

## Nursing Performance Regarding Monitoring of patients with Ischemic stroke during administration of Tissue Plasminogen Activator Drug

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### Abstract

**Background:** Treatment with tissue plasminogen activator (TPA) for acute stroke requires intensive care of the patient. The risk of thrombolytic therapy and the need for rapid interventions make it clear that the nursing role during this time is crucial. **The aim:** This study aims to assess the nurses' Performance regarding monitoring of patients with stroke during administration of Tissue Plasminogen Activator drug. **Study design:** A descriptive exploratory design. **Subject:** A convenient sample of all nurses (30) working at the previously mentioned setting were recruited to participate in the study. **Setting:** This study was conducted at the stroke unit at the neurology department affiliated to Ain Shams University Hospital. **Tools:** two tools were used for data collection; self-administered questionnaire and nurses' practice observational checklist. **Results and conclusion:** the results of this study showed that, all of the studied nurses had unsatisfactory total knowledge and total practice and two thirds of the studied nurses had negative attitude regarding monitoring patients with ischemic stroke during administration of TPA drug. A positive statistically significant correlation between total level of nurses' practice and their total level of knowledge was found and there was no statistically significant correlation between total level of nurses' practice and knowledge and their total level of attitude. **Recommendation:** Providing in-service educational programs and upgrading courses based on evidence-based guidelines based on nurses' needs to improve their knowledge and practice related to administration of TPA drug. Knowledge sources in Arabic language must be provided for nurses in work place such as simplified and comprehensive educational guidelines, policies, booklets and websites about TPA administration and the role of nurse pre, during and after administration.

**Keywords:** Tissue plasminogen activator, ischemic stroke, nursing performance, monitoring of patient.

### INTRODUCTION

Stroke is the leading cause of long-term disability in developed countries and one of the top causes of mortality worldwide. The past decade has seen substantial advances in the diagnostic and treatment options available to minimize the impact of acute ischemic stroke. The key first step in

stroke care is the early identification of patients with stroke and triage to centers capable of delivering the appropriate treatment, as fast as possible. Urgent reperfusion of the ischemic brain tissue is the major target of acute ischemic stroke treatment (Phipps & Cronin, 2020).

Tissue Plasminogen Activator (TPA) is a powerful thrombolytic agent used in the

lysis of acute thromboembolism. It is used as a first-line drug for the acute treatment of ischemic stroke. It acts within the endogenous fibrinolytic cascade to convert plasminogen to plasmin by hydrolyzing the arginine-valine bond in plasminogen. The activated plasmin then degrades fibrin and fibrinogen, allowing for the dissolution of the clot and re-establishment of blood flow (**Hughes, Tadi & Bolu, 2020**).

Thrombolysis is the first line of treatment in hyperacute ischemic stroke. TPA is the only agent approved by the European Medicines Evaluation Agency (EMA) since 2002 for acute ischemic stroke within 3 h of stroke onset according to the benefits observed in multicenter clinical trials in North America and Europe. The time window was extended to 4.5 h in light of the benefits observed in the European Cooperative Acute Stroke Study III (ECASS III) trial (**Modrego, 2019**).

Not everyone who has an ischemic stroke is eligible for TPA. The use of TPA has very strict inclusion criteria. General inclusion criteria as; patient age should be equal or older than 16 years with the presence of acute ischemic stroke symptoms, measurable neuromuscular failure should be present, Absence of hemorrhage or stroke mimic on baseline CT, and the onset of symptoms should be at least 4.5 hours before the onset of treatment (**Douglass, 2019**).

Despite the efficacy of TPA drug in improving ischemic stroke patients' outcome, the most significant adverse effect of TPA is intracerebral hemorrhage and the other adverse effects include extracranial hemorrhage, orolingual angioedema, and seizure. The risk of TPA therapy and the need for rapid interventions make it is clear that the nursing role during this time is crucial (**Jilani & Siddiqui, 2020**).

The main target of the stroke nurse is continuous monitoring of the patient who is

receiving TPA drug. The nurse should be a good observer for any signs of major or minor bleeding, any changes in neurological status, signs of orolingual angioedema, or any signs of sICH occur, such as severe headache, acute hypertension, nausea or vomiting, or worsening neurological examination. The TPA administration should be stopped and a CT scan obtained (**Ignatavicius, Workman, Rebar & Heimgartner, 2020**).

