

## A Retrospective Study of Lacunar Stroke Cases in University Malaya Medical Centre (UMMC) According to Age and Gender

Noor Zuani Asyikin Binti Mustafa<sup>1</sup>, Fairuz Mohd Nasir<sup>1\*</sup>, Azizah Ab Ghani<sup>1</sup>

<sup>1</sup>Faculty of Health Sciences, Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Kuala Nerus, Terengganu  
\*fairuznasir@unisza.edu.my

### Abstract

Worldwide, stroke was ranked as the second commonest cause of death and the third most common cause of disability-adjusted life-years. Lacunar stroke is one type of stroke. The aim of this study is to determine the dependability of gender differences in lacunar stroke epidemiology on patient age as the influence of gender on stroke risk and outcome changes across the lifespan. Thus, this study was to identify age, and gender differences among lacunar stroke patients at University Malaya Medical Centre (UMMC). This study was conducted retrospectively from January 2016 to December 2019 in UMMC. Patients were selected based on inclusion and exclusion criteria. The inclusion criteria include a clinical diagnosis of lacunar stroke, age categories of middle age (40 – 59 years old) and older age (60 years and above), as well as undergo CT examination. The exclusion criterion is other than lacunar stroke patients. Patient's data on gender and age were retrieved from the database PACS of UMMC. The analyzation includes cross tabulation of categorical data and independent t-test. Among 94 cases, higher cases of lacunar stroke are found to occur in men (58.51%). Furthermore, both middle age (13.83%) and older age (44.68%) among male patient shows higher percentage of lacunar incidence compared to female patients. Moreover, old age patients (76.60%) for each gender shows higher percentage of lacunar incidence compared to middle-aged patients (23.30%). Meanwhile the independent t-test result demonstrated that the mean age of female patients (67.79) diagnosed with lacunar stroke is not statistically different from the mean age of male patients (68.47). The study indicated that lacunar stroke is most likely to occur in men either at age 40 or 60 and above. Higher cases were recorded in older category which is at age 60 and above for both genders.

**Keywords:** lacunar stroke, ischemic stroke, risk factor of lacunar stroke

\*Author for Correspondence

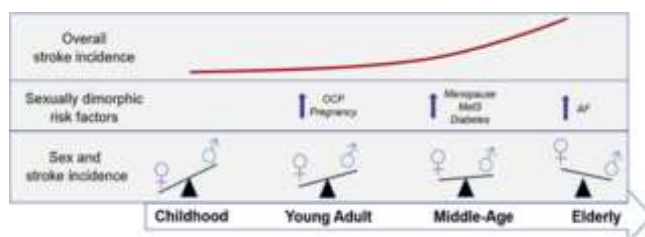
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## Introduction

A stroke is a cerebrovascular accident (CVA) impacting the blood circulation to the brain. There are two types of strokes, ischemic stroke and haemorrhagic stroke. An ischemic stroke takes place when a blood vessel supplying the brain is blocked and blood circulation to a part of the brain is damaged. Within minutes, the brain cells and tissues start to die upon deficiency of oxygen and nutrients. A quarter of all ischemic strokes is lacunar type. A lacunar stroke occurs due to one of the arteries that provide blood to the brain's deep structures being blocked. Lacunar stroke is a small infarction (2–20 mm in diameter) in deep cerebral white matter, basal ganglia or pons, believed to occur due to obstruction of a single small perforating artery supplying the subcortical areas of the brain [1]. These arteries are small and vulnerable. Contrary to most arteries, which progressively narrow to a smaller size, the small arteries of a lacunar stroke divide straight out of a large, high-pressure, heavily muscled main artery. Hypertension or high blood pressure is one of the causes of lacunar stroke because it induces an abnormally rapid heart rate as the arteries do not progressively reduce in size, high blood pressure can impair these arteries right away.

