Cardiothoracic Care Nurses' Practice and Beliefs toward Endotracheal Suction Post Coronary Artery Bypass Graft at Teaching Hospital

Mohamed Goda Elbqry\textsuperscript{1,2}

\textsuperscript{1}Department of Medical Surgical Nursing, College of Nursing, Qassim University, Saudi Arabia.
\textsuperscript{2}Medical Surgical Nursing Department, Faculty of Nursing, Suez Canal University, Ismailia, Egypt.

m.elbqry@qu.edu.sa E-mail:
ORCID: https://orcid.org/0000-0002-0654-9702

Abstract

Background: Although endotracheal suction (ETS) is a crucial practice, it is not free of complications and hazards particularly when operated improperly or/and critical condition. Therefore, it is particularly important to perform this procedure with professional competence, especially among high risky groups with threatening conditions. Aim: This study aimed to assess cardiothoracic care nurses' practice and beliefs toward endotracheal suction post coronary artery bypass graft at teaching hospital. Materials and Method: A cross-sectional descriptive study conducted at cardiothoracic care unit (CTCU) at the teaching hospital. A convenience sample of thirty-two nurses utilized self-administrated scale to assess nurses’ beliefs and observational checklist to assess their level of practice toward Endotracheal Suction Post Coronary Artery Bypass Graft at Teaching Hospital. Results: Mostly of the studied nurses were female and had technical institutions. Most of them (56\%) had a moderate level of practice and adequate beliefs toward suction post coronary artery bypass graft. However, there was a statistically significant correlation between their level of practice and beliefs. Conclusions: Approximately all the studied nurses had a moderate level of practice in terms of ET suctioning with adequate level of beliefs, and mostly of them did not attend training courses toward endotracheal suction post coronary artery bypass graft at teaching hospital. Recommendations: An in-service trainer must conduct continuous training courses to improve nurses’ practice and enhance their beliefs toward Et suction. Cardiothoracic care nurses should be updated with nursing guidelines and oriented toward the use of advanced suction equipment and technique to promote the provided practice and their beliefs.

Keywords: Cardiothoracic care, Coronary artery bypass graft, Endotracheal suction, Nurses' beliefs, practice.

Introduction

Cardiothoracic care nurses are essential members of a multidisciplinary team who care for hospitalized patients with cardiac surgeries [1]. Coronary artery bypass grafting is a frequent surgery to treat coronary artery disease and requires highly qualified nurses for competent nursing care. The coronary heart disease deaths in Egypt reached 107, 232 or 23.14\% of total deaths that ranks Egypt 23 in the world. Postoperative care is emergent and crucial management of a patient after this threaten life of surgery. This includes the care given during the immediate post operation to promote recovery level and/or accompanied complications [2,3].

Endotracheal tube suction can be life-threatening and should be used in accordance with established protocols and guidelines. It is essential considerations to reduce of mortality, morbidity, hospital expenditures, and length of stay, as well as to improve quality outcomes by hastening patient recovery among this group [4].

Furthermore, approximately 20\% or more of people are expected to receive potentially harmful care. Endotracheal tube (ETT) insertion is a life-saving procedure that can improve and protect the natural airway while also allowing mechanical ventilation to be delivered [5]. It is the most common invasive procedure performed by critical care nurses for patients who require mechanical ventilation. Unfortunately, when a patient is connected to a ventilator, the normal airway is disrupted, coughing occurs, and secretory accumulation in the lungs and tube occurs, which can lead to microbial activity, airway obstruction, hypoxia, bronchospasm, bronchiectasis, increased intracranial pressure, tachycardia, cardiac arrest, and death [6,7].
The open suction system (OSS), which is amenable to traditional suction, requires the ventilator to be detached from the patient and the use of a single-use catheter [8].

During ETS, however, a closed suction system (CSS) can remain in line for 24 hours with a multiple-use catheter through the plastic sheath of multiple use drains [9]. CSS is now very popular and is partially the most used type of treatment in intensive care units because ventilation continues during the suction procedure, reducing lung volume loss and avoiding gas exchange impairment, preserving positive end-expiratory pressure (PEEP), reducing environmental pollution, and potentially lowering costs. One advantage of this approach is that setting up and cleaning the equipment takes less time, and patients experience less anxiety [10].