Nurses should be familiar with the safe dosage and administration of TPA for stroke, which is clearly different than the administration of TPA for myocardial infarction. Furthermore, thrombolytic stroke treatment must be accompanied by intensive neurological monitoring to observe for complications. Intracerebral hemorrhage is usually accompanied by an acute change in neurological status and vital sign instability. Intensive monitoring of the neurologic condition, vital signs, cardiac status, and other standard critical care practices must be initiated immediately to optimize patient outcomes (**Williams, Perry & Watkins, 2020**).

#### **SIGNIFICANCE OF THE STUDY**

Stroke is the second leading cause of death worldwide and a leading cause of adult disability. In the US, each year approximately 795,000 people experience a new or recurrent stroke. In 2016, on average every 3 minutes 42 seconds, a person died of a stroke, accounting for 1 in 19 deaths in the United States. In 2013, the number of deaths from stroke was 4.85 million in low- and middle-income countries compared to 1.6 million in high-income countries. From 2011 to 2014 the overall stroke prevalence was estimated as 2.7% (**Boehringer Ingelheim International, 2020**).

In Egypt, stroke is now the 3rd most common cause of death, after heart and liver disease. In Upper Egypt, there are  $\leq 250\ 000$

cases each year, and at least 75% of patients will be left with a marked disability. The thrombolysis rate is 4.5%, and there is 52 percent that provides thrombolysis, half of which are university hospitals and 10 percent are ministry of health centers (Caso, Zakaria, Tomek, Mikulik, Martins, Nguyen & Rossouw, 2018).

The major complication of TPA is symptomatic intracranial hemorrhage (SICH), which happens in around 6.4% of cases in the National Institute of Neurological Disorders and Stroke (NINDS) trial, or higher in the European Cooperative Acute Stroke Study (ECASS) II trial (8.8%). The in-hospital mortality due to SICH after thrombolysis was 52.3% (67/128 cases), independently of treatment. Also, orolingual angioedema is a life-threatening complication of TPA. The incidence of orolingual angioedema is 1%–5%, and concurrent use of angiotensin-converting enzyme inhibitors (ACEIs) is associated with up to 65 % of cases (Modrego, 2019; Nakajima, 2019).

The nurse's role is so critical concerning this procedure to reduce the risk and prevent complications that occur after TPA administration. Stroke nurses should monitor vital signs and the neurological status pre, during, and post the drug administration. Specialist stroke nurses must be aware of inclusion/exclusion criteria of the eligible stroke patient as well as the side effects and decision when should stop this medicine immediately in case of experience any problems such as allergic reaction or uncontrollable bleeding (Topcuoglu & Tulek, 2020).

#### **AIM OF THE STUDY**

This study aims to assess the nurses' Performance regarding monitoring of

patients with stroke during administration of tissue plasminogen activator drug through:

- 1- Assessing level of nurses' performance regarding monitoring (pre, during and post) of patient with ischemic stroke during administration of tissue plasminogen activator drug.
- 2- Assessing factors affecting nurses' performance regarding monitoring (pre, during and post) of patient with stroke during administration of tissue plasminogen activator drug.

#### **Research question:**

This study is based on answering the following question:

1. What is the level of nurses' performance (knowledge, practice and attitude) regarding monitoring of patient with ischemic stroke during administration of tissue plasminogen activator?
2. What are the factors affecting the nurses' performance regarding monitoring of patient with ischemic stroke during administration of tissue plasminogen activator?

#### **SUBJECT AND METHODOLOGY**

**This study was portrayed under the four main designs as the following:**

1. Technical design.
2. Operational design.
3. Administrative design.
4. Statistical design

#### **Technical design:**

The technical design includes research design, setting, subjects, and tools of data collections.

**Research Design:**

A descriptive exploratory design was used to achieve the aim of this study.

**Research Setting:**

This study was conducted at the stroke unit at the neurology department affiliated to Ain Shams University Hospital. The stroke unit includes two rooms; the bed capacity of the first room is 6 beds and the bed capacity of second room is 5 beds. Each bed is equipped with monitor and oxygen access. There is a crash care, a defibrillator and there are 2 suction machines.

**Subjects of the study:**

A convenient sample of all nurses (30) working at the previously mentioned setting were recruited to participate in the study.

