**Evaluation of a Structured Teaching Program Impact on Pediatric Staff Nurses’ Knowledge Regarding Application of New Ballard’s Score**

Ramudevi C.1,\*, Linta Thomas2, Nimmi Peter2, Aimy George2

***Abstract***

*The Ballard score is a calculator to assess the gestational maturity of your newborn in the first 24 hours. A unified system has been developed that enables physicians and other health care professionals to rapidly and accurately classify all newborns and identify high-risk neonates. Our study aimed to evaluate the impact of a structured teaching program on the knowledge of pediatric staff nurses in a selected multispecialty hospital in Wayanad regarding the application of the new Ballard score. We employed a quasi-experimental design with one group, involving pretest and posttest assessments. Samples were selected using the convenience sampling method, and the sample size was 30. Data was collected via the administration of a structured questionnaire, and participants independently filled out the survey. A pilot study was carried out to evaluate the practicability of the research. During the main study, data were collected by administering the questionnaire to each participant, followed by a structured teaching program of 30 minutes duration. The posttest was administered two weeks later. Data were analyzed using descriptive and inferential statistics, in line with the study’s objectives and formulated hypotheses. The study’s results indicated that the structured teaching program significantly enhanced the knowledge of pediatric staff nurses in the application of the new Ballard score. The posttest score of 15.30 ± 1.60 was notably higher than the pretest score of 8.8 ± 2.85, with a “P” value of 0.000. There was no significant association between the knowledge of pediatric staff nurses regarding the application of the new Ballard score and any of the selected demographic variables.*

**Keywords:** Effect, structured teaching program, knowledge, new Ballard score

**INTRODUCTION**

\***Author for Correspondence**

Ramudevi C.

E-mail: ramudevi.c@drmoopensnc.ac.in

1Professor and HOD, Dr. Moopen’s Nursing College, Naseera Nagar, Meppadi, Wayanad, Kerala, India

2Lecturer, Department of Child Health Nursing, Dr. Moopen’s Nursing College, Naseera Nagar, Meppadi, Wayanad, Kerala, India

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Accurate determination of gestational age in newborns is crucial for assessing the likelihood of morbidity and mortality. The method used to assess gestational age should not distress unwell infants and should be capable of distinguishing between premature and growth-restricted babies, regardless of intrauterine growth quality. Various scoring systems that rely on neurological and physical examinations are employed in neonatal units to determine the gestational age. Assessing gestational age is highly beneficial in categorizing newborns as preterm, full-term, or post-term and in predicting the subsequent progress of these infants [1].

The Ballard Score was introduced by Dr. Jeanne. L. Ballard in 1979 to determine gestational age through neuromuscular and physical assessment of a newborn infant. Subsequently, in 1991, this approach was adapted to encompass extremely premature infants. The Modified Ballard score utilizes physical and neuromuscular criteria for a newborn examination [2].

Gestational age assessment means figuring out the number of weeks of pregnancy. A full-term pregnancy is usually 40 weeks. It is important to assess if gestational age is uncertain or if your baby is smaller or larger than expected [3]. It involves assessing different criteria, and the cumulative score is used to estimate the gestational age of the fetus. These criteria are categorized into physical and neurological assessments. This scoring system provides an estimate of gestational age within the range of 26 to 44 weeks. The New Ballard Score, an extension of this method, encompasses extremely pre-term infants, even up to 20 weeks [4–6].

The scoring system is based on the fetal developmental changes that occur within the uterus. The neurological criteria primarily focus on muscle tone, while the physical criteria are based on anatomical changes. Neonates (those younger than 37 weeks) typically exhibit physiological hypotonia, and this muscle tone gradually increases as the fetus continues to develop in the womb. Consequently, a more premature infant would exhibit lower muscle tone [7].

