

The Effects of ETT Suction Education on the Knowledge and Performance of Intensive Care Nurses

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ABSTRACT:

Background: Many neonates require oxygen therapy and mechanical ventilation and endotracheal tube (ETT) suction is a vital protocol for the maintenance of artificial airway patency. But suctioning is associated with serious complications including hypoxia. Despite some existing protocols nurses still use it injudiciously in pediatric and neonatal patient groups. Therefore, continuing education has been regarded as a tool to cope with the fast changes in care methods and improving nursing professional standards.

Objective: The study was conducted to evaluate the training and educational needs in nurses working with NICUs affiliated to the Shiraz University of Medical Sciences to increase their potential with regards to ETT suctioning.

Type of study: An experimental interventional study

Place and period: NICUs affiliated to the Shiraz University of Medical Sciences, Shiraz (Iran) during 2006

Methods: Sample size was 50 persons caring for neonates with ETTs under mechanical ventilation. Using systematic random allocation, they were divided into study and control groups. Data collection was done by a test with 30 points to evaluate knowledge and a check list with 47 points to evaluate performance. After random allocation, the subjects' knowledge was evaluated. Then, ETT suction education was given to the test group and NICU infection control education was given to the controls. Two days and two months after the intervention, the subjects were re-evaluated. The results were compared. Results: Man-Whitney test showed that the level of knowledge between the two groups at the beginning of the study had no significant difference ($p = 0.71$), while the average score in the two groups 2 days and 2 months after the intervention (education) had significant difference ($p = 0.001$). There was a significant difference 2 days and 2 months after intervention ($p = 0.001$) in the performance.

Conclusion: It can be concluded that education significantly increases the level of knowledge and degree of performance of neonatal endotracheal tube suctioning; however, with the passage of time, the levels fall, necessitating the need for continued education in this matter.

Key words: Neonates; ETT suctioning; Education; Performance

INTRODUCTION

The primary goal of the at-risk neonate's care is the initiation and maintenance of breathing. Many of these neonates require oxygen therapy and mechanical ventilation. An artificial airway is usually used in mechanical ventilation. Endotracheal tube (ETT) suction is a vital protocol for the maintenance of artificial airway patency. This protocol is not without danger however, and should not be performed as a routine.¹ Serious complications such as hypoxia, cardiac arrhythmias, increase in intracranial pressure, atelectasis, mild to severe haemorrhages, tracheobronchial tears, emphysema, pneumothorax, infections (in both patients and caregivers), cardiac arrest and even death have been associated with suctioning.²⁻⁴

The rate of nosocomial infections in neonatal intensive care units (NICUs) has been reported at 6 to 25 %, with the highest involvement being the respiratory tract, which may be associated with suctioning.⁵ Another complication is hypoxia, which may itself initiate cardiac arrhythmias, bradycardia, seizure attacks, and cardiac arrest.⁶ Intermittent hypoxia during suctioning may be prevented by special presuctioning maneuvers which have been proved effective, especially pre-suctioning hyper oxygenation, although the performance of nurses has been weak in this regard.⁷ It has been shown that negative pressure and deep suctioning (advancing the suction catheter into the ETT upto the point of maximal resistance) causes right upper lobe collapse in 24% of cases and pneumothorax in another 4%. On the other hand, suctioning with a measured catheter (superficial suction) caused right upper lobe collapse in 7% of cases, and no pneumothorax.⁸ Despite the known complications of convectional ETT suctioning, 71.2% of nurses still use it injudiciously in pediatric and neonatal patient groups.⁹

Given the dangers of ETT suctioning, it is vital for nurses to adhere to all aspects of current research recommendations on the subject. In the recent years there has been an enormous volume of literature

published on this subject, but most of the authors have accorded less attention to the clinical aspect and what is happening at the bedside.¹⁰ ETT suctioning protocols in neonates differs from that of older patients, and each nurse has his/her own preferred action-line regarding the specific set standards.¹¹ Therefore, continuing education has been regarded as a tool to cope with the fast changes in care methods and improving nursing professional standards.¹² However, to increase the potential of the nurses in care-giving, their training and educational needs should be carefully evaluated and fulfilled.¹³

