

# Nurse' Performance in Oxygen Therapy for Infants Hospitalized at the Neonate Intensive Care Unit

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## Abstract

**Background:** The main problem of preterm infants is lung function disorder and disordered oxygenation due to an immature respiratory tract, therefore, appropriate performance of nurses in oxygen therapy is very important.

**Objectives:** The aim of this study was to investigate nurses' performance during oxygen therapy for hospitalized infants at the neonatal intensive care unit (NICU).

**Patients and Methods:** In this descriptive, cross-sectional study, 110 nurses working at the NICU of teaching hospitals affiliated with the Isfahan University of Medical Sciences were enrolled by the census. Data were gathered from a questionnaire on demographic characteristics and a checklist for observational assessment of nurses' performance. Data analysis was done with the SPSS 20 software.

**Results:** Of the nurses, 39.1% had favorable performance. Furthermore, Spearman's correlation coefficient indicated that age and nurse's performance were directly and significantly correlated, yet education level and work shift types were not correlated with performance.

**Conclusions:** Since oxygen is frequently administered at the NICU, holding in-service training courses for improving nurse's performance and preventing long-term complications due to oxygen administration seem necessary.

**Keywords:** Performance, Nurse, Oxygen Therapy

## 1. Background

Preterm birth is referred to giving birth to a baby prior to the gestational age of 37 weeks (1). Despite no reliable estimate of preterm birth rate, it has been rising in the recent decades (2). Four million newborns are annually born in the USA, 12.5% of whom are preterm births. The prevalence of preterm births is also high in Iran (3). The prevalence of preterm births has reached 5% - 7% in developed countries over the past 20 years (4).

The main problem in preterm infants is lung function disorder and disordered oxygenation due to an immature respiratory tract. Some therapies such as surfactants and oxygen supplementation as adjunct and alternative therapy are used for lung development in preterm infants. Oxygen is the most commonly administered drug for infants with pathological conditions leading to tissue hypoxia (5). Oxygen delivery is adopted depending on the infant's needs and the type of disease. Oxygen delivery is conducted to transfer adequate oxygen to tissues, prevent

hypoxia-induced acid-base disequilibrium, and avoid oxygen toxic effects (6).

Although oxygen therapy is the most common therapy used for infants, inappropriate control of administered oxygen could lead to irrevocable damage to many of the newborns, particularly preterm infants (5). As oxygen is considered as a drug, then required cautions with reference to pharmacotherapy principles should be used in its administration (7) and, as with any other drugs, its indications and complications, care practices in administration, and monitoring should receive much attention (8).

Decline in oxygen saturation in preterm infants in the early weeks of life could cause long-term hypoxia, which could result in some complications such as growth failure, brain lesions, cardiac complications, chronic lung diseases, defective Neuro-development, and even death. However, the side effects of hyperoxia (treatment with excessive oxygen), such as retinopathy, should not be disregarded (9).

The study of Karkhaneh et al. (10) (2008) demonstrated that the length of oxygen delivery was correlated with incidence of retinopathy in infants. Kord et al. (8) reported that nurses' performance prior to oxygen therapy was 90% weaker for the hood method and 83.3% weaker for ventilation. Furthermore, nurses' performance during oxygen therapy was reported as 84% moderate for the hood method and 53.3% moderate for ventilation, and after oxygen therapy, 92.2% weaker for the hood method and 98.6% weaker for ventilation. Another study also indicated that nurse's performance prior to oxygen therapy was 100% weaker, and during oxygen therapy was 100% weaker on the first observation and mostly (96%) weaker by the second observation (11).

Therefore, since nurses are held responsible for controlling newborns' response to oxygen therapy, old hypotheses should no longer be referred to and instead reliable evidence should be considered in practice, so that the nurses are able to offer the required health care and take the necessary measures to prevent complications or take appropriate actions if the complications occur (12).

The presence of experienced, skillful, and trained nurses is the first step to achieving desired therapeutic outcomes at the NICU. The nurses should perform healthcare practices with reference to a wide range of holistic healthcare standards. Because nurses play a significant role in newborn healthcare, quality of their practice is critical to recovery of newborns.

## 2. Objectives

Since oxygen therapy is the most commonly administered therapy at the NICU and is considered as the main constituent of nursing practice, and regarding the importance of health care practices during oxygen therapy, the present study was conducted to examine nurses' performance during oxygen therapy for newborns hospitalized at the NICU.

## 3. Patients and Methods

In this descriptive cross-sectional study, 110 nurses at the NICU of teaching hospitals affiliated with the Isfahan University of Medical Sciences (Imam Hossein, Shahid Beheshti and Al-Zahra hospitals) were enrolled by the purposeful census method. In this study, nurses' performance was considered as the main variable, and age, gender, education level and work shift type, as underlying variables.

After the approval of Isfahan University of Medical Sciences and relevant officials was obtained, sampling was started at the hospitals under study. To reduce the effect

of researcher's presence on nurses' performance, the data were gathered by resident nurses at the NICU. For filling out the questionnaire, nurses' performance was observed when the newborns needed oxygen therapy during the morning, evening, and night shifts.

The data gathering instrument consisted of two sections: demographic characteristics and a researcher-developed checklist of nurses' performance in oxygen therapy. This checklist consisted of 16 three-choice items; the choice doesn't do was scored as 0, occasionally does as 1, and always does as 2. The checklist, total score ranged from 0 to 32. For scoring, the scores above 66 were considered favorable, 34 - 66 as partially favorable, and 0 - 32 as unfavorable.

