Turkish Journal of Pediatric Disease

Original Article

Evaluation of basic life support training provided to mothers of preterm infants

Okan Şahin[1], Sabriye Korkut[2], Sara Erol[2]

[1]Department of Pediatrics, Ankara City Hospital, University of Health Sciences, Ankara, Türkiye
[2]Department of Neonatology, Ankara City Hospital, University of Health Sciences, Ankara, Türkiye

ABSTRACT

Objective: Preterm infants admitted to neonatal intensive care units (NICUs) are at an increased risk of requiring basic life support (BLS). This study aimed to evaluate the impact of BLS training on the knowledge and anxiety levels of mothers of preterm infants.

Material and Methods: This prospective descriptive study included mothers of preterm infants born at less than 37 weeks of gestation who were either discharged from the NICU or being treated in the mother-infant adaptation unit. Participants were provided with BLS training using visual materials. A questionnaire assessing knowledge levels and the State-Trait Anxiety Inventory (STAI Form TX-1 and TX-2) were administered before and after the training. Pre- and post-training questionnaire responses and anxiety scores were analyzed.

Results: A total of 100 mothers participated in the study. Post-training knowledge levels regarding BLS significantly improved ($p<0.001$). State and trait anxiety scores significantly decreased after the training ($p<0.001$). Mothers with a university education had higher pre-training knowledge scores compared to those with primary or secondary education ($p<0.001$); however, post-training knowledge levels were similar across all educational groups ($p = 0.600$).

Conclusion: BLS training increased knowledge levels and reduced anxiety among mothers of preterm infants. Therefore, developing and disseminating appropriate BLS training programs for parents may play a crucial role in improving public health. Moreover, reducing parental anxiety through such training could contribute to enhancing the quality of neonatal care.

Keywords: Preterm, mother, parent, basic life support, education, anxiety

INTRODUCTION

Basic life support (BLS) involves life-saving interventions performed without the use of medications, such as establishing airway patency, providing ventilation support, and performing chest compressions to maintain circulation. These interventions are simple yet effective measures applied to preserve vital functions until professional healthcare personnel arrive at the scene (1). Therefore, it is critical for the general population to possess basic knowledge about BLS. Regular BLS training for lay rescuers has been shown to improve survival rates and reduce long-term sequelae in cases of out-of-hospital cardiac arrest (2).

Globally, each year, 15 million babies are born preterm, which is estimated to be about 11% of all deliveries (3). The risk of mortality and both short- and long-term morbidity increases as gestational age decreases (4). The risk of mortality is increased in neonates who are premature and/or have low birth weight for gestational age, and this risk continues until the second month of life (5). Even after discharge from the neonatal intensive care

Correspondence Address:
Okan Şahin
e-mail: drokan3865@gmail.com

Received : 18.02.2025
Accepted : 04.08.2025
DOI: 10.12956/TJPD.2025.1222

unit (NICU), preterm infants remain at risk for mortality. Studies have shown that 1-2% of preterm infants experience mortality after discharge until their corrected ages of 22 to 26 months (6). Therefore, discharge decisions for these infants should consider the caregivers' ability to assess vital signs, recognize pathological findings, and perform BLS procedures with adequate skill and confidence (7).

Caring for a high-risk infant post-discharge is a significant source of anxiety for parents. Non-healthcare professionals may experience heightened anxiety due to the fear of being unable to respond appropriately to a life-threatening situation requiring BLS. Parental education on this topic not only improves post-discharge care but also helps alleviate parental anxiety (8).

The primary objective of this study was to investigate the impact of BLS training on the knowledge and anxiety levels of mothers of preterm infants. Secondary objectives included assessing the influence of maternal and infant characteristics on these knowledge and anxiety levels following BLS training.

MATERIALS and METHODS

This prospective descriptive study was conducted between September 2023 and December 2023 at the NICU of Ankara City Hospital. The study included mothers of preterm infants born at less than 37 weeks of gestational age who were either discharged from the NICU or being treated in the mother-infant adaptation unit.

Sample Size: A previous study showed that 40% of parents were knowledgeable about basic life support (BLS), specifically chest compressions and ventilation. To detect a significant 50% increase in knowledge levels following BLS training, the required sample size was calculated as 97 participants, with 80% power and a 0.05 alpha level. Considering potential data loss, the study included 100 participants.

Inclusion Criteria: Mothers of preterm infants born at less than 37 weeks of gestational age at Ankara Bilkent City Hospital who voluntarily agreed to participate in the study.

