Factors Associated with Nasogastric Tube Feeding Complications among Patients with Cerebro-vascular Stroke

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Abstract

Background: Nasogastric tube feeding is the most frequently used method of enteral feeding among critically ill patients and it is accompanied by some complications. **Aim:** Assess factors associated with nasogastric tube feeding complications among patients with cerebro-vascular stroke through assessing patients' related factors and nurses' related factors. **Design:** Adescriptive design was conducted to achieve the aim of this study. **Settings:** The study was conducted in three intensive care units, two units at Ain shams university hospital (Combined medical intensive care unit and neurological ICU). And one unit at El-demerdash hospital (Emergency ICU). Study **subjects:** A convenient sample of all available nurses 50 working in the previous mentioned settings and purposive sample of 100 patients. **Tools:** data were collected through using four tools Stroke patient's assessment tool, nurse's self-administered questionnaire, nurses' practice observational checklist and Nasogastric tube feeding complications assessment tool. **Results:** The result reveals that 70% of the studied nurses had unsatisfactory level of total knowledge and100 % of the studied nurses had unsatisfactory level of practice regarding NGT and 77% of patients had electrolyte imbalance and 59 % of them had weight loss. **Conclusion:** this result concluded that, there was a highly statistically significant relation between nurses' years of experience, total knowledge, total practice and total complications with P-Value (0.000). **Recommendations:** Implementing educational program for nurses to improve their knowledge and practice regarding nasogastric tube.

Key words: Nasogastric tube feeding, factors, complication, cerebrovascular stroke.

Introduction:

Cerebrovascular stroke (CVS) is an ischemia inadequate blood flow to a part of the brain or hemorrhage into the brain that results in death of brain cells functions. The severity of the loss of function varies according to the location and extent of the brain involved. Following the onset of a stroke, immediate medical attention is crucial to reduce disability and death (**Sarkar, et al., 2019**)

Cerebrovascular stroke remains the third major cause of death worldwide and the leading cause of mortality and disability in Egypt. Internationally, stroke has an impact on peoples' lives and therefore, has been gaining the recognition it deserves, both as an acute and chronic disease. Cerebrovascular stroke is considered as one of the leading causes of serious long-term disability in the world. Over 4 million individuals in the world today are living with the effects of stroke (**Hota et al., 2021).**

Cerebrovascular stroke symptoms include paralysis, numbness, slurred speech, blurred vision, impairment of the conscious level, and severe headache. A cerebrovascular accident (stroke) mainly consists of three main types, these being: ischemic stroke, intracerebral hemorrhage, and subarachnoid hemorrhage. Almost half of the stroke patients have dysphagia, which impedes the oral intake of nutrition and deteriorates the nutritional status (**Ram et al., 2021). .**

Dysphagia is a silent killer after stroke. Swallowing disorders affect more than half of 800,000 people who have a stroke every year in the United States. Dysphagia frequently results in pneumonia, malnutrition, and dehydration, which can lead to increased mortality and poor outcome to prevent these complications, nasogastric tube feeding is indicated in selected cases. Nasogastric tube feeding carries some risk and can lead to

discomfort, local infections, bleeding, and the need to restrain patients. (**Sremanakova et al., 2019**).

Nasogastric tube feeding maintains the functional integrity of the gut and prevents increased gut permeability, thus it reduces the likelihood of systemic infection and higher risk for multiple-organ dysfunction syndrome. However, the appropriate dose of daily caloric intake for stroke patient patients in the first week of hospitalization lacks a clear consensus (**Yuan et al., 2019**).

Nasogastric tube feeding may be accompanied by complications, that included. Aspiration of the stomach contents leading to asphyxia, abscess formation or aspiration pneumonia; trauma injury including perforation of the nasal, pharyngeal, esophageal or gastric tissue, pulmonary hemorrhage, emphysema, pneumothorax, pleural effusion or pneumonia from a malposition nasogastric tube, nosebleeds, secondary infection in the sinus, throat, esophagus or stomach, development of a tracheal-esophageal fistula, erosion and/or necrosis of nasal (**Chow et al., 2020**).

Nasogastric tube care one of the most important nursing procedure and the nurse had a pivotal role and should highly qualify in performing this procedure. Since nurses spend more time at patients' bedside comparing other health care delivers and are liable to permanent evaluation of the patients, they play a critical, significant role in identifying malnutrition susceptible patients, assessing nutrition adequacy and management of nasogastric tube feeding (**Alhassan et al., 2019**).

Nurses are responsible for delivering prescribed nutrition, fluid, and medication in a safe and effective way. Nurses are also responsible for ascertaining nasogastric feeding volume and quality of given formulae, and they are in a key position to influence patient's outcomes (**McLaren&Arbuckle, 2020**).

Many factors affecting patients with NGT feeding complications including patients' factors as age, diagnosis, gastrointestinal problem, body mass index. Also, the nurses' factors as knowledge, experience, and practice have major effect on the occurrence of NGT related complications (**Nascimento, et al., 2018**).

