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Implementing NIDCAP training in a low-middle-income country: Comparing nurses and physicians' attitudes

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ABSTRACT

Background: The Newborn Individualized Developmental Care and Assessment Program (NIDCAP) provides developmentally supportive environment for preterm infants and their families. Few studies evaluated staff perceptions about NIDCAP implementation and its effect on infant and parents and working conditions.
Aims: To assess the perception and experience of NICU staff during the NIDCAP implementation.
Study design: Cross-sectional anonymous online survey.
Subjects: 57 NICU staff (29 nurses and 28 doctors) who were present at least one year prior to and during the implementation of NIDCAP training in a tertiary care center.
Outcome measures: A standard questionnaire addressing attitude, perceived behavioral control, subjective norm, intention, behavior and NIDCAP impact related to NICU conditions was used after initiating developmental care activities and NIDCAP training in the unit from June 2014 to May 2018.
Results: Forty-six doctors and nurses filled the questionnaire; they scored ≥3 out of 5 on all the questionnaire items. Nurses scored significantly higher than doctors (mean 4.00 ± 036) versus (3.57 ± 0.30) ($p < 0.001$) on the overall NIDCAP score. Specifically, nurses scores were significantly higher for attitude ($p < 0.001$), perceived behavioral control ($p = 0.029$); subjective norm ($p = 0.011$), intention ($p = 0.024$) and behavior ($p < 0.001$) questions.
Conclusion: The implementation of NIDCAP in a low-middle income country was perceived as a positive experience for both nurses and doctors: It was thought to have improved infant care and wellbeing as well as the staff relationship with parents, however working conditions remained a challenge. More studies are needed to address areas of improvement for implementation.

1. Introduction

Premature infants are repeatedly exposed to stressful stimuli during their stay in Neonatal Intensive Care Unit (NICU) [1,2]. Studies have provided ample evidence that exposure to stressful stimuli such as painful procedures, noise and light have negative consequences on the future development of premature infants [3,4]. To ameliorate adverse neurodevelopmental outcomes due to stressors in the NICU several interventions were attempted in the past four decades [5]. One such intervention which has had worldwide support is the developmentally supportive care, founded on the principles of the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) [6–8]. NIDCAP is a model that provides developmentally supportive environment for preterm infants and their families and supports the balance between an infant's physiologic, motor and state subsystems [9–12]. NIDCAP focuses on two main approaches: individualized care and positively modifying the NICU settings to minimize stressors such as having quiet time to allow undisturbed sleep. NIDCAP targets five subsystems of infants' functioning: autonomic, motor, state regulatory/organizational, attentional/interactional and self-regulatory system. It tracks the degree of smoothness and modulation, regulation, and differentiation of these five subsystems [13]. Based on an infant's meticulous observations, individualized goals and recommendations for a plan of care are discussed with the infant's caregivers including parents. Studies have shown that infants cared for using this approach have less hospital stay [10,14,15], better brain development [12,16], more weight gain [12,14,17], less episodes of sepsis, less ventilatory assistance [12], and better growth and development after discharge home

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[12,14,18]. The NIDCAP approach also changes the organizational structure, philosophy, delivery of care and relationship between families and medical professionals [13]. It promotes parental bonding and decreases their stress level; in addition, it helps NICU staff in their ability to assess infants' well-being [19,20] and promotes their satisfaction [14,20–22]. Research addressing staff perception during the implementation of developmental care is limited. Few studies conducted in Sweden, France and the Netherlands showed that the staff perceived that the NIDCAP had as a positive impact on infants and parents [23]; while other studies reported the NIDCAP approach as time-consuming [8,20] and linked to worse working conditions [20].

The purpose of this study is to assess the perception and experience of NICU staff during the NIDCAP implementation; the study addresses the following questions:

1) What is the staff perception of the NIDCAP model's impact on their relationship with parents, their working conditions in the unit and on infants' wellbeing?
2) What is the difference between doctors and nurses' perception toward the implementation of NIDCAP model?
3) What is the relationship between the participants' characteristics and the overall NIDCAP score?
4) What are the barriers and challenges perceived by professionals during the NIDCAP implementation?