Exclusion Criteria: Mothers unable to communicate due to language problems or cognitive impairment. Participants who initially enrolled but later withdrew from the study.

BLS Training and Questionnaire Administration: The BLS training was conducted by study physicians and neonatal nurses in either the mother-infant adaptation unit or neonatal outpatient clinic. Training sessions were planned for one or two participants at a time and included visual materials such as images and infant mannequins. The content and BLS algorithm were designed based on the 2020 American Heart Association (AHA) Pediatric BLS and Cardiopulmonary Resuscitation guidelines (9).

Each BLS training session lasted approximately 30 minutes and included hands-on practice using infant mannequins and visual slides. The BLS knowledge questionnaire used in this study was developed by the researchers based on current guidelines. The BLS knowledge questionnaire was originally developed to reflect the full content of BLS education.

Before the training, participants completed a questionnaire comprising:

Seven questions about demographic characteristics.

Ten questions assessing BLS knowledge.

The same BLS-related 10-question section was administered again after the training. No time limit was imposed for answering the questionnaire, and responses were recorded in written form.

Assessment of Anxiety Levels: To evaluate anxiety levels, the following two forms were administered to participants both before and after the training: State Anxiety Inventory (STAI Form-I): A 20-item scale assessing transient anxiety experienced in response to specific situations or events. Trait Anxiety Inventory (STAI Form-II): A 20-item scale assessing a person's general predisposition to anxiety (10).

State anxiety reflects temporary feelings of tension and worry triggered by particular situations, while trait anxiety represents a more enduring sense of nervousness and stress.

In addition to the survey responses, a study form was completed containing infants' demographic data and length of stay in the Neonatal Intensive Care Unit.

Statistical analyses

The normality of data distribution was assessed using the Shapiro-Wilk test. Descriptive statistics for non-normally distributed variables were expressed as medians (25^{th} percentile–75^{th} percentile). The Wilcoxon signed-rank test was used for paired comparisons of two dependent groups. Chi-square tests were applied for comparisons of categorical variables between groups. Spearman's correlation analysis was conducted to examine relationships between continuous variables, with correlation coefficients reported as Rho. A p-value of <0.050 was considered statistically significant for all tests.

RESULTS

A total of 100 mothers of premature infants participated in the study. The demographic characteristics of the mothers and their infants are presented in Table I. Among the participants, 25% had previously received BLS training, 11% had prior experience with BLS, and 7% had previously applied BLS to their own child. Additionally, 3% of the participants were healthcare workers.

The knowledge level of the mothers participating in the study increased after the BLS training, and both state and trait anxiety scores decreased ($p<0.001$) (Table II).

The BLS knowledge level was compared according to education level. The knowledge level of university graduate mothers before

Table I: Characteristics of mothers and newborns

Variable	n (%)
Maternal Age (years)	
18-24	27 (27)
25–35	55 (55)
>36	18 (18)
Number of Children	
1	15 (15)
2–3	46 (46)
≥ 4	39 (39)
Education Level	
Primary	8 (8)
Secondary	51 (51)
University	41 (41)
Gestational Age (weeks)	
34–36	55 (55)
32–33	19 (19)
28–31	19 (19)
<28	7 (7)
Birth Weight (grams)	
>2500	27 (27)
2500–1500	46 (46)
1500–1000	16 (16)
<1000	11 (11)
Duration of NICU Stay (days)	
Median (IQR)	15 (5–45)

Data are presented as number (percentage) or median (interquartile range). ***NICU:*** *Neonatal Intensive Care Unit*

Table II: Comparison of pre-and post-training knowledge, state anxiety, and trait anxiety scores

Variable	Pre-Training Median (25^{th}–75^{th} p)	Post-Training Median (25^{th}–75^{th} p)	p
Knowledge Level	6 (4–7)	10 (9–10)	<0.001
State Anxiety Score	35.0 (30.0–41.0)	32.0 (29.0–37.7)	<0.001
Trait Anxiety Score	38.5 (32.0–45.0)	35.0 (29.0–42.0)	<0.001

Data are presented as median (25^{th}–75^{th} percentile)

the training was found to be higher than the other groups (p<0.001). The knowledge level after the training was found to be similar between the education groups (p=0.600). State and trait anxiety scores before and after the training were similar in the education groups (p>0.050).