Significant of study:

According to the latest report of *World Health Organization (WHO),* 2020, stroke is carries a high risk of death. Annually, 15 million people worldwide suffer a stroke. Of these, 5 million die and another 5 million are left permanently disabled, In Egypt, there is no doubt that CVS is a major health concern. Whereas, there were 14.8% of total number of population are suffering from stroke, and 1600 cases died annually from it. Nasogastric tube feeding may be accompanied by complications. May include: aspiration of the stomach contents leading to asphyxia, aspiration pneumonia, emphysema, pneumothorax, pleural effusion, malnutrition, and dehydration. Many factors may lead to occurrence of complications to CVS patients on NGT feeding including patients and nurses related factors. So that, assessing factors affecting nasogastric tube feeding with CVS is very important for preventing complications as decrease cost and improve patients prognosis (**Tsao, et al., 2022**).

Aim of the study

This study aimed to assess factors associated with nasogastric tube feeding complications among patients with cerebro-vascular stroke through the following

Assessing patients' related factors

Assessing nurses' related factors

Research question:

What are the factors associated with nasogastric tube feeding complications among patients with cerebro-vascular stroke?

Subjects and Methods:

The study was portrayed under the four main designs as follows:

- Technical design.
- Operational design.
- Administrative design.
- Statistical design.

I) Technical design

The technical design was included research design, setting, subjects and tools for data collection.

Research design

A descriptive exploratory design was used in conducting this study, which used to observe,

describe, and explore aspects of situation (person, organization, setting, and phenomena. (**Kanika, 2015; Harrison, et al., 2017**)

Setting:

The study was conducted in three intensive care units, two units at Ain shams university hospital (combined Medical Intensive Care Unit and neurological ICU). And one unit at El-demerdash hospital (Emergency ICU unit).The combined ICU located at the 1st floor, and composed of 17 beds, and had 7staff nurses and 2 assistant nurses.   The neurological ICU was located in 4th floor, included 20 beds, had 6 staff nurses and 4 assistant nurses. The emergency ICU was located 1st floor, composed of 10 beds, had 5staff nurses   and 2 assistant nurses.

Subjects

A convenient sample of all available nurses (50) working in the previous mentioned settings and who caring for patients with cerebrovascular stroke with nasogastric tube feeding. Purposive sample of 100 patients with cerebrovascular stroke admitted in the previous mentioned settings connected with nasogastric tube for feeding who fulfilled the following inclusion criteria

Inclusion criteria included

1-Adult patients 20 -60 years old

2- Had getting nasogastric /orogastric or bolus feeding

Exclusion criteria

1-Had gastric surgery

2-Continuous aspiration

3-Continuous enteral feeding

Sample size

The sample size was determined considered the total number of patients (1440) who had admitted during the year 2019 in the previous mentioned settings, based on the power analysis that indicate 100 patients would be enough to conduct this study. A sample size required to detect an assumed proportion of complications, with error margin 10% on a significance level 95%   is 84 with added number of 16 cases for anticipated missing data so, a total sample size of 100 was taken considering alpha type I error (α) = 5% with confidence level 95%   and significant level at 0.05 and power of study (power of test) 90% with type II beta error (B) = 10%

$$Sample\ Size = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1+(\frac{z^2 \times p(1-p)}{e^2 N})}$$

Where z is the ordinate on the normal curve corresponding to the alpha level P assumed proportion, N population size, E error margin

z=1.96, P= 0.36 , e= 0.1, N=1440

Tools of data collection

Data was collected using the following:

Ị: Stroke Patient's assessment tool:

This tool was divided into two parts

Part 1: Patient demographic characteristics: It was developed by the investigator written in English language based on the related literatures (**Metwaly, et al., 2013; Abdullah, et al., 2014; Saengsuwan., et al 2017; Ebied Abdeldaiem, 2018**) to assess patients' demographic characteristics as age, gender, marital status, educational level, occupation, and department and it consisted of six questions

Part 2: Patient's medical data: It was developed by the investigator based on the related literatures (*Mahmoud & Abd Elaziz, 2016*; *Lewis, et al., 2017*; *Linton, 2015*; *Hinkle & Cheever, 2014*; *Frisullo et al., 2020 ;Juan et al., 2020*). It was uses to assess patients' medical data including :

A- Present medical history consisted of 6 items (type of stroke, associated sign and symptoms, length of hospital stay, body mass index, cognitive function of stroke, and current medication.

B- Past medical/ surgical and family history consisted of 4 items as recurrence of stroke and suffering from other chronic diseases, past surgical history, family history

C- Clinical assessment consisted of 8 systems that included:

1-Respiratory system as dyspnea, cough, oxygen therapy as non, mask, nasal, vent, Patient on Mechanical Ventilator, mode of mechanical ventilator as Control mechanical   ventilation (CMV), Synchronized intermittent mandatory ventilation (SIMV), Continuous positive airway pressure (CPAP) , and need for suction as aspiration.

