



## **Epidemiological Profile of Stroke patients at Neuropsychiatry Department, Tanta University Hospitals**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Background:** Stroke is the second most common cause of death and long-term disability worldwide with up to one of every six survivors remaining permanently disabled. It is a devastating and disabling cerebrovascular disease with significant amount of residual deficit leading to economic loss and disease burden worldwide.

**Aim:** Describe the epidemiological profile of stroke during the period of five years (2014-2018).

**Study Design:** cross- sectional study.

**Place and Duration of Study:** This study was carried out in the Neuro-psychiatry hospital (free and economic departments) at Tanta University Hospital. This study started from the first of April 2019 and completed by July2021.

**Methodology:** The sample we included 3435patient medical records. Tools of the study were: file extracted sheets of the five years (2014-2018).It was about data related to epidemiological profile of stroke.

**Results:** This study included 3435patient medical records admitted with stroke at the years2014-2018 and had the following epidemiological profile: the age ranged from 30-95 years and the

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median age was 65 years old .Male constituted 51.8% of patients, about two thirds, (64.9%) of patients were from urban residence and 66.8%were married. As regards type of stroke: ischemic stroke presented by 63.5%of patients and hemorrhagic stroke by 36.5%.Of all patients 30% had favorable outcome, 67.4% had stable condition and 2.7% were died.

**Conclusion:** The rate of stroke was increasing through the studied five years with most cases at year 2018 and the epidemiological profile was not different from other studies.

*Keywords: Epidemiology; stroke; neuropsychiatry; hospital.*

## 1. INTRODUCTION

Stroke is defined by WHO as a rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death with exclusion of any apparent causes other than vascular origin [1,2].

Stroke is classified into two types; a hemorrhagic stroke (cerebral hemorrhage) in which an artery may rupture resulting in bleeding into the brain, while an ischemic stroke results from atherosclerosis where an artery may become blocked by progressive thickening of walls or due to embolism as a clot blocks an artery and prevents blood getting to part of the brain [3,4].

Stroke is the second leading cause of death and disability worldwide with up to one of every six survivors remaining permanently disabled. It is a devastating and disabling cerebro vascular disease with significant amount of residual deficit leading to economic loss and disease burden worldwide [5].

The aim and rationale of this study to describe the epidemiological profile of stroke during the period of study for effective prevention and control.

## 2. SUBJECTS AND METHODS

**Study Design and Setting:** The study was cross sectional and carried-out at Neuropsychiatry hospital (free and economic departments) of Tanta university hospitals, Egypt. This study started from the first of April 2019 and completed by July2021. This hospital is a teaching and referral hospital providing health services to the population of Tanta and neighboring rural and urban areas. Tanta University Hospitals are considered as the largest health institutions in Gharbia Governorate. The neuropsychiatry department started in1968 as a part of internal medicine

department, and then it became a separate department at 1994. New center was joined to it in 2007. The new center was a good addition to the department as it includes economic department for patient with medical insurance and it is the only department in Gharbia Governorate and delta region that provide high quality investigations and treatment for neurological and psychiatric diseases. The department receives around 3000 patients/year. The majority of patients are diagnosed and treated at the department. Other cases are referred from other health institutions to get the specific care provided by the department. It provide investigations and treatment of neurological diseases e.g.: stroke management, intensive care unit, EEG, nerve and muscle unit, Botox injection, physiotherapy &rehabilitation unit, brain catheter, sleep disorders unit, ultra sound and duplex for brain arteries , addiction treatment unit.

**Study Population:** All medical records of stroke patients at the five years of study (2014-2018) at neuropsychiatry department (free and economic departments) of Tanta university hospitals, Egypt. Any medical record with other neurological disease rather than stroke and incomplete records were excluded.

**Tools of the Study:** A file extracted sheet was used for data extraction from medical records of patients admitted to Neuropsychiatry department to portray epidemiological profile of stroke during the five years of the study (2014-2018): it included: age, sex, occupation, residence, diagnosis, time of admission, date of leaving hospital , and outcome.

**Data Collection:** Data extraction started at June 2019 until the end of February 2020 from medical records.

**Statistical Analysis** was performed using SPSS 20.Numerical data was presented as median and categorical ones as number and percentage.

### 3. RESULTS

The total number of patient medical records in the study was 3435. It was noted that (Fig. 1) there is increase of percentage of stroke during the period of the study with most frequent 31.8% was in year 2018 and the least 20.5% was in year 2014.

Among the studied patients during the years 2014-2018 (Figs. 2,3,4,5), all years were nearly the same with 71.2% were at the age group 61-70 years, males were slightly more than females (51.8% Vs. 48.2% ), about two thirds 64.9% were from urban residence. Married patients constituting 66.8% of patients and more than half 52.6% of them were nonprofessional.

Among the studied patients during the five years (Table 1, Fig. 6) ;77.7% stayed in hospital more than one week with mean±sd:8±2.001 and with median 8, about two thirds 73.2% were discharged in stable condition followed by 23.5% discharged as improvement in their condition then dead by 3.3%.

