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Effect of nasogastric tube feeding care program on nurse's knowledge and practice

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Abstract: **Enteral nutrition is the preferred feeding method for those patients with normal functioning tracts as comatose patients, and patients breathing with the assistance of a mechanical ventilator, gastrointestinal tract plays an important role in maintaining body immunological defenses, reduces infection rate and promotes better survival rate in critical care units. Feeding the critically ill patient is a unique challenge in nutritional management and nutritional support should be started as soon as possible after admission and should be maintained as long as the patient does not eat adequately because prolonged starvation increases the risk of morbidity and mortality. Aim of the study The aim of this study is to assess the effect of the educational program on the nurse's knowledge and practice regarding caring of Nasogastric tube feeding in critical ill patient. Method .A Quasi-experimental design with Pre and Post Test was used for the current study. Conducted in ICU department at Prince Sultan Military Medical City, in Riyadh, inspired to be the premier hospital in providing the highest standards of healthcare services for its patients. Tool of Study .Three tools were used for data collection for the present study as follow: Tool 1: Socio-demographic characteristics of the study participants, Tool 2: Knowledge of nasogastric tube feeding questionnaire This questionnaire was developed by (Mahmoud et al., 2012) and it consists of 45 questions related to enteral feeding from different aspects. Tool 3: The observational checklist it was developed by (Mahmoud et al., 2012) and it consists of three main checklists; to assess the nurses' practices regarding enteral nutrition. . Result of the current study showed that nurses reported a good level of knowledge and practice before the educational program and their level was improved after the program. There were fair level of knowledge and practice for some items of the scale of knowledge and practice, which were improved obviously after the program. Conclusion. The study concluded that nurses reported a good level of knowledge and practice before the educational program and their level was improved after the program. There were fair level of knowledge and practice for some items of the scale of knowledge and practice, which were improved obviously after the program. There were also some levels of poor knowledge and practice before the program that were improved later after the intervention. The study provided an evidence of the effectiveness of the educational intervention in raising the level of knowledge and practice regarding this specific type of nursing care in a specific care unit.**

Keywords: **Enteral Nutrition, Nasogastric tube feeding Nurses' Knowledge, Nurses' Practice, Educational program.**

1. INTRODUCTION

"Every careful observer of the sick will agree in this that thousands of patients are annually starved in the midst of plenty, from want of attention to the ways which alone make it possible for them to take food (1)

The gastrointestinal tract plays an important role in maintaining body immunological defenses, it improves gut and liver functions, reduces infection rate and promotes better survival rate in critical care units. Tube feeding is used for a patient who has at least some digestive capability but is unwilling or unable to consume enough food by mouth. Nutritional support has become a routine part of the care of the critically ill patient. Feeding the critically ill patient is a unique

challenge in nutritional management. Nutritional support should be started as soon as possible after admission and should be maintained as long as the patient does not eat adequately because prolonged starvation increases the risk of morbidity and mortality.(2)

Enteral Nutrition means the infusion of a liquid diet directly into the GI tract (gastrointestinal system) via a nasogastric or enter cutaneous tube. Use of enteral feeding is associated with preservation of gut integrity, barrier and immune functions and reductions in septic complications .(3)

The nasogastric tube was first used to deliver enteral nutrition. Some say the Italian general medical personnel; aquapendente used a silver nasogastric tube in the 1600s, while others credit the first use to John Hunter, who fed a patient using a flexible, hollow leather nasogastric tube in 1790. Levin introduced a flexible, rubber nasogastric tube in 1921, and since that time, nasogastric tubes made of polyvinyl chloride, silicone and polyurethane have gotten to be available, with polyurethane and silicone preferred because they remain soft, flexible, and nonreactive over time. (4)

Another important factor that may affect nurses' Enteral Nutrition care is the documentation system, which was found to provide nurses with moderate support to implement their Enteral Nutrition care. Despite the presence of competent staff, patients' nutritional data were found to be incomplete in their records. Such incomplete EN data could be attributed to insufficient time and knowledge, and frequent documentation requirements, along with the poorly constructed documentation system. This incomplete documentation of EN care may lead to miscommunication, assumptions, and misinterpretation of patients' information among nutritional support team members, which requires implementation of a precise and correct documentation system.(5).

Caring of the nasogastric tube is one of the most important nursing responsibilities and the nurse had a pivotal role, which required a highly skill and qualification in performing this procedure (6). Patients in the critical care setting are at high risk of malnutrition, due to the nature of their illness and their hyper-metabolic state. Their immune system is compromised, so they are at increased risk of infection and septicemia. Delayed healing and infections contribute to prolonged intensive care stay, increased mortality, morbidity, and higher treatment costs (7).

However, in more advanced critical care units, the RNs calculate patient’s needs of calories, body's requirements, analyze daily calories delivery and advocate for early enteral feeding. (7)

Nasogastric tube insertion is a common procedure in hospitalized, particularly critically ill patients. Simple yet serious, this procedure may carry severe complications, increasing the odds of morbidity and mortality. The interactions between patient and procedure risk factors probably aggravate the range of drawbacks. Training, observation, and confirmation techniques would help to prevent or at least minimize the complication and maximize safe practice (8).

Also emphasizing were put on the improper tube insertion, which can lead to a variety of serious complications these include: the tube may enter the lungs Because of the proximity of the larynx to the oesophagus; the Nasogastric tube may enter the larynx and trachea, this may cause a pneumothorax (8).

Perforation of the oesophagus is a rare but may occur in pre-existing oesophageal disease as in case of presence of an unrecognised diverticulum of the oesophagus. Retropharyngeal abscess may occur from perforation of a piriform sinus and will cause swallowing problems (9).

Refrigerating the tube may help to avoid coiling and keeps it stiff. Alternatively, using a guide wire can help with both these issues. A well-lubricated tube may help to decrease friction during insertion. If the nostrils are of unequal size the wider one should be used. If resistance is felt, the tube should not be forced. Parotitis this can be prevented by good oral hygiene. Oral bacteria enter the parotid duct, causing infection of the gland (9).

Aspiration Pneumonia (AP) is defined as the inhalation of either oropharyngeal or gastric contents into the lower airways. This is affected by quantity and nature of the aspirated material, the frequency of aspiration, and the host factors that predispose the patient to aspiration (9).