2- Cardio vascular assessment as arrhythmia, edema, hypertension, shock.

3-Neurological system as agitated, disturbance conscious level, aggressive, Glasgow coma scale:

4-Urinary system as incontinence, hematuria, dysuria, oliguria.

5- Muscle skeletal as weakness, cramps, paralysis.

6-Gastrointestinal system as diarrhea, constipation, vomiting, oral ulcer.

7-Integumentary as pressure ulcer, bleeding.

8-Activity of daily living: consisted of 5 items as walking, transferring, toileting, Feeding, and bathing.

D- Nasogastric tube feeding assessment tool divided into three parts.

Part I: NGT assessment, it was consisted of 6 items as tube type, length tube, size of tube, site of insertion, date of insertion, duration of tube application.

Part II: Formula assessment: it was consisted of 4 items as rout of administration, total amount of feeding each day, water flushes, and total amount of water before and after feeding.

Part III: Clinical signs assessment: consisted of 6 items as swallowing reflex, gag reflex, choking, voice change, dysphagia, aspiration.

II -Nurse's self-administered questionnaire

Part 1: Nurse's demographic characteristics: It was developed by the investigator and written in Arabic language based on related literature (**Mohammed, et al., 2017**). It was used to assess nurse's demographic characteristics of the nurses and consisted of 8 items about age, gender, marital status, qualification and years of experience, years of experience in intensive care units, working unit and attended training courses about nasogastric tube:

Part 2: Nurse's knowledge assessment

It was developed by investigator and written in Arabic language based on related literatures (**Sacco, et al.,2013; Metwaly, et al., 2013; Babpour et al., 2016; Schwarz, 2019; Paciaroni et al., 2019; Garavelli, et al., 2021**). It

was used to assess nurses' knowledge related to nasogastric tube feeding and its complications among patients with CVS. It was consisted of 53 questions distributed on five parts as following:

a- Assessment of nurses' knowledge related to stroke (4 multiple choice questions (MCQ).

b- Nurses' knowledge regarding nasogastric tube (5 MCQ).

Nurses' knowledge regarding complications associated with nasogastric tube (11true or false questions)

Nurses' knowledge regarding factors that lead to complications from the nasogastric tube (9 true or false questions)

Nurses' knowledge regarding nursing care of patients undergoing NGT feeding (was composed of 24 true or false questions distributed) as (6) before feeding, (14) tube daily care, (4) after nasogastric tube feeding

❖ **Scoring system**

The score distributed for each question: one mark for each correct answer, and zero for incorrectly answer the total score converted into percentage and graded as following:

<80% (<43 marks) was considered unsatisfactory level of knowledge.

≥80% (≥43 marks) was considered satisfactory level of knowledge

III -Nurses' practice observational checklists:

It was developed by investigator in English language based on related literatures (**DeWit & Williams, 2013; Babapour, et al., 2016; Doyle, & McCutcheon, 2016; Cooper& Gosnell, 2022; Xu, et al., 2020; Delves, et al., 2022**). It was used to assess nurses' practice regarding nasogastric tube feeding as insertion, feeding, daily care and its removal. It was composed of four procedures distributed as: a- NGT insertion (25 steps), b- NGT feeding (23 steps), c- NGT daily care (22 steps), d- NGT removal (21 steps).

❖ **Scoring system**

The score distributed as one mark for each steps correctly done, and zero for incorrectly done .the total score converted into percentage and graded as following:

<75% (<69 marks) was considered unsatisfactory level of practice.

≥ 75% (≥69 marks) was considered satisfactory level of practice

IV-Nasogastric tube feeding complications assessment tool

It was developed by the investigator and written in English language after reviewing related literatures (**Wright, et al., 2014; Blumenstein, et al., 2014; Willihnganz & Clayton, 2016; Lewis et al., 2017; Wanden-Berghe, et al., 2019; Sigmon, & An, 2021; Mohammed, et al., 2021; Garavelli, et al., 2021**). It was used to assess the complications associated with NGT feeding as GIT complications as nausea, vomiting, diarrhea, constipation, bleeding, difficulty swallowing, pain, ulceration, and distention. respiratory complications as aspiration. endocrine complications as hyperglycemia, hypoglycemia. Fluid electrolyte complications as electrolyte imbalances, dehydration. Weight complications as decrease, increase. Local complication at site as bleeding, pain, ulceration, voice change.

❖ **Scoring system** distributed as: two marks for each present complications and one for not present complications

II) Operational design:

It was conducted in four phases: preparatory phase, content validity and reliability, pilot study and field work.

1. Preparatory phase:

It included reviewing of related literatures, and theoretical knowledge of various aspects of the study using books, articles, internet periodicals and magazines to develop tools for data collection.