**Tools of data collection:**

Two tools were constructed by the researcher to collect data pertinent to this study, these tools are:

**A. Nurses Self-administered Questionnaire:** consisted of the following:

**Part 1:** It was concerned with demographic characteristics and related data of nurses under the study such as (age, gender, educational levels, and years of experience...etc.

**Part 2:** It was concerned with assessment of nurses' knowledge regarding monitoring of patients with stroke during administration of Tissue Plasminogen Activator drug. It consists of: the structure and function of brain and meninges; stroke disease an assessment of nurses' knowledge about TPA.

**❖ Scoring system of knowledge:**

Each correct answer was given one grade and zero for incorrect answer with total score of 56 grades, classified as the following:

- Level of knowledge  $\geq 85\%$  ( $\geq 47$ grades) was considered satisfactory level of knowledge.
- Level of knowledge  $> 85\%$  ( $>47$ grades) was considered unsatisfactory level of knowledge.

**Part 3:** It includes likert scale to assess nurses' attitude toward administration of TPA.

**❖ Scoring system of attitude:**

Scoring for each sentence was as the following; agree responses were given one grade while disagree/ neutral responses were given zero taking into consideration that the agree response was considered a positive response while disagree/ neutral response is considered a negative response. The total score of 18 grades, classified as the following:

- Level of attitude  $\geq 70\%$  ( $\geq 12$  grades) was considered positive attitude..
- Level of attitude  $> 70\%$  ( $>12$  grades) was considered negative attitude.

**Part 4:** It was concerned with assessment of factors affecting nurses' performance toward monitoring of patient with ischemic stroke during administration of TPA as perceived by them. It was divided into 4 sections; Factors related to nursing staff, Factors related to job satisfaction, Factors related to patient safety measures, Factors related to work environment.

**❖ Scoring system of factors:**

Each nurse respond for each item with two options (yes or no). If the response is no, it means that the factors didn't affect their performance and scored zero. If the response is yes, it means that the factor affect their performance and scored one. The total score was 28 items.

### **B. Nurses' observational checklist:**

It was used to assess the nurses' level of practice, regarding monitoring of patient with ischemic stroke during administration of TPA. The observational checklist includes checklists regarding the following procedures including; administering of TPA drug, performing cardiac monitoring, reconstituting powdered drugs, administering drug using a syringe pump, Electronic blood pressure measurement, and assessing consciousness level according to glasgow coma scale.

#### **❖ Scoring system:**

Each step that was not done or incorrectly done was scored zero, while one grade was given for correctly done step, total score was 159 grades classified as the following:

- The level of practice  $\geq 85\%$  ( $\geq 135$  grades) was considered satisfactory level of practice.
- The level of practice  $< 85\%$  ( $< 135$  grades) was considered level of unsatisfactory practice.

### **Operational design:**

The operational design included preparatory phase, pilot study, content validity and reliability and field work.

#### **Preparatory phase:**

It included reviewing of related literature, and theoretical knowledge of

various aspects of the study using books, articles, internet, periodicals and magazines to develop tools for data collection. Permission for data collection and implementation of the study at the stroke unite in Ain Shams University Hospital was obtained from the hospital administrative personals by the submission of a formal letter from the faculty of nursing, Ain Shams University. Meeting and discussions were held by the researcher and nurses to explain the aims, the nature and the objectives of the study.

### **Ethical considerations:**

The research approval was obtained from the scientific ethical committee in Faculty of Nursing, Ain Shams University. The objective and aim of the study were clarified to the nurses included in the study by the researcher. The researcher keeps maintaining anonymity and confidentiality of the study subjects. All the nurses under study were informed about their rights to participate or withdraw from the study at any time.

#### **Pilot study:**

Pilot study was be carried out on 10% of nurses to test the applicability, clarity and efficiency of the tools, then the tools was modified according to the results of pilot study. The nurses who shared in pilot study were included from study subjects.

#### **Tools validity and reliability:**

##### **• Tools validity:**

The tools were revised for content validity by a jury of seven experts in medical surgical nursing at faculty of nursing. The

percentage of agreement of jury upon self-administrated questionnaire was ranged between 86 to 100%. The percentage of agreement of jury upon nurses practice observational checklists was ranged between 95 to 100%

- **Tools reliability:**

Internal consistency reliability was assessed in the present study tools consistency via Cronbach's alpha reliability analysis to measure internal consistency of the 2 tools used in current study. The reliability test score for nurses' self-administered questionnaire was 0.848. Meanwhile the reliability test score for nurses' practice observational checklist was 0.918.