Patients diagnosed with ischemic stroke (Fig. 7) were higher than those diagnosed with hemorrhagic stroke in all years and constituting (63.5% vs. 36.5%) respectively.

Among the studied ischemic patients (Table 2) during the years 2014-2018; 83.0% were at the age group 56-65 years, females were slightly more than males (55% vs. 45%), and more than half 51.9% were from rural residence. Married patients were constituting 65.5% of patients and about two thirds 63.3% of them were nonprofessional. Among the studied hemorrhagic

patients (Table 3) during the years 2014-2018; 40.8% were at the age group 76-95years, males were more than females about two thirds (63.7% vs. 36.3%), about two thirds 87.7% were from urban residence. Married patients constituting 68.9% of patients and about two thirds 65.9% were professional. Among the studied ischemic patients (Table 4) during the years 2014-2018; 96.7% stayed in hospital more than one week with mean±sd:8.67±2.022 and with median 8 , about two thirds 67.4% were discharged in stable condition followed by 29.9% discharged as improvement in their condition then dead by 2.7% .Among the studied hemorrhagic patients (Table 5) during the years 2014-2018; 55.6% stayed in hospital for one week with mean±sd:6.83±1.303 and with median 6, the majority 83.2% were discharged in stable condition followed by 12.3% discharged as improvement in their condition then dead by 4.5%.

### 4. DISCUSSION

When a disease occurs in a population, epidemiology help us to understand where the disease is coming from, and who it is most likely to impact. The information gathered can then be used to control the spread of the disease and prevent future outbreaks.

Regarding the epidemiological profile, there was increase in incidence during the study period (Fig. 1), stroke incidence increase every year because of more awareness of patients and their relatives, knowing the warning signs, more affection with chronic diseases as hypertension, diabetes mellitus and cardiac diseases. More advance in investigations and treatment. This is

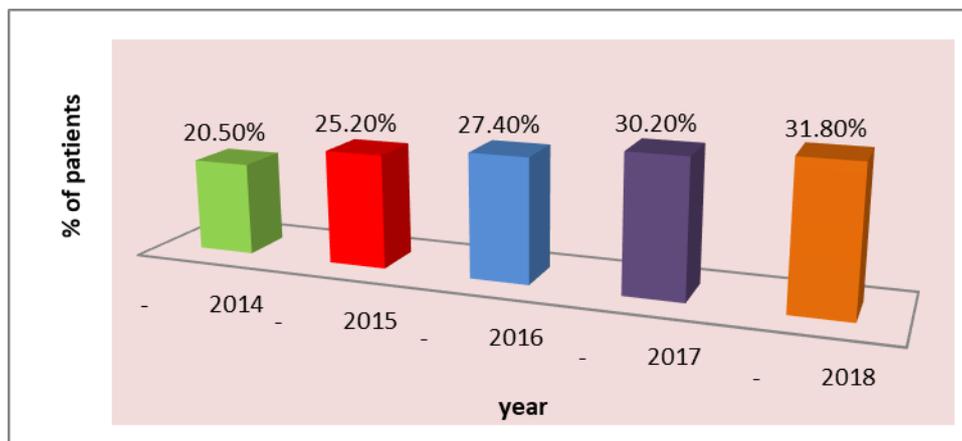


Fig. 1. Distribution of stroke patients admitted to the neuropsychiatry department during the period of 2014-2018

