Original Article

# Saudi Emergency Physicians' Knowledge about Recombinant Tissue Plasminogen Activator for Acute Ischemic Stroke

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## Abstract

The risk of ischemic stroke is an emergent concern in the Kingdom of Saudi Arabia. Recent studies indicate that cardiovascular conditions account for 33% of deaths each year in Saudi Arabia. The benefits of t-PA for acute ischemic stroke within the first 4-5 hours after the onset of stroke are established in the literature. However, a considerably small patient population receives this type of treatment. The underutilization of recombinant tissue-type plasminogen activator (t-PA) arises due to several reasons, including the lack of information and awareness about recognition and response to stroke signals, risk of symptomatic intracerebral hemorrhage, and complexities involved in stroke care. Using a cross-sectional study design consisting of 127 emergency Saudi physicians, this study assessed emergency physicians' knowledge about recombinant tissue plasminogen activator for acute ischemic stroke. Emergency physicians are less likely to use RT-PA in the treatment of acute ischemic stroke due to hemorrhage risk and lack of benefit in neurological outcome. Knowledge in emergency physicians was found to be approximately the same for both experienced and non-experienced physicians.

**Keywords:** Hemorrhage, ischemic stroke, stroke

## INTRODUCTION

Ischemic stroke affects thousands of people annually, and there is no direct treatment to reduce the degree of neurologic injury. The risk of ischemic stroke is an emergent concern in the Kingdom of Saudi Arabia with the increasing cases of cardiovascular diseases. For instance, recent studies indicate that cardiovascular conditions account for 33% of deaths each year in Saudi Arabia [1, 2]. However, there is paucity in research with regard to stroke in the Kingdom of Saudi Arabia. While stroke is an acute health concern in the GCC region, there is little research, and some studies indicate that there exist patients who have never even heard of the term stroke [3]. These findings are alarming, especially in a population with the highest risk factor for stroke due to old age, high blood pressure, prior stroke, transient ischemic attack, diabetes, or high cholesterol. The poor knowledge and attitudes about stroke in the general population could be generalized for the medical personnel.

### Objectives of the Study

Improving clinical outcomes for stroke patients depend on the use of proven therapies throughout the broader medical community. Consistent with previous studies, only 1% of stroke patients receive t-PA more than 12 years after its

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approval by the American drug regulatory body, FDA [4]. Studies indicate substantial improvement is attainable, even with widespread concerns that the current treatment rates fall considerably below estimates for eligible patients, including patients reported in optimized stroke care systems. Other studies indicate that knowledge translation, the process through information from clinical studies are adopted and incorporated by clinicians into practice is needed to improve outcomes associated with the use of t-PA for ischemic stroke [5, 6]. Some strategies are largely lacking in various hospitals across the world, or are often overlooked. Increasing the knowledge base of physicians requires development and implementation of educational intervention that would motivate EPs and other healthcare providers to understand principles of acute stroke care [6, 7]. This study assesses emergency physicians' knowledge about recombinant tissue plasminogen activator for acute ischemic stroke.

## Literature Review

The benefits of t-PA for acute ischemic stroke within the first 4-5 hours after the onset of stroke is established in the literature [2, 6, 8, 9]. However, a considerably small patient population receives this type of treatment. For instance, in the United States, the rate of thrombolysis is a paltry 3-5%, suggesting a massive underutilization [4]. Studies suggest that the underutilization of recombinant tissue-type plasminogen activator (t-PA) arises due to several reasons, including the lack of public information and awareness about recognition and response to stroke signals, the complexities involved in stroke care, and the slow adoption of the therapy in the medical community [4, 8]. Concerns are raised about the knowledge and attitudes of emergency physicians towards recombinant tissue-type plasminogen activator (t-PA), and their propensity to use this therapeutic intervention. Emergency physicians often have a pivotal role to play in the stroke system and care, as they are directly involved in prehospital care of stroke. Equally, they play a great role in on-scene recognition, prenotification bypass and direct transport decisions of stroke patients.