Both the physical and neuromuscular criteria encompass a total of six parameters each. The physical criteria involve evaluating the skin, eyes/ears, presence of lanugo, genitalia, the plantar surface of the feet, and breast development, while the neuromuscular criteria involve assessing the baby’s posture, square window, scarf sign, popliteal angle, arm recoil, and heel-to-ear maneuver. Each of these criteria is assigned an individual score within the range of −1 to 5. All of these parameters’ total is then compared with a reference chart that provides the corresponding gestational age based on the Modified Ballard Score. Modified Ballard scoring is most accurate when conducted within the first 12 to 20 hours of a neonate’s life. However, several studies suggest that it can still be reasonably accurate for up to seven days after birth, but not beyond that period. Therefore, when assessing the gestational age of a neonate who is presented to us after their first week of life, utilizing the Modified Ballard score may not yield accurate results. The scoring system assigns values to six physical criteria and six neuromuscular criteria that indicate maturity. These criteria are rated on a scale from −1 to 5. The individual scores are summed to determine the neonate’s estimated gestational age, which can fall within a range from -10 to 50. Lower scores are associated with premature babies, while higher scores are linked to babies born later in their gestational period [8–10].

The template for a Ballard examination is frequently not incorporated into electronic health records and is consequently not being performed as frequently and systematically at our institutions. Staff nurses and nursing students have less familiarity with the components of a Ballard examination and are less likely to be able to systematically assess gestational age with the New Ballards Score. It is important to know the gestational age in order to identify high-risk babies [11–13].

Health assessment skills are among the most crucial competencies that nurses need. More accurate assessments lead to better outcomes and an enhancement in the quality of patient care.

**STATEMENT OF THE PROBLEM**

An investigation into the efficacy of a structured teaching program in enhancing the knowledge of pediatric staff nurses at a selected hospital in Wayanad regarding the application of the New Ballard’s Score.

**Objective**

The objectives of the study were to

* To assess the effectiveness of structure teaching program on knowledge regarding application of New Bellard’s score among pediatric staff nurses.
* To find out the association between knowledge on application of new Ballard score among pediatric staff nurses with the selected demographic variables.

**Hypothesis**

* *H1:* The mean posttest knowledge score is significantly different from the mean pretest knowledge score of pediatric staff nurse regarding application of New Ballard score in preterm newborn at 0.05 level of significance.
* *H2:* There is no significant difference in the mean posttest knowledge scores from the mean pretest knowledge scores of pediatric staff nurse regarding application of New Ballard score in newborn at 0.05 level of significance.

**MATERIALS AND METHODS**

A Quantitative approach with quasi experimental research design (one group pretest posttest design) was adopted to achieve the objectives. The Sample were selected by using convenience sampling technique. The study included pediatric staff nurses who had the ability to read and understand either Malayalam or English, expressed their willingness to participate, and were present during the data collection period. After getting ethical clearance from institutional Review Board, Permission to conduct the study was obtained from head of the department of pediatrics. The investigator, obtained their informed written consent from the participant. The researcher explained the nature of the study and the guidelines to complete the tool in a detailed manner to each participants individually and assured the confidentiality of their identity and responses. After establishing a healthy rapport with the participants the structured questionnaire was given to collect the personal data and knowledge among application of new Ballard score. Following the pretest, a structured teaching program was conducted for 30 minutes. Any questions or concerns raised by the participants were addressed. The posttest was administered using the same tool two weeks later. The data collection process was terminated after thanking the respondents for their cooperation.

The tool used for the study was a structured questionnaire It comprised of two sections:

1. *Section A:* Socio demographic data It consisted of 6 items describing the socio demographic variables of pediatric staff nurse such as age, educational status, sex, gender, year of experience in neonatal unit and source of health information regarding new ballad score.
2. *Section B:* Survey on pediatric staff nurses’ familiarity with the application of the New Ballard’s Score. The survey comprises 20 questions designed to evaluate the level of understanding regarding the use of the New Ballard’s Score among pediatric staff nurses. Each correct answer carries 1-mark, wrong answer carries zero mark and the total score will be 20. Based on the percentage of total marks obtained for knowledge questionnaire they are categorized as excellent (76%–100%), good (51%–75%), average (26%–50%) and poor (0%–25%) the categorization was done as follows in Table 1.