To evaluate these needs in nurses working with NICUs affiliated to the Shiraz University of Medical Sciences with regards to ETT suctioning, a pilot study was conducted on 12 nurses and midwives in 2006, the results of which showed that their knowledge was average and their performance was weak. In addition, there was no concordance between knowledge and performance ($p = 0.30$, $r = 0.32$), which necessitated the need for intervention such as education. Therefore, this study was designed to improve the standards of knowledge and performance through education regarding ETT suctioning in neonates so as to achieve the goals of reduction of complications associated with protocol application, shorten hospital stay, reduction of health-care provision costs and a healthier neonate, family and society at large.

METHODS

This was an experimental interventional study conducted in the year 2006 designed to evaluate the effect of ETT suction protocol education on the knowledge and performance of the nurses in NICUs affiliated to the Shiraz University of Medical Sciences. The study sample was selected from the personnel caring for neonates with ETTs under mechanical ventilation in these units during the period of study who volunteered to participate in the study and adhered fully to the education program. Sample size was 50 persons. Using systematic random allocation, they were divided into two study and control groups by one of the authors who visited the NICUs and examined the nurses' duty roster to assign the even

The Effects of ETT Suction Education on the Knowledge and Performance of Intensive Care Nurses

numbers and odd numbers as study and control groups, respectively, each with 25 persons. Data collection was done by a test with 30 points to evaluate knowledge and a check list with 47 points to evaluate performance. These were designed by the authors, its content validity certified by a team of nursing specialists and reliability confirmed by the pilot study. The test reliability was checked by alpha cronbach 0.95 method and that of the checklist was done by inter-observer reliability with a minimum and maximum of 88.6% and 97.8%, respectively. Before intervention, all subjects' performance was evaluated twice and the average was recorded as the base performance. After random allocation, the subjects' knowledge was evaluated. Then, ETT suction education was given to the test group and NICU infection control education was given to the controls. Two days and two months after the intervention, the subjects were re-evaluated, consecutively. Different trained assistants were used in the three stages of evaluation. Descriptive data was reported as frequency, mean, and standard deviation while analytic data was processed by Chi-square, Mann-Whitney test and Spearman correlation coefficient. A p-value of less than 0.05 was considered significant.

RESULTS

Table 1: Comparison of association coefficient between the knowledge and performance

p-value	Association Coefficient	Variable 2	Variable 1	Group
0.04	-0.4	Performance Before education	Knowledge before education	Study
0.29	0.22	Performance 2 days after education	Knowledge 2 days after education	Study
0.44	0.15	Performance 2 months after education	Knowledge 2 months after education	Study
0.04	0.39	Performance before education	Knowledge before education	Control
0.03	0.42	Performance 2 days after education	Knowledge 2 days after education	Control
0.001	0.67	Performance 2 months after education	Knowledge 2 months after education	Control

This study showed no significant difference between the study group and the controls as regard to age, level of experience in the NICU team, level of