2. Methods

2.1. Design

A cross sectional design with an online anonymous survey was used to meet the objectives of this study.

2.2. Setting

The study was carried out in a 22-bed level IV neonatal intensive care unit (NICU), in Lebanon between July 2018 and February 2019. The NICU has around 250 admissions per year; among those 50% are low birth weight and 11% are very low birth infants. The NICU is equipped to the highest standards of care and nursing to infant ratio is one to one or one to two based on the acuity of infants.

2.3. Participants

All 57 NICU staff (29 nurses and 28 doctors) who were present at least one year prior to and during the implementation of NIDCAP training were invited to participate using the survey.

2.4. Procedure

The study was carried out in two phases.

2.4.1. Phase one from June 2014 to May 2018

During this period NIDCAP training and Developmental Care (DC) principals were initiated by a core group of health care providers, the NIDCAP trainees. The group consisted of one doctor and three nurses who later achieved certification as NIDCAP professionals, after 4 years of training. Many initiatives, education sessions and quality improvement projects were carried out in parallel to support DC and NIDCAP training.

During the 4 years training period, the NIDCAP trainees (the core group) implemented several interventions to promote staff awareness and knowledge about NIDCAP and DC. They developed and delivered regular educational sessions to all NICU nurses and doctors; they sent emails of a “weekly tip” to all NICU staff and pediatricians. Tips were written as either fun facts or questions about developmental care (example: “Did you know that father's touch increases paternal attachment levels?”). The NIDCAP core group developed a web-based course on DC that became mandatory for all NICU nurses and that was given to pediatric residents as part of their core curriculum lectures. They also formed taskforces composed of NICU nurses; each taskforce addressed the implementation of one aspect of DC or was involved in quality care improvement projects aiming to integrate DC into daily practice. Some examples include dedicating specific hours for quiet time in the unit, supporting infant positioning, encouraging parents to hold their babies and practice skin to skin or kangaroo care and raising parents' awareness about infants' cues and behaviors.

2.4.2. Phase two from June 2018 to February 2019

During this phase a survey adopted from Westrup and colleagues [22] in the English language was sent to all the staff involved via the internet using Lime Survey (Appendix 1). The survey is based on the theory of planned behavior which stipulates that perceived behavioral control reflects personal beliefs as to how easy or difficult it is to perform a certain behavior; the performance of a behavior is predicted from intention and from perceived behavioral control [24]. The theory of planned behavior correlates positively with the staffs' opinion after NIDCAP implementation [20]; it measures staff perception using 25 items divided into six factors: attitude (8 items), perceived behavioral control (4 items), subjective norm (4 items), intention (2 items), behavior (1 item) and NIDCAP impact related to working condition (6 items).

The items are formulated as statements using a 5 point Likert scale with answers ranging from 1 (totally disagree) to 5 (totally agree). The total scores per item vary for each factor: attitude is 40 points; perceived behavior, 20 points; subjective norm, 20 points; intention, 10 points; behavior five points and NIDCAP impact, 30 points. The total cumulative NIDCAP score is 125 points.

For the purpose of this study, we also added three open-ended questions pertaining to staff experiences during NIDCAP training implementation, in addition to demographic questions including gender, age, years of experience in NICU, and degree (Appendix 2).

2.5. Statistical analysis

The Statistical Package for Social Sciences (SPSS, version 25) was used for data analysis.

Descriptive statistics using means and standard deviations for continuous variables and percentages for categorical variables were used. Due to the small sample size, the means and standard deviations on the six factors of the survey were computed and compared between physicians and nurses using Mann-Whitney *U* test. The relationship between participants' characteristics and NIDCAP overall score was calculated using Kruskal Wallis test. A Box plot was used to display the overall patterns of responses with median, interquartile ranges, and upper and lower ranges of responses. We used Spearman correlation coefficients to look at relationship between the NIDCAP overall score and subscales for nurses and doctors.

