SHORT TERM OUTCOMES OF PATIENTS WITH STROKE ADMITTED TO INTENSIVE CARE UNIT: A FOUR YEAR SURVEY IN URMIA, IRAN

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ARTICLE INFO

ABSTRACT

Background: Stoke is the third cause of death and a main cause of the long-term disabilities. It is divided into two subtypes: ischemic and hemorrhagic. Most studies in this area were conducted in neurology wards, then we aimed to investigate this subject in intensive care units. This study was aimed to investigate the short term outcomes of patients with stroke admitted to intensive care unit
Method: This cross-sectional retrospective study was conducted over a period of four years (2011-2014) in the intensive care unit of Urmia Imam Hospital in west Azerbaijan of Iran. All patients admitted to intensive care unit and information including demographic characteristics (age, gender), underlying disease, the duration of the mechanical ventilation, the length of stay in intensive care units, ventilator-associated pneumonia, upper gastrointestinal bleeding, pressure ulcers , were extracted from patient medical records. The data was analyzed by SPSS software version 20.
Results: Of 362 patients, 40.9% of patients were male and 59.1% were female. The average age of patients was 70.90 ± 13.11 years. 66.9% of patients received mechanical ventilation for an average duration of 20.42 ± 17.42 days. The average length of stay in ICU was 22.78 ± 20.53 days and the average duration of a hospital stay was 24.80 ± 22.16 days. The mortality rate was 43.6% (158 cases) .There was a significant difference for smoking, heart disease and arrhythmia as predisposing factors between different sex groups.
Conclusion: The results of this study generally align with those of previous studies and they are acceptable.

Introduction

Cerebrovascular disease was first defined 2,400 years ago. Since then, these disorders have assumed different names, such as apoplexy, stroke, cerebrovascular attack, cerebrovascular accident, and cerebral attack and sometimes are used interchangeably but the term "stroke" is the preferred term [1]. By definition stroke is a sudden non-convulsive focal neurologic deficit. It is the third leading cause of death in the United States and also a main cause of long-term disabilities [2]. Each year, stroke involves almost 795,000 individuals in United States .More precise definition of stroke is a vascular

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deficit which starts suddenly, lasts more than 24 hours, and lefts a neurological deficits [3]. Broadly speaking cerebrovascular disease which really is a clinicopathologic term relates to any pathological process of vessels and is the third leading cause of death, after ischemic heart disease and cancer, in the United States [4]. The stroke is one of the main disability and mortality factors worldwide and is the cause of over five million deaths annually [5]. Although men are involved more than women, half post-attack mortalities occur in women and it is the second cause of the death for women in the United States [6]. Despite this, the mortality rate has decreased in the United States ,Western Europe, Japan, Australia, in recent decades [7, 8], which could be related to certain changes in risk factor prevalence in this particular population [9, 10]. Stroke is subdivided into two types: ischemic and hemorrhagic. Among them, 80-88 percent of cases are ischemic and the rest are hemorrhagic. Of all ischemic strokes 80%   are thrombotic and 20% are embolic. Although more than 25% of hemorrhagic strokes are due to subarachnoid hemorrhages, epidural and subdural hematoma do not categorized to stroke [10]. The acute ischemic stroke is a serious medical emergency and both short and long-term survival rates are essential for estimating hospital capacity [11]. Several studies took place for symptomatology, epidemiology, and treatment and they were mostly conducted in general neurology wards as opposed to intensive care units. A study conducted in Taiwan, in 2012, compared risk factors and subtype of attack and its outcomes between patients of 65 years old and younger and above 65 years old. This study showed that, despite important risk factors, effective management could be helpful in younger patients [12]. Another study in 2014 revealed that, among patients over 80 years of age, attacks are more severe and they have predisposing factors but could still expect proper relief after the attack [13]. Knopf L and his colleagues concluded that efficacy of treatment improves in the presence of an ICU neurologist. However, other studies which compare subarachnoid hemorrhages versus intra cerebral hemorrhages suggest poor outcome despite the presence of a neurologist in neurology ICU [14].

Also, a study that was conducted in Iran suggests that offered services for cerebrovascular disease treatment do not necessarily lead to a meaningful difference, but enhancing the quality of general hospital wards which could reduce hospital expenses [15].

Considering the previous subject and the prevalence of cerebral vascular diseases among the population motivated us to have a study in the intensive care unit of Urmia Imam Hospital in west Azerbaijan of IRAN and assessment of services provided regarding cerebrovascular diseases.