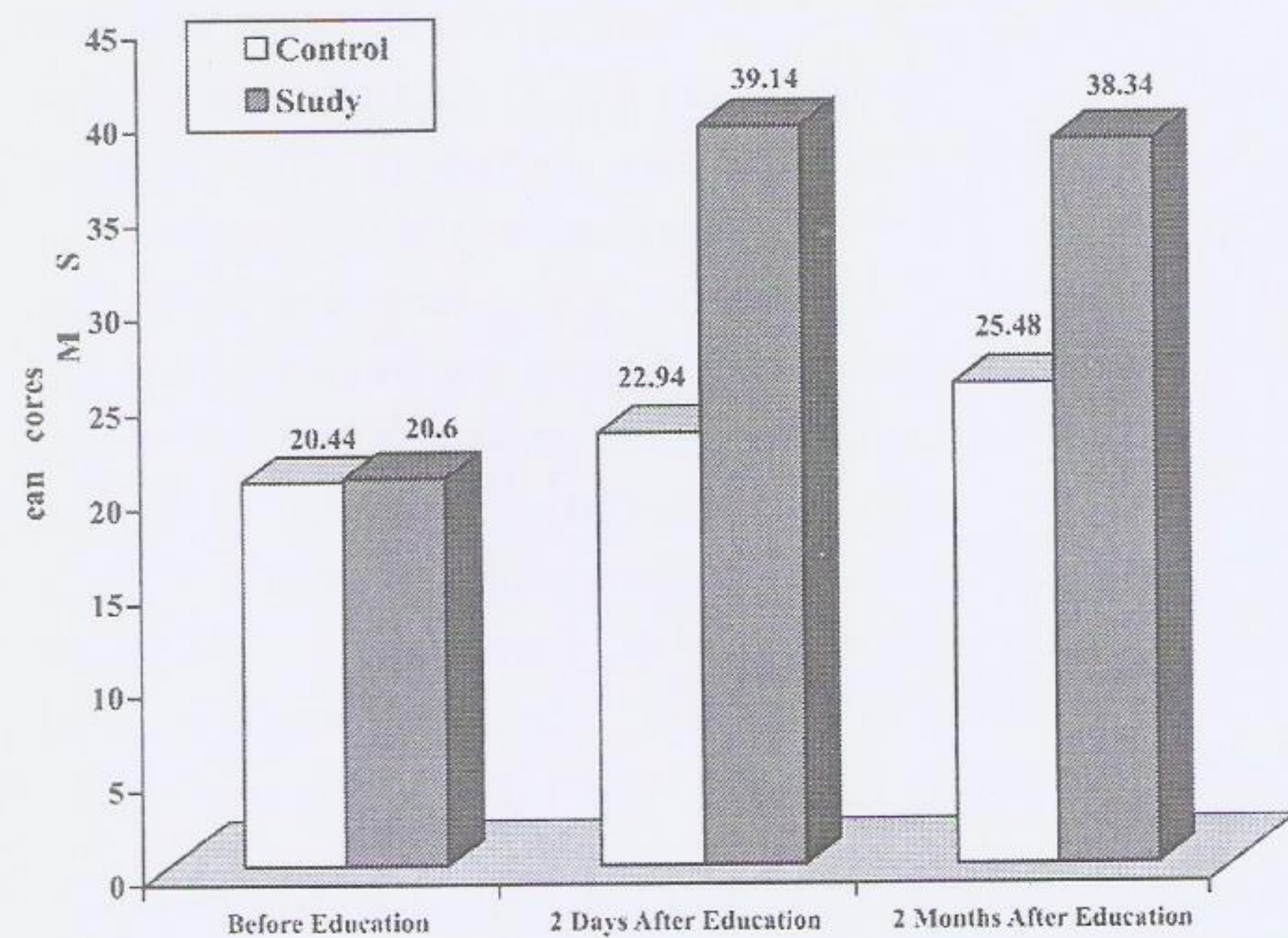


Figure 2: Comparison of nurses mean scores on performance

education (graduate, post graduate, or diploma) and job position ($p > 0.05$).

Man-Whitney test showed that the level of knowledge between the two groups at the beginning of the study had no significant difference ($p = 0.71$), while the average score in the two groups 2 days and 2