The study was exempted from the Institutional Review Board committee of the university.

3. Results

3.1. Characteristics of participants

The survey was sent to 57 participants (29 nurses and 28 doctors) using a university-based lime survey. The response rate was 81% (96.5% for nurses and 64% for doctors). Most participants were female with a mean age of about 30 years. Slightly more than half of the nurses worked in the NICU for an average of 12.06 ± 6.19 years and all held a bachelor degree in nursing (Table 1).

Table 1
Characteristics of participants.

Total sample	NICU nurses	Doctors	P value
	N = 28	N = 18	
Gender			
Male n (%)	3 (10.7%)	2 (11.1%)	
Female n (%)	25 (89.3%)	16 (88.9%)	
Age (years)			
Mean ± sd	30.57 ± 6.90	28.17 ± 2.36	0.280
Education			
BS n (%)	28 (100%)	N/A[a]	0.265
Medical n (%)	N/A[a]	18 (100%)	

[a] N/A: not applicable.

3.2. Research question 1: what is the staff's perception of the NIDCAP model's impact on their relationship with parents, their working conditions in the unit and the infants' well-being?

Nurses stated that they had better relationships with parents after implementing NIDCAP than doctors (mean 4.36 ± 0.73 and mean = 3.58 ± 0.66) ($p = 0.009$) (Fig. 1, Item 21).

Nurses were more satisfied than doctors after NIDCAP training (mean = 4.18 ± 0.66 and 3.42 ± 0.71) ($p \leq 0.007$) (Fig. 1, item 20). Both nurses and doctors agreed that the NIDCAP had a positive impact on infant's wellbeing (mean 4.39 ± 1.10 and 4.17 ± 0.93) ($p = 0.299$) (Fig. 1; Item 4).

3.3. Research question 2: what is the difference between doctors' and nurses' perception toward the implementation of the NIDCAP model?

Both doctors and nurses scored ≥3 out of 5 on all the items of questionnaire. Overall scores were higher for nurses compared to doctors on the six subscales. Specifically, mean scores were significant for the attitude ($p < 0.001$), perceived behavior ($p = 0.029$); subjective norm ($p = 0.011$), intention ($p = 0.024$) and behavior ($p < 0.001$) (Table 2). Fig. 2 shows the median and interquartile range for the subcategories,

Looking at individual items, there were significant differences between nurses and doctors on several items (Fig. 1 - box plot) depicts the median and interquartile ranges. On the other side Nurses and doctors found that NIDCAP is time consuming; item 2 "*Using NIDCAP during care-giving is time consuming*" (mean = 3.39 ± 1.32 and 2.85 ± 1.28) and negatively affected workload; item 22 "*My workload increased after NIDCAP*" (mean = 3.00 ± 1.25 and 3.17 ± 0.72).They also perceived the implementation of NIDCAP was not well coordinated among the care team; item 23 "*There was lack of coordination between different professionals in implementing NIDCAP*" (mean = 3.25 ± 1.01 and 3.25 ± 0.86). In addition, nurses and doctors were neutral regarding the need for change in the physical environment for NIDCAP; item 24 "*The required changes in the physical environment were too demanding*" NIDCAP (mean = 3.39 ± 0.96 and 3.00 ± 0.74).

3.4. Research question 3: what is the relationship between participants' characteristics and the overall NIDCAP score?

In terms of educational background, Nurses scored significantly higher than doctors (mean 4.00 ± 036) versus (3.57 ± 0.30) ($p < 0.001$) on the total NIDCAP score. However, gender, age, years of experience showed no significant differences between the two groups. The nurses' overall scores showed significant positive correlations for all NIDCAP subscales except for the subjective norm (r = 0.3) (attitude (r = 0.7), intention (r = 0.7), behavior (r = 0.8) and NIDCAP impact (r = 0.5)). While doctors' showed significant positive correlations for all subscales except NIDCAP impact (r = −0.1) (attitude (r = 0.6), perceived behavior (r = 0.8), subjective norm (r = 0.8), intention (r = 0.8) and behavior (r = 0.8)).