The ETS procedure for critically ill patients' nursing practice varies greatly between organizations and practitioners. This could be due to resistance to change or a lack of resources. Nurses’ beliefs can be broadly described as a subjective attitude that a proposition is true or as a situation that can influence nurses’ ability to provide care for patients [11,12]. CSS has recently been assumed to be a new challenge in teaching hospitals plus open suction system. Hence, the present observational study was necessary to assess cardiothoracic care nurses' practices and beliefs toward endotracheal suction post coronary artery bypass graft at teaching hospital.

**Significance of the study:**

Investigation cardiothoracic care nurses’ practice and beliefs toward life threaten conditions closely as post coronary artery bypass graft and play a pivotal role in fostering a sense of preparedness and safety among both patients, their families, hospitals, and healthcare workers directly those nurses. Furthermore, in the same line of national Egyptian vision 2030 goal (3) to identify health dipartites and promote the delivery of care [13].

Frequent support initiatives led toward nurses in critical care area can significantly enhance the effectiveness and competencies toward directed care to hospitalized patients. Artificial airway suctioning is a key component of airway management and a core skill for clinicians and nurses charged with assuring airway patency. Suctioning of the artificial airway is a common procedure performed worldwide on a daily basis. As such, it is imperative that nurses are familiar with the most effective and efficient methods to perform the procedure [14].

**Aim of the study:**

This study aimed to assess cardiothoracic care nurses’ practices and beliefs toward endotracheal suction post coronary artery bypass graft at teaching hospital. To achieve this overarching goal, the following specific objectives were pursued:

1. To evaluate the level of practice among nurses toward endotracheal suction post coronary artery bypass graft.
2. To determine the level of beliefs among nurses toward endotracheal suction post coronary artery bypass graft.
3. To Identify relation between nurses’ practice, beliefs among nurses with demographic profile.

**Research questions:**

1. What is the level of practice among nurses toward endotracheal suction post coronary artery bypass graft.
2. What are the levels of beliefs among nurses toward endotracheal suction post coronary artery bypass graft?
3. What is the relation between nurses’ practice, beliefs among nurses with demographic profile.

**Subject and methods**

**Design of the study:**

A cross sectional descriptive research design was employed to fulfill the study's objectives.

**Setting:**

The study was conducted from October 2021 to March 2022 in cardiothoracic care unit affiliated with teaching hospital in Ismailia city, Egypt.

**Sampling:**

A convenience sample of participants in the current study included thirty-two nurses from the previously mentioned setting. Using an epidemiological information system, the sample size and power were estimated with a 95% confidence interval, a 10% dropout rate for each group, and a 90% power of the study [15, 16].

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The data collection process of this research involved the utilization of two tools:

**Tool I:** A self-administered questionnaire was meticulously developed through an in-depth review of pertinent literature and related previous studies. This questionnaire consisted of three distinct sections:

- **Part A:** This section comprises 8-items designed to capture the characteristics of the participating nurses. These items encompassed closed-ended inquiries concerning age, gender, marital status, educational level, years of experience, hospital affiliation, and prior attendance of training programs ET suction and availability of guidelines or/and policies in the unit.
- **Part B:** To assess the nurses’ level of belief (7-items) about endotracheal suction post coronary artery bypass graft. This scale was shaped by the researchers' insights and guided by [17,18].

**Scoring system:**

When it comes to assessing the beliefs of the participant, the response was on the Likert scale from zero to four as strongly disagree, disagree, neutral, agree, strongly agree. The researchers collected the total and developed it to percentages, the score percentage was classified as below 75% are categorized as inadequate level, while the scores surpassing 75% are regarded as adequate level.

**Tool II:** Observational Checklist: This tool was adopted by researchers from clinical textbooks and related previous studies [19,20,21]. It consisted of sixty steps to assess the studied nurses’ level of practice with respect to ET system suction preprocedural, procedure, and post-procedure. The studied nurses were observed at the time of applying the utilized procedures.

**Scoring system:**

Each correct step was given one grade, while an incorrect step was given zero. The total score varies from zero to sixteen in the used section; a score is considered to indicate a low level of practice if it is less than or equal to 50%, moderate if it is fluctuated between 51% to less than 75, and high level if more than or equal 75%

**Tools developments:**

The researchers made some modifications to the tools after reviewing recent literature and previous related studies in the same concern of the research variables.

**Content Validity and Reliability:**

For assessing content validity, the present study underwent evaluation by five academic nursing experts specialized in Critical care Nursing, Medical Surgical Nursing, and cardiothoracic medicine at Suez Canal University teaching hospital and Faculty of Nursing. These experts scrutinized the study's content for appropriateness and clarity, providing valuable recommendations for refinement. The suggested modifications were subsequently incorporated into the study materials.