- **Field work**

Nurses who agreed to participate in the study were interviewed individually by the researcher to explain the nature and purpose of the study. Data were collected from 15 October 2019 to the end January of 2020. The researcher visited the stroke unit at morning and afternoon shift from 8am to 8pm 2 days weekly. The observational checklist was checked prior to administration of questionnaire to ensure maximal realistic observation of nurses' practice and minimize the possibility of bias. Each nurse was

observed by indirect observation three times (for each phase) of TPA drug administration by using nurses observational checklist, the mean of the three observations was calculated. Nurses' self-administered questionnaire was filled by the nurses under study during their shift work. It took about 20-30 minutes to be fulfilled to each one.

- **Administrative design:**

An official letter was sent from the faculty of nursing at Ain Shams University to the director of Ain Shams University Hospital for permission to conduct this study.

- **Statistical Design:**

All data were collected, tabulated and subjected to statistical analysis. Statistical analysis is performed by Statistical Package for the Social Sciences (SPSS) and version 21. Also, Microsoft office excel is used for data handling and graphical presentation and proper statistical tests were used to determine whether there significant difference or not. The following statistical analysis was used: number, percentage (%), mean, stander deviation (SD), t- test, ANOVA (F- test), cronbach alpha test, reliability (r) test and proportion probability of error (P value). Significance level is considered at  $P \leq 0.05$  (S); while for  $P > 0.05$  is considered non-significant result.

regarding TPA administration. Regarding presence of guide manual related to TPA administration, 100% of the studied nurses exhibited presence of guide manual related to TPA administration.

**Figure (1):** illustrates that 100% of nurses under study had unsatisfactory level of total knowledge regarding monitoring of patients with ischemic stroke during administration of TPA drug.

**Figure (2):** illustrates that 73% of the studied nurses had negative attitude

## RESULTS

**Table (1):** demonstrates that 46.67% of the nurses under study their age ranged between (20<30) and 73.33% of them were females. 90.00% of the nurses under study were married, 50% of them were holding technical institute of nursing degree and 43.33% of them their general years of experience ranged between (1<5) years. Also, 60% of nurses under study didn't attend training courses

regarding nursing performance for TPA administration.

**Figure (3):** illustrates that 100 % of the studied nurses have got unsatisfactory level of total practice regarding nursing performance for TPA administration.

**Table (2):** Regarding nursing related factors, table (2) indicates that, 76.67% of nurses under study reported that availability of ongoing training on how to perform better care for patients receiving TPA drug affecting on their performance. Regarding job satisfaction related factors, 73.33% of nurses under study reported that feeling motivation regarding role in stroke unit affecting on their performance. Regarding patient safety related factors 80.00% of nurses under study reported that Presence of 1:1 patient-nurse ratio for patient receiving TPA drug affecting on their performance. Regarding work environment related factors 100.00% and

86.67% of nurses under study reported that availability of good training for new nurses on nursing care for stroke patients receiving TPA drug & availability of continues training related to nursing performance before, during, and after administration of TPA drug affecting on their performance.

**Table (3):** demonstrates that, there was positive statistically significant correlation between total level of nurses' practice and their total level of knowledge ( $r = 0.42$  at  $p\text{-value} < 0.05$ ).

There was no statistically significant correlation between total level of nurses' practice and their total level of attitude ( $r = 0.17$  at  $P\text{-value} > 0.05$ ).

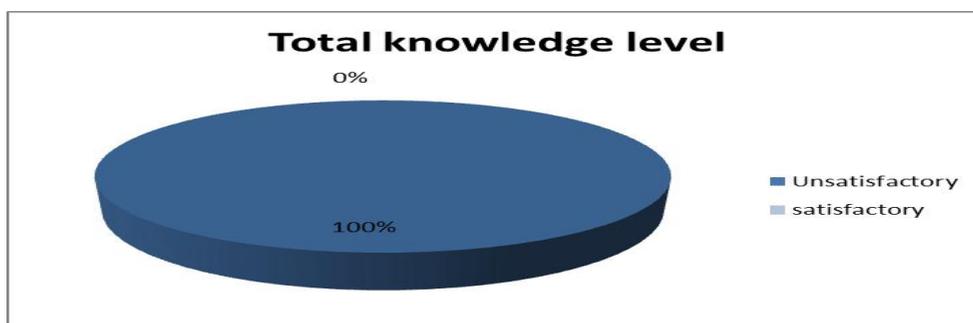
There was no statistically significant correlation between total levels of nurses' attitude and their total level of knowledge ( $r = 0.11$  at  $p\text{-value} > 0.05$ ).