There are several factors that contribute to this higher risk, including prolonged maintenance of a supine position, gastro paresis because of the underlying illness, and nasogastric intubation. 4–6 Hospitalized patients are also more likely to develop aspiration pneumonia because the gastric contents may be colonized by pathogenic microorganisms when the pH

of the stomach is increased by the use of histamine-2 receptor blocking agents, proton-pump inhibitors, and enteral tube feeding . 7–10 finally, the prevalence of aspiration associated with enteral tube feeding is approximately 5% with an incidence of 2.4 events per 1000 tube-feeding days. 11 Fortunately for many of these patients, the event is not life threatening, and enteral nutrition may be safely continued (10).

In support of 2030 vision of our Kingdome is need to enhance the quality of care of patient and all needs in hospital with need more strengthen educational to promote knowledge and practice to decrease the incidence of work that may increase the rate of mortality . As I reads in In-service of education is one aspect of staff development, ongoing in all health care institution and refers to skill development for the direct caregivers support that by study done by DR Nagla in., 2017 support IOSR Journal of Nursing and Health Science found there a statistical significant difference in pre-test knowledge scores between the participants who attended previous educational study; found a statistical significant difference in pre-test knowledge scores between the participants who attended previous educational sessions regarding enteral nutrition and others who did not. Nurses who attended previous educational sessions scored significantly higher than the others did in pre-test knowledge (11)**.**

As a critical care nurse, the researcher noticed some nursing noncompliance with the enteral feeding instructions and protocols regarding enteral nutrition; such as tube verification, amount and frequency of enteral feeding, drugs crushing, medications mixing and many other observations. At the same time, little is known about the nurses' knowledge regarding enteral nutrition in the critical care units; moreover, few studies

From my experience, no one from health care provider can deny that, patient has the right to receive the effective and safe care in everywhere in the hospitals and in each health care settings in which it is need a well-trained nurse who has knowledge, awareness to improve and increase the quality of the provided care, So this study was conducted to examine the effect of the educational program on the nurse's practice and knowledge in relation to care of nasogastric tube feeding.

A Quasi experimental design with pre and post test was used for the current study to answer the research questions. Quasi-experimental was chosen because choosing a random sample was not possible due to the nature of the study setting (ICU) and the intervention was provided for the convenience sample with no control group. Since the validity of the quasi-experimental design could be threatened, the researcher made every possible effort to control the external environment, the intervention, and the procedure of data collection. In addition, quasi-experimental design save time, effort, resources and reduce the difficulty of ethical concerns associated with the true experimental designs. (13) and; William R, 2002. Pre test post test was performed to have a base line data to compare against after providing the educational program to examine the effect of the program on the participants.

2. METHODS OF DATA ANALYSIS

The data was reviewed, validated and checked for missing data before data entry. Data was entered on SPSS (Statistical Package for Social Sciences), version 21.

Descriptive statistics were used in terms of number and percentages to describe the demographic characteristics of the study sample and to answer research questions 1, 2, 5 and 6. Paired sample t- test was used to answer research questions 3 and 7 to find out if there a difference in the mean score of nurse's knowledge between pre and post the educational program. Spearman correlation was used to answer research question 4 and 8 to find out if there is any association between the demographic characteristics if the study sample and their knowledge and practice.

Setting:

The study was conducted in SUADIA ARABAI at Intensive care unit at Prince Sultan Military Medical City in Riyadh. PSMMC (Prince Sultan Medical City) was established in Riyadh in 1399 Hijri as a pioneering step in caring for the members of the armed forces and their families in addition to opening medical and non-medical departments offering the latest services in the Kingdom and the Middle East. Prince Sultan Medical Military City in Riyadh equipped with more than one thousand beds and provide tertiary care. It have many specialists' centers, which provide a high level of quality of care.

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Study Population and Sampling:

A convenience sample of all available nurses working with patient with nasogastric tube in Intensive Care Unit at Prince Sultan Medical Military City will be include (about 135 nurses according to the hospital census). A convenience sample was chosen because it fits with the study design, easy to access, cost effective and save time and effort where randomization is not possible.

Sample technique

Convenient sampling techniques was used through using sample size calculator, an official website for public service research system survey soft ware

(https://surveysystem.com/).

-one hundred nurses were estimated to be a sample size of the current study.

-one hundred nurses is divided in 10 groups every group consist of 10 nurses.

The sample size were recruited in the study according to the following inclusion criteria.

The inclusion criteria for the study sample include:

- Nurses who are working in the Intensive Care Unit and work with patients with nasogastric tube feeding.
- At any age group.
- Saudi or non-Saudi
- Both gender.
- Willing to participate in study.

Exclusion criteria include:

- Head nurse supervisor, educator or nurses who are not involved in direct patients' care and they have knowledge could affect the validity of the study
- Nurse whom on maternity leave or end of contract.

Study tools

Three tools were be used in the current study:

Tool I:

Sociodemographic characteristics of the study participants, which include age, gender, marital status, nationality, educational level, unit, and years of experience.

Tool-II:

Knowledge of nasogastric tube feeding questionnaire: Appendix IV

This questionnaire was developed by Mahmoud (2).

it consists of 45 questions (37 correct, wrong and do not know and 8 questions true and false) related to enteral feeding from different aspects as follow:

1	Definition of enteral nutrition	3 Question
2	Indication used for enteral nutrition	3 Question
3	Contraindication of enteral nutrition	3 Question
4	Insertion of enteral feeding tube	5 Question
5	Enteral feeding	8 Question

6	Formula handling	3 Question
7	Medications administration	7 Question
8	Care of enteral nutrition	9 Question
9	Complication of enteral nutrition	4 Question

Scoring system include (2) correct answer and (1) incorrect answers and (0) do not know. The overall score of the questionnaire ranging from (0-90), the higher the score the better the knowledge. The total score was presented in terms of good level, fair level and poor level of knowledge. Scores of less than 30 was considered as poor knowledge, 31 to 60 is fair level of knowledge and more than 60 is considered as good level of knowledge.

Tool-III:

-The observational checklist:

It was developed by Mahmoud (2). And it consists of three main checklists; to assess the nurses' practices regarding enteral nutrition.

1- The insertion of Nasogastric tube,

2- The administration of medications through the enteral feeding tubes

3- The enteral feeding administration checklist.