Furthermore, to measure the internal consistency of the questionnaires, Cronbach's alpha values were calculated. Its values for the tools were as follows: 0.89 for nurses' beliefs, and 0.91 for nurses' practices. These alpha values indicate strong internal consistency, suggesting that the questions within each domain of the questionnaires were reliably measuring the intended constructs.

**Ethical Considerations:**

Upon being provided with a clear explanation of the study's objectives, the nurses expressed their willingness to participate and before initiating the data collection process, they were thoroughly briefed about the study's purpose and its overall nature. They were explicitly informed about their right to decline participation or withdraw from the study at any stage or to give any reasons without any obligations.

Furthermore, a crucial emphasis was placed on maintaining the confidentiality of the information they provided, ensuring that the collected data would be used solely for research purposes. It is important to underscore that participation in this study was entirely voluntary, and the researchers took measures to preserve the anonymity of the participants by encoding their data. The study received ethical approval from the Ethics Committee of the Faculty of Nursing at Suez Canal University. This ethical clearance validated the study's adherence to ethical standards and the safeguarding of participants' rights and confidentiality.

**Fieldwork:**

The researchers carried out the study in the following manner:

**Pilot study:**

Prior to initiating the primary study, a pilot study was conducted involving 5 nurses from the prementioned setting. These participants were subsequently excluded from the main study.
sample. The pilot study served multiple purposes, including providing valuable insights into the questionnaire administration process and aiding the researchers in estimating the time needed for participants to complete the forms.

The comprehensive data collection process spanned a duration of approximately six months, commencing in October 2021 to March 2022. This extensive timeframe enabled the researchers to effectively collect data from the participants and ensure the accuracy and reliability of the findings. The researcher was always available to answer any questions or concerns. The researcher observed the nurses’ practices twice using an observational checklist to evaluate the nurses’ practices during procedure preparation, during the actual procedure, and after the procedure for closed-system suctioning.

The researcher observed each nurse for 5-10 minutes for each practice. A total of fifty-five data collection sessions were included, with an average of eight hours for belief assessment and nine hours for observing nurses' practices. Following the data collection, the researcher rechecked the collected data, provided simple feedback on the questionnaire results, and greeted the participating nurses and healthcare workers in the study setting.

**Statistical Design**

The data were statistically analyzed, tabulated, and analyzed using the statistical program SPSS (version 20). The Kolmogorov–Smirnov test was used to determine if the acquired data were normal, and it was determined that the data were parametric. To describe patient characteristics, the collected data were reviewed for frequency and distribution. Variable differences were measured using independent sample t tests (t) for related groups, and the Pearson correlation coefficient (r) was used to determine how closely two variables were related. The significance level was set at p 0.05.

**Results:**

Table 1: explain that among the participants' mean (SD) age was 27.8 (6.4) and their range was 19-34 years. About more than half (62.5%) of the nurses were female. Furthermore, half (50%) of them had technical experience, and approximately more than half (53.2%) had 4:6 years of experience.

Figure 1 displays that the more than two-quarters (72%) of the studied nurses at cardiothoracic care unit did not receive related training courses of ET suction post coronary artery bypass graft. Approximately, three quarter (75%) of the studied nurses expressed available polices or procedures in the unit.

Figure 2 shows that the overall level of practice was moderate for more than half of the participants (56%), while less than one-fourth (14%) of the participants had a high level of practice regarding the suction system.

Figure 3 Approximately two-quarters (61%) of the studied nurses had an adequate level of beliefs, while more than one-third (39%) had an inadequate level of beliefs.

However, based on the Pearson correlation coefficient test results in the present study, there was a statistically significant correlation between nurses' practice score and nurses’ beliefs score, with a p value ≤0.05. This process is described in Table 2.