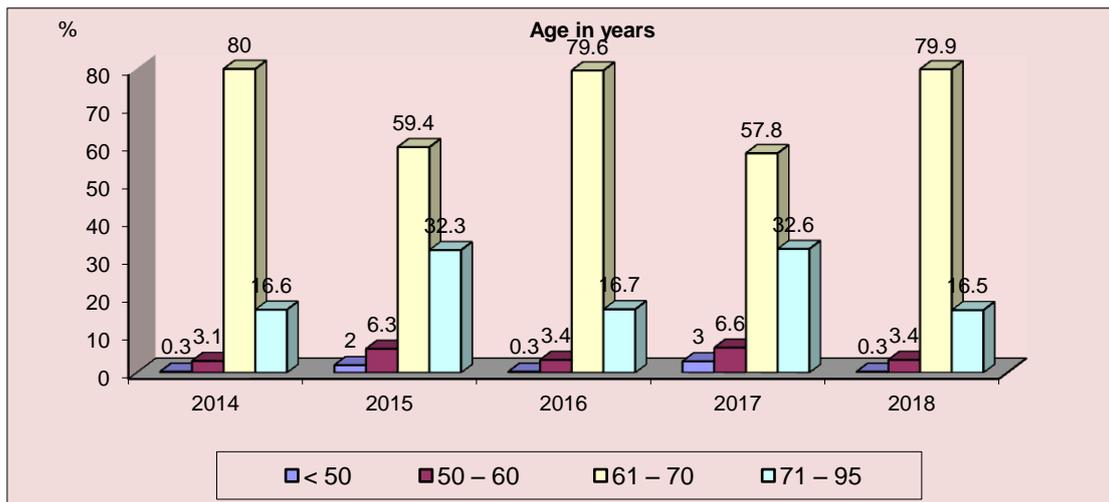


Fig. 2. Age in years during the period of 2014-2018

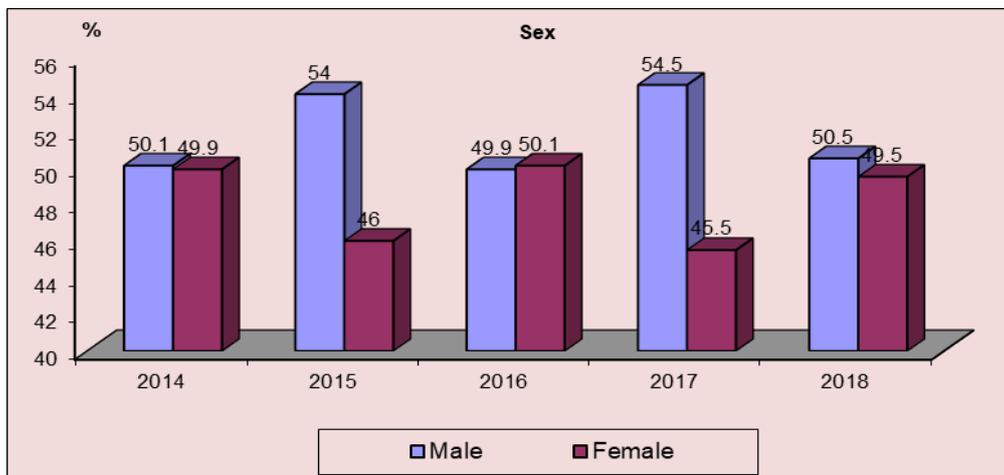


Fig. 3. Sex during the period of 2014-2018

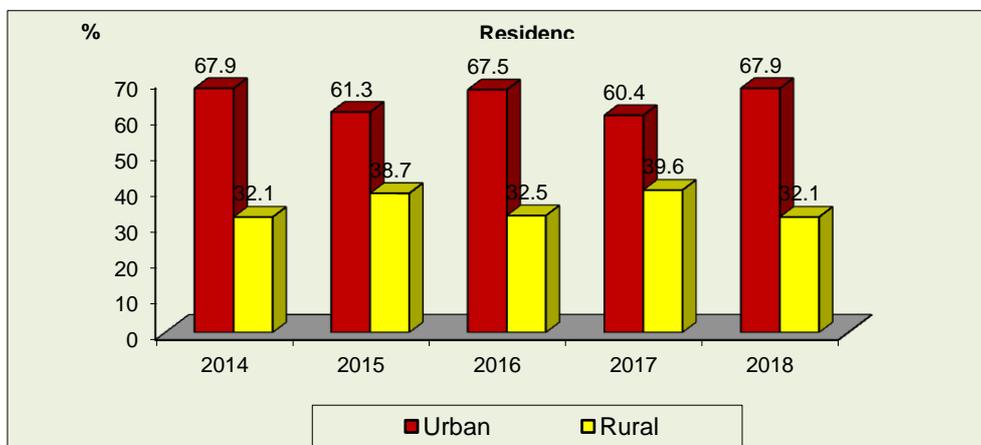


Fig. 4. Residence during the period of 2014-2018

in agreement with results of El-Hajj et al., [6] who found that the epidemiology of stroke was changing rapidly all over the globe. Over the

1990-2013 periods, there was a significant increase in stroke incident events, survivors and deaths for both ischemic and hemorrhagic stroke

with a substantial increase in the absolute number of disability-adjusted life years (DALYs) due to ischemic stroke [6].

reported that about 87% of all strokes are ischemic strokes, in which blood flow to the brain is blocked [7].

As regard to diagnosis of stroke in (Fig. 8), more than half were ischemic stroke while about one third were hemorrhagic stroke. In agreement with our study Khedr et al., [7] who found that The crude prevalence rate of ischemic stroke was significantly higher than that of hemorrhagic stroke (797 vs. 125 of 100,000) [8]. Also CDC

In agreement with our results, a study found that ischaemic stroke continues to constitute the largest proportion of all new strokes (comprising 62.4% of all incident strokes in 2019), followed by intracerebral haemorrhage (27.9%), and subarachnoid haemorrhage (9.7%) [9].