To study the reliability of the instrument, in a pilot study the checklist was administered to 10 individuals with the inclusion criteria in the study and Cronbach's alpha was calculated as 89% by SPSS and a statistician's assistance. The individuals participating in the pilot study were excluded from the main study. Furthermore, the checklist validity was investigated by nursing staff and university teachers and, if necessary, some other items were also added to the initial version.

Data analysis was done by descriptive (frequency percentage, mean, standard deviation, and Pearson's correlation coefficient) and analytical (T-test) statistics using the SPSS 20 software.

## 4. Results

The age distribution of the participants was as follows: two (1.8%) were 20 - 25 years, 37 (33.6%) were 26 - 30 years, 38 (34.5%) were 31 - 35 years, 28 (25.5%) were 36 - 40 years, and five (4.5%) were 41 - 45 years. Regarding shifts during which the questionnaires were completed, 42.7% of the nurses were working in the morning shift, 41.8% in the evening shift, and 15.5% in the night shift. All the nurses were female and 92.7% of them had BSc.

Spearman's correlation coefficient indicated a direct and significant correlation between age and nurses' performance ( $P = 0.009$   $r = 0.24$ ), yet there was no significant correlation between education level ( $P = 0.18$   $r = 0.12$ ), and the shift type with nurses' performance ( $P = 0.11$   $r = -0.15$ ). As Table 1 indicates, 28 (25.5%) nurses had unfavorable performance, 39 (35.5%) had a relatively favorable performance, and 43 (39.1%) had favorable performance.

## 5. Discussion

Oxygen is the most common drug administered to newborns with a pathological condition leading to tissue

**Table 1.** Frequency of Nurses' Performance in Oxygen Therapy

Levels	Number	Relative Frequency, (%)
Unfavorable	28	25.5
Relatively favorable	39	35.5
Favorable	43	39.1

hypoxia, and oxygen therapy is considered a main nursing practice. The nurses are conventionally in the first line of defense to maintain newborns safety, which helps them detect issues that influence newborns safety, closely and directly. Thus detecting and relieving a source of damage is critical to offering safe care. Nurses play a significant role in meeting newborns safety-related requirements. A Considerable decrease in mistakes and improvement of nurses' performance at the NICU is realized when NICU nurses understand and recognize the related reasons and then implement evidence-based interventions (12).

The purpose of this study was to determine the nurses' performance in oxygen therapy for the infants hospitalized at NICU of teaching hospitals affiliated with the Isfahan University of Medical Sciences in 2015. In this study, 39.1% of the nurses had a favorable performance in oxygen therapy and 35.5% had a relatively favorable performance.

In this regard, the study of Solberg et al. (13) (2011) evaluating nurses during oxygen administration to preterm infants under ventilation indicated a gap between professional criteria of oxygen administration and the criteria used to assess infants' needs, as a high proportion of nurses in this study used oxygen saturation to assess newborns need for oxygen, while only 17% of them used the oxygen-hemoglobin dissociation curve for needs assessment.

The study of Eastwood et al. (14) (2012) investigated ICU nurses' viewpoints and self-reported performance in oxygen therapy and indicated that 8.9% of the nurses never did oxygen therapy without a physician's order and 33% argued that toxicity with oxygen was associated with high risk of lung injuries.

The study of Kord et al. (8) (2014) that explored the audition of oxygen therapy using hood and ventilation indicated that the adherence rate to oxygen therapy standards for preterm infants hospitalized at the NICU of the hospitals affiliated with the Ahvaz University of Medical Sciences was 90% and 83.3% weaker for hood method and ventilation, respectively. The study of Rood-Dehghan et al. (11) on standards of adherence to oxygen therapy, before and during oxygen therapy at the hospitals affiliated with a medical university in Tehran, demonstrated that the adherence rate to these standards was 100% weaker before oxygen

therapy.

Because of the significance of this healthcare domain for newborns, further efforts are still required to achieve a favorable nursing performance in oxygen therapy (8). Poor nursing performance could result from inadequate staffing, no continuous monitoring by skillful professionals, insufficient work motivation, unsatisfactory nursing knowledge, and failure to attend training courses of oxygen therapy and specialized courses of neonatal intensive care (15).

Therefore, availability of efficient and qualified nurses is an important factor for reducing the adverse events and related outcomes, because newborns with small bodies are more predisposed to injury-induced consequences, and even minor mistakes could result in long and short-term destructive outcomes and death in newborns because of their unique vulnerability (16). In the study of Attari et al. (17) on frequency of oxygen therapy complications, 17 patients developed ear injuries, one acquired convulsion, and one became poisoned by oxygen. These findings could highlight inattention to the duration of oxygen delivery and related standards.

In the study of Babaei et al. (18) on 80 newborns at the Imam Ali hospital of Kermanshah, 13.1% of the newborns acquired retinopathy, mostly due to long-term oxygen delivery to newborns. Therefore, considering long and short-term complications of oxygen therapy, which cause irrevocable damage to newborns, training NICU nurses and auditing their performance could reduce these complications.

This study demonstrated a significant correlation between age and nurses' performance, but education and work shift type were not correlated with their performance. Similarly the study of Kord et al. (8) indicated that nurses' age was directly and significantly correlated with the adherence rate to oxygen therapy standards, but the shift type and academic certificate were not significantly correlated with adherence rate to these standards.

Since an increase in age is directly correlated with increased experience in nurses, nurses' performance is expected to improve over time as they gain more and more experience. A limitation of the present study was that the researcher was not blind to the nurses' performance. However, this limitation was partially adjusted by asking the nurses at the NICU to fill out the questionnaires.

### 5.1. Conclusion

Given that oxygen is the most commonly administered drug at the NICU and is considered as the main constituent of nursing performance, study of nurses' performance with regards to oxygen therapy and holding in-service

training courses for prevention of related long term complications seem necessary.

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