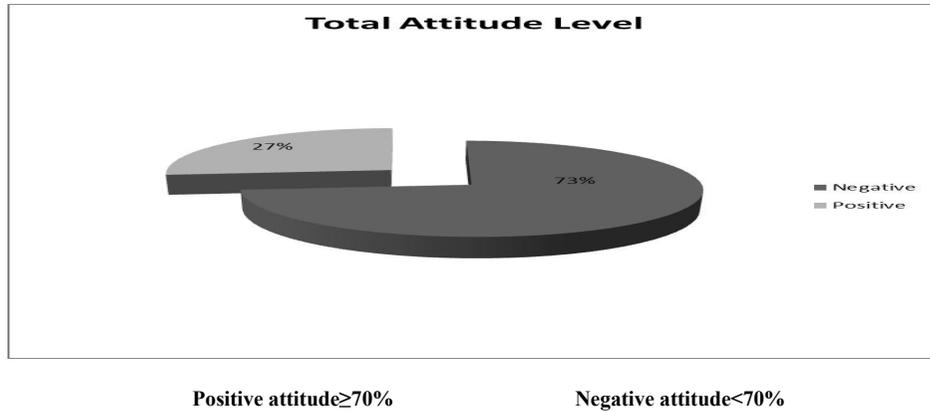
**Table (1):** frequency and Percentage Distribution of Demographic Characteristics of the Studied Nurses (n=30).

Item	Study sample	
	No.	%
<b>Age</b>		
20 <30 years	14	46.67%
30 <40 years	8	26.67%
40 <50 years	6	20.00%
≥50 years	2	6.67%
Mean±SD (Standard Deviation)	33.7 ± 9.74	
<b>Gender</b>		
Male	8	26.67%
Female	22	73.33%
<b>Marital status</b>		
Married	27	90.00%
Single	3	10.00%
<b>Qualifications</b>		
Diploma nursing	9	30.00%
Technical institute of nursing	15	50.00%
Bachelor degree of nursing	6	20.00%
Post graduate studies of nursing	0	0.00%
<b>Years of experience</b>		
1<5 years	13	43.33%
5<10 years	8	26.67%
≥10 years	9	30.00%
Mean±SD (Standard Deviation)	7.0 ± 4.51	
<b>Attendance of training courses regarding TPA administration</b>		
Yes	12	40.00%
No	18	60.00%
<b>Availability of guide manual related to TPA administration</b>		
Yes	30	100.00%
No	0	00.00%

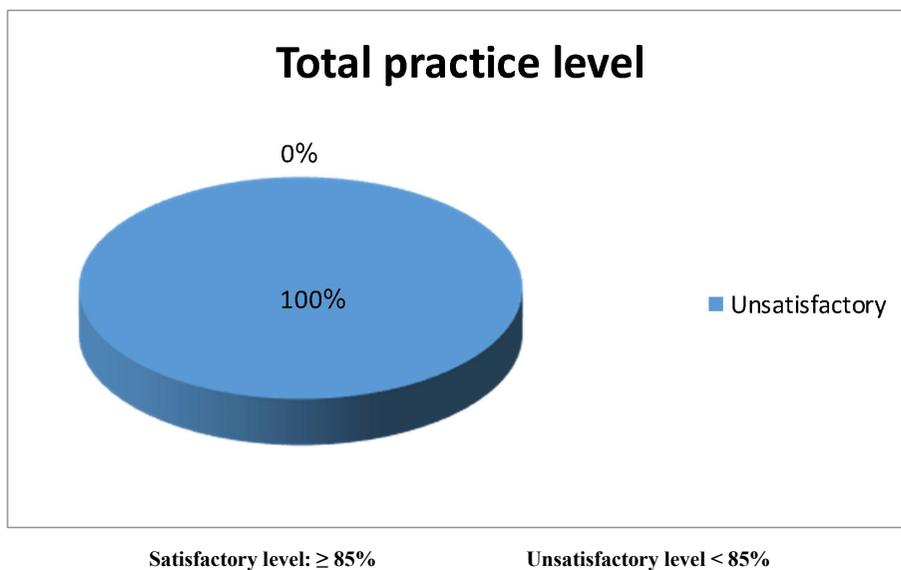
Satisfactory level: ≥85%

Unsatisfactory level &lt;85%

**Figure (1):** Total studied nursing knowledge level regarding monitoring of patients with ischemic stroke during administration of TPA drug (n=30).