Method And Materials

After approval of Urmia University of Medical Sciences ethics board committee, this study was conducted in neurological intensive care unit of Urmia Imam Hospital as part of a cross-sectional retrospective study, The study focused on the short-term outcomes of stroke patients admitted to the hospital during a 4-year period (2011-2014).During the study, the medical records of all studied patients were reviewed and underwent a thorough analysis. Patients with GCS=3 and brain death or admission less than 48 hours were not considered in this study. All demographic characteristics, including age, sex, underlying diseases and risk factors (hypertension, diabetes, hyperlipidemia, ischemic heart disease, arrhythmia and smoking), duration of the mechanical ventilation, the length of stay in the intensive care unit, mortality, ventilator-associated pneumonia, upper gastrointestinal bleeding, and pressure ulcers were compiled into a checklist. All aforementioned information was extracted from patient's files and results were entered into SPSS 20. Less than 0.05 was considered as the level of significance.

Results

Of 362 patients studied, 148(40.9%) were men and 214(59.1%) were women. The average patient age was 70.90+_13.11 years .102(28.2%) patients were smokers and 260(71.8%) patients were nonsmokers.260 patients (71.8%) had hypertension and 102 patients (28.2%) had normal blood pressure.128 patients (35.4%) had diabetes and 234 patients (64.6%) did not have diabetes. 86 patients (23.8%) had hyperlipidemia and 276 patients (76.2%) did not.144 patients (39.8%) had heart disease and 218 patients (60.2%) did not.

The average length of stay in intensive care was 22.78 ± 20.53 days and the average length of ventilator treatment was 20.43 ± 17.42 days.

Below is a summary of the results:

242 patients (66.9%) received   mechanical ventilation versus 120 patients (33.1%).

Almost 170 patients (47%) had arrhythmia (atrial fibrillation) versus 192 patients (53%).

In 44 patients (12.2%) pneumonia was reported and 318 patients (87.8%) did not.

Gastrointestinal bleeding in 78 patients (21.5%) versus 284(78.5%).

Of 362 patients, 138 patients (38.1%) had pressure ulcers and 224 (61.9%) did not.

Of 362 observed patients, 158(43.6%) died and 204 patients (56.4%) survived and were discharged from hospital (Table 1)

Table 1. Absolute and partial prevalence versus outcome

Outcome	Absolute Prevalence	Partial Prevalence
Death	158	43.6
Discharged	204	56.4
Total	362	100

Out of 152 male patients, 50 cases (32.9%) did not receive a mechanical ventilation and out of 228 female patients, 83 cases (36.4%) did not receive it as well (P=0.4).

Of 148 male patients, 90 cases (60.8%) were smokers and 58 cases (39.2%) were non-smokers.

Twelve (5.6%) out of 214 female patients were smokers and 202 (94.4%) were non-smokers (P=0.001).

Out of 148 male patients, 102 cases (68.9%) had high blood pressure and 46 patients (31.1%) had normal blood pressure. Out of 214 female patients, 158 cases (73.8%) had high blood pressure and 56 cases (26.2%) had normal blood pressure (P=0.18).

Out of 148 male patients, 46 cases (31.1%) were diabetic versus 102 cases (68.9%).

Out of 214 female patients, 82 cases (38.3%) were diabetic and 132 cases (61.7%) were non-diabetic (P=0.96).

Out of 148 male patients, 32 cases (21.6%) had hyperlipidemia versus 116 cases (78.4%). Out of 214 female patients, 54 cases (25.2%) had hyperlipidemia and 160 cases (74.8%) did not have it (P=0.25).

Also of 148 male patients, 46 cases (31.1%) had ischemic heart disease versus 102 cases. Out of 214 female patients, 98 cases (45.8%) had ischemic heart disease and 116 cases (54.2%) did not have it (P=0.003).

Out of 148 male patients, 82 cases (55.4%) had arrhythmia and 66 cases (44.6%) did not have it.From214 female patients, 88 cases (41.1%) had arrhythmia and 126 cases (58.9%) did not have it (P=0.005).

Out of 148 male patients, 92 cases (62.2%) were using mechanical ventilator and 56 cases (37.8%) did not and of 214 female patients, 150 cases (70.1%) were using the mechanical ventilator and 64 cases (29.9%) did not use it (P=0.072).

Out of 148 male patients, 24 cases (16.2%) had ventilator pneumonia and 124 cases (83.8%) did not have it. Out of 214 female patients, 20 cases (9.3%) had ventilator pneumonia and 194 cases (90.7%) did not have it (P=0.03).

Out of 148 male patients, 24 cases (16.2%) had gastrointestinal bleeding versus 124 cases (83.8%0) and of 214 female patients, 54 cases (25.2%) had gastrointestinal bleeding and 160 cases (74.8%) did not have it (P=0.026).