Stroke has a larger impact on women compared to men since women have more stroke occurrences and are less probably to heal. Age-specific stroke rates in men are higher. Nevertheless, women have more stroke occurrences than men in general due to women's longer life expectancy and the significantly higher prevalence of stroke at an older age. In the overall population, men have been discovered to encounter more ischemic strokes while women typically have more infarctions concerning the anterior circulation and encounter more subarachnoid haemorrhages. Age and sex are critical factors in ischemic stroke pathology. In childhood and early adulthood, as shown in figure 1, males have a greater incidence of ischemic stroke [2]. In middle age, the rates of an ischemic stroke begin to rise in females, simultaneous with the beginning of menopause and loss of female sex hormones [3]. After middle age, stroke rates proceed to rise in females, with some reports of greater stroke incidence in elderly women (age >85 years) in contrast with elderly men [4].



**Figure 1** Schematic illustration of the relationship between age- and sex-related risk factors across the lifespan [2]

Stroke is a significant global health problem, contributing to major morbidity and mortality for both developed and developing countries. The literature regarding gender-specific aspects of cerebrovascular diseases is quite limited. It is well-documented that in all age groups, the occurrence of stroke is higher in men than in women, and women are, on average, many years older than men when having their first stroke. The prevalence of stroke is higher among men up to the age of approximately 75 years, after which it

becomes higher in women [5]. A majority of studies indicate that the case-fatality rate is higher in female than in male stroke patients. There is also some evidence, although relatively weak, indicating a better functional outcome in men. Furthermore, age-specific stroke incidence and mortality rates are higher in men than in women, but stroke affects a greater number of women because of their increased longevity and the fact that stroke event rates increase substantially in the oldest age groups.

Stroke is among the five major causes of death and among the 10 major causes for hospitalization in Malaysia. Stroke is also among the major five diseases with the largest disease burden, in reference to disability-adjusted life years. Despite that, prospective studies on stroke in Malaysia is restricted. With the growing number of stroke cases every year, more government and non-government organizations must engage in primary and secondary prevention strategies. Better understanding and adequate knowledge of stroke including sociodemographic characteristics in lacunar stroke incidence; age and gender will encourage efficient strategies in promoting stroke prevention and outcomes. Most studies on the age and gender of stroke patients are comprehensive to ischemic stroke and hemorrhage stroke only. There have been no specific studies on the age and gender of lacunar stroke patients. Therefore, this study is aimed to study the age and gender influence upon lacunar stroke incidence among stroke patients admitted to University Malaya Medical Centre (UMMC). This study is expected to provide an overview of the gender and age of patients with lacunar stroke.

## Materials and methods

The study was conducted in UMMC. Ethical approval was obtained from UniSZA Research Ethics Committee (UHREC) and the UMMC Medical Research Ethics Committee. Study populations are all of the lacunar stroke patients including male and female, age 40 years old and above. The inclusion criteria include a patient which clinically diagnosis with lacunar stroke, age 40 and above, and has been diagnosed with radiological examination, Computed Tomography Scan (CT scan). The exclusion criteria are stroke patient that is other than lacunar stroke patients, such as hemorrhagic stroke patients and patient that has been diagnose using other radiological examination such as Magnetic Resonance Imaging (MRI). The sampling frame is 94 lacunar stroke patients where convenience sampling is chosen as the sampling method. Convenience sampling is a non-probability sampling technique that allows selection of samples based on selective criteria rather than random selection.

Data is retrieved from UMMC collected database via PACS. All medical records of patients admitted between January 2016 and December 2019, with a diagnosis of lacunar stroke, are examined. Sociodemographic characteristics: age and gender, data of each patient are retrieved for analysis. Patients are selected according to inclusion and exclusion criteria. Data collected then are analyzed using Statistical Package for the Social Sciences (SPSS) software. The analysis includes cross tabulation of categorical data (Crosstab) and performing statistical test which is independent t-test.

## Results

A total of 94 lacunar stroke patients were reviewed. Among 94 subjects, 39 of lacunar stroke patient are female while 55 are male as summarized in table 1. All subject was grouped into two age categories, 40 – 59 years old are categorized as middle age while age 60 and above are categorized as older age. The highest cases of lacunar stroke were observed in older age patient with 72 cases while 22 cases were observed in middle age category as summarized in table 2.