**Figure (2):** Total studied nursing attitude level regarding monitoring of patients with ischemic stroke during administration of TPA drug (n=30).



**Figure (3):** Total nursing practice level regarding monitoring of patients with ischemic stroke during administration of TPA drug (n=30).

**Table (2):** Frequency and percentage distribution of the factors affecting the studied nurses' performance regarding monitoring of patients with ischemic stroke during administration of TPA drug (n=30).

Factors	Frequency and percentage distribution				
	Yes		No		
	No.	%	No.	No.	%
<b>Nursing related factors</b>					
Availability of job description	16	53.33%	14	46.67%	
Availability of specialized nursing team to deal with patients receiving TPA drug	16	53.33%	14	46.67%	
Availability of sufficient information and nursing expertise to provide the best care for patients receiving TPA drug	15	50.00%	15	50.00%	
Adequate time to provide the best nursing care for patients receiving TPA drug	17	56.67%	13	43.33%	
Availability of supervision during nursing care for patients receiving TPA drug	16	53.33%	14	46.67%	
Availability of ongoing training on how to perform better care for patients receiving TPA drug	23	76.67%	7	23.33%	
<b>Job satisfaction related Factors</b>					
satisfaction with work place	14	46.67%	16	53.33%	
Satisfaction with the role	14	46.67%	16	53.33%	
Feeling motivation regarding role in stroke unit.	22	73.33%	8	26.67%	
Adequate salary	21	70.00%	9	30.00%	
Availability of competitive rewards	11	36.67%	19	63.33%	
Suitable working hours	17	56.67%	13	43.33%	
Availability of opportunities for creativity	19	63.33%	11	36.67%	
<b>Patient safety related Factors</b>					
Availability of sharing system for all information about stroke patients receiving TPA drug	13	43.33%	17	56.67%	
Presence of 1:1 patient-nurse ratio for patient receiving TPA drug	24	80.00%	6	20.00%	
Development of individualized nursing care plan for each patient receiving TPA drug	15	50.00%	15	50.00%	
Presence of written protocols for nursing practice regarding before, during and after administration of TPA drug	18	60.00%	12	40.00%	
Presence of clear and specific criteria for patients receiving TPA drug	10	33.33%	20	66.67%	
Commitment to the time of TPA drug administration.	13	43.33%	17	56.67%	
Availability of clear bodies responsible for achieving safety measures for stroke patients receiving TPA drug	15	50.00%	15	50.00%	
<b>Work environment related Factors</b>					
Presence of harmony between the medical team of doctors and nurses	8	26.67%	22	73.33%	
availability of the doctor at any time and communicate with him at TPA administration	10	33.33%	20	66.67%	
Presence collaboration between my colleagues in the stroke care unit	11	36.67%	19	63.33%	
Cooperation between health team members in setting goals regarding TPA administration	12	40.00%	18	60.00%	
Availability of good training for new nurses on nursing care for stroke patients receiving TPA drug	30	100.00%	0	0.00%	
Communication with supervisors is available	18	60.00%	12	40.00%	
Availability of continues training related to nursing performance before, during, and after administration of TPA drug	26	86.67%	4	13.33%	
Availability of policy manual and nursing skills for the care of stroke patients receiving TPA drug	18	60.00%	12	40.00%	



(2014), in a study titled "**Critical care nurses' knowledge and practice regarding administer of total parental nutrition at critical care units**" which showed that about two third from the study nurses had experience less than five years.

The present study finding showed that, more than half of the studied nurses didn't attend training courses related to TPA administration. This might be due to shortage of staff, work load and lack of time in ICU. This finding is consistent with **Zidan, Elfeky, Yossif and Abd Allah (2017)**, in a study titled "**Impact of a Designed Acute Stroke Nursing Management Protocol on Nurse's Knowledge and Practices**" which found that all of the studied nurses did not attend any training program. They explained that the training courses for nurses are very important to improve their performance that affect positively on quality of care.