3.5. Research question 4: what are the barriers and challenges perceived by professionals during the implementation of the NIDCAP?

This was reflected by the answers of (28/46) 60% staff to three open ended questions. To the first question (*How do you feel about having NIDCAP training in the NICU?*) 93% of the ones who answered said that "*NIDCAP training was an important and exciting experience*". They said that it "*improved the care of infants and is important for the wellbeing of infants, nurses and doctors*". To the second question (*How did the NIDCAP training change your way of delivering care to NICU babies?*) all those ones who answered said that "*NIDCAP changed the way they delivered care to the babies*" and 46% stated that "*after using NIDCAP, they were able to understand more infant behaviors and offer care according to infant cues and behaviors*". To the third and last question (*Why do you think NIDCAP training is or is not important to NICU nurses and babies?*) 44% of doctors and nurses stated that NIDCAP is important in general, around 70% stated that NIDCAP is important to understand infant cues and to better developmental outcome, and 30% stated that NIDCAP is important for nurses, families and other disciplines.

4. Discussion

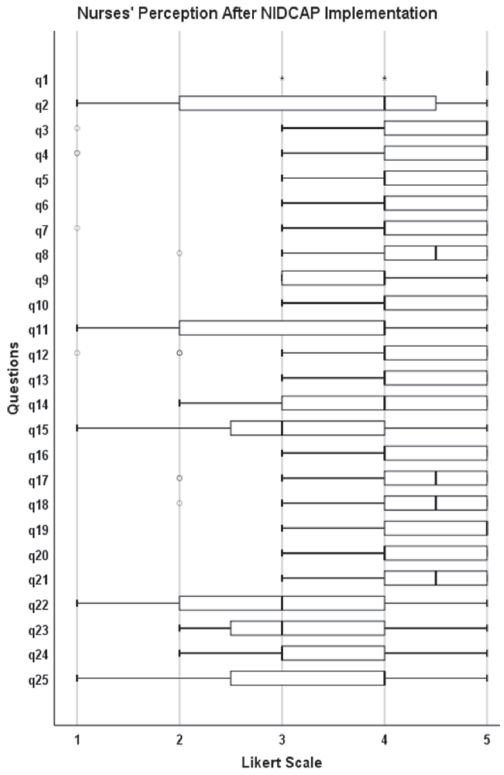
In this study, respondents were mostly positive about NIDCAP implementation. Nurses scored higher than doctors when comparing the overall scores of attitude, perceived behavior, intention and behavior. Both nurses and doctors perceived that NIDCAP model improved infant wellbeing, their relationship with parents and their working conditions.

Moreover, respondents agreed that NIDCAP requires additional time, increases workload and does not improve staff interdisciplinary coordination. This is in accordance with a study in the Netherlands that reported that while all respondents had overall positive responses; nurses had higher scores on attitude, behavioral control and a positive impact of the NIDCAP on NICU conditions than doctors [20]. Similarly, other studies showed that staff experienced positive impact of NIDCAP implementation [22,23].

In this study, nurses agreed that using NIDCAP improves the care of infants which is congruent with other studies where doctors and nurses agreed that NIDCAP improves infant wellbeing especially after reducing light, noise and activity [22,23,25]. Likewise, van der Pal et al. and Westrup reported that doctors and nurses perceived that NICDCAP as time consuming [20,22], while Mosqueda et al. who surveyed staff during NIDCAP implementation found that lack of coordination and noise control were the main obstacles in implementing NIDCAP [8]. In this study, despite regular and extensive education about NIDCAP and developmental care, most staff indicated that more education was needed. This is congruent to a study conducted in 20 neonatal units in Spain where 566 participants attending a developmental care and NIDCAP course perceived that more education was needed [26].

In terms of the Theory of planned behavior, Nurses scored higher than doctors in their intention of applying the NIDCAP. This indicates that their intention may translate to a change in behavior [24]. This is in agreement with van der Pal et al. who described that intention is important for the transition to actual implementation of NIDCAP [20]. It is evident in literature that the theory of planned behavior is widely used in heath related fields where behavior modification is needed.