Items of each checklist are presented as follow:

1	Insertion of nasogastric tube	22 items
2	Administration of medication	21items
3	Enteral feeding administration	10 items

The response options for each of the observational checklist are (2) done correctly, (1) fairly done, and (0) did not done. The total score for the NGT insertion rage from 0 to 44. Good practice of insertion is calculated for scores of 29 and more, fair practice if scores ranged from 13 to 28 and poor practice for scores 12 and less. For the Administration of medication, the scores range from 0 to 42. Good practice was granted if scores (29 to42), fair practice (14 to 28) and poor practice if scores is 14 and less. For enteral feeding, scores range from 0 to 20, good practice of enteral feeding was calculated if scores is 14 to 20, fair practice if the scores 8 to 13 and poor if scores is 7 and less.

Procedure of the data collection

After obtaining the needed approval from authorized persons in the PSMMC, the researcher arranged to meet the eligible participants at their convenience to explain about the study objectives and obtain consent from those who agree to participate.

After explaining the study objectives and obtaining consent, participant were interviewed to collect the base line data and assess the learning needs of the study participants. The pre-test about knowledge and practice regarding NGT feeding through semi-structured interview using questionnaire and observational checklist.

The questionnaire tool 20-30 minutes to be filled by each nurse. The researcher was available to answer questions and clarify concerns.

The observational checklist took about 15 minutes to be finished.

After collecting data about knowledge, all nurses were randomly grouped into subgroups and scheduled for the training program according to their convenience without interfere with their work. The educational program included two parts. The first part is the theoretical part, which include the scientific& theoretical information regarding Nasogastric tube. It was provided through power point presentation, active sessions and group discussion. Second part included the practical part in a form of demonstration of the procedure steps & checklist by the researcher and video demonstration and remonstration.

The theoretical part of the programme followed the MOH guidelines of Saudi Ministry of Health of NGT feeding (Nursing Management of Nasogastric Tube Feeding in Adult Patients, 2010. (15).

This guideline include:

- Introduction and definition of nasogastric tube feeding.
- Training and guidelines algorithm for management of nasogastric tube feeding.
- Nasogastric tube feeding placement, care and administration of feeding and medication.
- Nasogastric tube feeding and management implementation guide line.
- Risk factor and complication of NGT feeding and how to manage it.

According to Farkhondeh and Lockhart the best time to assess the effectiveness of an educational program is within the first four months after the conduction of the program. In the current study, the effect of the educational programme on nurses' knowledge and practice was assessed right after conducting the educational intervention to follow the effectiveness of the program and reinforce learning to increase the quality of the provided care.(16)

3. RESULT

1-The total results of nurses' knowledge regarding care of ngt feeding showed that majority of the participants were having good level of knowledge and few were fair.

2-The total results of nurse's practice regarding care of ngt feeding was calculated and showed that most of the nurses reported good practice and few of them reported fair practice and the minimum reported poor practice regarding care NGT feeding.

3-The total results showed that there is a moderate statistically significant correlation between nurses' knowledge and practice of care of ngt feeding of patient this indicate that the higher the nurses' level of the knowledge, the better their practice regarding care of ngt feeding.

Correlation analysis indicated that revealed that there was a statistically significance relationship between knowledge and practice ($r = .31^{**}$, $p = .002$) meaning that the higher the level of knowledge, the better is the practice regarding NGT feeding among nurses.

4. DISCUSSION

In this chapter the finding of the study were discussed according to the finding related to the procedure of NGT feeding and the related variable pre-post educational program.

Discussion included finding related to participant of the study, their level of practice and knowledge as well as the effect of educational program. also in this chapter describes the finding in relation to each research question ,justify them and then reflect to supporting and contradicting finding from different previously conducted studies in the same area of research .

The current study aimed at examining the effect of educational program on nurse's knowledge and practice related to care of nasogastric tube feeding. In this chapter, the main results will be discussed in the light of previous research. Afterward, conclusion and recommendations along with limitations will be outlined.

As the present study detected majority of the study participant were in age group of 23-35, males hold bachelor degree of nursing, while more than half of the sample were singles. In addition, the study result showed that near to half of the sample have 1-5 years of experience .in addition, about one quarter received training an NGT feeding.

In addition, Metwaly (7) found that more than one-third of nurses had 1-4 years' experience. Moreover, (Mohammed & Abdelfattah.(6) found that more than half of nurses in neonatal intensive care units are having more than 10 years of working experiences.19. also have found that BSN degree was earned among the majority of participants in their study and nearly one third of studied sample had training course at NICUs. This training program helps practitioner nurse to keep up to date on the most recent developments in nursing and to be able to manage the needs of nursing practice. Further, Metwaly (17) .reported that more than half of participants in her study had training courses.

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Knowledge

In terms of general score of knowledge, the current study reported a noticeable improvement in the nurses' knowledge regarding tube feeding after the educational program. Nurses in this study showed good knowledge among 64.4% of participants, fair knowledge among 26.6% and poor knowledge among 9%. These percentages jumped to 92% good level of knowledge and 8% fair level of knowledge after the educational program. Fair level of knowledge is considered acceptable in some areas of nursing practice, but in ICUs and working with special patients' population such as unconscious patients in our study, fair knowledge is considered alarming. This was in agreement with many previous researches who investigated similar objectives.

AlKalaldeh(20).used a descriptive study to assess the level of enteral feeding knowledge of nurses who are working in critical care units in 3 hospitals in Jordan. The study indicated that about 3 quarters of the nurses who participated in the study scored less than 60% in knowledge comprehension regarding enteral nutrition.

Bourgault ,2015 (21)implemented an educational program regarding nasogastric tube feeding on 50 critical care nurses from 3 various critical care units. Their results reported significant increase in the mean score of knowledge post the program. In the same context, Mota M .(22).reported a deficient level of nurses' knowledge regarding enteral feeding and medication administration techniques in a study done in Brazil. The study related the deficient knowledge to the low educational background of the nurses who participated in the study.

El-Meanawi D .implemented an educational program regarding care of nasogastric tube feeding on nurses' knowledge and practice. The study concluded significant differences between the pre and post the program in relation to knowledge and practice. (23)

Mohammed and Abdelfattah in 2018 (6) conducted a study to assess the effectiveness of educational program on nurses' knowledge and their practices about nasogastric tube feeding at neonatal intensive care units. Their results indicated that the educational program enhanced nurses' knowledge and practice related to nasogastric tube feeding. The study recommended developing a written protocol of nasogastric tube feeding to for nurses to follow to make sure that nurses provide a save practice especially in NICU.