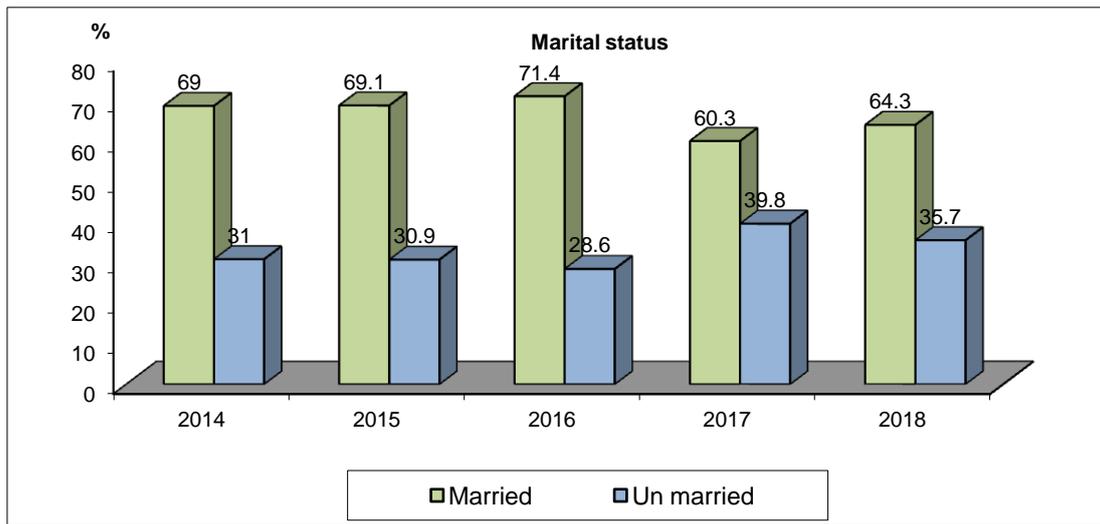
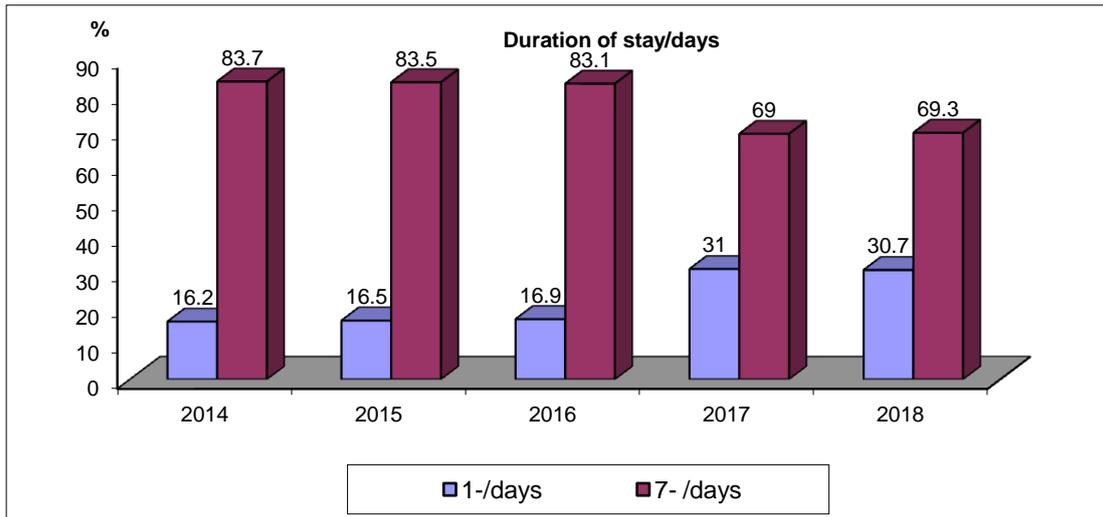


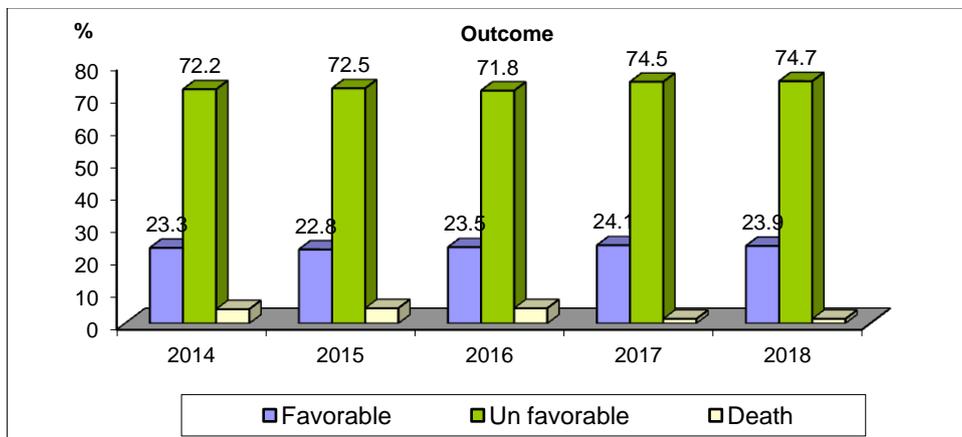
Fig. 5. Marital status during the period of 2014-2018

Table 1. Duration of hospital stay and outcome of stroke patients admitted to neuropsychiatry department during the period of 2014-2018