**RESULT**

**Section 1: Description of Personal Data of Participants**

This section deals with description of participants based on their characteristics. It encompasses factors such as age, educational background, gender, years of experience in the neonatal unit, and the source of health information related to the new Ballard score, regularly assessing NBS. The data were analyzed using frequency and percentage. Distribution and the result were presented in tables and figures.

**Table 1.** Survey on pediatric staff nurses’ familiarity with the application of the New Ballard’s Score.

|  |  |  |
| --- | --- | --- |
| **Marks** | **Grading** | **Percentage** |
| 0–5 | Poor knowledge | 0%–25% |
| 6–10 | Average knowledge | 26%–50% |
| 11–15 | Good | 51%–75% |
| 16–20 | Excellent knowledge | 76%–100% |

***Distribution of Participant According to Their Age***

The data shows that most of the participants (56.7%) belonged to the age group of 31 to 40 years. 40% of pediatric staff nurses are between the ages of 20 and 30 and 3.3% of pediatric staff nurses are between the ages of 41 to 50 years (Figure 1).

***Distribution of Participant According to Gender***

The data depicts that 100% of pediatric staffs were female (Figure 2).

***Distribution of Participant According to their Educational Status***

The data depicts that 30% pediatric staff nurses were B.Sc. Nursing, 63.3% were general nursing and midwifery, and 6.7% were Post Basic B.Sc. Nursing (Figure 3).

**Figure 1.** Graph showing distribution of participants according to their age.

**Figure 2.** Graph showing distribution of participants according to gender.

**Figure 3.** Graph showing distribution of participants according to their educational status.

***Distribution of Participant According to Their Years of Experience***

The data depicts that the majority (46.70% of pediatric staffs nurses) have less than 1 year of experience, 30% have 6 to 12 years of experience, 20% have 1 to 6 years of experience, and 3.3% of participants have more than 12 years of experience (Figure 4).

***Distribution of Participants According to******Source of Health Information Regarding New Ballard Score***

The data shows that the majority of nurses (63.3%) have not received any information, and the remaining 36.7% have received information from textbooks regarding the new Ballard score (Figure 5).

***Distribution of Respondents Assessing New Ballard Score in the Regular Basis***

The data shows 23.3% participants were assessing and the 76.7% participant were not assessing New Ballard Score on the regular basis in the newborn care (Figure 6).

**Figure 4.** Graph showing distribution of participants according to their years of experience.

**Figure 5.** Graph showing distribution of participants according to Source of health information regarding new Ballard score.

**Figure 6.** Graph showing distribution of respondents assessing new Ballard score in the regular basis.

**Table 2.** Frequency and percentage distribution of participants based on knowledge score before and after the structured teaching program (n = 30).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Knowledge score** | **Pretest** | | **Posttest** | |
| ***f*** | ***%*** | ***f*** | ***%*** |
| Excellent (16–20) | 0 | 0 | 17 | 56.7 |
| Good (11–15) | 10 | 33 | 13 | 43.3 |
| Average (6–10) | 16 | 54 | 0 | 0 |
| Poor (0–5) | 4 | 13 | 0 | 0 |

**Table 3.** Significance of difference between pretest and posttest knowledge score of participants regarding application of New Ballard score (n = 30).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Knowledge  score** | **Mean** | **SD** | **“t” Value** | **p Value** | **Significance** |
| Pretest | 8.8 | 2.85 | 5.62 | 0.000 | S\* |
| Posttest | 15.30 | 1.60 |

***\*****Level of significance at 0.05 level.*

Data presented in Table 2 revealed that during the pretest, majority of the participants (54%) had average knowledge, 33% of the participants had good knowledge, 13% of the participants had poor knowledge, and none of the participants had excellent knowledge regarding the application of the new Ballard score among pediatric staff nurses.

During the posttest, 56.7% of participants had excellent knowledge and 43.3% had good knowledge; none of the participants belonged to the poor knowledge or average knowledge category regarding the application of the New Ballard score. Hence, the results showed that there was a significant increase in the knowledge score of pediatric staff nurses regarding the application of the New Ballard score after the Structure teaching program.