Prior to the training provided in this study, the baseline knowledge levels of mothers with and without previous BLS training were compared. Participants who had received BLS training previously had a significantly higher mean number of correct answers compared to those without prior training (p<0.001). When the knowledge levels of participants who received and did not receive BLS training were evaluated separately after the training, the increase in knowledge levels was found to be statistically significant (p<0.001).

Both before and after the training knowledge levels were similar between the child number groups (p>0.050).

Table III. Number of correct answers in the questionnaire before and after BLS training

Questions	Pre-Training n (%)	Post-Training n (%)	p
1. What is the first thing you should do when encountering a situation requiring BLS?	28 (28)	94 (94)	<0.001
2. What is the first thing you assess in an infant requiring BLS?	29 (29)	93 (93)	<0.001
3. How do you assess the infant's consciousness?	69 (69)	99 (99)	<0.001
4. By which method is the infant's breathing assessed?	81 (81)	98 (98)	<0.001
5. If you are alone and without a phone in a situation requiring BLS, what should you do?	49 (49)	95 (95)	<0.001
6. If you are alone with a phone in a situation requiring BLS, what should you do?	87 (87)	97 (97)	0.009
7. When providing BLS and there is no suspicion of trauma, how should you open the airway?	61 (61)	93 (93)	<0.001
8. In BLS performed alone, what is the chest compression-to-rescue breath ratio?	15 (15)	96 (96)	<0.001
9. Where should chest compressions be applied during CPR?	74 (74)	100	<0.001
10. What constitutes effective chest compressions in an infant?	69 (69)	98 (98)	<0.001

Data are presented as number (percentage), ***BLS:*** *Basic Life Support,* ***CPR:*** *Cardiopulmonary Resuscitation*

The correlation between the length of stay in the NICU and anxiety levels was evaluated. A positive correlation was found between the length of stay in the NICU and the trait anxiety level both before and after the training. (Rho=0.33, p=0.001) (Rho=0.40, p=0.001), respectively. No significant correlation was found between the length of stay in the NICU and the state anxiety level both before and after the training (p>0.050).

While no correlation was found between the gestational week and the state anxiety after the training (Rho=-0.19, p=0.060), a weak-moderate negative correlation was observed between the trait anxiety after the training (Rho=-0.36, p=0.001).

The answers given by the participants to the knowledge level questionnaire were compared before and after the training. The rate of correct answers to all questions after the training was found to be higher than before the training (p<0.050) (Table III).

DISCUSSION

Preterm infants monitored in NICUs are at a higher risk of requiring BLS, particularly during the early post-discharge

period, compared to the general population. One study indicated that families encountering situations requiring BLS often panicked and attempted to transport their children to the hospital rather than performing initial life-saving measures (11). This response reduces the likelihood of timely and effective intervention, adversely impacting outcomes.

In our study, the effects of BLS training on both the knowledge and anxiety levels of mothers of preterm infants were evaluated. The findings demonstrated that BLS training significantly increased knowledge levels while reducing both state and trait anxiety scores.

In the 'Children Save Lives' recommendation approved by WHO in 2015, the starting age for BLS training was shown as 12 (12). Starting BLS training at an early age, repeating and expanding practical skills throughout school life ensures that society has people who can intervene in emergencies, normalizes first aid learning, and increases the desire to intervene when faced with an emergency (13). Seventy-five percent of the mothers in our study reported that they had never received BLS training before, 11% had encountered a situation requiring BLS, and 7% had experienced a BLS event involving their own child. These rates highlight the necessity of education on this topic.

In our study, the proportion of correct answers to BLS knowledge questions ranged from 40% to 70% before training, increasing to 90% to 100% after training. Similarly, a study conducted with newborn parents in Turkey showed that correct answer rates, which ranged between 36.8% and 86.8% before training, increased to 86.2% and 99.2% after training (14). In our study, a statistically significant increase was observed in the number of correct responses for all 10 BLS knowledge questions post-training.

The fact that 25% of the participants had previously received BLS training may have influenced the primary outcome. When we compared participants with and without prior BLS training, there was a significant difference in their pre-training knowledge levels. However, post-training knowledge scores increased significantly for both participants, reaching similar levels. These findings indicate that lay rescuers can apply BLS steps accurately and effectively with appropriate training.