While stroke is one of the leading killers, only 1 FDA approved—rt-PA—is available for treatment [5, 6, 8, 10]. However, this drug is poorly administered, with evidence indicating that the drug is only used in 1-2% of ischemic stroke patients [4]. Evidence from medical centers indicate that less than 20% of eligible patients are treated with intravenous rt-PA [5]. However, aggressive community interventions, including increasing awareness in emergency physicians has been shown to increase rt-PA use for ischemic stroke patients. However, despite such efforts, evidence shows that more eligible ischemic stroke patients fail to obtain the therapy, suggesting the need for further interventions and other thrombolytic agents [11, 12].

Studies that have attempted to understand the reasons for reduced rt-PA use among EP have significantly reported the risk of symptomatic intracerebral hemorrhage as a critical determinant to the failure to use rt-PA as compared to the lack of efficacy [13, 14]. Some EPs feel that there is no authoritative scientific evidence that ratifies the use of rt-PA in ischemic stroke patients, and even if there are such studies, they fail to gain the trust of regulatory bodies [14]. The role of EPs in the care of stroke patients cannot be underestimated; they play a significant role in identifying patients eligible for thrombolysis in the ED, fast triage, and even timely referral to stroke team depends on their knowledge [7, 15]. Concerns are also raised in rural regions of Saudi Arabia, with acute shortage of stroke expertise, where emergency physicians are required to take the lead in t-PA administration with support from remote neurology consultation.

Despite evidence, concerns about the effectiveness of thrombolysis for acute stroke has been pervasive among EPs for more than 20 years. In KSA, many hospitals implemented various programs to change the perception of EPs, including thrombolytic programs, but the level of engagement has remained considerably low.

## Materials and Methods

The study involved 4 regions, 18 cities and 38 hospitals within the Kingdom of Saudi Arabia. The participants were Saudi Emergency Physicians working in hospitals that offer residency training program certified by Saudi commission for health specialties. We adopted a cross-sectional study and samples were selected through convenience sampling method. A questionnaire consisting of 14 items was used in the study and delivered to the participants in hard copy after the daily morning meeting. A total of 127 Saudi Emergency Physicians involved in the study. The data of the questionnaire was then transferred to an excel sheet for statistical analysis.

## Data Collection Process

The questionnaire was administered to the physicians after their morning meeting. Physical administration of the questionnaire was necessary to improve the response rate for the study as many physicians would be willing to answer to the questions due to the presence of the researchers. The survey contained information on a number of variables that assessed the EPs with reference to specific indicators, including the numbers of years they have been in practice, determinants of their use of rt-PA, where they had undergone residency training. Equally, the EPs were assessed on a scenario-based basis to understand the decisions informing their use or not of rt-PA. For instance, in an ideal setting (with the availability of a CT scanner, neuroradiology, neurotology support, appropriate candidates and other indicators that inform an ideal setting), they were assessed if they would use rt-PA for acute ischemic stroke. Such perspectives were tested to understand whether the use or not of rt-PA arises generally due to the lack of information of about the condition or just due to general negative attitude among healthcare professionals.

## Survey Data Characteristics

In the study, we collected the demographic data and general characteristics, including information on age, gender, level of qualification, experience, level of hospital designation, availability of stroke expertise, volume of stroke patients previously seen, and clinical care requirements in the emergency department. Equally for the study, and as required for studies involving human as subjects, consent was obtained from the physicians in the form of agree or disagree option at the start of the survey. The study has been approved by necessary regulatory bodies, including the Institutional Review Board of the university.

## Data Analysis

The collected data was transferred to excel to aid in the analysis. However, due to the limited scope of excel for data analysis, SPSS software was used for the analysis. We adopted two types of analysis; descriptive statistics and inferential statistics. Descriptive analysis was used to provide information on the demographic indicators of the physicians, including workplace characteristics, age of practice, etc. However, inferential statistics was used to show the relationships between some of the critical aspects of the survey and determinants that informed the use or not of rt-PA for ischemic stroke patients. The relationships between respondents and de-identified data was compared through the use of chi-square. The use of chi-square was informed by the need to measure how expectations could be compared with actual observed data. The data set further meets the criteria for data for chi-square tests as it was random, mutually exclusive, drawn from independent variables, and drawn from a large sample under study. The missing data were excluded from the survey.