Regarding presence of guide manual related to TPA administration, the present study results indicated that all of the studied nurses exhibited presence of guide manual related to TPA administration. The researcher found that the manual was in an English language and designed for medical staff, so the studied nurses can't get benefit from the manual guide..

#### **Part II: Assessment of nurses' knowledge, attitude and practice regarding monitoring of patients with ischemic stroke during administration of TPA drug.**

Concerning total nurses' level of knowledge regarding monitoring of patients with ischemic stroke during administration of TPA drug, the results of current study showed that all of studied nurses had unsatisfactory knowledge. These results may be because more than half of the studied nurses didn't attend the training

courses related to TPA administration. In addition, the guide manual related to TPA administration is not available in Arabic language for nurses.

These result is consistent with **Khalil, Eweas and Ismaeel (2018)**, in a study titled "**Thrombolytic therapy in acute MI: coronary care nurses' knowledge and practice**" found that the majority of studied nurses had unsatisfactory knowledge. Also, this finding is consistent with **Abd Elmegeid (2020)** in a study titled "**Emergency Nurses' Knowledge and Practice Regarding Care of Acute Ischemic Stroke Patients Undergoing Recombinant Tissue Plasminogen Activator**" found that, more than half of studied nurses had total unsatisfactory level of knowledge regarding care of acute ischemic stroke patients.

Concerning total nurses' level of attitude regarding monitoring of patients with ischemic stroke during administration of TPA drug the study revealed that more than two thirds of studied nurses had negative attitude.

These findings may be due the wrong concept of studied nurses that training programs are unuseful and time consuming, in addition to the staff shortage, workload and absence of motivation and appreciation. The current study findings are in the same line with **Mustafa and Elfaki (2016)** in a study entitled "**Nurses' Attitude with Physician Collaboration during Management of Patient with Acute Myocardial Infarction Using Thrombolytic Agent at Public Teaching Hospitals in Khartoum State, Sudan**" which revealed that most of the studied subjects' attitude levels were poor regarding streptokinase administration.

This is supported by **Islam (2018)** a study entitled "**Factors Influencing**

**Performance of Stroke Management among Nurses in Bangladesh**" which demonstrated that majority of the nurses had a negative to neutral level of attitudes on stroke management.

As regard to the total level of nurses' practice, the present study showed that all of the studied nurses had unsatisfactory level of practice regarding monitoring of patients with ischemic stroke during administration of TPA drug. This could be attributes to lack of nurses' knowledge which reflects on their performance, inadequate in-service training program, lack of qualification as most of nurses were diploma and nurses technical institute graduates, lack of number of nursing staff, lack of job satisfaction and lack of close supervision.

This result is consistent with **Khalil, Eweas and Ismael (2018)**, a study entitled **"Coronary Care Nurses' Knowledge and Practice Regarding Management of thrombolytic therapy among acute myocardial infarction patients"** found that the majority of study nurses had unsatisfactory practice regarding the nurses' practices in administering thrombolytic therapy. Also, this result is agreed with **khatab (2017)**, who found that the majority of studied nurse had unsatisfactory practice regarding administer TPA medication intravenous. The most of the studied nurses had competent regarding care of acute ischemic stroke patients undergoing recombinant tissue plasminogen activator.

### **Part III: Factors affecting the studied nurses' performance regarding monitoring of patients with ischemic stroke during administration of TPA drug.**

As regards to nursing related factors, the current study showed that more than three fourths of the studied nurses stated that

availability of ongoing training on how to perform better care for patients receiving TPA drug affecting on their performance. This result goes in the same line with **Rageb and Metwally (2016)**, a study entitled **"Effect of Training Program on Reduction of Nurse's Medication Errors"** reported that there is a positive effect of training program on reduction of nurse's medication errors.

This result is supported by **Ortega, Cecagno, Llor, Siqueira, Montesinos, and Soler (2015)** a study entitled **"Academic training of nursing professionals and its relevance to the workplace found in his study that nurses"** reported that linking academic education to the workplace impacts on the quality of care provided.

