

## Original Article

# Comparing the Effects of Education through Compact Disk and Social Media on Knowledge and Practice Regarding the Assessment of Preterm Infant Behavior among Nurses in Neonatal Intensive Care Units

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### ABSTRACT

**Background:** Nurses in neonatal intensive care units (NICUs) need adequate professional knowledge and skills for providing quality developmental care to premature newborns. **Objectives:** This study aimed to compare the effects of education through compact disk (CD) and social media (SM) on knowledge and practice regarding the assessment of preterm infant behavior (APIB) among nurses in NICUs. **Methods:** This quasi-experimental study was conducted on fifty NICU nurses. They were randomly allocated to a CD and a SM group. The intervention for both the groups was the same and consisted of education about APIB. Participants' APIB-related knowledge and practice were assessed before and after the intervention using a researcher-made knowledge questionnaire and the APIB checklist, respectively. Data were analyzed through the Chi-square, the independent-samples *t*, and the paired-samples *t*-tests as well as the analysis of covariance. **Results:** The pretest mean scores of knowledge and practice were, respectively,  $9.72 \pm 4.95$  and  $207.64 \pm 109.49$  in the SM group and  $9.16 \pm 5.94$  and  $209.88 \pm 110.46$  in the CD group. After the study intervention, these values significantly increased to  $14.80 \pm 1.80$  and  $361.96 \pm 38.24$  in the SM group ( $P < 0.05$ ) and  $12.46 \pm 2.10$  and  $295.44 \pm 53.30$  in the CD group ( $P < 0.05$ ). Although there were no significant differences between the groups regarding the pretest mean scores of knowledge and practice ( $P > 0.05$ ), the posttest mean scores of knowledge and practice in the SM group were significantly greater than the CD group ( $P < 0.05$ ). **Conclusion:** SM-based education is more effective than CD-based education in improving APIB-related knowledge and practice among NICU nurses.

**KEYWORDS:** Compact disk, knowledge, practice, preterm infant, social media

## INTRODUCTION

Prematurity is one of the most important issues in neonatal nursing. By definition, prematurity is birth before the gestational age of 37 weeks. In 2015, around fifteen million premature newborns were born worldwide, constituting 15% of all newborns in that year.<sup>[1,2]</sup>

Prematurity is associated with many different physical, behavioral, familial, and socioeconomic complications.<sup>[3]</sup> It accounts for 75% of neonatal mortality. Moreover, 30%–50% of extremely premature newborns die worldwide.<sup>[2]</sup>

The Newborn Individualized Developmental Care and Assessment Program (NIDCAP)<sup>[4]</sup> is an evidence-based strategy for improving neonatal developmental outcomes,

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particularly among premature newborns. However, most nurses in developing countries receive limited, if any, education about this program.<sup>[5]</sup> Studies highlighted that education for nurses is necessary to promote their compliance with the standards of developmental care.<sup>[5,6]</sup> However, there are limited educational programs on developmental care for nurses who work in neonatal intensive care units (NICUs) in Iran.<sup>[6]</sup>

Although traditional teaching methods are widely used for providing education to nurses, these methods are no longer sufficient to address rapid advances in medical sciences and increasing demands of nurses. Therefore, electronic teaching methods have become prevalent in last decades. Using compact discs (CDs) is one of the electronic methods for providing education to nurses.<sup>[7]</sup> CD-based education provides the opportunity for learning in a comfortable place and condition, is flexible, reduces the need for face-to-face education, and hence, reduces the need for equipment and staff.<sup>[8,9]</sup>

Education through mobile phone is another electronic method for education. In this method, learners can access educational materials at any time and location. Moreover, it provides the opportunity for the exchange of information in groups and via social media (SM).<sup>[7]</sup>

Electronic teaching methods for providing nurses with education about professional skills seem to produce beneficial results.<sup>[10]</sup> Some reported the positive effects of virtual education on nurses' psychological empowerment<sup>[11]</sup> and clinical skills.<sup>[12]</sup> However, a study reported that compared with education through short message service, traditional lecture-based education was more effective in improving nurses' knowledge about diabetic ketoacidosis.<sup>[13]</sup> Another study also reported that CD-based education was as effective as traditional lecture-based education in improving nursing students' knowledge.<sup>[14]</sup> Moreover, there are limited comparative studies into the effects of education using CD and SM. Therefore, the present study was conducted to address these gaps.