2. Validity &Reliability:

The developed tools were revised by jury of seven experts (3 professors, 4 assistant professors) in Medical Surgical Nursing field at Faculty of Nursing; Ain shims University who reviewed the content of the tool for comprehensiveness, accuracy, clarity, relevance and applicability. The modification was done included adding clinical local signs and local complications of patient's assessment tool based on expert's judgement and the final form was developed

Reliability of the study tools:

Testing reliability of the proposed tools ware done statistically by Cronbach alpha The reliability scores for stroke patient's assessment tool, nurse's self-administered questionnaire, Nurses' practice observational checklist, nasogastric tube feeding complications assessment tool, were 0.79, 0.78, 0.954, 0.871 respectively

Pilot study:

A pilot study conducted on 10 % of all studied nurses 5 nurses and 10 patients to test clarity, feasibility and applicability of the data collection tools. The subjects who were included in the pilot study were included in the sample because no modification was done after conducting the pilot study and also to test study process.

Field work:

An official letter from the Dean of Faculty of Nursing Ain Shams. For permission to conduct the proposed study for the directors of Ain Shams University Hospital including the aim of study to obtain permission after establishing a trustful relationship each subject interviewed nurses by investigator to explain the study purpose. The data collection stared and completed within six months from beginning of November 2021 until the end April 2022. Data collection was done by investigator at the previous mentioned setting three days per week in the morning and afternoon shifts to every nurse and patients. The used tools took about 45 minutes to filed from each patient, nurse's self-administered questionnaire: was distributed on mentioned every day at the end of morning shift and the beginning of the evening shift for nurses working, Each nurse filled the questionnaire when time was available, while nurses observation checklists was filled by investigator during the actual mentioned care for patients undergoing NGT feeding. The time need evaluation complication after each feeding and during care.

Ethical Considerations:

The ethical consideration in the study included the following:

The investigator approval was obtained from the Ethical Committee in the Faculty of

Nursing before starting the study. The investigator was clarified the objective and aim of the study to subjects included in the study. The researcher was assured anonymity and confidentiality of subjects' data and all participation had the right to withdrawal from the study at any time .All data collection was confidential and used only for their benefit and for research purpose. A master list of participant names was separated from subject's data

III) Administrative design:

Approval to carry out this study was obtained from the Dean of the Faculty of Nursing and directors of Ain Shams University Hospital. Subjects consent was obtained for data collection after explaining the purpose of the study.

(IV)Statistical design:

All Data were collected, tabulated and subjected to statistical analysis. Statistical analysis was performed with SPSS® Statistics Version 20 for Windows. Quantitative measured variables are described by the Mean, Standard Deviation (SD), while Qualitative categorical variables are described by frequency and Percentages. All quantitative scales are normalized on 100 point scale from 0 to 100. Independent samples t test is used for comparing two groups means.. Pearson correlation coefficient is applied for correlation analysis of continuous variables. Significance level is considered at $P < 0.05$ (S); while for $P < 0.01$ is considered highly significant (HS). Two Tailed tests are assumed throughout the analysis for all statistical tests

Results:

Table (1): reveals that 81% of the studied patients their age ranged from 45-60, and 62% of them were male, 42% of them were illiterate, while 24% were graduated from secondary school, and 79% of them had no work. As regards marital status, 91% of them were married and regarding the intensive care unit of admission, 52% of them were admitted to neurological I CU.

Table (2): indicates that, 64% of the studied nurses their age ranged from 20-30 years, 70% of them were females, and 58% of them were

married. Regarding education, 42% of the studied nurses studied diploma in nurses, and 30% of them graduated nursing institute and moreover, 54% of them were working in Neurological-intensive care, and 58% of them had experience less than one year in intensive care unit while, only 32% of them attended nasogastric tube training course once.

Figure (1) :reveals that 70% of the studied nurses had unsatisfactory level of total knowledge while 30% of them had satisfactory knowledge about nasogastric tube.

Figure (2) :shows that, 100% of the studied nurses had unsatisfactory level of practice regarding NGT

Table(3): reveals that, 71% of the studied patients complained of difficulty swallowing, 59 % of them complained from distention and constipation and 55% of them complained from abdominal pain. Regarding respiratory complications 13% of the studied patients complained from aspiration. As regards to fluid and electrolyte, 77% of the studied patients had electrolyte imbalance, and 58% of them had dehydration and moreover, 59% of the studied patient had a decrease body weight.

Table(4): Reveals that, 58% of the studied patients complained of pain at site of insertion and 20 % of them complained of nasal bleeding and voice change. Moreover, 47% of them had ulceration at the site of insertion

Table (5): shows that, there was a highly statistically significant relation between nurses' years of experience, total knowledge, total practice and total complications with P-Value (0.000).

Table (6): shows hat, there was no statistically significant correlation between demographic characteristic and total complication with P-Value (0.318 to 0.930).

Table (1): Frequency and percentage distribution of demographic characteristics among the studied patients (n=100).