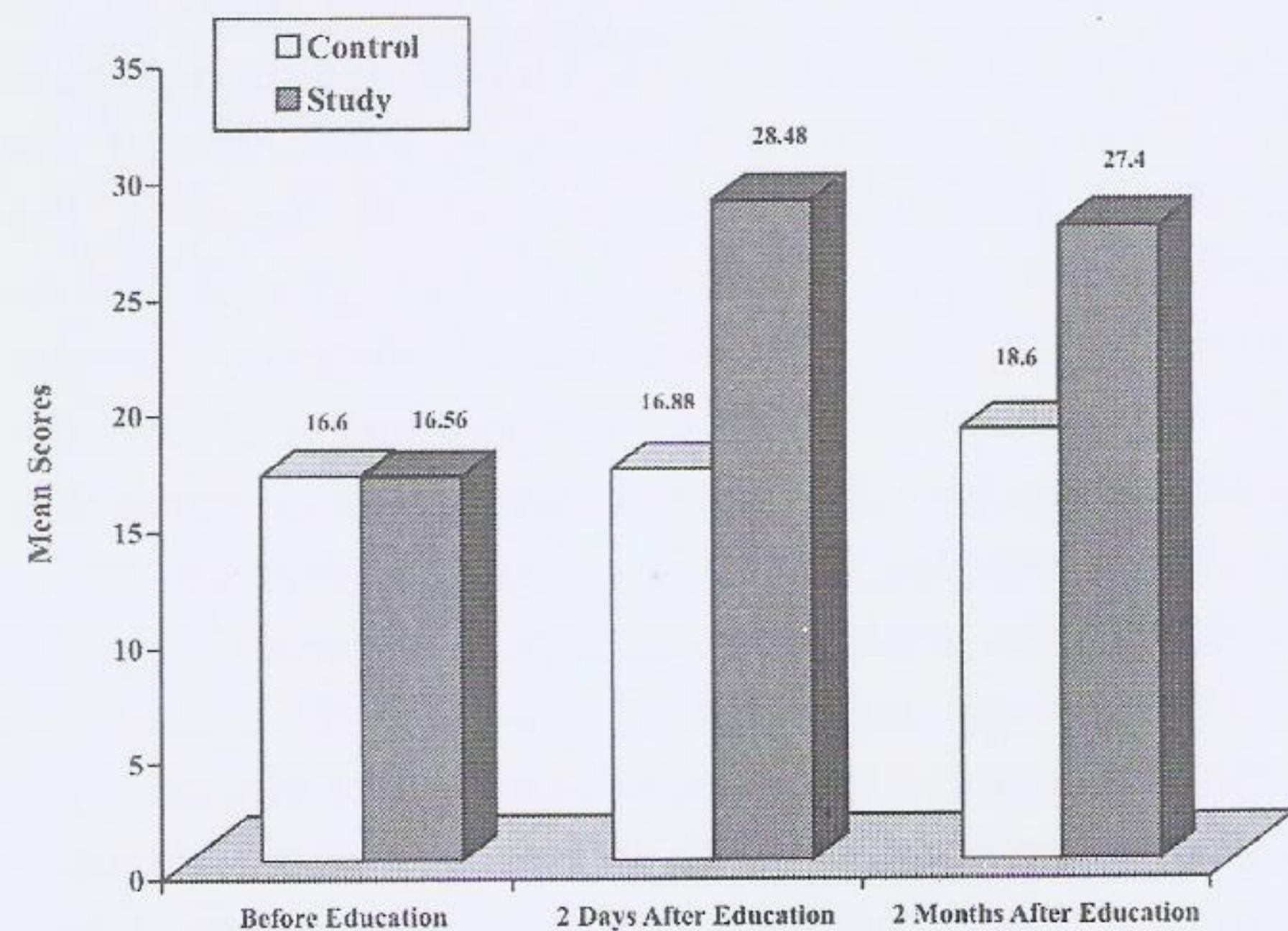


Figure 1: Comparison of nurses mean scores in knowledge at different stage of the study.

months after the intervention (education) had significant difference ($p = 0.001$). (Figure 1) It also showed no difference in the performance of the control and study groups before the study ($p = 0.80$), while there was a significant difference 2 days and 2 months after intervention ($p 0.001$) (Figure 2).

Spearman dissociation coefficient showed that before education on ETT suction, there was generally no relationship between the nurses' knowledge and their performance ($r = 0.01$, $p = 0.94$). Within the groups, however, it was seen that there was a significant negative association between knowledge and performance in the study group ($p = 0.04$). After the intervention, this association was found to be positive, but without a statistical significance ($p > 0.05$). In the control group, there was a significant positive association of the knowledge and performance in the above stages ($p > 0.05$). (Table 1).