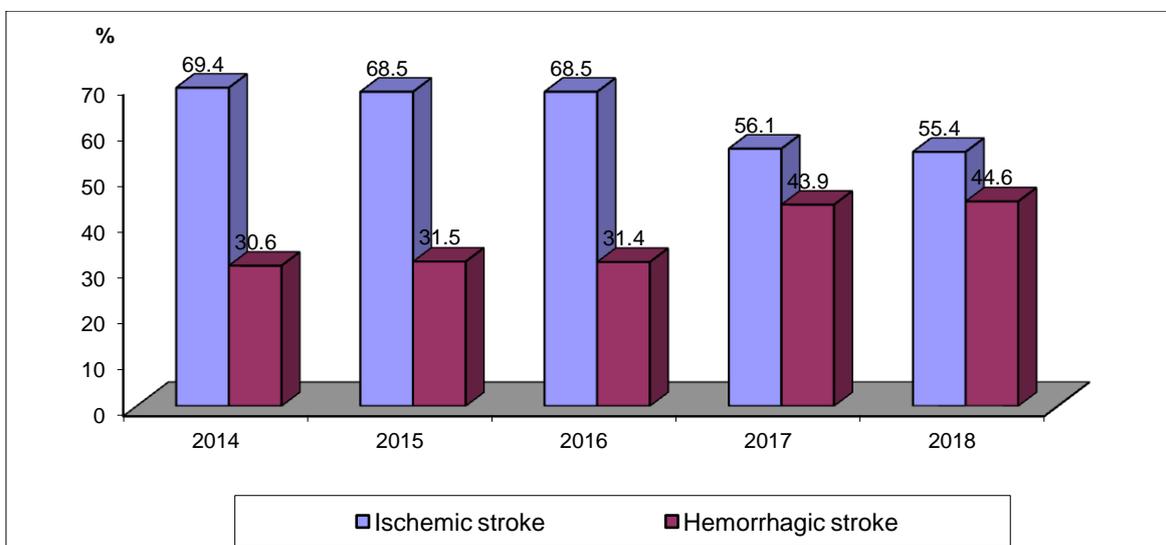
| Variable                        | Year of study   |      |                 |      |                 |      |                 |      |                 |      |                   |      |
|---------------------------------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-------------------|------|
|                                 | 2014<br>(n=677) |      | 2015<br>(n=679) |      | 2016<br>(n=685) |      | 2017<br>(n=694) |      | 2018<br>(n=700) |      | Total<br>(n=3435) |      |
|                                 | n               | %    | N               | %    | N               | %    | N               | %    | n               | %    | N                 | %    |
| <b>Duration of stay/days:</b>   |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| <7                              |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| ≥7                              | 110             | 16.2 | 112             | 16.5 | 116             | 16.9 | 215             | 31.0 | 215             | 30.7 | 768               | 22.3 |
| <b>Mean±SD</b>                  | 8.18±1.812      |      | 8.17±1.805      |      | 8.15±1.82       |      | 7.76±2.233      |      | 7.75±2.21       |      | 8±2.001           |      |
| Range                           | 1-30            |      | 1-30            |      | 1-30            |      | 1-30            |      | 1-30            |      | 1-30              |      |
| Median                          | 8               |      | 8               |      | 8               |      | 8               |      | 8               |      | 8                 |      |
| <b>Outcome:</b>                 |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Favorable (Improved)            | 158             | 23.3 | 155             | 22.8 | 161             | 23.5 | 167             | 24.1 | 167             | 23.9 | 808               | 23.5 |
| Un favorable (Stable condition) | 489             | 72.2 | 492             | 72.5 | 492             | 71.8 | 517             | 74.5 | 523             | 74.7 | 2513              | 73.2 |
| Death                           | 30              | 4.4  | 32              | 4.7  | 32              | 4.7  | 10              | 1.4  | 10              | 1.4  | 114               | 3.3  |



**Fig. 6. Duration of stay during the period of 2014-2018**



**Fig. 7. Outcome of during the period of 2014-2018**



**Fig. 8. Distribution of stroke types during the study period of 2014-2018**

Table 2. Sociodemographic characteristics of ischemic stroke patients admitted to neuropsychiatry department during the period of 2014-2018