Concerning the different aspects on the knowledge scale, nurses in the current study reported variation in the level of knowledge before the educational program. In some aspects, a majority would prove good knowledge, while in other aspect, nurse has demonstrated fair knowledge. Although all aspects of any nursing intervention are important, one interesting and assuring thing is that nurses in our study reported good knowledge in the most important aspects of the process of enteral feeding before and improved more after the program. These aspects were related to (types of enteral feeding tubes, indications, proper patient's position, needed equipment, when to check residual, how to keep formula, flushing of the tube, assessment of the patients' tolerance signs of formula intolerance, complications).

The are many reasons that nurses in the current study reported a considerable level of knowledge before the program and get their knowledge obviously increased after the program. First, majority of nurses in this study were young (23 to 35) years old. Being newly graduated means that knowledge still fresh and easy to recall. Ninety two per cent of nurses had BSN in nursing, 39% had 6 to 10 years of experience and 16% had more than 10 years of experience. One important reason for reporting a good knowledge among nurses is the working unit is ICU. Working in such special unit such as ICU requires a good deal of knowledge and skills. The critical situation of the patients being treated in ICU necessitate that all nurses working in this unit to be professionals. In addition, the setting from which data were collected is following a well-established protocol regarding enteral feeding management in the ICU. This point of view is supported by Simpson 2014 (24) who did a study in a long - care-nursing facility demonstrated that in their study, the mean score of nurses' knowledge about NGT was low before the educational program and failed to show any improvement after the program they received. This reveals that the nurses' knowledge about enteral feeding in regular departments was low and inadequate. Some departments may not have patients who needs enteral feeding and by the time nurses, working in these units might miss knowledge and skills required in this regard (24).

Nurses should have broad base of nursing knowledge that is required for close patients monitoring, nutritional assessment ant evaluation of those who needs enteral feeding. Specialized nutritional support is needed for nurses to be able to take sound clinical decisions for individual patient Bartholomew in 2001(25).

In our study, nurses reported inadequate level of knowledge regarding some aspects of the NGT feeding before the program such as definition of NGT, precautions for insertion, number of trials allowed for a nurse to insert NGT, bolus feeding, proper action of residual is more than 150 ml, giving oily medications, when enteral feeding connection should be changed, when lab tests should be performed, if it is better to give formula using bolus method via gastrostomy tube or not, and if phenytoin should be given on an empty stomach).

This was in agreement with some other works, Fulbrook (26) .showed that nurses in their study were lacking knowledge related to assessment of patients' nutritional status and that there was limited involvement of ICU nurses in patient's assessment. Persenius 2008 (27).also found that patients in their study were not well nutritionally assessed because nurses scored low regarding nutritional assessment. In addition, Likewise, Persenius 2006 (27) .concluded that almost half of the nurses reported that they are not competent enough in aspirating gastric residual volume. They showed also that Registered Nurses do not often check gastric residual volume, even though high gastric aspirate is an early marker of upper digestive intolerance.

Practice

Although the practice of nurses in the current study was considered as good before the educational program, nurses' level of performance was improved in all the steps of performance after the educational program. Our results were consistence with Kenny 2015 (28).who indicated that that the nurses' practice of nasogastric feeding either feeding or medication administration were improved after implementation of the educational program.

Educational programs are found to enhance not only knowledge but also the level of practice regarding all aspects of nursing care for variety of health problems. Nurses in our study reported good level of practice regarding NGT insertion, feeding and medication administration before and after the program. Our results were different than many other results. Metwaly 2013 (17). Conducted a study to investigate the effect of educational intervention on nurses' knowledge and practice regarding congenital hypothyroidism. Their results showed inadequate level of knowledge and practice before the program and showed positive effect of the program at post-test.

In the same context, Mohammed A and Abdelfattah 2018 (6). reported that the mean score of nursing practice related to nasogastric tube feeding was low and very well improved after the educational program. Our results showed that majority provided good practice regarding flushing the tube after administering medication. Similarly, Keithley J & Swanson 2004(29). in their study indicated that the majority of nurses preferred to use a large bore tube indicating that they have knowledge of the appropriate tube size for gastric tube insertion. This is supported by the literatures that large bores of gastric tube, is preferred for easy gastric aspirations and to avoid clogging when using small bores. Same practice was supported by Roynette, 2008 (30). Who concluded that majority of nurses in their study reported that they are usually and always flush the tube after feeding and medication to maintain the tube patent.

It is the nurse responsibility to verify the correct position of the NGT after insertion. Practice regarding confirmation of the NGT placement in this study was reported as good in the pre and post the educational program. Nurses in this study used different methods to confirm the placement such as air bolus, x-ray, and litmus paper. Similar results that nurses use different strategies to confirm the position of the NGT were documented. For example, Williams 2002 (14) indicated that the majority of nurses reported that they confirm tube placement using bubbling method. Metheny 2007 (31) also mention bubbling as one of the bedside methods used in their study.

Persenius ,2006 (7) reported that the majority of nurses used auscultation over the epigastric areas to confirm tube placement. Fulbrook , 2007 (33). Showed that pH aspirate, the color of the aspirate and auscultation as the best bedside confirmatory of the tube positioning.

Metheny 2007(31) claim that bedside tests are used with varying degrees of success, though x-ray remains the gold standard but Turgay and Khorshid 2010 , (35) suggested that repeated radiographic confirmation is not effective and might put a radiation risks to the patients especially for those who are critically ill.

Majority of nurses in this study demonstrated a good practice of patients positioning during the insertion of the NGT, during feeding and medication administration. Dillon A reported similar findings; Munor and Grap 2002 (36) who reported that majority of nurses in their study were observed performing accurate patients' positioning and bed angles before the procedure. They concluded that their results were consistent with the guidelines of the clinical guidelines task force that state that the head of the bed should be elevated at 30 to 45 degrees during intermittent feeds to minimize

aspiration, unless it is contraindicated as ASPEN Board of Directors and clinical guidelines Task Force, 2002. (37). On the other hand, Persenius ,2006 (7)found that nurses in their study demonstrated minimal head elevation during the NGT feeding. They collected data through observation of nurses, and they did not provide a clear definition of the position or head elevation, i.e. semi fowlers, upright or sitting.