Table 3 shows that there was a statistically significant correlation between nurses' practice score and demographic feature (p value ≤0.05) and education. Furthermore, there was a statistically significant correlation between nurses' level of beliefs and demographic features, with P values ≤0.05 indicating age and experience.
**Table 1:** Demographic profile of the studied cardiothoracic care nurses (n=32).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency (n=32)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
</tr>
<tr>
<td><strong>Age years</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>13</td>
</tr>
<tr>
<td>≥25</td>
<td>19</td>
</tr>
<tr>
<td><strong>Mean±SD, Range</strong></td>
<td>27.8 ±6.4</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>20</td>
</tr>
<tr>
<td>Males</td>
<td>12</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
</tr>
<tr>
<td>Bachelors</td>
<td>3</td>
</tr>
<tr>
<td>Technical institute</td>
<td>16</td>
</tr>
<tr>
<td>Technical bachelors</td>
<td>4</td>
</tr>
<tr>
<td>Diploma</td>
<td>9</td>
</tr>
<tr>
<td><strong>Experience years</strong></td>
<td></td>
</tr>
<tr>
<td>1-3 years</td>
<td>10</td>
</tr>
<tr>
<td>4- 6 years</td>
<td>17</td>
</tr>
<tr>
<td>7- years</td>
<td>5</td>
</tr>
<tr>
<td><strong>Mean ± SD</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.6±6.8</td>
</tr>
</tbody>
</table>

**Figure 1:** Frequencies and percentage of the studied nurses regarding receiving related training courses and availability of policies procedure in the unit (n=32).
Figure 2: Overall practice level of the studied nurses in endotracheal suction post coronary artery bypass graft (n=32).

Figure 3: Overall beliefs level of the studied nurses in endotracheal suction post coronary artery bypass graft at teaching hospital. (n=32).
Table 2: Correlation matrix between the overall practice level of endotracheal suction and beliefs scores of the studied nurses (n=64).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Overall nurses’ beliefs score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r</td>
</tr>
<tr>
<td>Overall ET system suction practice score</td>
<td>0.19</td>
</tr>
</tbody>
</table>

(r) Pearson Correlation coefficient *significant at the 0.05 level

Table 3: Correlation matrix between overall practices, beliefs in endotracheal suction and demographic profile of the studied nurses (n=32).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Demographic profile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age</td>
</tr>
<tr>
<td></td>
<td>r</td>
</tr>
<tr>
<td>Overall ET system suction score</td>
<td>0.41</td>
</tr>
<tr>
<td>Overall nurses’ beliefs score</td>
<td>0.13</td>
</tr>
</tbody>
</table>

(r) Pearson Correlation coefficient *significant at the 0.05 level

Discussion

Endotracheal suction (ETS) required for any critically ill patient who requires invasive mechanical breathing, with the primary goal of clearing secretions and avoiding ETT airway blockage [18,19]. Regardless of the suctioning method used, intensive care nurses are essential in peri-suctioning, which includes baseline screening for signs of respiratory distress and monitoring for common problems such as bradycardia and hypoxia [1,21]. Therefore, the current study was conducted to assess cardiothoracic care nurses' practice and beliefs in endotracheal suction post coronary artery bypass graft at teaching hospital.

The present study emphasizes the pivotal role of awareness in enhancing preparedness and care toward life threaten condition about ET suction post coronary artery bypass graft. By investigating nurses’ competencies of ET suction, early identification becomes possible to promote the directed area. This can result in quicker implementation of robust care, curbing the transmission of the hazards. Such measures contribute to Sustainable Development Goal 3’s aim of reducing the global burden of diseases and preventing avoidable complications [7,13].

The current study revealed that the demographic profile' findings of the studied nurses (Table 1), and the participants' mean (SD) age was 27.8 (6.4) years. Furthermore, the findings revealed that more than half of the nurses were female. Moreover, half of them had technical institute experience, and more than half also had 4.6 experience with mean (SD) 3.6±6.8 years.

These nurses were aware of the impact of adult ET suction progress, educational level, psychological status and were able to clearly describe medical procedures and anticipated results. In these concerns, Dastdadeh and Vahedian specified that these conclusions are consistent with their study findings that stated more than half of the participant were male with higher experience level and marital status [22]. Otherwise, these study findings are incompatible with those of Aboalizm and Elhy, who reported that nurses aged 22-31 years, and had more than eight years of higher education experience with most of them having diploma degree [23].

Moreover, Figure (1) of the current study's finding demonstrated that more than two-quarters of the participants did not receive related training courses as well as presented that there were no available for police or procedures in the unit. The researchers' points of view confirm that most of the Egyptian nurses were female and that the recruited nurses graduated from university nursing institutes. This agreed with Kadhim & Mhabes stated that inadequate level of receiving continuous training courses among the studied participant [9]. In the opposite way, El Desouky, et al. clarified that the polices and
procedures toward endotracheal suction were available and updated at the study settings [1].