The results of this study showed that nurses scored higher than doctors in all items related to the subscales of perceived behavior, subjective norm, intention and behavior, which could be explained by the fact that nurses were exposed to extensive knowledge about NIDCAP more than doctors and they had more years of experience in NICU.



Attitude: 8 items
q1: Using NIDCAP during care giving is an improvement of our care (mean=4.75).
q2: Using NIDCAP during care-giving is time consuming (mean=3.39)*
q3: It is enjoyable to use NIDCAP during care giving (mean=4.50)
q4: Using NIDCAP during care giving does not lead to an improvement in the health and development of the infants (mean=4.39)*
q5: The NICU care is good enough without NIDCAP (mean=4.11)
q6: Using the NIDCAP during care giving is not practical when carrying out my job (mean=4.14)*
q7: It is self-fulfilling to use NIDCAP during care-giving (mean=4.04)
q8: Using NIDCAP during care-giving is good for my job progress (mean=4.39)

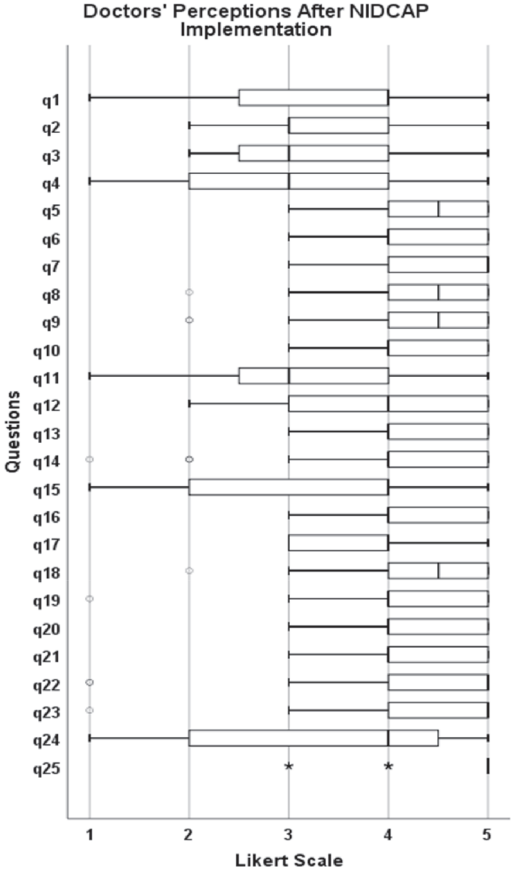
Perceived Behavior: 4 items
q9: I have enough NIDCAP knowledge to use NIDCAP during care-giving (mean=3.89)
q10: I have enough abilities to use NIDCAP during care giving (mean=4.18)
q11: It is my own choice if I want to use NIDCAP during care-giving (mean=3.29)
q12: It is not difficult for me to use NIDCAP during care giving if I want (mean=4.04)

Subjective Norm: 4 items
q13: The nurses think the NIDCAP method should be used during care giving (mean=4.36)
q14: The medical specialists think the NIDCAP method should be used during care giving (mean=4.07).
q15: The opinion of others is important to me in my choice to use NIDCAP during care giving (mean=3.00).
q16: I expect others to use NIDCAP during care-giving (mean=4.36)

Intention: 2 items
q17: I would like to use the NIDCAP method during my care-giving (mean=4.29)
q18: I am planning to use the NIDCAP method during care giving (mean=4.32)

Behavior: 1 item
19: I use the NIDCAP method during care giving (mean=4.54)

NIDCAP impact: 6 items
20: My job satisfaction improved after NIDCAP (mean=4.18)
21: My relationship with parents improved after NIDCAP (mean=4.36)
22: My workload increased after NIDCAP (mean=3.00)
23: There was lack of coordination between different professionals in implementing NIDCAP (mean=3.25) *
24: The required changes in the physical environment were too demanding (mean= 3.39) *
25: More education materials were needed. (mean=3.36)
***Reverse order =** (highly disagree 5 – highly agree 1)