Our results showed that nurses demonstrated good practice regarding checking volume pre and after the educational program. This was not congruent with the work of Tume, L (39) who found that nurses in the ICU did not measure gastric residual volumes.

It is important for the nurses to document their practice.If nursing care or intervention was not documented, this means it was not performed. Although, nurses in the current study reported a good practice in this study before the educational program and this level of practice was also increased after the program, a high percentage of them did not document their practice pre the educational program. This was consistent with the findings of Persenius (7) who found that important nutritional aspects were not documented by the nurses in their study.

Miles L 2009 (41) stated that professional and ethical standard specify that documenting nursing practice is obligation and failure to document nursing practice is considered as deviation from standard.

The current study showed that nurses reported lack of practice regarding some aspects of the NGT feeding and insertion procedure such as, explaining the procedure to the patients and provide privacy for the patients during the procedure. Although, this could be due to some reasons, but still such practice is not satisfactory or acceptable. One reason could be that patients are unconscious and will not be able to respond or hear the explanation of the procedure. Other reason could also be that patients are treated in the ICU while the environment itself maintain the patients' privacy. No data were available from previous research to compare this piece of result.

The current study revealed that sociodemographic factors such as age, marital status, education, working unit had no statistical significance relationship with practice. Knowledge also did not show association with good practice. Only years of experience and enteral feeding training showed significance association with practice. This was not similar to Al Hawaly 2016 (4). who reported no significance association between knowledge and practice regarding feeding pattern of NGT. In the same context, Ahmed N and Mondal ,2014 (42) reported statistical signifies correlation between knowledge and practice of staff nurses regarding Ryle's tube feeding. Similarly, Shahin ,2012(2)stated that there was a highly statistically significant correlation between participants' scores of knowledge and practice in their study.

Years of experience reported significance association with practice in this study. Bedier. 2016 (3). Showed similar results as they concluded that years of experience was important factor that detected significance association with practice pre and post the educational program they provided. Abdulla, 2014 (43) indicated that low years of experience contributed to high level of knowledge and knowledge reported negative association with practice in their study. Being newly graduates may contribute to good level of knowledge because the gained information during years of study still fresh and they can memorize easily. On the other hand, practice needs, training and continuous demonstration that help nurses to acquire skills and they learn from their mistakes in practice.

5. CONCLUSION

The aim of the present study was to examine the effectiveness of educational program on nurses' knowledge and practice regarding NGT. Patients who requires NGT feeding are mostly critically ill and unconscious. This would necessitate that nurses who are caring of such patients would have a special skills and good level of knowledge. They should have the ability to assess the nutritional needs of the patients, complications of NGT feeding, how to assess residual volume and how to intervene and take good decisions if they face problems. Our results showed that majority were young, males who are holding a BSN degree and who have a considerable year of experience. Results of the current study showed that nurses reported a good level of knowledge and practice before the educational program and their level was improved after the program. There were fair level of knowledge and practice for some items of the scale of knowledge and practice, which were improved obviously after the program. There were also some levels of poor knowledge and practice before the program that were improved later after the intervention. The study provided an evidence of the effectiveness of the educational intervention in raising the level of knowledge and practice regarding this specific type of nursing care in a specific care unit which is ICU. The critical condition of patients who are treated in the ICUs and who require continuous monitoring and evaluation necessitate that nurses should be well knowledgeable and skilled to be able to evaluate

patients' condition and take accurate decisions. Years of experience and enteral feeding training reported significance association with practice. Knowledge on the other hand did not provided any significance association with practice in this regard. The identified results underline the need for adequate knowledge, and contentious training to enhance the performance of tube feeding. Educational interventions could improve nurses' knowledge and performance regarding NGT feeding. This in turn will enhance the quality of care provided and improve patients' outcomes.

6. RECOMMENDATIONS

Based on the results of the current study, the following recommendation are stated.

3.1 Recommendations for clinical practice Developing a booklet that include all the needed information for assessing and monitoring the level of conscious using GCS. This booklet should be available in all departments that would have unconscious patients who needs neurological assessment and monitoring of level of consciousness.

3.2 Recommendations for policy makers The current study employs some recommendations as follow:

Recommendations for policy-makers:

- Developing an evidence- based guidelines regarding enteral nutrition especially in units with special characteristics such as ICUs. Nurses working in such units should be oriented and trained contentiously and their level of practice should be monitored regularly.

Recommendations for Nursing practice:

- Providing contentious in-service education for nurses regarding enteral feeding and all aspects related to it. Such training should focus on the gap addressed from this study. The training should be provided in a way that do not interfere with the nature of the work at ICUs and the nurses' work load (nurses free days).

- Provide a chance for nurses to attend conferences and workshops to update their knowledge and practice regarding enteral feeding to enhance their professional development. This will help enhancing nurses' practice to achieve high quality of care.

- Newly hired nurses should be oriented about all aspects of enteral feeding in the unit.

- Documentation of nursing care is vital, and nurses in this study reported lack of documentation. It is important for the nursing practice to standardize documentation process.

- Develop a written booklet that should be updated regularly about enteral feeding that is accessible for all nurses in each unit that deal with enteral feeding. Information provided in the booklet could be in a form of checklist rubric for nurses to follow while performing NGT feeding, questions and answers about trouble shooting problems that might encountered.

- The ICUs managers should emphasize the collaboration among the multidisciplinary teamwork that include nurses, physicians, nutritionist, patients and family. Such collaboration would ensure that the patient receives the right feeding safely and appropriately.

Recommendation for Nursing Education:

- Tube feeding is known to be taught at different levels and nursing courses throughout the BSN program. It has been taught in nursing care of adults' courses, pediatric nursing courses, and critical care nursing courses. However, it is important for the contents included in each course to be updated and reviewed regularly based on new evidences. It is the responsibility of curriculum committees' at all educational institutions to review contents based on evidences to bridge the gap between theory and practice.

- It is also crucial for nursing faculty who are teaching in nursing schools to make sure that the clinical training sites following the same policy and resources from which the students were taught and trained during years of education in nursing labs. This would reduce the conflict and bridge the gap between gained knowledge and practice. For example, nursing students may be trained in the simulation lab about NGT insertion and feeding using a specific checklist. When they go for practice in the clinical settings, they might find the nurses using or following different checklist. This would create conflict and would affect the practice.