Items	Frequency (N)	Percent (%)
Age:		
30<45	19	19
45-60	81	81
Mean ± SD	45.23±17.25	
Gender:		
Female	38	38
Male	62	62
Educational level:		
• Illiterate	42	42
• Primary school	34	34
• Secondary school	24	24
Marital status:		
Married	91	91
Not married	9	9
Occupation:		
No working	79	79
on working	21	21
Hospital (ICU)Unit		
Combined medical ICU)	27	27
Neurological ICU	52	52
Emergency ICU	20	20

Table (2): Frequency and percentage distribution of demographic characteristics among of the studied nurses (n=50).

Items	Frequancy	Percent
Age:		
from 20 to less than 30 years	32	64
from 30 to less than 40 years	16	32
from 40 to 50 years	2	4
Mean ± SD	31.93±25.33	
Gender:		
Male	15	30
Female	35	70
Marital status:		
Married	29	58
Not married	21	42
Educational level:		
Diploma of nursing	21	42
Nursing institute	15	30
Bachelor of nursing	13	26
Postgraduate studies	1	2
Year of experience		
Less than one year	11	22
Fromn1- less than 5 year	13	26
From 5- less than 10 year	10	20
10 year or more	16	32
Number of years of experience in intensive care units:		
Less than one year	29	58
Fromn1- less than 5 year	13	26
From 5- less than 10 years	5	10
10 year or more	3	6
Working unit		
Combined medical care	9	18
Neurological intensive care	27	54
Emergency care unit	13	26
Have you attended any training courses		
No	34	34
Yeas	16	32
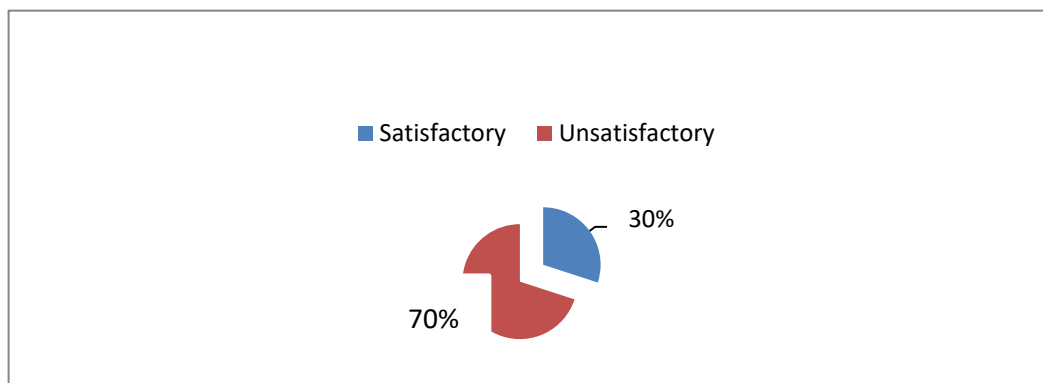
Figure (1): Percentage distribution of total knowledge among studied nurses.
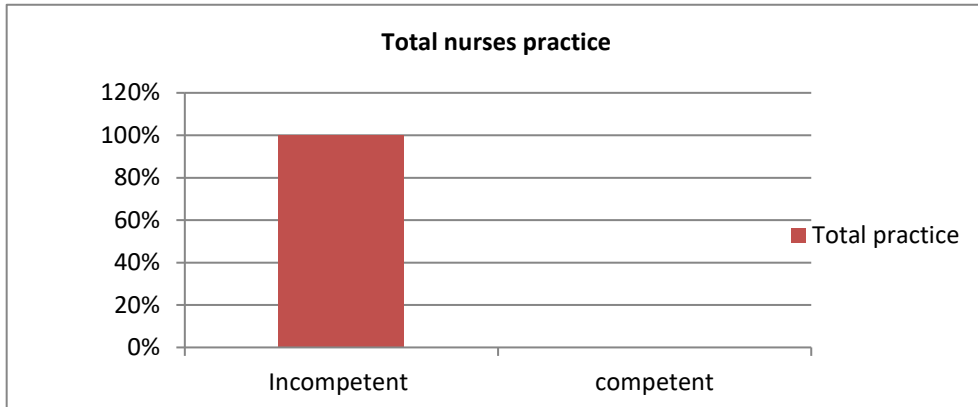
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Total nurses practice

Figure (2): Percentage distribution of total practice among studied nurses regarding nasogastric tube.

Table (3): Frequency and percentage distribution of systemic complications of nasogastric among patients with nasogastric tube (n=100).

Items	Present		Not present	
	N	%	N	%
Gastrointestinal:				
Nausea	18	18	82	82
Vomiting	36	36	64	64
Diarrhea	41	41	59	59
Constipation	59	59	41	41
difficulty swallowing	71	71	29	29
Bleeding	36	36	64	64
Abdominal pain	55	55	45	45
Distention	59	59	41	41
Respiratory:				
Aspiration	13	13	87	87
Endocrine:				
Hyperglycemia	54	54	46	46
Hypoglycemia	0	0	100	100
Fluid electrolyte:				
Electrolyte imbalances	77	77	23	23
Dehydration	58	58	42	42
Weight:				
Decrease	59	59	41	41
Increase	0	0	100	100

Table (4): Frequency and percentage distribution of local complication of nasogastric tube among patients with stroke (n=100).