Attitude: 8 items
q1: Using NIDCAP during care giving is an improvement of our care (mean=4.08).
q2: Using NIDCAP during care-giving is time consuming (mean=2.85) *
q3: It is enjoyable to use NIDCAP during care giving (mean=3.75)
q4: Using NIDCAP during care giving does not lead to an improvement in the health and development of the infants (mean=4.17)*
q5: The NICU care is good enough without NIDCAP (mean=3.75)
q6: Using the NIDCAP during care giving is not practical when carrying out my job (mean=3.50)*
q7: It is self-fulfilling to use NIDCAP during care-giving (mean=3.75)
q8: Using NIDCAP during care-giving is good for my job progress (mean=3.58)

Perceived Behavior: 4 items
q9: I have enough NIDCAP knowledge to use NIDCAP during care-giving (mean=3.08)
q10: I have enough abilities to use NIDCAP during care giving (mean=3.17)
q11: It is my own choice if I want to use NIDCAP during care-giving (mean=3.25)
q12: It is not difficult for me to use NIDCAP during care giving if I want (mean=3.83)

Subjective Norm: 4 items
q13: The nurses think the NIDCAP method should be used during care giving (mean=3.50)
q14: The medical specialists think the NIDCAP method should be used during care giving (mean=3.58).
q15: The opinion of others is important to me in my choice to use NIDCAP during care giving (mean=3.00).
q16: I expect others to use NIDCAP during care-giving (mean=3.83)

Intention: 2 items
q17: I would like to use the NIDCAP method during my care-giving (mean=4.00)
q18: I am planning to use the NIDCAP method during care giving (mean=3.67)

Behavior: 1 item
19: I use the NIDCAP method during care giving (mean=3.25)

NIDCAP impact: 6 items
20: My job satisfaction improved after NIDCAP (mean=3.42)
21: My relationship with parents improved after NIDCAP (mean=3.58)
22: My workload increased after NIDCAP (mean=3.17)
23: There was lack of coordination between different professionals in implementing NIDCAP (mean=3.25) *
24: The required changes in the physical environment were too demanding (mean=3.00) *
25: More education materials were needed. (mean=3.75)

***Reverse order =** (highly disagree 5 – highly agree 1)

Fig. 1. Box plot comparing nurses and doctors' perceptions after NIDCAP implementation.

Table 2
Nurses and doctors scores regarding NDCAP implementation.

Total sample	NICU nurses N = 28	Doctors N = 18	P value
Attitude (8 item) (mean ± sd)	4.23 ± 0.57	3.71 ± 0.46	0.001
Perceived behavior (4 items) (mean ± sd)	3.87 ± 0.59	3.23 ± 0.63	0.029
Subjective norm (4 items) (mean ± sd)	3.96 ± 0.53	3.66 ± 0.47	0.011
Intention (2 items) (mean ± sd)	4.32 ± 0.85	4.03 ± 0.62	0.024
Behavior (1 item) (mean ± sd)	4.54 ± 0.58	3.44 ± 0.63	< 0.001
NIDCAP impact (6 items) (mean ± sd)	3.60 ± 0.52	3.38 ± 0.31	0.130
Overall score	4.00 ± 0.36	3.57 ± 0.30	< 0.001

4.1. Strengths/limitations

To our knowledge, this is the first study was conducted to assess the perception and experience of NICU staff comparing nurses and doctors during the NIDCAP implementation in a middle-income setting. The questionnaire was submitted anonymously online which eliminates the response bias. Although the response rate was high; the sample size was small limiting generalizations to larger units with more staff. In addition, the questionnaire was submitted after NIDCAP implementation, it could help to compare staff perceptions between two time periods. Furthermore, the group characteristics were different, nurses were older and had more years of experience in NICU than doctors, this could justify that nurses had higher scores on the subscales of questionnaire.