| Variable               | Year of study   |      |                 |      |                 |      |                 |      |                 |      |                   |      |
|------------------------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-------------------|------|
|                        | 2014<br>(n=470) |      | 2015<br>(n=465) |      | 2016<br>(n=470) |      | 2017<br>(n=389) |      | 2018<br>(n=388) |      | Total<br>(n=2182) |      |
|                        | N               | %    | n               | %    | N               | %    | n               | %    | n               | %    | n                 | %    |
| <b>Age in years:</b>   | 9               | 1.9  | 8               | 1.7  | 9               | 1.9  | 18              | 4.6  | 21              | 5.4  | 65                | 3.0  |
| ≤55 years              |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| 56- 65                 | 417             | 88.8 | 414             | 89.0 | 417             | 88.8 | 283             | 72.7 | 279             | 71.9 | 1810              | 83.0 |
| 66- 75                 | 19              | 4.0  | 18              | 3.9  | 19              | 4.0  | 38              | 9.8  | 38              | 9.8  | 132               | 6.0  |
| 76-95                  | 25              | 5.3  | 25              | 5.4  | 25              | 5.3  | 50              | 12.9 | 50              | 12.9 | 175               | 8.0  |
| Range                  | 45-90           |      | 40-95           |      | 45-90           |      | 45-90           |      | 40-95           |      | 40-90             |      |
| Median                 | 65              |      | 65              |      | 65              |      | 65              |      | 65              |      | 65                |      |
| <b>Sex:</b>            | 197             | 41.9 | 192             | 41.3 | 197             | 41.9 | 191             | 49.1 | 190             | 49.0 | 982               | 45.0 |
| Male                   |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Female                 | 273             | 58.1 | 273             | 58.7 | 273             | 58.1 | 198             | 50.9 | 198             | 51.0 | 1200              | 55.0 |
| <b>Residence:</b>      | 272             | 57.9 | 269             | 57.8 | 272             | 57.9 | 158             | 40.6 | 161             | 41.5 | 1132              | 51.9 |
| Rural                  |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Urban                  | 198             | 42.2 | 196             | 42.2 | 198             | 42.2 | 231             | 59.4 | 227             | 58.5 | 1050              | 48.1 |
| <b>Marital status:</b> | 323             | 68.7 | 318             | 68.4 | 330             | 70.2 | 210             | 53.9 | 249             | 64.2 | 1430              | 65.5 |
| Married                |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Un married*            | 147             | 31.3 | 147             | 31.6 | 140             | 29.9 | 179             | 46.0 | 139             | 35.8 | 752               | 34.5 |
| <b>Occupation:</b>     | 199             | 42.3 | 197             | 42.4 | 199             | 42.3 | 105             | 27.0 | 101             | 26.0 | 801               | 36.7 |
| Professional           |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Non professional       | 271             | 57.7 | 268             | 57.6 | 271             | 57.7 | 284             | 73.0 | 287             | 74.0 | 1381              | 63.3 |

\*Un married (single, divorced and widow)

**Table 3. Sociodemographic characteristics of hemorrhagic stroke patients admitted to neuropsychiatry department during the period of 2014-2018**

| Variable               | Year of study   |      |                 |      |                 |      |                 |      |                 |      |                   |      |
|------------------------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-------------------|------|
|                        | 2014<br>(n=207) |      | 2015<br>(n=214) |      | 2016<br>(n=215) |      | 2017<br>(n=305) |      | 2018<br>(n=312) |      | Total<br>(n=1253) |      |
|                        | N               | %    | n               | %    | N               | %    | n               | %    | N               | %    | n                 | %    |
| <b>Age in years:</b>   | 3               | 1.4  | 3               | 1.4  | 3               | 1.4  | 23              | 7.5  | 13              | 4.2  | 45                | 3.6  |
| ≤55                    |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| 56-65                  | 96              | 46.4 | 103             | 48.1 | 104             | 48.4 | 66              | 21.6 | 83              | 26.6 | 452               | 36.1 |
| 66-75                  | 35              | 16.9 | 35              | 16.4 | 35              | 16.3 | 70              | 23.0 | 70              | 22.4 | 245               | 19.6 |
| 76-95                  | 73              | 35.3 | 73              | 34.1 | 73              | 33.9 | 146             | 47.9 | 146             | 46.8 | 511               | 40.8 |
| Range                  | 45-95           |      | 45-95           |      | 45-95           |      | 30-95           |      | 40-95           |      | 30-95             |      |
| Median                 | 70              |      | 68              |      | 66              |      | 75              |      | 72.50           |      | 70                |      |
| <b>Sex:</b>            | 141             | 68.1 | 148             | 69.2 | 149             | 69.3 | 180             | 59.0 | 180             | 57.7 | 798               | 63.7 |
| Male                   |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Female                 | 66              | 31.9 | 66              | 30.8 | 66              | 30.7 | 125             | 41.0 | 132             | 42.3 | 455               | 36.3 |
| <b>Residence:</b>      | 185             | 89.4 | 192             | 89.7 | 193             | 89.8 | 261             | 85.6 | 268             | 85.9 | 1099              | 87.7 |
| Urban                  |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Rural                  | 22              | 10.6 | 22              | 10.3 | 22              | 10.2 | 44              | 14.4 | 44              | 14.1 | 154               | 12.3 |
| <b>Marital status:</b> | 144             | 69.6 | 151             | 70.6 | 159             | 74.0 | 208             | 68.2 | 201             | 64.4 | 863               | 68.9 |
| Married                |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Un married*            | 63              | 30.3 | 63              | 29.4 | 56              | 26   | 97              | 31.8 | 111             | 35.6 | 390               | 31.1 |
| <b>Occupation:</b>     | 118             | 57.0 | 118             | 55.1 | 118             | 54.9 | 236             | 77.4 | 236             | 75.6 | 826               | 65.9 |
| Professional           |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Non professional       | 89              | 43.0 | 96              | 44.9 | 97              | 45.1 | 69              | 22.6 | 76              | 24.4 | 427               | 34.1 |

\*Un married (single, divorced and wido)