Out of 148 male patients, 44 cases (29.7%) had pressure ulcers and 104 cases (70.3%) did not have it. Out of 214 female patients, 94 cases (43.9%) had pressure ulcers and 120 cases (56.1%) did not have it (P=0.004).

Out of 148 male patients, 54 cases (36.5%) died and 94 cases (63.5%) were survived and discharged.

Out of 214 female patients, 104 cases (48.6%) died and 110 cases (51.4%) survived and discharged (P=0.015).

The length of stay in intensive care among discharged patients was 20.05 ± 17.83 days and, among deceased patients, the length of stay was 26.23 ± 23.09 days (Table 2).

Among discharged patients, the length of treatment using a mechanical ventilation was 18.76 ±
13.83 days and, among deceased patients, the length was 21.69 ± 19.66 days (P=0.19) (Table 2).

Table 2. Comparison of average and deviation of length of stay in ICU versus days of treatment with Mechanical ventilation

Variable		Average ± Deviation	P. Value
Admitted in ICU	Deceased	26.23 ± 23	0.005
	Discharged	20.05 ± 17.83	0.005
Treated with Mechanical Ventilation	Deceased	21.69 ± 19.66	0.19
	Discharged	18.76 ± 13.83	0.19

Discussion

This was performed for assessment of short-term outcome in Urmia Emam Hospital on patients with stroke (ischemic and hemorrhagic) in 2011-2014.Hypertension, ischemic heart diseases, diabetes, hyperlipidemia were the most frequent risk factors in studied cases. Almost half of the patients had arrhythmia but this finding not necessarily indicates that the origin of

ischemic stroke is arrhythmia such as atrial fibrillation because many cardiac rhythm abnormalities can result from strokes as complications such as myocardial ischemia, arrhythmia, and secondary ST-T changes. The mortality rate among the studied cases was 43.6%. Among various risk factors, smoking and ischemic heart disease and cardiac arrhythmia had a significant difference in different sex groups, although there was a meaningful difference between male and female mortality rates in ventilator-associated pneumonia and gastrointestinal bleeding and pressure ulcer cases ($P<0.05$).

There are a few studies regarding risk factors and medical complications and their outcomes for patients with stroke in general neurology wards comparing to intensive care units.

(14), studied the influence of the presence of an ICU specialist on patients who experience an attack and ultimately determined that presence of a specialist yielded a better clinical outcome, particularly in subarachnoid hemorrhages. The outcome of patients with intracerebral hemorrhage without the presence of intensive care specialist or admittance into the neurologic intensive care unit was poor. Our retrospective study, comparing to that of Knopf and his colleagues, involved one fifth the patient's number and took place in both neurologic and conventional neurologic wards. The cases we studied were mostly old and 66.9% of them were treated with mechanical ventilation for a long time. Since most of the patients with stroke are admitted to general neurologic care units with the presence of a neurologist, we skipped the study related to the presence of a neurologist as this subject requires separate research itself. Furthermore, we did not study subarachnoid hemorrhage which are a subtype of cerebral vascular disorders with less prevalence.

[15], compared therapeutic results in patients with cerebrovascular accident in neurology and intensive care units .They find that control of risk factors and complications, such as hypertension, diabetes and pneumonia, were better in stroke intensive care units (Neuro-ICU) but this was not meaningful statistically. They also noted that promoting the quality of general hospital wards reduces expenses, however, there was a meaningful difference regarding pressure ulcers and length of stay in hospital. The study took place in an intensive care unit however, it is possible to design a study about the prognosis of patients who admitted to hospital in both general and intensive care units, though the severity of underlying diseases in studied groups differ and it is an interfering factor for comparison. Also, %38 of studied patients had different degrees of pressure ulcers that were considered acceptable for this group.

In our study, we did not go through the details of neurological findings such as aphasia, hemiplegia or tetraplegia and other neurologic deficits. Several isolated studies took place in this matter. For example, [16] reported 22.7% prevalence of aphasia in their patients which was dominant in the male group.

[17], reported that 33% of patients with cerebral ischemia and up to %58 of patients with intracerebral hemorrhages are prone to infection; most commonly urinary tract and respiratory infections. %12.2 of patients developed ventilator-associated pneumonia because of prolonged treatment with the ventilator and majority contracting sepsis.

One important finding was that %21.5 of patients receiving prophylaxis for peptic ulcer developed gastrointestinal bleeding. Although we do not know our patient's PH of gastric secretions, but receiving prophylaxis for upper gastrointestinal bleeding interferes with gastric PH which leads to bacterial translocation related to ventilator-associated pneumonia.