5. Conclusion

The implementation of NIDCAP training was perceived as a positive experience which may translate to improvement in the care of infants. Nurses were highly satisfied with the developmental care approach using NIDCAP. Some of the challenges addressed by respondents are the increase in workload, the need for coordination between different disciplines, the provision of more educational materials, and changes in the physical environment. More studies are needed to address those challenges.

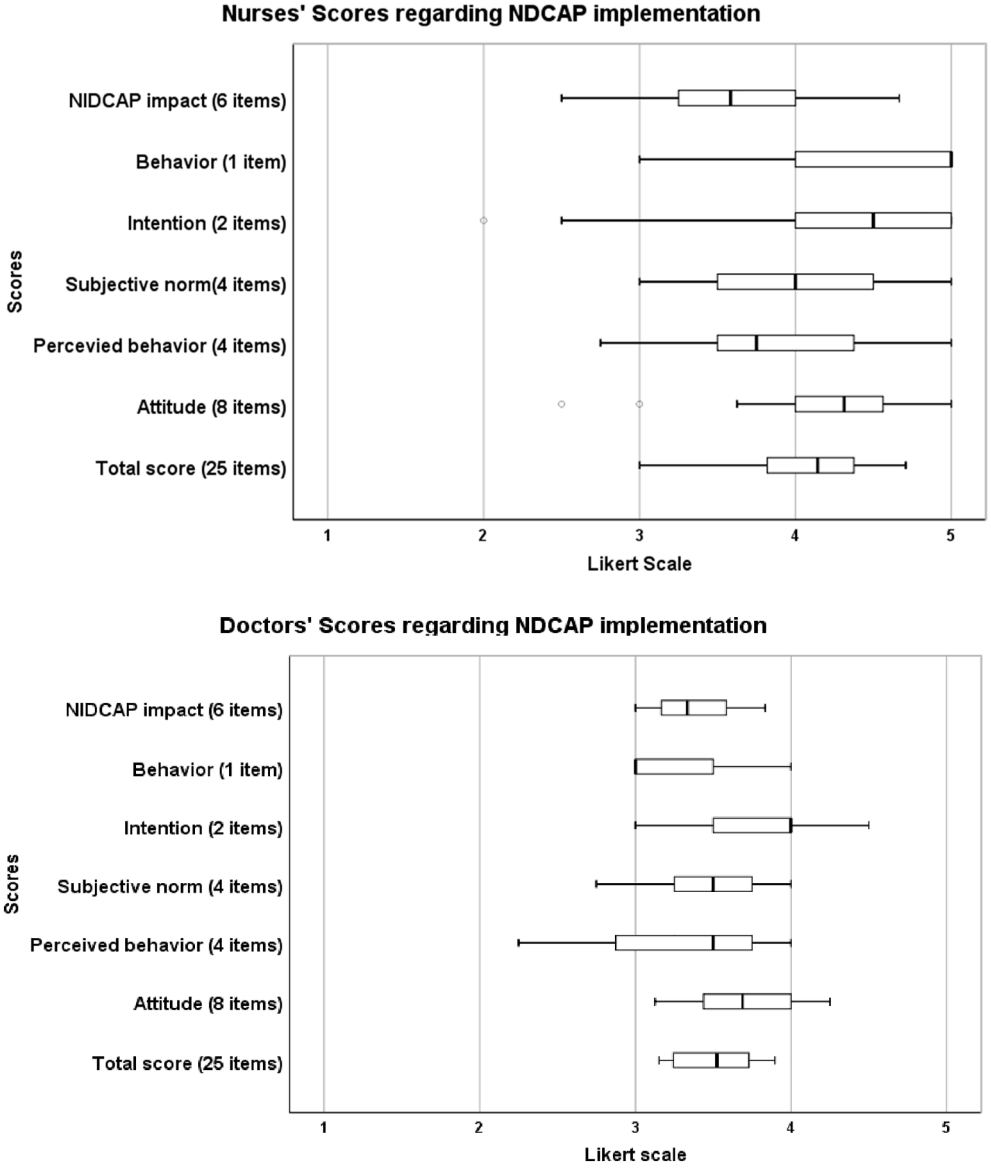


Fig. 2. Nurses and doctors scores regarding NDCAP implementation.