Limitations

The current study acknowledges some limitations that are related to methodology:

- The current study used a self-administered questionnaire to measure level of knowledge. Responses for self-administered questionnaire could be based on what nurses believed the researcher wanted to know, rather than data reflecting the true state of the practice.
- Nurses in this study reflected good level of practice regarding NGT insertion, feeding and medication administration. Nurses' practice in this study was measured through observation, it was not sure if all nurses were blinded or not. If all nurses were blinded for observation, their practice would have been different.
- Convenience sample which is the consents only of available member =s of the population which is often leads to biased study.

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Result had performed through using SPSS version 21 to achieve objective of this study .The current study aimed at examining the effect of educational program on nurse's knowledge and practice related to care of nasogastric tube feeding. A convenience sample of 100 nurses were interviewed to assess their knowledge and were observed for their.

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APPENDICES – A

List of Table:

Table 1: Demographic characteristics of the study sample

Item	Number (%) N = 100	%	Total
Age			
23 to 35	81	81	
36 to 45	17	17	100
46 and more	2	2	
Gender			100
Females	83	83	
Males	17	17	
Marital Status			100
Single	53	53	
Married	46	46	
Divorced	1	1	
Widow	-		
Education			100
BSN	92	92	
Diploma	4	4	
Technical institute	3	3	
Post graduate	1	1	
Working Unit			100
ICU	100	100	
Years of Experience			100
1 to 5 yeas	44	44	
6 to 10 years	39	39	
More than 10 years	16	16	
Training programs			100
Yes	23	23	
No	77	77	
Total	100	100%	100%

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Table 2: Frequency distribution of nurses' knowledge regarding NGT feeding pre-educational program.

	Questions	Correct answer	Wrong answer	Don't know
1	Definition of enteral feeding	49%	38%	13%
2	What precautions should be taken to insert NGT	29%	57%	14%
3	Enteral feeding tubes include which of the following.	89%	8%	3%
4	NGT extends from	75%	22%	3%
5	Factors affecting patients' nutritional needs	78%	20%	2%
6	Indication to use NGT	85%	15%	0%
7	NGT considered…	48%	49%	3%
8	Contraindication of NGT	62%	37%	1%
9	NGT should not be inserted if the patient has a major injury of.	59%	38%	3%
10	Contraindication of enteral feeding	61%	39%	0%
11	The proper patient position during NGT insertion.	67%	33%	0%
12	NGT measured from….	77%	15%	8%
13	Number of trials allowed for a nurse to insert the NGT	16%	83%	1%
14	Safe methods to confirm NGT placement	39%	60%	1%
15	Enteral feeding is preferred to be given	44%	51%	5%
16	The bolus feeding is allowed in	35%	59%	6%
17	When we start enteral feeding for the first time	62%	35%	3%
18	The equipment required to give enteral feeding include	63%	36%	1%
19	When to check the residual volume	62%	31%	7%
20	If the amount of residual is high, the nurse should	53%	44%	3%
21	In the intermittent feeding, what is the proper action if the residual is 150 ml	40%	55%	5%
22	Opened formula and nutritional supplements that kept in fridge should be discarded after	93%	7%	0%
23	The formula should be given	90%	8%	2%
24	When we give a medication through the NGT, we should.	56%	38%	6%
25	For giving medication through the NGT, the nurse should.	48%	52%	0%
26	To give oily medication through a feeding tube	19%	80%	1%
27	During continuous enteral feeding, the residual volume should be checked every.	88%	12%	0%
28	During continuous enteral feeding, the feeding tube should be flushed every.	92%	7%	1%
29	During intermittent feeding, the feeding tube should be flushed every.	47%	51%	2%
30	Which of the following is preferred to use when you flush the enteral feeding tube?	89%	11%	0%
31	To assess the patient tolerance to the formula, the nurse should.	78%	22%	0%
32	The enteral feeding connections (syringe, formula bag and lines) should be changed every.	34%	63%	3%
33	The follow up of patients on enteral feeding include.	57%	41%	2%
34	The lab tests of patients on enteral feeding should be done at least.	40%	58%	2%
35	The NGT should be removed if the patient has.	86%	13%	1%
36	Signs and symptoms of formula intolerance include.	85%	15%	0%
37	Which of the following is considered a complication of enteral feeding	65%	30%	5%
		True	**False**	**Don't know**
A	The formula should be kept in the fridge"	93%	6%	1%
B	It is better to give the formula using bolus method via gastrostomy tube	42%	58%	0%
C	To administer cancer tablets and hormonal capsules through the feeding tube, the nurse should crush the medication.	69%	29%	2%
D	It is prohibited to crush slow release medication.	78%	22%	0%

E	Phenytoin should be given on an empty stomach.	40%	57%	3%
F	It is preferred to give Aspirin on an empty stomach to enhance absorption.	71%	29%	0%
G	The most important complications of enteral feeding are diarrhea, vomiting, abdominal distension and constipation.	88%	12%	0%
H	Enteral feeding could cause stomach ulcer.	59%	38%	3%
Total level of knowledge pre the educational program		**Good**	**Fair**	**Poor**
		64.4%	26.6%	9%

Table 3: Frequency distribution of nurses' knowledge regarding enteral feeding post educational program.