## Objectives

The aim of the study was to compare the effects of CD- and SM-based education on knowledge and practice regarding the assessment of preterm infant behavior (APIB) among nurses in NICUs.

## METHODS

### Design and participants

This quasi-experimental study was conducted in 2019 using a single-blind parallel-group design. Participants were fifty nurses recruited from Imam Reza, Mohammad Kermanshahi, Hazrat Masoumeh, and Imam Hossein Hospitals, Kermanshah, Iran. Inclusion

criteria were a bachelor degree or higher in nursing, an NICU work experience of more than 6 months, access to a mobile phone, personal computer, and Internet, and ability to use social networks using mobile phone. Participants were excluded if they did not regularly attend the intervention sessions, did not completely answer the study instruments, and changed their unit during the study. All eligible nurses in the study setting were invited to the study and allocated to the study groups (i.e., a CD group and a SM group) via a simple randomization method with a 1:1 ratio.<sup>[15]</sup> The name of each participant was written on a piece of paper, and all papers were put in an opaque bag. Then, the researchers who allocated the intervention to the groups were blind. The papers were randomly taken from the bag one by one and alternately allocated them to the groups.

Each two groups received the intervention in separate times. First, CD group received educational contents on CD. Then, SM group received educational contents in the Telegram channel or WhatsApp channel after that the CD group completed their educations and evaluated by researcher.

It is needed to note that the educational contents which uploaded into Telegram channel or WhatsApp channel were not available for other participants. Participants did not know other participants that there were in the groups. Furthermore, joining by the link of channel or adding someone by participants into the channel was limited by the researcher who uploaded the educational contents into the channel. Hence, the possibility of exchanging of information was reached at least.

Sample size was calculated using the findings of a pilot study. In the pilot study, the pre- and posttest mean scores of practice were  $243 \pm 90.60$  and  $310 \pm 36.42$ , respectively. Then, with a confidence level of 95%, a power of 80%, and a probable attrition rate of 10%, sample size was calculated to be 25 nurses per group.

### Data collection instruments

The following three instruments were used for data collection.

#### *A demographic questionnaire*

This questionnaire included items on participants' demographic and professional characteristics, namely age, NICU work experience, education level, attendance in International Computer Driving License (ICDL) courses, daily hours of using mobile phone, and familiarity with NIDCAP.

#### *Knowledge assessment questionnaire*

Participants' knowledge was assessed using a 17-item researcher-made questionnaire developed based on

the guideline for NIDCAP.<sup>[4,16]</sup> The total score of this questionnaire was 0–17, and higher scores showed greater knowledge. For content validity assessment, content validity ratio and index were calculated. Accordingly, ten pediatric nursing instructors and neonatal specialists were asked to rate the essentiality of the items on a three-point scale and the simplicity, relevance, and clarity of the items on a four-point scale. Then, the content validity ratio and index of the questionnaire were calculated to be 0.62 and 0.79, respectively. The reliability of the questionnaire was also assessed through the internal consistency method which revealed a Cronbach's alpha of 0.87 for the knowledge questionnaire.

#### *The assessment of preterm infant behavior checklist*

This checklist was used to assess nurses' APIB-related practice. It consisted of 87 items on behavioral reactions and symptoms in the autonomic, motor, state organization, attention, and self-regulation systems.<sup>[4,16]</sup> The reliability of this checklist was assessed through inter-rater reliability assessment method, in which two raters simultaneously used the checklist to rate the behavior of five infants in five videos. The kappa coefficient for inter-rater agreement was 0.78.

