High %<) 70(
	100	47	100	63	Sum
	64.54		48.75		Mean

Tables 3.Absulote and Relative frequency of Behavioral changes (Facial, Voice and Body movement) knowledge of Nurses and Physicians of NICU

Test Results	Physicians		Nurses		**Population** **Frequency** **Behavior parameters knowledge**	
	Percentages	**Numbers**	**Percentages**	**Numbers**		
Mann-Whitney Z= - 2.841 P= 0.004 Significant	59.6	28	38.1	24	Low >) 50(%	Facial expiration
	40.4	19	61.9	39	Medium)50-70(%	
	0	0	0	0	High<) 70 (%	
	100	48	100	63	Sum	
	45.81		62.73		Mean	
Mann-Whitney Z= - 2.130 P= 0.033 Significant	44.7	21	27	17	Low >) 50(%	Voice Changes
	55.3	26	73	46	Medium)50-70(%	
	0	0	0	0	High<) 70 (%	
	100	47	100	63	Sum	
	48.45		60.76		Mean	
Mann-Whitney Z= - 1.846 P= 0.065 Significant	55.3	26	34.9	22	Low >) 50(%	Body movement changes
	29.8	14	39.7	25	Medium)50-70(%	
	14.9	7	25.4	16	High<) 70 (%	
	100	47	100	63	Sum	
	49.28		60.14		Mean	

Figure.1. Comparison of total knowledge of physiological and behavioral pain criteria of physicians and nurses



CONCLUSION

The issue of infant pain has still unclear spots to be discussed and studied. Further studies can clarify this issue and bring a moral and humane caring plan for the infants. The results of the present study and previously conducted ones in this field show that the nurses' and physicians' knowledge of the criteria of assessing infant pain is not satisfactory. In fact, one abovementioned factor which is also reported by previously conducted studies is that there is a relationship between attending educational training and the level of knowledge of the issue. This shows the necessity of developing related educational programs in order for the nurses and physicians to broad their horizon over the infant pain assessment, its criteria, and related tools and procedures. The results of this study can be used as guidance for developing proper medical services, management strategies in delivering medical services, research and educational plans for the nurses and physicians with the aim of enhancing the quality of delivering medical services in NICU. Considering the importance of infant pain assessment, especially in the premature ones, and the results of this study, the following suggestions are presented by the authors which can be useful in enhancing the nurses' and physicians' knowledge of infant pain:

- Holding regular educational programs about the infant and neonatal pain assessment for at service nurses and physicians,
- Supporting the nurses and physicians who include the infant pain assessment procedures into their daily work instructions,
- Paying more attention to the issue of infant pain and its related assessment procedures in the nursing science and medical faculties.

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