Items	Present		Not present	
Site of insertion	N	%	N	%
Bleeding	20	20	80	80
Pain	58	58	42	42
Ulceration	47	47	53	53
Voice change	20	20	80	80

Table (5): Relation between nasogastric tube complication, nurses total Knowledge, and practice:-

Items	Total complications		
	Mean ±SD	t	P-Value
Years of Experience:	6.34±2.18	20.54	0.000*
Total knowledge	7.72±2.08	26.23	0.000*
Total practice	7.84±2.083	26.60	0.000*

Table (6): Correlation between nasogastric tube complication, and nurse's demographic data.

Items	Total complication	
Nurses	r	P-Value
Age	-0.144	0.318
Gender	-0.035	0.811
Training	-0.157	0.276
Educational level	-0.083	0.565
Working unit	-0.013	0.930

Significant at P > 0.05 non significant

Discussion:

Regarding age of the studied patients the current study result revealed that, the most majority of the studied patients their age ranged from 45-60. The present study result disagree with **Hossain et al., (2017**) who applied study entitled "Analysis of risk factors associated with stroke in young adults" and showed that, most of them were between 51 to 70 years of age. This might be related to old age people, more liable to stroke than younger as physiological changes which include narrowing or blockage of blood vessels of the brain.

As regard to gender the present study result showed that, less than two thirds of them were males. The present study result agree with **Hossain et al., (2017)** that two thirds of the studied patients were male. Also the result is in agreement with **Zhang, et al., (2016)** who applied study entitled "Clinical factors in patients with ischemic versus hemorrhagic stroke in East China" who mentioned that the majority of the study stroke patients were males.

Regarding educational level of the studied patients this result mentioned that, more than two fifths of them were illiterate, while less than one quarter of them were graduated from secondary school, the present study result is in disagreement with **Subha, et al., (2017)** who conducted study entitled "Pattern and risk factors of stroke in the young among stroke patients admitted in medical college hospital" and mentioned that, highly percentage of the studied patients had secondary level of education

As regards marital status the present study result mentioned that, the most of them were married. The present study result goes in the same line with **Zhang, et al., (2016)** who found that, highly percentage of the studied patients were married. From the investigator point of view this result may be due to culture of society that people married at young age

As regarding occupation the studied patients the result showed that, more than three quarters of them had no work. This result goes in the same line with **Wang, et al., (2019)** who applied study entitled "Effect of an indwelling nasogastric tube on swallowing function in elderly post-stroke dysphagia patients with long-term nasal feeding" and found that, highly percentage of the studied patients not work. From investigator point of view this result may be due to advanced age of patients, having chronic diseases, the affect person's ability to work

Regarding the intensive care unit of admission the current study result mentioned that, more than half of them were admitted to neurological I CU. This may be due to stroke patients were admitted to neurological ICU. And their need for NGT feeding. The current study result disagrees with **Subha, et al., (2017)**

who mentioned that, low percentage of the studied patients were admitted to I CU.

Regarding age of the studied nurses the current study result revealed that, less than two thirds of the studied nurses their age ranged from 20-30 years. This result is consistent with **Babapour, et al., (2016).** In study entitled "Nurses' practice about performance of nasogastric tube feeding in intensive care unit" whose results revealed that half of the nurses' age was less than 30 years old. From the investigator point of view these results may be due to the studied nurses who were working in critical area (ICU) are recently graduated and young age to be able to do with workload.

Regarding gender the present study result showed that, less than three quarters of them were females. This result is compatible with **Chen and Fang, (2018)** in their study entitled "Improving nurse skill of medication administration via NGT whose results revealed that all of the nurses' samples were females. From the researcher point of view this result may be due to females work in nursing field more than males.

Regarding education level of the studied nurses the two fifths the studied nurses studied diploma in nursing, less than one third of them graduated nursing institute. This result is disagreement with **Mahmoud, (2018).** in a study entitled "Nurses' performance regarding nasogastric tube feeding among critically ill patients" whose results revealed that, near half of the nurses under study were had technical institute degree.

As regard to nurses' years of experience in ICU the current study revealed that, more than half of them had experience less than one year in intensive care unit. This result was inconsistent **with Huang, et al., (2019)** in their study entitled "Current status and influencing factors of barriers to NGT feeding of A multicenter study" whose results revealed that half of nurses had 6-10 years of experience in ICU. From the researcher's point of view this finding may be due to most of the nurses under study were recently graduated and young ages.