**Table 4. Duration of hospital stay and outcome of ischemic stroke patients admitted to neuropsychiatry department during the period of 2014-2018**

| Variable                          | Year of study   |      |                 |      |                 |      |                 |      |                 |      |                   |      |
|-----------------------------------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-------------------|------|
|                                   | 2014<br>(n=470) |      | 2015<br>(n=465) |      | 2016<br>(n=470) |      | 2017<br>(n=389) |      | 2018<br>(n=388) |      | Total<br>(n=2182) |      |
|                                   | n               | %    | n               | %    | N               | %    | n               | %    | N               | %    | n                 | %    |
| <b>Duration of stay/day:</b>      | 12              | 2.6  | 9               | 1.9  | 12              | 2.6  | 19              | 4.9  | 19              | 4.9  | 71                | 3.3  |
| < 7                               |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| ≥ 7                               | 458             | 97.4 | 456             | 98.1 | 458             | 97.4 | 370             | 95.1 | 369             | 95.1 | 2111              | 96.7 |
| Mean±SD                           | 8.69±1.778      |      | 8.73±1.740      |      | 8.69±1.778      |      | 8.62±2.422      |      | 8.61±2.421      |      | 8.67±2.022        |      |
| Range                             | 2-30            |      | 2-30            |      | 2-30            |      | 2-30            |      | 2-30            |      | 2-30              |      |
| Median                            | 8               |      | 8               |      | 8               |      | 8               |      | 8               |      | 8                 |      |
| <b>Outcome:</b>                   |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Favorable<br>(Improved)           | 123             | 26.2 | 118             | 25.4 | 123             | 26.2 | 145             | 37.3 | 145             | 37.4 | 654               | 29.9 |
| Unfavorable<br>(Stable condition) | 333             | 70.8 | 333             | 71.6 | 333             | 70.8 | 236             | 60.7 | 235             | 60.6 | 1470              | 67.4 |
| Death                             | 14              | 3.0  | 14              | 3.0  | 14              | 3.0  | 8               | 3.0  | 8               | 2.1  | 58                | 2.7  |

Table 5. Duration of stay and outcome of hemorrhagic stroke patients admitted to Neuropsychiatry Department during the period of 2014-2018

| Variable                          | Year of study   |      |                 |      |                 |      |                 |      |                 |      |                   |      |
|-----------------------------------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-------------------|------|
|                                   | 2014<br>(n=207) |      | 2015<br>(n=214) |      | 2016<br>(n=215) |      | 2017<br>(n=305) |      | 2018<br>(n=312) |      | Total<br>(n=1253) |      |
|                                   | N               | %    | N               | %    | N               | %    | n               | %    | n               | %    | N                 | %    |
| <b>Duration of stay/day:</b>      | 98              | 47.3 | 103             | 48.1 | 104             | 48.4 | 196             | 64.3 | 196             | 62.8 | 697               | 55.6 |
| <7                                |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| ≥7                                | 109             | 52.7 | 111             | 51.9 | 111             | 51.6 | 109             | 35.7 | 116             | 37.2 | 556               | 44.4 |
| Mean±SD                           | 7.01±1.269      |      | 6.97±1.289      |      | 6.96±1.293      |      | 6.66±1.306      |      | 6.69±1.307      |      | 6.83±1.303        |      |
| Range                             | 1-15            |      | 1-15            |      | 1-15            |      | 1-15            |      | 1-15            |      | 1-15              |      |
| Median                            | 8               |      | 8               |      | 8               |      | 6               |      | 6               |      | 6                 |      |
| <b>Outcome:</b>                   |                 |      |                 |      |                 |      |                 |      |                 |      |                   |      |
| Favorable<br>(Improved)           | 35              | 16.9 | 37              | 17.3 | 38              | 17.7 | 11              | 7.1  | 11              | 7.1  | 154               | 12.3 |
| Unfavorable<br>(Stable condition) | 156             | 75.4 | 159             | 74.3 | 159             | 73.9 | 144             | 92.3 | 144             | 92.3 | 1043              | 83.2 |
| Death                             | 16              | 7.7  | 18              | 8.4  | 18              | 8.4  | 1               | 0.6  | 1               | 0.6  | 56                | 4.5  |

The increased risk of intracerebral haemorrhage in low-income and upper middle-income countries might be related to the high relative clinical significance and population-attributable risk of hypertension in these countries [10]. Their finding that a greater proportion of incident strokes in low-income to upper-middle-income countries are intracerebral haemorrhages in males than in females are in line with previous observations [11,12] and might be explained by lower levels of awareness and control of hypertension in low-income to upper-middle-income countries than in high-income countries as well as increased exposure to risk factors predisposing a higher proportion of males to intracerebral haemorrhage compared with females [13,14].

In India, a multicentric, prospective, hospital-based case-control study in the West Central region revealed that diabetes mellitus, hypertension, tobacco use and low hemoglobin rather than cholesterol level were the most important risk factors of ischemic stroke [15]. Prospective community based risk factor studies using well-defined protocols would be ideal but implementation of such project would be cost prohibitive in India [15]. Cross-sectional community based case-control study for risk factor analysis in Kolkata demonstrated that hypertension was the most important risk factor for stroke with odds ratio of 5.04 (95% CI 4.16-5.92) in women and 21.87 (95% CI 18.69-25.05) in men [16]. Another community based cross-sectional case-control study showed heart disease, hypertension and smoking to be significantly associated with stroke [17].