Table 3 presents a clear illustration of the substantial increase in the mean posttest knowledge score (15.30) among pediatric staff nurses concerning the application of the new Ballard score after the implementation of the educational program. This posttest score is significantly higher compared with the mean pretest knowledge score (8.8). The statistical analysis resulted in a p-value of 0.000 at a 0.05 level of significance with a 95% confidence interval, indicating an extremely significant outcome. As a result, the null hypothesis was refuted and the research hypothesis was supported. Therefore, it can be concluded that the difference in mean observed was a true difference, and the planned teaching program was effective in increasing the knowledge of pediatric staff nurses regarding the application of the New Ballard score.

**Section 2: Analysis of Association Between Knowledge of Pediatric Staff Nurse Regarding Application of New Ballard Score with Selected Variables**

The data in Table 4 revealed that the p values corresponding to the calculated chi square obtained for age, educational status, year of experience, source of information, and assessing NBS on a regular basis regarding the application of the new Ballard score were more than 0.05 level of significance, hence the null hypothesis was accepted. This showed that there was no significant association between the selected personal variables and the knowledge of pediatric staff nurses regarding the application of the new Ballard score.

**DISCUSSION**

In 2022, Gaurav Kumar et al. conducted a study to assess the effectiveness of educational packages on knowledge regarding the new Ballard score among nursing students [13]. The scale can be used for neonates born between 20 and 44 weeks of gestation. A pre-experimental research design was used to assess the effectiveness of the educational package regarding the new Ballard score. A purposive sampling technique was used to select 60 students. The data was gathered using a structured questionnaire. The pretest results revealed that 78.3% of the students exhibited a low level of knowledge, 21.7% had a moderate level of knowledge, and none demonstrated a high level of knowledge regarding the New Ballard Score among third-year B.Sc. nursing students. After educational package on the New Ballard Score knowledge level showed that 65% of students had good knowledge, 35% had moderate knowledge, and no one had poor knowledge. Regarding knowledge, the mean posttest knowledge score (8.5167 ± 2.988) after receiving need-based education was higher than the mean pretest score (22.166 ± 3.221). The calculated 't' value (t = 31.6493, p < 0.05) exceeds the tabulated value (t59 = 2) at the 0.05 significance level [14, 15].

**Table 4.** Association between the knowledge of participants with their selected variables.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **χ2** | **df** | **p value** | **Significance** |
| Age | 1.691 | 4 | 0.792 | NS\* |
| Educational status | 6.811 | 4 | 0.146 | NS\* |
| Years of experience | 3.438 | 6 | 0.752 | NS\* |
| Sources of information | 3.517 | 2 | 0.172 | NS\* |
| Assessing NBS on regular basis | 1.840 | 2 | 0.399 | NS\* |

*\*Level of significance at 0.05 level.*

The current study demonstrated that the structured teaching program effectively improved participant knowledge. In the posttest, 56.7% of participants achieved an excellent level of knowledge, and 43.3% exhibited good knowledge (15.30 ± 1.60), compared with the pretest, where 54% had an average level of knowledge, 33% had good knowledge, and 13% had poor knowledge (8.8 ± 2.85) in the application of the New Ballard Score among pediatric staff nurses. The ‘P’ value was 0.000, indicating statistical significance. There was no significant association between the knowledge of pediatric staff nurses regarding the application of the new Ballard score and any of the selected demographic variables [16].

**CONCLUSION**

There was a significant increase in the knowledge score of pediatric staff nurses regarding the application of the New Ballard score after the planned teaching program. Conducting physical and neurological examinations is a vital method for assessing newborns. It aids in diagnosing conditions and offering insights into prognosis. Physical and neurological issues can either manifest before birth or emerge in the early neonatal phase. Staff nurses are the primary care givers of children, so the investigator felt the need to assess the knowledge to improve the skills of pediatric staff nurses regarding the application of new Ballard score in the part of neonatal care. In future research work, can focus on assessing the practical skills of staff nurses when using new Ballard scales in neonatal settings.

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