As regarding working unit, the current study revealed that, more than half of them were working in Neurological-intensive care unit. This result is in accordance with **Huang et al., (2019)** revealed that half of nurses working in ICU

Finally regarding attendance of training courses regarding nasogastric tube feeding the current study revealed that, less than one third of them attended nasogastric tube training course once. This result is in accordance **with Al-Hawaly, et al., (2016)** who revealed that, near one third only of studied samples had training courses regarding nasogastric tube care. Also, this result is in disagreement with **Abd El-Hay et al., (2018)** who mentioned that, the majority of them not attended training sessions about care of stroke patients. From the researcher's point of view this result may be due to those training courses specific to nasogastric tube weren't held at the hospital.

Regarding total knowledge the current study revealed that, the more than two thirds of the studied nurses had unsatisfactory level of total knowledge about nasogastric tube. From the researcher point of view this result may be due to multiple factors such as low level of education, low experience, lack of previous in-service training programs among nurses and absence of updated knowledge through workshop sessions which improved the quality of nursing care. Moreover, the nurses lacked the efficiency of updating their knowledge after being stated in the clinical environment for a longer time. This result goes in the same line with **Abd El-Hay et al., (2018)** who reported that, high percentage of the nurses had poor level of knowledge related to nasogastric tube. Also agree with **Reynolds, et al., (2016)** who applied study entitled "Implementation of a stroke competency program to improve nurses' knowledge of and adherence to stroke guidelines" and founded that, highly percentage of the studied nurse had unsatisfactory knowledge while there was significant improvement in nursing total stroke knowledge assessment score post guidelines. Nurses who are managing stroke patients require specific educational and training program to be able to deliver patient-focused care and prevent secondary complications.

While disagree with **Muneer, et al., (2016)** who conducted a study to assess nurses' knowledge and performance regarding feeding of patients with nasogastric tube and illustrated that nearly three-quarters of the studied nurses had a satisfactory total level of knowledge regarding NGT feeding. This may be due to difference in educational level and nurses experience

Regarding total practice the current study revealed that all of the studied nurses had unsatisfactory level of practice regarding NGT. From the researcher point of view this result d may be due to poor skills, workload, lack of concentration and lack of experience and lack training. The present study result goes in the same line with **Chang et al., (2015)** who applied study entitled "The effects of systematic educational interventions about nasogastric tube feeding on caregivers' knowledge and skills and the incidence of feeding complications" and noted that most nurses had a pre intervention level of unsatisfactory practice regarding nasogastric tube insertion and care.

Also in agreement with **Mahmoud, (2018)** who applied study entitled "Nurses' performance regarding nasogastric feeding among critically ill patients" and documented that, highly percentage of the studied nurses had unsatisfactory level of practice regarding NGT. There is a huge gap between the standard guidelines and what are the nurses actually practices. In researcher point of view, this may be due to lack of training sessions, absent of continuous supervision and evaluation. Also, it might be due to lack of hospital policy and no standard guidelines for administration of enteral feeding and may be due to increase in number of patients and work overload especially in ICU. While it is in disagreement with **Nabil et al., (2020) w**ho illustrated that, majority of the nurses had appropriate practices regarding NG tube.

Regarding systemic complication of gastrointestinal tract among patients with nasogastric tube the current study result revealed that, vomiting presents in more than one-third of the studied sample, diarrhea two fifths and constipation more than half. The finding is merely in disagreement with that of **Kadamani, et al.,** **(2014)** who conducted a study about 'Incidence of aspiration and gastrointestinal complications in critically ill patients using continuous versus bolus infusion of enteral nutrition. From the investigator's point of view, the most common complications associated with NGT feeding were the gastrointestinal complication, as vomiting, diarrhea, constipation, nausea, abdominal distension, and the incident rate of these was varying from one patient to another due to a lot of factors, such as the method of tube feeding, hemodynamic instability, some medication, and other factors regarding nursing practice and formula preparation.

Regarding difficulty swallowing of studied patients, the current study result revealed that, more than two thirds of studied patients, impaired swallowing was a common complication of acute stroke. This goes in the same line with **Fedder, (2017) and Assefa, et al., (2022).** Swallowing disturbance was reported in 37–78% of stroke patients, and was responsible for more than a threefold increased risk of SAP

Regarding respiratory complications of the studied patients, the current study result mentioned that, minority of them complained of aspiration. This result is in disagreement with **Rahman et al., (2018)**. who founded that, the most common complication was more than one third complained of nasal irritation and one third complained of tube blockage

Also this result in contrasted with **Motta and Gobbo, (2021)** who applied study entitled "Nasogastric / nasoenteric tube-related adverse events: an integrative review" And showed that, nasogastric tube related adverse events are relatively common and the majority involved respiratory harm that resulted in increased hospitalization and/or death. The results may contribute to healthcare professionals, especially nurses, to develop an evidence-based guideline for insertion and correct positioning of bedside enteral tubes in adult patients.

Regarding aspiration of studied patients, the current study result revealed that 13% the present result disagree with **Wanden- Berghe, et al., (2019).** . A western study found that up to 27.0% remain at risk of aspiration by seven days.

Aspiration may occur with no obvious vomiting or coughing, and pneumonia can develop silent.