Neither the age of the mothers nor the number of children they had impacted their knowledge levels before or after the training. However, there was a significant difference in knowledge levels based on education levels. Mothers with a university degree had higher pre-training knowledge levels compared to those with primary or secondary education. However, this difference disappeared post-training, suggesting that BLS education can equalize knowledge levels across different educational backgrounds, enabling lay rescuers to apply BLS steps correctly regardless of their education or age.

During the neonatal period, mothers often feel a lack of confidence in caring for their infants. The health and safety of their babies are significant sources of anxiety, particularly for first-time mothers (15). The inability to respond appropriately to emergencies requiring BLS can exacerbate this anxiety (15, 16). In our study, there were no significant differences in state or trait anxiety scores before and after BLS training among groups stratified by the number of children they had.

Mothers who feel more prepared to handle potential emergencies may experience reduced overall anxiety (17). Mothers knowledgeable about BLS can respond to emergencies more calmly and effectively (18). Therefore, providing BLS training during the prenatal or postnatal period can enhance mothers' knowledge and confidence, thereby reducing their anxiety levels.

One study found that mothers of extremely preterm infants were more anxious compared to mothers of moderately preterm infants. This study demonstrated an association between gestational age and state anxiety only (19). In our study, a weak-to-moderate correlation was observed between gestational age and post-training trait anxiety. This finding may be explained by the increased concern among mothers as the degree of prematurity rises, leading to a heightened awareness of the potential need for BLS.

A positive correlation was identified between NICU length of stay and trait anxiety levels both before and after BLS training. This finding suggests that longer NICU stays and increased awareness of BLS may lead to temporary anxieties becoming persistent.

Studies have shown that 10-20% of mothers experience anxiety or depressive disorders during the postpartum period, which can negatively impact the mother, child, and family (20). In our study, BLS training reduced both state and trait anxiety scores among mothers, suggesting that providing such training could alleviate postpartum anxiety and positively affect infant care.

One study linked higher education levels to an increased risk of anxiety (21). However, in our study, no significant relationship was found between education level and state or trait anxiety scores either before or after BLS training. This could be due to the fact that the majority of participants in our study were either high school or university graduates, resulting in minimal variation in educational levels.

Limitations

This study has certain limitations. First, the anxiety levels might have been influenced by the hospital environment during data collection. Second, long-term retention of BLS knowledge was not evaluated. In anticipation of difficulties in reaching participants after discharge, the post-training survey was administered on the day of training or the following day.

Future studies should include follow-up assessments to evaluate long-term knowledge retention and behavioral outcomes.

CONCLUSION

In conclusion, our study demonstrated that BLS training significantly increased knowledge levels and reduced anxiety among mothers of preterm infants. Developing and disseminating appropriate BLS training programs for parents could play a crucial role in reducing mortality and morbidity through timely interventions, thereby improving public health. Additionally, reducing anxiety levels through such training may enhance parental self-efficacy and contribute to improved neonatal care quality.

Ethics committee approval

This study was conducted in accordance with the Helsinki Declaration Principles. Ethical approval was obtained from the Ethics Committee of Clinical Research No. 2 at Ankara Bilkent City Hospital (July 19, 2023/ E2-23-4577).

Contribution of the authors

Study conception and design: ***OS, SK;*** data collection: ***OS;*** analysis and interpretation of results: ***OS, SE, SK;*** draft manuscript preparation: ***OS, SK, SE.*** All authors reviewed the results and approved the final version of the article.

Source of funding

The authors declare the study received no funding.

Conflict of interest

The authors declare that there is no conflict of interest.