As regard to sociodemographic characteristics of all stroke patients over the last five years (Figs. 2,3,4,5 and Tables 2,3), the age of studied patients ranged from 30-95 years old the majority were at age group 61-70 years old. Patients with ischemic stroke were younger than those of the hemorrhagic one where the majorities of ischemic were at the age group 56-65 year corresponding to those of hemorrhagic one. The highest percentage of hemorrhagic patients were at age group 76-95 years and this was in line with the finding of Gebreegziabher et al., [18] who reported that the high prevalence of hemorrhagic stroke among patients above 50 years old is mainly related to a steadily progressing generalized vascular disease most often of arteriosclerotic type. Also hypertensive vasculopathy which gives rise to extensive hyaline degeneration and some aneurysmal changes [19].

As regard to sex of all stroke patients, females were more than the half. This observation was in similar opinion with the findings of Watila et al., [20] who found that lower than half 48% of stroke patients were males compared to more than half 52% of female stroke patients. The high percentage of ischemic stroke among females may be related partially to previous intake of contraceptive pills for longer period of time especially of an irregular manner [18].

Also, this may be attributed to an increased incidence of cerebrovascular events during the pregnancy and post-partum period. Arterial occlusion occurring in the second and third trimesters and the first week after delivery is mostly related to the focal vascular lesions during pregnancy and early puerperium. A unique postpartum illness consisting of headache and fluctuating transient ischemic attacks associated with diffuse vasospasm of cerebral cortical vessels is also described [20].

Another point of view, males as an earning power of the community refuse in patient admission and prefer treatment in outpatient clinics especially males not covered by health insurance and those with mild attacks [21]. On the other hand, Wilson et al., [22] who found that more than half 61.7% of ischemic patients were males and about one third 38.3% were females. Different strategies of financial coverage of population in different countries with specific behavioral characters may explain the difference in sex between our results and their results [23].

When age adjusted to the European population. Incidence rates for ischemic stroke among men were more than twice as high as rates recorded for women (23.6 compared with 9.2 per 100 000, respectively [24].

Among hemorrhagic patients more than half were males while slightly more one third were females. This predominance of male patients than female ones could be attributed to the more prevalence of hypertension among the male geriatric patients than females. This result agreed with the findings of Everett et al., [25].

As regard to residence of all stroke patients, more than half were living in urban areas while about one third were living in rural areas. This may be explained by increased stress of living in urban environment and sedentary life style due to improvement in living conditions with better home heating in colder seasons.

On the other hand Hesami et al., [26] found that about third of quarter of hemorrhagic patients were rural while lower than third were urban. This may be explained by reluctance and non-compliance of patients in rural areas in treating common risk factors especially hypertension, diabetes mellitus, cardiac disorders and obesity. Some authors suggest that the frequency of intracranial hemorrhage is not higher in temperate regions than in tropical or subtropical regions [25].

As regard to marital status of all stroke patients, more than half were married while lower than half were un married (single, divorced, widow) because married patients were surrounded by their beloved persons, relatives and off springs who help getting them early to the hospital.

As regard to duration of stay and outcome in (Tables 1,4,5), in this study the median of length of hospital stay among ischemic stroke patients was 8 days, while it was 6 days for hemorrhagic one. In agreement with our results, Rincon et al. [27] who found that the mean length of hospital stay among patients with non-hemorrhagic stroke was  $8.2 \pm 0.4$  days [26].

On the other hand, Fonarow et al., [28] found that the mean length of hospital stay for hemorrhagic patients was  $11 \pm 11$  days while it was  $12 \pm 10$  days among ischemic ones [27]. Liu et al., 2020 found that patients admitted had a median stay of seven days if they died, 19 days if they returned home and 149 days if they needed alternative long term accommodation. In a study conducted in Amsterdam, Netherlands, 2019, Van Straten A. and his colleagues found that, the mean length of hospital stay for stroke patients was 28 days [28].

As regard to outcome of all stroke patients in this study about third of quarter were in stable condition ,lower than third were improved and least were dead , the highest mortality rates was encountered among hemorrhagic patients . On the other hand one third of ischemic stroke patients were discharged as favorable improved condition as they can walk with or without aid.

## 5. CONCLUSION

Frequency of stroke is increasing and it is the most frequent among the neurological disorders. The most common non modifiable risk factors contributing to stroke were old age >70 years old, female sex, rural residence, none educated and married.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

Communication to authorities was done and approval to conduct the study was obtained from Ethical Committee for Research at Tanta Faculty of Medicine with postal code (33142/05/19) and the Neuropsychiatry hospital. Data was not used for any purpose other than the scientific research.

## RECOMMENDATIONS

Establishment of a health education program in mass media and health centers aiming at improving knowledge, attitude and practice of individuals towards stroke. This programme is concerned with: The nature and mechanism of occurrence of stroke and the most probable risk factors predisposing to stroke.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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