DISCUSSION AND CONCLUSION

The data analysis in this study showed that the variables of age, experience, level of education and job position had no significant difference between the controls and the subjects, and that the two groups were similar. This shows that these variables were successfully controlled by the systematic randomization process.

As demonstrated in figure 1, knowledge scores before education in the two groups showed no significant difference ($p = 0.71$). Knowledge scores in the study group averaged at 16.56, while that of the controls was 16.60. Also, as seen in figure 2, the performance score between the two groups before intervention shows no significant difference between the two groups ($p = 0.80$). The average score for the study group was 20.60 while that of the controls was 20.44. However, 2 days after intervention, the difference in knowledge and performance between the two groups was significant ($p = 0.001$), in that, the average score for knowledge 2 days after education in the study group was 28.48 and in the control group it was 16.88. The average score for performance 2 days after education in the study group was 39.14 and in the controls it was 22.94. In addition, two months after education, there was a significant difference in the score for both knowledge and performance ($p = 0.001$) in that, the average score for knowledge two months after education in the study group was 27.40 and 18.60 in the controls, and the average score for performance two months after education was 38.34 in

the study group and 25.48 in the control group. In a study by Day et al in 2001, the study and control groups showed no significant difference in knowledge and performance scores before education on ETT suction ($p > 0.05$). However, 4 days and 4 weeks after education, the level of knowledge and performance in the study group improved and showed a significant difference to the control group ($p < 0.01$).¹⁴

Given the results above, it can be seen that the average score for knowledge and performance in both groups has changed. The increase in the knowledge and performance in the control group may have been caused by passing of knowledge from the study group to the control group (through sharing of information and experiences in members of the same nursing teams) or by any other means, knowledge of the controls about the subject of study, bias of observation by the undertakers, and individuals' reactivity quality (the change of the persons behavior in the presence of observers).¹⁴

In the study group, two months after education, the average score in knowledge and performance declined. Such that the average score for knowledge dropped from 28.48 two days after education to 27.40 two months after, and the average score for performance declined from 39.14 two days after education to 38.34 two months later. In the study by Day et al, too, the level of knowledge and performance in the study group declined after 4 weeks, such that the average score for knowledge dropped from 22.90 four days after education to 22.80 four weeks afterwards, and the average score for performance declined from 22.37 four days after education to 21 four weeks later. They concluded that as time passes, the effect of education is reduced, and there is a need for continued education.¹⁴

The results of the evaluation of a relationship between the level of knowledge and the degree of performance before the education shows that there is no association between these two variables ($p = 0.94$, $r = - 0.01$). Day et al reported that there was a weak

association between knowledge and performance of tracheostomy tube suction, which was not statistically significant ($p > 0.05$, $r = 0.33$). They concluded that there is no association between knowledge and performance.¹⁰

When the two groups are analysed separately, it can be seen that in the study group, there was a negative association between knowledge and performance before education. This means that a subject may have good knowledge yet a bad performance and vice versa. The negative association between the knowledge and performance in the study group before education may be caused by several factors. These may include fatigue and lack of personnel manning NICUs, large patient population, lack of resources, lack of motivation etc, which will result in a minimal performance despite a high knowledge level in one's field. Day et al explain that the present day nurse has appreciated the importance of research, but some may not be willing to nurse in accordance with experimentally approved facts.¹⁴ After education, this negative association was lost, however, the association between knowledge and performance was not statistically significant ($p > 0.05$). In the control group in this study, in all the stages there was a significantly positive association between knowledge and performance, which was retained even after education ($p < 0.05$). As is known, this may have not necessarily been due to a true relationship between the two variables but a third unmeasured factor instead.

Generally, based on the findings of this study, it can be concluded that education significantly increases the level of knowledge and degree of performance of neonatal endotracheal tube suctioning; however, with the passage of time, the levels fall, necessitating the need for continued education in this matter. A negative association that exists between the knowledge and performance may be reversed by education, although the change may not be significant. The authors suggest incorporating ETT suction to the NICU nurse continued education program.

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