# RESULTS

## Descriptive analysis

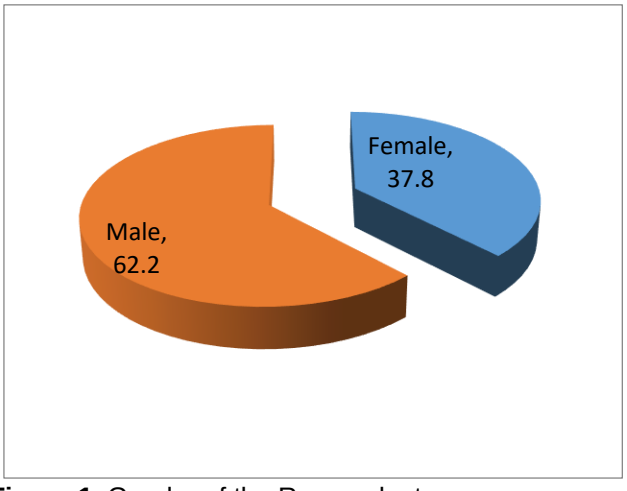


**Figure 1.** Gender of the Respondents

Majority of emergency physicians interviewed in this study were male (62.2%); while, female were 37.8%.

**Table 1.** Professions of the Respondents

| | Frequency | Valid Percent |
|---|---|---|
| **Consultant** | 15 | 11.8 |
| **Intern** | 23 | 18.1 |
| **Resident** | 56 | 44.1 |
| **Specialist** | 33 | 26.0 |
| **Total** | 127 | 100.0 |

(Researcher, 2019)

44.1% of the respondents were resident physicians, 26.0% were specialist, 18.1% interns and 11.8% were consultants.

**Table 2.** The work place of the respondents

| | Frequency | Valid Percent |
|---|---|---|
| **A nonteaching hospital** | 52 | 40.9 |
| **University Hospital** | 75 | 59.1 |
| **Total** | 127 | 100.0 |

(Researcher, 2019)

The researcher wanted to know where the emergency physicians' interviewed in this study were working. 59.1% were working in university hospitals; while, 10.9% were working in nonteaching hospitals.

**Table 3.** The experience of the respondents

| | Frequency | Valid Percent |
|---|---|---|
| **No** | 48 | 37.8 |
| **Yes** | 79 | 62.2 |
| **Total** | 127 | 100.0 |

(Researcher, 2019)

62.2% of the respondents said that they had prior experience in using RT-PA to treat a stroke patient; while, 37.8% did not have any prior experience.

**Table 4.** The probability of using rt-PA to treat acute ischemic stroke

| | | Frequency | Valid Percent |
|---|---|---|---|
| **In the ideal setting (CT scanner availability, neuroradiology and neurology support, administrative support,** | Likely | 19 | 15.0 |
| | Uncertain | 19 | 15.0 |
| | Unlikely | 25 | 19.7 |

| | | | |
|---|---|---|---|
| **appropriate candidate, etc.), how likely you would use rt-PA to treat acute ischemic stroke?** | Very likely | 30 | 23.6 |
| | Very unlikely | 34 | 26.8 |
| | Total | 127 | 100.0 |

(Researcher, 2019)

The researcher evaluated the likelihood of the emergency physician to use RT-PA in the treatment of acute ischemic stroke and they responded as follows; very unlikely (26.8%), Very likely (23.6%), Unlikely (19.7%), Uncertain (15%) and likely (15%).

**Table 5.** The rate of personal experience with rt-PA influence on the respondents' decision

| | Frequency | Valid Percent |
|---|---|---|
| **No** | 52 | 40.9 |
| **Yes** | 75 | 59.1 |
| **Total** | 127 | 100.0 |

(Researcher, 2019)

59.1% responded that their decision on whether to use or not use RT-PA in the ideal set up was largely influenced by their personal experience with RT-PA.