Regarding job satisfaction related factors the current study showed that about three fourths of nurses under study reported that feeling motivation regarding role in stroke unit affecting on their performance. This is consistent with **Aduo-Adjei,**

**Emmanuel and Forster (2016)**, a study titled **"The impact of motivation on the work performance of health workers: Evidence from Ghana"** who revealed that job satisfaction, logistic provision, and an enabling work environment are intrinsic motivating factors that affect the work performance of health workers; extrinsic factors such as financial reward, accommodation, and transportation also impact work performance. Furthermore, motivation is key to the work performance of nurses.

Regarding patient safety related factors the most of nurses under study reported that presence of 1:1 patient-nurse ratio for patient receiving TPA drug affecting on their performance. The result is inconsistent with **El sayed (2017)**, in a study

titled "Factors Affecting Nurses' Performance for Patients with Acute Myocardial Infarction within the Golden Hours" who revealed that the nurse/ patient ratio is far from optimal; hence this negatively affects nurses' performance because it increases the chance of nurses making medical errors due to fatigue.

Also, this finding is congruent with **Kamati, Cassim and Karodia (2014)**, a study titled "An evaluation of the factors influencing the performance of registered nurses at the national referral hospital in Namibia" which found that more than four fifths of the studied nurses cited that a shortage of staff is a factor that negatively affects or contributes to poor performance.

Regarding work environment related factors, the current study showed that the all nurses under study agree about availability of good training for new nurses on nursing care for stroke patients receiving TPA drug and availability of continuing training courses related to nursing performance before, during, and after administration of TPA drug are factors affecting their performance. This result goes in the same line with **Abd El-Hay, Abed Allah and Tag El Din (2018)**, in a study titled "The effect of implementing designed educational training program for neurological nurses on clinical outcomes of stroke patients" which reported that there were significant improvements in nurses' knowledge and practice regarding care of stroke patients post training program.

Revealed that a highly statistically significant relation between Nurses' qualification, Nurses' experience and training of palliative care with total mean of knowledge revealed that a highly statistically significant relation between Nurses' qualification, Nurses' experience and training of palliative care with total mean of knowledge

#### **Part IV: The correlation between knowledge, and attitude, practice:**

The current study demonstrates that, there was positive statistically significant correlation between total level of nurses' practice and their total level of knowledge. It means that nurses under study had poor knowledge and consequently poor practice level. It seems reasonable to conclude on the basis of the study findings that the total studied nurses' knowledge and practice levels are unsatisfactory.

The above result in the same line with **Abo El-Ata, Ibrahim, Mohamed and Allawy (2019)**, a study entitled "Nurses' Performance Regarding Administration of Inotropic Medications for Critically Ill Patients" and found that there was a highly positive correlation between nurses' practice and nurses' knowledge.

Also, the current study revealed that there were no statistically significant correlations between total level of nurses' practice and their total level of attitude. From researcher point of view, practice is not necessarily affected by the attitude, the level of unsatisfactory practice of studied nurses is may be related to the low nurses' knowledge. These findings agreed with **Islam (2018)**, a study entitled "Factors influencing performance of stroke management among nurses in Bangladesh" who found that nurses' attitudes were not significantly associated with their practice of stroke patient management.

This result was in the same line with **Di Muzio, Tartaglini, Marzuillo, La Torre and De Vito (2016)**, a study entitled "Knowledge, attitudes, behavior and training needs of ICU nurses on medication errors in the use of IV drugs" who reported that, adequate medication practice is not associated with positive

attitudes for management of intravenous medications.

Also, this study finding revealed that there was no statistically significant correlation between total level of nurses' attitude regarding monitoring of patients with ischemic stroke during administration of TPA drug and their total level of knowledge. It may be because of the study nurses' concept that TPA drug administration is the role of physician not a nurse and this wrong concept affected on their attitude, that is not reflected the strong relation between knowledge and attitude improvement.

The current study findings disagreed with **Sallam (2016)**, a study entitled "**Nurses' Performance Regarding Administration of High Alert Medication in Coronary Care Unit**" who reported that there was a positive relation between nurses' attitude and their knowledge.

#### **RECOMMENDATIONS:**

**The following recommendations were inferred from the study:**

- Providing in-service educational training programs and upgrading courses based on evidence-based guidelines based on nurses' needs to improve their knowledge and practice related to administration of TPA drug.
- A simplified and comprehensive educational guidelines, booklets and websites in Arabic language about TPA administration and the role of nurse pre, during and after administration should be afforded to nurses caring for patients who treated with TPA drug.

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