As regards fluid and electrolyte of the studied, more than three quarters of them had electrolyte imbalance, and more than half of them had dehydration and moreover, more than half of the studied patient had a decrease body weight. the present study result goes in the same line with **Wanden-Berghe et al., (2019)** who applied study about " Complications associated with enteral nutrition" and reported that, there was a higher incidence of gastrointestinal complications and found that, electrolyte imbalance was found in 43.0% patients. The actual reason behind the electrolyte imbalance may be multifactorial. One of the contributing factors might have been the diarrhea. from researcher view point may be due to factors might be over hydration due to supplementary IV fluids, excess loss due to drugs, result of the stroke itself, electrolyte imbalance has been attributed to re-feeding syndrome.

Regarding hyperglycemia of studied patients, the current study result revealed that, more than half. This result is in disagreement with (**Capes, et al., 2001**). Who found that hyperglycemia at admission in the stroke patient of between 8% and 63%. On the other hand, the incidence of initiation of complete enteral nutrition by nasogastric tube in this pathology ranges between 8.5 % and 29 % . From researcher view the point may be due to patient with stroke has an increased tendency to hyperglycemia and high rate of dysphagia associated to the pathophysiology of the disease

Regarding dehydration of studied patients, the current study result revealed that, 58% the present study result agrees with **Rowat, et al., (2012)** who applied study about dehydration in hospital-admitted stroke patients: detection, frequency, and association .Stroke**.**

Regarding local complication of nasogastric tube feeding the present study revealed that, more than half of the studied patients complained from pain at site of insertion and one fifth of them complained of nasal bleeding and voice change, moreover, less than half of them had ulceration at the site of insertion. This result in the same line with **Rabaut et al., (2022) w**ho reported that, low percentage of the studied cases complained from nasal bleeding. while disagreement with **Rabaut et al., (2022)** who applied study entitled "Clinical outcomes and patient safety of nasogastric tube in acute stroke patients" and mentioned that, complication of nasogastric tube feeding as the following one quarter of the studied sample had failed insertion, half of them pulled out NGT, two fifth of them had NGT placed in wrong positions and require reinsertion, five cases of pneumothoraxes, majority of lung disease had gastro hiatus hernias, one case of oesophageal ulceration, one third coiled, kinked or resistance., one third of the patients required restraints.

Regarding nasal ulceration of the studied patients, the current study result revealed that, more than two fifths suffer nasal ulceration the present study result inconsistent a with (**Onosson, et al., 1994).** who mentioned that, there was reported by (53.0%) of patients among the complications studied in western countries, following NG tube insertion, nasal ulceration is one of the more common one and it is more prevalent in those requiring large bore ones.

Regarding relation between nasogastric tube complications, nurses total Knowledge, and practice the present study result showed that, there was a highly statistically significant relation between nurses' years of experience, total knowledge, total practice and total complications with P-Value (0.000). the present study result goes in the same line with **Mohammed, et al., (2021)**.who mentioned that, there was high significant statistical positive correlation between studied nurses' total knowledge score and total practice score regarding nasogastric tube pre and post intervention. Also agree with **Mohammed et al., (2017)** who conducted study entitled "Assessment of the nurses performance in providing care to patients undergoing nasogastric tube in Suez Canal University Hospital" and reported that, there was positive correlation between nurse's knowledge related to complication and years of experience. From researcher point view the result may be due to an increase in nurses knowledge and practice accompanied with decrease in nasogastric tube complications.

Regarding correlation between nasogastric tube complication, and nurse's demographic data there with P-Value (0.318 to 0.930). The study showed that there was no statistical significant relation between studied nurses' total complications and their demographic characteristics regarding age, gender, educational level, and training courses, work units regarding nasogastric tube complication. These findings are in agreement with **Ahmed et al., (2018)** whose result show that nurses' age, gender and years of experience were found to be not significantly related with nurses' knowledge at post implementation of educational guidelines.

Conclusion:

The results of this study concluded that:

The factors that affecting nasogastric tube were patients related factors including: Age , gender, work unit, type of stroke, length hospital stay, BMI, activity daily living, Glasgow coma scale, .oxygen therapy, recurrent stroke. Also, the factors including nurse- related factors as Age, gender, nurse education level, , attendance of training courses, work unit water flushes, duration of tube application and there was a highly statistically significant relation between nurses' years of experience, total knowledge, total practice and total complications with P-Value (0.000).

Recommendation:

Recommendations related to patients

Establish simplified and illustrated educational booklet for the conscious patients connects with NGT about basic information about NGT

Recommendations related to nurses

Implementing nurses 'educational program to improve their knowledge for nasogastric tube.

Designed about nasogastric tube insertion, feeding and checklists and guidelines for all procedures administration should be available for nurses in ICUs.

Ongoing monitoring of staff nurses' practice by head and charge nurses when caring for patients who receiving nasogastric tube feeding and provision of guidance to correct poor practices

Recommendations related to research

Replication of the study using a larger probability sample from different geographical areas to attain more generalizable results.

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