	Questions	**Correct answer**	**Wrong answer**	**Don't know**
1	Definition of enteral feeding	95%	4%	1%
2	What precautions should be taken to insert NGT	68%	31%	1%
3	Enteral feeding tubes include which of the following.	97%	3%	0%
4	NGT extends from	80%	20%	0%
5	Factors affecting patients' nutritional needs	95%	5%	0%
6	Indication to use NGT	92%	8%	0%
7	NGT considered…	84%	13%	3%
8	Contraindication of NGT	91%	9%	0%
9	NGT should not be inserted if the patient has a major injury of.	97%	3%	0%
10	Contraindication of enteral feeding	92%	8%	0%
11	The proper patient position during NGT insertion.	93%	7%	0%
12	NGT measured from….	99%	1%	0%
13	Number of trials allowed for a nurse to insert the NGT	46%	52%	2%
14	Safe methods to confirm NGT placement	90%	10%	0%
15	Enteral feeding is preferred to be given	84%	16%	0%
16	The bolus feeding is allowed in	69%	31%	0%
17	When we start enteral feeding for the first time	95%	5%	0%
18	The equipment required to give enteral feeding include	94%	6%	0%
19	When to check the residual volume	76%	24%	0%
20	If the amount of residual is high, the nurse should	93%	7%	0%
21	In the intermittent feeding, what is the proper action if the residual is 150 ml	81%	19%	0%
22	Opened formula and nutritional supplements that kept in fridge should be discarded after	100%	0%	0%
23	The formula should be given	99%	1%	0%
24	When we give a medication through the NGT, we should.	93%	7%	0%
25	For giving medication through the NGT, the nurse should.	96%	4%	0%
26	To give oily medication through a feeding tube	70%	30%	0%
27	During continuous enteral feeding, the residual volume should be checked every.	97%	3%	0%
28	During continuous enteral feeding, the feeding tube should be flushed every.	95%	5%	0%
29	During intermittent feeding, the feeding tube should be flushed every.	83%	16%	1%
30	Which of the following is preferred to use when you flush the enteral feeding tube?	99%	1%	0%
31	To assess the patient tolerance to the formula, the nurse should.	97%	1%	2%
32	The enteral feeding connections (syringe, formula bag and lines) should be changed every.	89%	11%	0%
33	The follow up of patients on enteral feeding include.	95%	5%	0%
34	The lab tests of patients on enteral feeding should be done at least.	62%	38%	0%
35	The NGT should be removed if the patient has.	96%	4%	0%
36	Signs and symptoms of formula intolerance include.	97%	3%	0%
37	Which of the following is considered a complication of enteral feeding	96%	4%	0%

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		True	False	Don't Know
A	The formula should be kept in the fridge"	91%	9%	0%
B	It is better to give the formula using bolus method via gastrostomy tube	67%	33%	0%
C	To administer cancer tablets and hormonal capsules through the feeding tube, the nurse should crush the medication.	96%	4%	0%
D	It is prohibited to crush slow release medication.	88%	12%	0%
E	Phenytoin should be given on an empty stomach.	85%	15%	0%
F	It is preferred to give Aspirin on an empty stomach to enhance absorption.	92%	8%	0%
G	The most important complications of enteral feeding are diarrhea, vomiting, abdominal distension and constipation.	93%	7%	0%
H	Enteral feeding could cause stomach ulcer.	67%	31%	2%
Total level of Knowledge after the educational program		**Good**	**Fair**	**Poor**
		84.5%	13%	2.5%

Table 4: Differences in the mean score of nurses' knowledge pre and post-educational Program

	Paired Differences					t	df	Sig.(2-tailed
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Knowledge	1.28	2.95	.295	125.07	126.24	424.76	99	.000

Significance level is set as 0.05 and less

Table 5: Correlation between demographic characteristics and knowledge

	Age	Marital status	Education	experience	Enteral feeding Training	Working unit
Knowledge	r = - .056 p = .58	r = - .037 p = .71	r = -.06 p .55	r = .16 p = .11	r = .11 p = .25	r = .09 p = ,36

r = correlation

P = (significance level) was set as < 0.05

A. Nurses' Practice of NGT insertion pre the educational program

Table 6: Nurses' practice regarding NGT insertion before educational program

Items	Correctly Done	Fairly Done	Did not Done
1. Wash hands	47%	0%	53%
2. Assemble equipment	80%	0%	20%
3. Explain the procedure to the patient	15%	0%	85%
4. Assist patient to assume high-fowler's or semi fowler's position	93%	0%	7%
5. Provide privacy	69%	0%	31%
6. Assess patency of nostrils	89%	0%	11%
7. Don clean gloves	96%	0%	4%
8. Estimate length of tube to be passed	39%	61%	0%
9. Don clean gloves	91%	0%	9%
10. Insert tube into opening of selected nostril	100%	0%	0%
11. Position curved edge of tube downward and direct tube along base of nostril	71%	29%	0%
12. Ask patient (if appropriate) to swallow	40%	0%	60%
13. Continue to pass tube until marked position	93%	7%	0%

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14. Confirm position of tube in stomach using routine methods (whoosh' test, air bubbles, Absence of respiratory distress, feeding tube aspirate)	100%	0%	0%
15. Wrap tape around tube, securing tape to bridge of the nose or use a tube holder, if available	97%	3%	0%
16. Check for proper NG placement using safe methods (X-Rays, Aspirate PH, withdraw recognizable gastric content)	100%	0%	0%
17. Attach tube to suction, feeding, or clamp as ordered	99%	1%	0%
18. Position patient for comfort	85%	15%	0%
19. Dispose soiled materials in appropriate container	92%	8%	0%
20. Remove gloves	82%	0%	18%
21. Wash hands	89%	2%	9%
22. Document all relevant information appropriately	23%	77%	0%
	Good	**Fair**	**Poor**
Total practice of NGT insertion	**80%**	**13%**	**7%**

Table 7: Nurses' Practice related medication administration before educational program

Items	**Correctly done**	**Fairly done**	**Not done**
1. Wash hands	87%	0%	13%
2. Assemble equipment	100%	0%	0%
3. Explain the procedure to the patient	42%	0%	58%
4. Position patient in high fowler's or semi fowler's position	100%	0%	0%
5. Provide privacy	81%	0%	19%
6. Stop any continuous tube feeding for 15 minutes if medication to be given on an empty stomach	100%	0%	0%
7. Dilute crushed medication in 30 ml water	98%	2%	0%
8. Don clean gloves.	100%	0%	0%
9. Confirm position of tube in stomach using routine methods (whoosh' test, air bubbles, Absence of respiratory distress, feeding tube aspirate)	91%	2%	7%
10. Clamp NG tube	100%	0%	0%
11. Attach syringe without plunger to NG tube	91%	7%	2%
12. Pour each medication separately to the syringe and open to allow flowing through gravity	2%	94%	4%
13. Flush tube with 10 to 30 ml water after each medication	20%	80%	0%
14. Flush tube with 30 ml water after all medications	84%	15%	1%
15. Restart tube feeding at appropriate time	100%	0%	0%
16. Provide oral and nasal hygiene	69%	31%	0%
17. Position patient for comfort	81%	19%	0%
18. Dispose soiled materials in appropriate container	92%	7%	1%
19. Remove gloves	97%	0%	3%
20. Wash hands thoroughly	97%	0%	3%
21. Document all relevant information appropriately	52%	48%	0%
	Good	**Fair**	**Poor**
Total Practice for medication administration	81%	11%	8%

B. Nurses' Practice regarding NGT feeding pre the educational program

Table 8: Frequency distribution of nurses' practice of NGT feeding pre educational program.