[18], based on his study conducted in China, in 2011,reported that the incidence of stroke increases with age and almost doubles with each decade after 55 years of age. Age was not a limiting factor in his trial. Their study took place in the group over 80 years old. The average age of our patients was 70.90 ± 13.11 years but our study period was longer as compared to that of Wang (4 years as opposed to 1 year).

[19], in Norway, studied the effect of early physical activity after an attack and its relation with functional outcomes after 3 months. They reported that the length of bed rest in the acute phase is related to 3 months poor functional outcome and should be avoided from long-term bed rest after the attack phase. Their study involved patients who experience a low-grade severity attack and were admitted to general neurology wards. One year ago, [20], studied 1070 patients who were admitted to cerebrovascular wards in Spain and evaluated early outcomes in 3 months. They did not notice any difference in outcome, hospital mortality rate, and patient mortality rate in the first 90 days. Our study, by contrast, involved patients who had experienced a severe attack and had been admitted to an intensive care unit for a period greater than 3 weeks. Note that our study did not include an assessment of quality of life of patients who were discharged from the hospital; such a follow-up assessment would require a separate study. According to [21], who evaluated the prevalence of pneumonia associated with stroke in intensive care units, this amount is acceptable. As sepsis prevalence was not a target in our study, we did not consider this factor in our assessments.

[22], in Germany, in 2015, evaluated the association of tracheotomy and stroke. Almost %50 of 143 patients discharged from the hospital and their regression analysis indicated that%3.2 decreasing in getting a good result with using mechanical ventilation every day. The duration of mechanical ventilation among our patients was 20.43 ± 17.42 days. On average, the duration was 5 days less in discharged patients comparing to deceased ones; this indicates that patients who experienced a stroke, and to whom ventilators are administered, are at risk of prolonged usage of mechanical ventilation and more tracheostomy. As mentioned earlier, more than %55 of our patients discharged from intensive care units which are more acceptable comparing.

[23], used Charlson index as an indicator of mortality rate and functional outcome of patients with cerebrovascular attacks after 6 months which revealed that the condition and underlying diseases of patient could affect the outcome of an ischemic or hemorrhagic stroke independently each month. We did not consider a regression analysis of underlying diseases

associated with attacks because presence of multiple factors were an obstacle for this study and needs a separate study in the future.

In another study by [24], data from a cohort of 198 hospitalized patients following an intensive care admission and not requiring mechanical ventilation in a single tertiary referral hospital were analyzed. A generalized linear model was used to identify the main effects of clinical and demographic variables on the outcomes of functionality (KATZ Index of Independence in Activities of Daily Living) and muscle strength (MRC Scale).The analysis differentiated the periods in the intensive care unit (ICU), in the Ward (WARD) and the total time of hospital stay (TOT).he concluded that it is possible to predict the final outcomes with functional, demographic and clinical variables at ICU admission. advanced age ,initial level of consciousness at admission ,presence of brainstem involvement and prolonged stay at ICU all are related to increased mortality which our study supports some items such as long time admission at ICU.

In a large study From January, 2009 to December, 2011 in China by Wei-Min Ho et al. [25], for study of in-hospital mortality in critical care unit, 611 ischemic and 805 hemorrhagic stroke patients who admitted to ICU were selected. their in-hospital mortality rate was 15.9% for ischemic and 20.4% for hemorrhagic stroke respectively which was lower in compared with our study (total 43.6% for both stroke subtypes).one reason for this difference is that they excluded many patients from study which their condition can adversely affect clinical outcome (patients with sepsis GI bleeding respiratory failure and etc.) but we included all this patients to our study. Age was major determinant factor for mortality in two groups. They also concluded that blood pressure fluctuation and heart rate variability both were associated with poor outcome. They also related mortality to other laboratory variables such as CBC and Neutrophil count, BUN, Cr which we didn`t included these parameters in our study and they didn`t study the role of ICU neurologist and comparison of outcomes in general and intensive care units.

Conclusion

Our research confirmed the findings of previous studies regarding prolonged use of mechanical ventilation for patients admitted to intensive care units. Also other complications such as pressure ulcers and pneumonia associated with ventilator, and mortality rate in patients, were similar to previous studies and fall within an acceptable range. It seems that incidence of upper gastrointestinal bleeding was higher in our study. This could be due to increased patient's stress or intermittent dosing versus continuous infusion of drugs for prophylaxis of stress ulcer which is not certain at this moment and needs further studies.

Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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