The results of the study of nurses’ practice level in Figure (2) illustrate that the overall level of practice of the studied nurses was moderate among more than half of them, while less than one fourth of the nurses had a highly level of practice toward ET suction practice. Hence, the researchers' point of view in this area may be concerned with the nurses' extensive experience, high educational level, traditional suction practices, and availability of resources have major influencing in the nursing care. These findings agreed with those of Pinto, D'Silva, and Sanil on the same issue, demonstrating that the similarity of the study findings indicates an adequate level of nurses' performance regarding closed-system suction [12]. Moreover, Mwakanyanga et al. disagreed with these findings, revealing a low level of closed endotracheal suction practice among nurses [24].

In concerning of the level of beliefs among the nurses who were studied, the exacting findings of this study in Figure (3) revealed that about less than two-quarters of the participant had adequate beliefs toward endotracheal suction post coronary artery bypass graft, while more than one-third (39%) had inadequate beliefs. The researcher point of view is linked with moderate level of the studied nurses, culture, Islamic religion in our country, educational level as well as individual moral concerns of them. However, based on the Pearson correlation coefficient test results in the present study, there was a statistically significant correlation between nurses' practice score and nurses’ beliefs score, with a p value ≤0.05. This process is described in Table 2.

Similarly, Ncube, C. stated that most of the studied nurses had an elevated level of belief regarding the endotracheal suction among critically ill patients [20]. Otherwise, Davies, Huang, and MacIntyre presented that the studied participants had a low level of beliefs and attitude regarding endotracheal suctioning among the studied nurses [25]. The researchers' points of view on this topic may be related to the nature of the study sample, the lack of experience in the closed suction group, and the fact that most of the nurses had a technical institute. There was a statistically significant correlation between nurses' practice score and demographic features (P value ≤0.05), such as education. Furthermore, there was a statistically significant correlation between nurses' level of beliefs and demographic features, with P values ≤0.05 indicating age and experience. One of the study's limitations was the use of the direct observation technique, which can influence nurses' behavior. The researcher attempted to mitigate this effect by repeating the observation twice and remaining present for several work shifts.

**Conclusion**

This study underscores that, more of the studied nurses attended a technical institute, and more of them did not receive suction training program or updated guidelines. The patients’ overall level of practice with the ET suction system was moderate. Furthermore, their level of belief in the ET suction system was adequate. However, there was a statistically significant relationship between overall nursing practice and beliefs. emergent in-service-led continuous training courses improve nurses' practices in ET suction and enhance their beliefs. Cardiothoracic nurses should be attentive. The results support the need for continuous training programs to ensure that nurses remain well-informed and adept in endotracheal suction post coronary artery bypass graft. The findings of this study also hold broader implications for healthcare providers' preparedness and responsiveness to emerging endotracheal suction.

**Recommendations:**

1. Allocated the emergent requirement of training sessions on nurses' practices, and beliefs ET suction post coronary artery bypass graft at regular intervals. The dynamic nature of healthcare necessitates continuous updates to keep nurses well-informed by raising their competences about the latest developments in ET Suction practice.

2. Design practical sessions that are tailored to the specific needs and challenges faced by nurses in the field. Incorporate case studies, real-world scenarios, and interactive discussions to engage nurses and enhance
their understanding of ET suction practice preparedness, skills, equipment and types.

3. Expand the scope of continued training sessions to include interdisciplinary collaboration. Collaborative training involving nurses, physicians, infection control specialists, and cardiothoracic physicians can lead to a comprehensive approach to ET Suction practice and beliefs post coronary artery bypass graft.

Abbreviations
Endotracheal Tube (ETT), Endotracheal Tube Suction (ETS), Open Suction System (OSS), Closed Suction System (CSS), Positive End-Expiratory Pressure (PEEP), Intensive Care Unit (ICU).

Acknowledgement
I sincerely appreciate the nurses and other healthcare workers in the cardiothoracic care unit for their support, help and cooperation. Deeply appreciation Assist. Prof. Fatma Elmansy for her meticulous revision and statistical guidance of the study result.

Ethical Approval:
Ethical Approval: The study received approval to proceed from the institutional Research Ethics Committee (REC) (Reference number 139/1-2022). Suez Canal University's Faculty of Nursing, Egypt. The director of the adult intensive care units at the study site gave his official approval for the study to begin.

Competing interests
There were no conflicts of interest associated with this study.

Funding Statement
The current study received no funding or economic support for any purpose.

Availability of Data
The datasets used and/or analyzed during the current study are available upon reasonable request from the corresponding author.

Author Contribution
The author industrialized the data assembly, methodology preparation, introduction, interpretation, conceptual framework, and tool conceptualization as all the contributions organized reference, manuscript design, and journal submission.

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