Items	**Correctly Done**	**Fairly Done**	**Not Done**
1. Wash hands	44%	56%	0%
2. Put on gloves	100%	0%	0%
3. Assemble equipment	98%	2%	0%
4. Explain the procedure to the patient	28%	0%	72%

5. Position patient in high fowler's or semi fowler's position	100%	0%	0%
6. Provide privacy	36%	51%	13%
7. Confirm the position of tube in stomach using routine methods (whoosh' test, air bubbles, Absence of respiratory distress, feeding tube aspirate)	100%	0%	0%
8. Insert 50 ml syringe into NG tube and aspirate to check residual volume	99%	1%	0%
9. Return residual and flush NG tube with water	97%	3%	0%
10. Clamp NG tube	100%	0%	0%
Total level of practice regarding patient feeding by NGT	**Good**	**Fair**	**Poor**
	91%	6%	3%

A. Nurses' practice of NGT insertion post educational program:

Table 9: Frequency distribution of nurses' practice regarding NGT insertion post the educational program.

Items	Correctly Done	Fairly Done	Did not Done
1. Wash hands	100%	0%	0%
2. Assemble equipment	100%	0%	0%
3. Explain the procedure to the patient	97%	0%	3%
4. Assist patient to assume high-fowler's or semi fowler's position	100%	0%	0%
5. Provide privacy	100%	0%	0%
6. Assess patency of nostrils	100%	0%	0%
7. Don clean gloves	100%	0%	0%
8. Estimate length of tube to be passed	97%	3%	0%
9. Lubricate of distal end of tube with water-soluble lubricant	100%	0%	0%
10. Insert tube into opening of selected nostril	100%	0%	0%
11. Position curved edge of tube downward and direct tube along base of nostril	100%	0%	0%
12. Ask patient (if appropriate) to swallow	100%	0%	0%
13. Continue to pass tube until marked position.	100%	0%	0%
14. Confirm position of tube in stomach using routine methods (whoosh' test, air bubbles, Absence of respiratory distress, feeding tube aspirate)	100%	0%	0%
15. Wrap tape around tube, securing tape to bridge of the nose or use a tube holder, if available	100%	0%	0%
16. Check for proper NG placement using safe methods (X-Rays, Aspirate PH, withdraw recognizable gastric content)	100%	0%	0%
17. Attach tube to suction, feeding, or clamp as ordered	100%	0%	0%
18. Position patient for comfort	100%	0%	0%
19. Dispose soiled materials in appropriate container	100%	0%	0%
20. Remove gloves	100%	0%	0%
21. Wash hands	100%	0%	0%
22. Document all relevant information appropriately	94%	6%	0%
Total practice of NGT insertion	**Good**	**Fair**	**Poor**
	98.5%	1%	0.5%

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Table 10: Nurses' practice Related to medication administration after educational program

Items	Correctly done	Fairly done	Not done
1. Wash hands	99%	0%	1%
2. Assemble equipment	100%	0%	0%
3. Explain the procedure to the patient	97%	0%	3%
4. Position patient in high fowler's or semi fowler's position	100%	0%	0%
5. Provide privacy	99%	0%	1%
6. Stop any continuous tube feeding for 15 minutes if medication to be given on an empty stomach	73%	27%	0%
7. Dilute crushed medication in 30 ml water	98%	2%	0%
8. Don clean gloves.	100%	0%	0%
9. Confirm position of tube in stomach using routine methods (whoosh' test, air bubbles, Absence of respiratory distress, feeding tube aspirate)	99%	1%	0%
10. Clamp NG tube	100%	0%	0%
11. Attach syringe without plunger to NG tube	100%	0%	0%
12. Pour each medication separately to the syringe and open to allow flowing through gravity	94%	6%	4%
13. Flush tube with 10 to 30 ml water after each medication	92%	8%	0%
14. Flush tube with 30 ml water after all medications	99%	1%	0%
15. Restart tube feeding at appropriate time	100%	0%	0%
16. Provide oral and nasal hygiene	100%	0%	0%
17. Position patient for comfort	96%	4%	0%
18. Dispose soiled materials in appropriate container	100%	0%	0%
19. Remove gloves	100%	0%	0%
20. Wash hands thoroughly	100%	0%	0%
21. Document all relevant information appropriately	95%	5%	0%
Total Practice for medication administration	**Good**	**Fair**	**Poor**
	88.5%	8.5%	3%

B. Nurses' Practice regarding NGT feeding after educational program

Table 11: Nurses' practice of patient feeding by NGT after educational program

Items	Correctly Done	Fairly Done	Not Done
1. Wash hands	100%	0%	0%
2. Put on gloves	100%	0%	0%
3. Assemble equipment	100%	0%	0%
4. Explain the procedure to the patient	97%	0%	3%
5. Position patient in high fowler's or semi fowler's position	100%	0%	0%
6. Provide privacy	98%	0%	2%
7. Confirm the position of tube in stomach using routine methods (whoosh' test, air bubbles, Absence of respiratory distress, feeding tube aspirate)	100%	0%	0%

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8. Insert 50 ml syringe into NG tube and aspirate to check residual volume	100%	0%	0%
9. Return residual and flush NG tube with water	99%	1%	0%
10. Clamp NG tube	100%	0%	0%
Total level of practice regarding patient feeding by NGT	**Good**	**Fair**	**Poor**
	99.5%	0%	0.5%

	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	**95% Confidence Interval of the Difference**		t	df	Sig.(2-tailed
				Lower	Upper			
Practice	2.13	1.04	.273	143.91	147.15	379.35	99	.836

Table 12: Differences in the mean score of nurses' practice pre and post educational program

Significance level was set as < 0.05

Table 13: Correlation between nurses' socio-demographic variables and practice

	Age	**Marital status**	**Education**	**Years of experience**	**Working unit**	**Enteral feeding Training**
Practice	r = .034 p = .34	r = .063 p = .15	r = .091 p =.72	**r = .29**** **p = .03**	r = .029 p = .38	**r = .25*** **p = .04**

r = Correlation

p = significance level, set as < 0.05

Table 14: Correlation between knowledge and practice

	Practice
Knowledge	r = .31** p = .002

r = correlation

p = significance level, set as < 0.05.