#### **Intervention**

Before the intervention, the participants completed the knowledge and practice questionnaire, as well as the assessment of preterm infant behavior (APIB) checklist. For the assessment of APIB-related practice, participants watched five videos of five premature newborns and completed the APIB checklist for them. Evaluation of the knowledge and practice of nurses was performed in two separate working shifts. The study intervention was education about the APIB which was developed based on the guideline for NIDCAP and simultaneously implemented for both the groups. The intervention for participants in the CD group was implemented through providing them with two CDs each containing four sessions. Educational materials on CDs were 5 videos, and participants were asked to study the content of each CD in 2 weeks. Education to participants in the SM group was provided using either the Telegram or the WhatsApp mobile phone application. Accordingly, they were added by a researcher, who was a nurse with master degree, to a Telegram or a WhatsApp channel which had exclusively been created for the sake of the present study. Educational materials for this group were designed for 2 weeks and were uploaded every 2 days. Participants could access and study the materials in 2 weeks. The contents of CDs and SM channel were the same.

It is noteworthy that participants in either of the groups had no access to the materials provided for their counterparts in the other group.

After the intervention ended, all nurses were asked again to answer to nurses' knowledge questionnaire and APIB checklist in two separate shifts. For the assessment of APIB-related practice, participants watched five videos of five premature newborns and completed the APIB checklist for them.

Videos contained the behaviors, reactions, and symptoms of the premature newborns while they were in bed or were receiving medical or nursing procedures. The videos used at pretest and posttest were not the same.

#### **Ethical considerations**

This study obtained ethical approval from the Ethics Committee of Tabriz University of Medical Sciences, Tabriz, Iran (code: IR.TBZMED.REC.1397.766). All participants were informed about the study aims and advantages and were ensured of confidential data management, voluntary participation in the study, and freedom to withdraw from the study at will. Written informed consent was obtained from all participants.

#### **Data analysis**

Data analysis was performed using the SPSS software v. 16 (SPSS Inc., Chicago, IL, USA). The data were presented using mean, standard deviation, absolute frequency, and relative frequency. The normality of the distribution of the data was assessed through the Kolmogorov–Smirnov test which showed that the distribution of all study variables was normal. Accordingly, the independent-samples *t* and the Chi-square tests were used for between-group comparisons respecting participants' demographic characteristics and mean scores of APIB-related knowledge and practice. Moreover, the paired-samples *t*-test was used for within-group comparisons. The analysis of covariance was also used for between-group comparisons respecting the mean scores of APIB-related knowledge and practice adjusted for the pretest mean scores of knowledge, practice, and other potential confounders. The level of significance was set at <0.05.

#### **RESULTS**

Participants were fifty NICU nurses (25 in each group) [Figure 1] with an age mean of 36.04 and 36.12 years for the CD and SM groups, respectively. Most participants had master's degree (64%), and around one-third of them had bachelor's degree (36%). The mean of work experience was  $10.96 \pm 5.79$  years in the CD group and  $11.40 \pm 6.86$  in the SM group. Most participants in the CD and the SM groups held ICDL certificate (56% vs. 76%). Moreover, most participants in the CD group and around half of them in the SM group

were familiar with NIDCAP (64% vs. 48%). Based on the results of the independent-samples *t* and the Chi-square tests, there were no statistically significant differences between the groups respecting participants' demographic and professional characteristics [ $P > 0.05$ ; Table 1].

The independent-samples *t*-test showed no statistically significant difference between the groups regarding the pretest mean scores of APIB-related knowledge and practice [ $P > 0.05$ ; Table 2]. However, the posttest mean scores of APIB-related knowledge and practice in the SM group were significantly greater than the CD group ( $P = 0.001$ ).