**Table 6.** The main reason of the respondents in not using rt-PA in the ideal setting

| | Frequency | Valid Percent |
|---|---|---|
| **Lack of benefit in neurological outcome** | 55 | 43.3 |
| **Risk of hemorrhage** | 72 | 56.7 |
| **Total** | 127 | 100.0 |

(Researcher, 2019)

The researcher found the main reasons that were making the emergency physicians to be uncertain, very unlikely and unlikely to treat acute ischemic stroke using RT-PA to be risk of hemorrhage (56.7%) and lack of benefit in neurological outcome (43.3%).

**Table 7.** The highest acceptable rate of intracerebral hemorrhage for using rt-PA for stroke

| | Frequency | Valid Percent |
|---|---|---|
| **10%** | 25 | 19.7 |
| **6%** | 54 | 42.5 |
| **8%** | 48 | 37.8 |
| **Total** | 127 | 100.0 |

(Researcher, 2019)

The highest acceptable rate of intracerebral hemorrhage for a physician to use RT-PA for stroke is 6% and 42.5% of physicians got it right in their responses. 37.8% said it should be 10% while 19.7 % said that it should be 10%. 57.5% did not know the actual percentage used.

**Table 8.** The minimally acceptable relative benefit that would be required through using rt-PA for stroke

| | Frequency | Valid Percent |
|---|---|---|
| **15%** | 38 | 29.9 |
| **30%** | 65 | 51.2 |
| **40%** | 24 | 18.9 |
| **Total** | 127 | 100.0 |

(Researcher, 2019)

Majority of the respondents were aware that 30% was the minimal acceptable relative benefit that would be required for the use of RT-PA for stroke given 6% hemorrhage rate.

## Inferential Statistics

**Table 9.** Chi Square Test

| | Value | Df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 4.272[a] | 2 | .118 |
| **Likelihood Ratio** | 4.355 | 2 | .113 |
| **Linear-by-Linear Association** | 4.231 | 1 | .040 |
| **N of Valid Cases** | 127 | | |

**a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.45.**

The study assessed emergency physicians' knowledge about recombinant tissue plasminogen activator for acute ischemic stroke. There was no enough evidence to say that emergency physicians knowledge was based on whether the physician was experienced or not ($X (2) = 4.272$, $p = 0.118$).

## Discussion

Majority of emergency physicians interviewed in this study were male (62.2%) working in University hospitals (59.1%) and with prior experience in using RT-PA to treat stroke patients (62.2%). 44.1% of the respondents were resident physicians, 26.0% were specialist, 18.1% interns and 11.8% were consultants.

The likelihood of the emergency physician to use RT-PA in the treatment of acute ischemic stroke was low in this study. 59.1% responded that their decision on whether to use or not use RT-PA in the ideal set up was largely influenced by their personal experience with RT-PA. The low likelihood of a physician to use RT-PA in treatment of acute ischemic stroke

can be explained by the high risk of hemorrhage (56.7%) and lack of benefit in neurological outcome (43.3%).

The highest acceptable rate of intracerebral hemorrhage for a physician to use RT-PA for stroke is 6% and 42.5% of physicians got it right in their responses. 37.8% said it should be 10% while 19.7 % said that it should be 10%. 57.5% did not know the actual percentage used. Majority of the respondents were aware that 30% was the minimal acceptable relative benefit that would be required for the use of RT-PA for stroke given 6% hemorrhage rate. There was no enough evidence to say that emergency physician's knowledge was based on whether the physician was experienced or not.

There are several studies that have been done in Saudi Arabia but they still show that emergency physicians are still reluctant in suing RT-PA in treating acute ischemic stroke within 4.5 hours on set.

## Conclusion

Many studies done in Saudi Arabia show that emergency physicians are less likely to use RT-PA in the treatment of acute ischemic stroke due to hemorrhage risk and lack of benefit in neurological outcome. Knowledge in emergency physicians was found to be approximately the same for both experienced and non-experienced physicians. It is therefore important to engage in more survey, training and debate on the use of RT-PA in treating patients with acute ischemic stroke in order to come up with a proper treatment plan that will be acceptable by all emergency physicians in the Kingdom of Saudi Arabia.

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