REFERENCES

1. Topjian AA, Raymond TT, Atkins D, Chan M, Duff JP, Joyner BL, et al. Part 4: Pediatric basic and advanced life support 2020 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Pediatrics. 2021; 147 (Supplement 1): e2020038505D. https://doi.org/10.1542/peds.2020-038505D
2. Schroeder DC, Semeraro F, Greif R, Bray J, Morley P, Parr M, et al. Kids Save Lives: Basic life support education for schoolchildren: A narrative review and scientific statement from the international liaison committee on resuscitation. Circulation. 2023 ;147(24):1854-68 https://doi.org/10.1161/CIR.0000000000001128
3. Harrison MS, Goldenberg RL. Global burden of prematurity. Semin Fetal Neonatal Med. 2016 ;21(2):74-9. https://doi.org/10.1016/j.siny.2015.12.007
4. Torchin H, Ancel PY. [Epidemiology and risk factors of preterm birth]. J gynecol obstet biol reprod (Paris). 2016 ;45(10):1213-30. https://doi.org/10.1016/j.jgyn.2016.09.013
5. Applegate JA, Islam MS, Khanam R, Roy AD, Chowdhury NH, Ahmed S, et al. Young infant mortality associated with preterm and small-for-gestational-age births in rural Bangladesh: A prospective cohort study. J Pediatr. 2024;269:114001 https://doi.org/10.1016/j.jpeds.2024.114001
6. Bell EF, Hintz SR, Hansen NI, Bann CM, Wyckoff MH, DeMauro SB, et al. Mortality, In-hospital morbidity, care practices, and 2-year outcomes for extremely preterm infants in the US, 2013-2018. JAMA. 2022 ;327(3):248-63. https://doi.org/10.1097/01.aoa.0000891644.03402.e8
7. Acunas B, Bas AY, Uslu S. Turkish Neonatology Society High-Risk Infant Follow-up Guide: 2018 Update. https://neonatology.org.tr/uploads/content/tanı-tedavi/17_min.pdf.
8. Teti DM, O'Connell MA, Reiner CD. Parenting Sensitivity, Parental Depression and child health: The mediational role of parental self-efficacy. Early dev parent. 1996 ;5(4):237-50. https://doi.org/10.1002/(SICI)1099-0917(199612)5:4<237::AID-EDP136>3.0.CO;2-5
9. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, Narwal R, et al. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. Lancet. 2012;379(9832):2162-72. https://doi.org/10.1016/S0140-6736(12)60820-4
10. Öner N and Le Compte A. The validity and reliability of the Turkish version of the State-Trait Anxiety Inventory (STAI). Psychological Bulletin, 1985;40(3):122-33.
11. Shen CC, Tsai LY, Yeh SH, Chen TH. Accuracy and related factors of emergency management in hospitalized scald burn patients and their helpers. New Taipei Journal of Nursing 2007;9:35- 48.
12. Böttiger BW, Lockey A, Georgiou M, Greif R, Monsieurs KG, Mpotos N, et al. Kids Save Lives: ERC position statement on schoolteachers' education and qualification in resuscitation. Resuscitation. 2020;151:87-90. https://doi.org/10.1016/j.resuscitation.2020.04.021
13. Greif R, Lockey A, Breckwoldt J, Carmona F, Conaghan P, Kuzovlev A, et al. European resuscitation council guidelines 2021: Education for resuscitation. Resuscitation. 2021 ;161:388-407. https://doi.org/10.1016/j.resuscitation.2021.02.016
14. Korkut S, Tayman C, Yurdagül N, Özel Ş, Beşer Özmen E, Ceran B, et al. Evaluation of basic life support training given to the parents of infants discharged from the neonatal intensive care unit. JGON. 2019;16, 37-40.
15. Smith ME. The impact of infant CPR training on maternal confidence and anxiety. BMC Pregnancy and Childbirth. 2018;18(1):78.
16. Kinsella MT, Monk C. Impact of maternal stress, depression and anxiety on fetal neurobehavioral development. Clin Obstet Gynecol. 2009;52(3):425-40. https://doi.org/10.1097/GRF.0b013e3181b52df1
17. Kroeger M, Chandler R. Managing parental anxiety: Strategies and techniques. Nursing Clinics of North America, 2017;52(2):219-30.
18. Dennis CL, Falah-Hassani K, Shiri R. Prevalence of antenatal and postnatal anxiety: Systematic review and meta-analysis. Br J Psychiatry. 2017;210(5):315-23. https://doi.org/10.1192/bjp.bp.116.187179
19. Trumello C, Candelori C, Cofini M, Cimino S, Cerniglia L, Paciello M, et al. Mothers' depression, anxiety, and mental representations after preterm birth: A study during the infant's hospitalization in a neonatal intensive care unit. Front Public Health. 2018;6:359. https://doi.org/10.3389/fpubh.2018.00359
20. Pawluski JL, Lonstein JS, Fleming AS. The neurobiology of postpartum anxiety and depression. Trends Neurosci. 2017 ;40(2):106-20. https://doi.org/10.1016/j.tins.2016.11.009
21. Van der Zee-van den Berg AI, Boere-Boonekamp MM, Groothuis-Oudshoorn CGM, Reijneveld SA. Postpartum depression and anxiety: a community-based study on risk factors before, during and after pregnancy. J Affect Disord. 2021;286:158-65. https://doi.org/10.1016/j.jad.2021.02.062