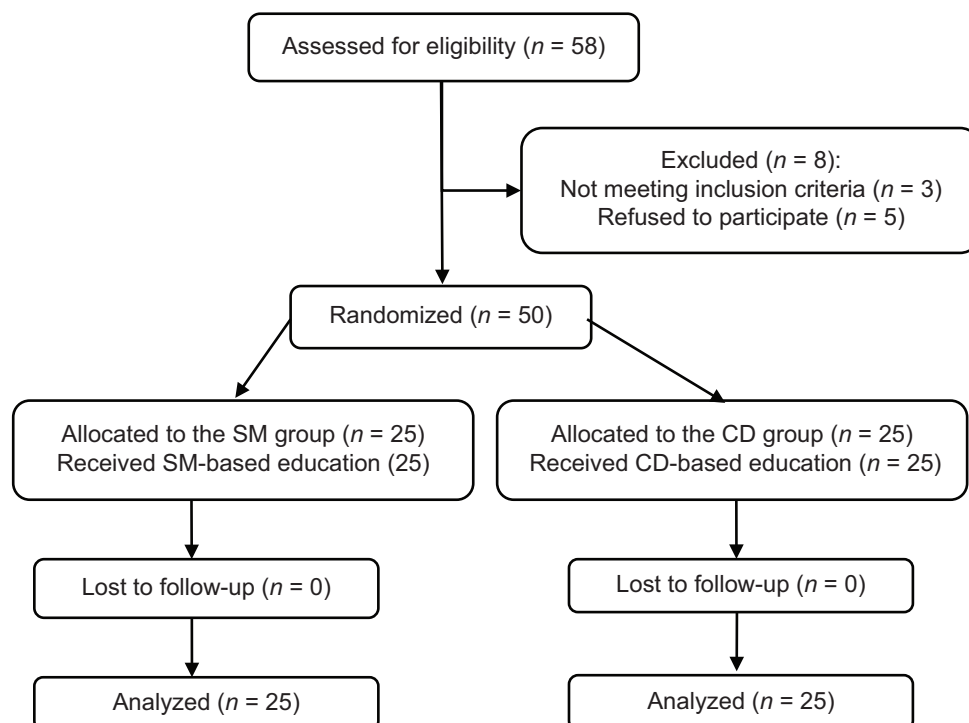
The results of the paired-sample *t*-test showed that the mean score of participants' APIB-related knowledge significantly increased in both the CD and SM groups by 3.3 and 5.08 points, respectively [ $P > 0.05$ ; Table 2]. Similarly, the mean score of APIB-related practice significantly increased in both the CD and SM groups by 85.56 and 154.32 points, respectively [ $P > 0.05$ ; Table 2]. The results of the analysis of covariance showed that when adjusted for the pretest mean scores of knowledge and practice and potential confounders (namely educational level, work experience, and age), the between-group differences respecting the pre- and posttest mean difference of APIB-related knowledge and practice were statistically significant [ $P < 0.05$ ; Table 2].

## DISCUSSION

**Table 1: Between-group comparisons regarding participants' demographic and professional characteristics**

Characteristics	Groups, mean±SD		P
	CD, n (%)	SM, n (%)	
Educational level			
Bachelor's	10 (40)	8 (32)	0.16 <sup>a</sup>
Master's	15 (60)	17 (68)	
ICDL certificate			
Yes	14 (56)	19 (76)	0.24 <sup>a</sup>
No	11 (44)	6 (24)	
Familiarity with NIDCAP			
Yes	16 (64)	12 (48)	0.21 <sup>a</sup>
No	9 (36)	13 (52)	
Hours of using mobile phone each day			
<1	3 (12)	3 (12)	0.27 <sup>a</sup>
1-2	10 (40)	6 (24)	
2.1-3	7 (28)	4 (16)	
3.1-4	4 (16)	7 (28)	
4.1-5	1 (4)	4 (16)	
>5	0 (0)	1 (4)	
Age (years)	36.04±6.27	36.12±7.01	0.22 <sup>b</sup>
Work experience (years)	10.96±5.79	11.40±6.86	0.17 <sup>b</sup>