CRediT authorship contribution statement

Lama Charafeddine: Conceptualization, Data curation, Investigation, Methodology, Resources, Project Administration, Supervision, Validation, Writing - review & editing. **Saadieh Masri:** Conceptualization, Methodology, Data curation, Formal analysis, Validation, Visualization, Writing - original draft, Writing - review & editing. **Sima Fatima Sharafeddin:** Data Curation, Writing - original draft, Writing - review & editing. **Lina Kurdahi Badr:** Conceptualization, Methodology, Formal analysis, Writing - review & editing.

Funding source

None.

Declaration of competing interest

None to declare.

Contribution of authors in alphabetical order:

1. Lina Kurdahi Badr: Conceptualized and designed the study, designed the data collection instruments, interpreted and analyzed the data, critically reviewed, edited and approved the final manuscript as submitted.
2. Lama Charafeddine: Conceptualized and designed the study, designed the data collection instruments, coordinated and supervised data collection, interpreted data, critically reviewed it and approved the final manuscript as submitted.
3. Saadieh Masri: Involved in the study design, data collection and analysis; drafted the initial manuscript, critically reviewed it and approved the final manuscript as submitted.
4. Sima Fatima Sharafeddin: Involved in the literature review, data entry, statistical analyses, interpreted data, drafted the initial manuscript, reviewed it critically, and approved the final manuscript as submitted.

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Appendix 1

Questionnaire

Below are statements about using NIDCAP in NICU. Please say how much you agree or disagree with the statement. Check one answer on each line.

Likert Scale (1 to 5):

Completely Disagree, Moderately Disagree, Neutral, Moderately agree, Completely Agree.

Questions
Attitude:
1. Using NIDCAP during care-giving is an improvement of our care.
2. Using NIDCAP during care-giving is time consuming.
3. It is enjoyable to use NIDCAP during care-giving.
4. Using NIDCAP during care-giving does not lead to an improvement in the health and development of the infants.
5. The NICU care is good enough without NIDCAP
6. Using the NIDCAP during care-giving is not practical when carrying out my job.
7. It is self-fulfilling to use NIDCAP during care-giving
8. Using NIDCAP during care-giving is good for my job progress
Perceived behavior
9. I have enough NIDCAP knowledge to use NIDCAP during care-giving
10. I have enough abilities to use NIDCAP during care-giving
11. It is my own choice if I want to use NIDCAP during care-giving
12. It is not difficult for me to use NIDCAP during care-giving if I want.
Subjective norm
13. The nurses think the NIDCAP method should be used during care-giving.
14. The medical specialists think the NIDCAP method should be used during care-giving.
15. The opinion of others is important to me in my choice to use NIDCAP during care-giving.
16. I expect others to use NIDCAP during care-giving
Intention
17. I would like to use the NIDCAP method during my care-giving
18. I am planning to use the NIDCAP method during care-giving.
Behavior
19. I use the NIDCAP method during care-giving.
NIDCAP impact
20. My job satisfaction improved after NIDCAP.
21. My relationship with parents improved after NIDCAP.
22. My work load increased after NIDCAP.
23. There was leak of coordination between different professionals in implementing NIDCAP.
24. The required charges in the physical environment were too demanding.
25. More education materials were needed.

Appendix 2

Demographic information

1. Study Number: _____2. Date filled: ___/___/____

(Date/Month/Year)

3. Age: _____ 4. Gender: □ Female □ Male

5. Degree: □ BT □ BS □ Master □ MD _____

6. Years of experience: _____ 7. NICU years of experience_____

8. I have worked in the NICU between June 2014 and April 2018 □ Yes □ No

9. How do you feel about having NIDCAP training in the NICU?

10. How did the NIDCAP training change your way of delivering care to NICU babies?

11. Why do you think NIDCAP training is or is not important to NICU nurses and babies?

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