<sup>a</sup>The results of the Chi-square test, <sup>b</sup>The results of the independent-samples *t*-test. SD: Standard deviation, NIDCAP: Newborn Individualized Developmental Care and Assessment Program, CD: Compact disk, SM: Social media, ICDL: International Certificate of Digital Literacy



**Figure 1: The flow diagram of the study**

Findings showed that both CD- and SM-based methods were effective in significantly improving nurses' APIB-related knowledge and practice. Consistent with our findings, previous studies showed that educational interventions were effective in improving nurses' knowledge and attitudes.<sup>[17,18]</sup> A study also showed that virtual education significantly improved psychological empowerment among nurses in neonatal care units.<sup>[11]</sup> Another study found that education through the CD-based and the demonstration methods was effective in improving vital signs measurement skills among nursing students.<sup>[19]</sup>

Study findings showed that SM-based education was more effective than CD-based education in improving nurses' APIB-related knowledge and practice. This finding may be due to the easy access of participants in the SM group to educational materials through mobile phone at any time and place. The findings of a former study also showed that computer-assisted education was more effective than traditional face-to-face education in improving handwashing practice among nursing students.<sup>[20]</sup> A systematic review also reported that web-based distance learning methods were as effective as or even more effective than traditional teaching methods in improving knowledge, skills, and self-efficacy among nurses and noted that most learners prefer web-based distance learning methods due to their flexibility, time efficacy, and learners' greater autonomy.<sup>[21]</sup> Web-based education facilitates the individualization of learning through decentralizing education and promoting learner's autonomy. Moreover, it creates the opportunity for providing textual and audiovisual educational materials, creates a safe environment for expressing opinions, and

hence, promotes deep learning and increases learners' interest in learning.<sup>[21,22]</sup> Similarly, a clinical trial showed that as a complementary method in medical education, mobile-based video clips significantly reduced students' stress and improved their motivation for learning, confidence in doing exercises, and satisfaction with classroom activities because they could frequently watch and review clips.<sup>[10]</sup> Another study reported the greater effectiveness of video-based lecture than traditional lecture in promoting students' learning, attracting their attention, and improving their motivation and concentration.<sup>[23]</sup> Several other studies also confirmed that electronic learning was more effective than traditional lecture.<sup>[24-26]</sup>

Mobile phones are becoming widely available throughout the world and are turning into one of the major teaching methods in higher education.<sup>[27]</sup> Video clips are also widely used for education. A study showed that video clips regarding clinical skills watched with mobile phones were more convenient for medical students than clips watched on personal computer.<sup>[28]</sup> Video-based education through mobile phones in nursing can also improve learning outcomes, improve learners' access to educational materials, and facilitate transition from teacher-based education to student-based learning.<sup>[29]</sup> Mobile-based education can also improve motivation for learning particularly among new generations who widely use mobile phones. A study reported that motivation for learning had direct relationship with satisfaction with classroom and concluded that mobile-based education can improve both motivation for learning and satisfaction with classroom.<sup>[30]</sup> The most useful feature of mobile-based education is learners' unlimited access to educational materials at any time and place. A study reported that

**Table 2: Within- and between-group comparisons regarding the mean scores of assessment of preterm infant behavior-related knowledge and practice**

Variables	Group/time			P <sup>a</sup>
	Before, mean±SD	After, mean±SD	Mean difference	
APIB-related knowledge				
SM	9.72±4.95	14.80±1.80	5.08	0.001
CD	9.16±5.94	12.46±2.10	3.3	0.018
P <sup>b</sup>	0.719	0.001		
Betweengroup comparison		2.63±0.96		
P <sup>c</sup>		0.024		
APIB-related practice				
SM	207.64±109.49	361.96±38.24	154.32	0.001
CD	209.88±110.46	295.44±53.30	85.56	0.002
P <sup>b</sup>	0.943	0.001		
Betweengroup comparison		-66.37±25.70		
P <sup>c</sup>		0.036		

<sup>a</sup>The results of the paired-sample *t*-test, <sup>b</sup>The results of the independent-samples *t*-test, <sup>c</sup>The results of the analysis of covariance adjusted for the effects of educational level, work experience, and age. SD: Standard deviation, CD: Compact disk, SM: Social media, APIB: Assessment of preterm infant behavior

mobile-based education promoted students' learning through providing them with the opportunity to frequently review educational materials, promoting their autonomy, and increasing their responsibility towards learning.<sup>[10]</sup>

Contrary to our findings, a study reported that face-to-face education is more effective than distance short-term education in improving psychological empowerment. In this regard, some of the reason can be mentioned. First, the learners of distance short-term education are present in their work environment during the online courses so that they might not be able to focus properly on the educational contents due to the intellectual preoccupation of the work environment, compared to those who received face-to-face education. Another important reason can be that the receivers of distance short-term education do not study the educational resources carefully and only participate in these courses to obtain a required score to pass the courses, which leads to reduce their motivation.<sup>[31]</sup> Another study also showed the insignificant difference between the effects of traditional education and CD-based education on students' learning.<sup>[14]</sup> Similarly, a study on occupational physicians reported that the effects of electronic learning and traditional teaching on knowledge were the same.<sup>[32]</sup> Another study found that compared with education through the short message service, traditional lecture-based education was more effective in improving nurses' knowledge about diabetic ketoacidosis. This difference might be due to the possibility of representing clear explanations by trainers and also asking questions by nurses. In addition, it is possible to represent educational contents in an organized manner. Moreover, the participants can be active and take notes while they receive traditional lecture-based education.<sup>[13]</sup> A meta-analysis study also showed that although electronic learning can be effective in improving learning outcomes in half of the cases, its effects are situational and are largely affected by many different confounders. That study concluded that no clear generalization can be provided about the effects of electronic learning.<sup>[33]</sup>

Mobile- and web-based teaching methods are also associated with some problems and disadvantages. For example, some learners may not have the necessary skills for using mobile phones or Internet or may not afford the costs of buying smartphone or personal computer.<sup>[10]</sup> Moreover, unreliable information on the web and malfunctioning of mobile phone or computer software and hardware can cause concerns and problems in learning. Another important disadvantage of these methods is that students may feel isolated and experience problems in participating in group discussions and expressing their opinions.<sup>[22,34]</sup> Producing educational

materials for mobile- and web-based education also necessitates sophisticated equipment, considerable compute skills, and large amounts of time and financial resources.<sup>[21,35]</sup> In addition, some aspects of nursing curriculum cannot be taught using electronic methods.<sup>[36]</sup>

Some participants were unfamiliar with SM-based education, did not have adequate time for participation in the study, or did not access Internet at home. We attempted to overcome these limitations by providing them with necessary equipment and facilities. Moreover, due to the limited access of users to the software of the computers in the study setting, we were compelled to use personal laptop to play videos during APIB practice assessment. In addition, the present study was conducted as a single-blind study because of lack of feasibility, which it was another limitation of our study.

## CONCLUSION

This study concludes that SM-based education is more effective than CD-based education in improving APIB-related knowledge and practice among NICU nurses. Therefore, SM-based education provided through mobile phone is recommended for improving learning and patient outcomes among nurses and nursing students. Education through mobile phones also helps nurses provide patients with necessary health information and support them to manage their conditions.

Conducting studies using double-blind design and also recruiting more participants with necessary equipment and facilities are recommended.

Studies are needed to assess the effects of SM-based education on knowledge, attitudes, and practice respecting different aspects of nursing among nurses in different hospital settings. For example, studies are recommended to assess the effects of SM-based education on self-efficacy, attitudes, documentation skill, and clinical practice of nurses in NICUs.

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## Conflicts of interest

There are no conflicts of interest.

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