**Table 1** Frequency of distribution of lacunar stroke patient according to gender

Gender	Frequency (n)	Percentage (%)
Female	39	41.5
Male	55	58.5
Total	94	100

**Table 2** Frequency of distribution of lacunar stroke patient according to age categories

Age group	Frequency (n)	Percentage (%)
Middle age (40 to 59)	22	23.4
Old age (≥60)	72	76.6
Total	94	100

Table 3 shows the cross tabulation of age categories and gender. The highest number of lacunar stroke patients are male in the older age category, which is 42 cases compare to female, 30 cases in the same category. Meanwhile in the middle age category also male cases is 13 cases which is higher than female only 9 cases.

**Table 3** Cross tabulation of age categories and gender

Age group	Gender		Total
	Female	Male	
Middle age (40 to 59)	9	13	22
Old age (≥60)	30	42	72
Total	39	55	94

Independent t-test was performed to study the difference in mean age between male and female patient diagnosed with lacunar stroke admitted to UMMC. The mean age of female lacunar stroke patients is 67.8 and the mean age of male lacunar stroke patients is 68.5 as shows in table 4. The p-value is > 0.05, and thus fail to reject the null hypothesis of the study. The mean age of females is not statistically different from the mean age of males.

**Table 4** Comparison of mean age between females and males (n = 94)

Variable	Mean (SD) (years)		Mean difference (95% CI)	t statistic (df)	P-value* *Independent T-Test
	Female	Males			
Age	67.8 (11.11)	68.5 (11.47)	-0.69 (- 5.39, 4.03)	-0.29 (92)	0.776

## Discussion

Lacunar stroke incidence among male patients (58.5%) shows higher percentage compared to female patients (41.5%) as shows in table 1. This is consistence as proclaimed by Hiraga 2017, the incident rates and outcomes are due to higher age-specific stroke among male [6]. Older patients (76.60%) for both male and female have higher lacunar stroke incidence percentage than middle-aged patients (23.40%). Strokes are more common in elderly as cardiovascular and metabolic disease incidence rises with age. Age is the strongest risk factor for stroke as for every consecutive decade after age 55, the stroke rate doubles in both genders [7]. Age stratification noted that the lifestyle risk factors concerning cardiovascular involving smoking, alcohol intake and obesity were more frequent in younger stroke patients (< 60 years), while incidence of hypertension, diabetes mellitus, myocardial infarction and intermittent arterial claudication were fewer in older stroke patients (> 70 to 80 years) [8]. The working age patient also reported to experience lacunar and hemodynamic strokes due to deficit of physical exercise, being obese and dyslipidemia; with decreasing involvement of smoking and stress which are more related to the working ages [9].

Comparing the percentage of lacunar stroke incidence between old age patients and middle-aged patients with respective gender, female old age patient (13.83%) shows lower incidence rates than male old age patients (44.68%). This is consistence as the finding from previous study that stated the rate of stroke event is 1.25 times higher in male than female and increases consistently with age for both gender [10]. Female has lower stroke incidence compared to male throughout most of the lifetime owing to protective effects of gonadal steroids, particularly estrogen [2]. As female age, they are excessively influenced by stroke, correspondent with the loss of estrogen due to menopause phase [2][10]. This postmenopausal occurrence, alongside longer lifespan are the causes for female being older at stroke onset as well as having more critical strokes [11]. The stroke risk in elderly women surpasses the risks among men. The reversal of this rate might be related to the other risk factor of strokes. In various studies, it has been proved that cigarette smoking is a strong risk factor for stroke [12]. In 2016, the proportion of adult males who smoked in Malaysia was at 42.4% [13]. The smoking rate among males in Malaysia was considerably higher than that for females, as perspective of Malaysian society regarding smoking being considered an inappropriate behavior for females. Thus, majority Malaysian females are not accustomed with smoking habit.

The mean difference (t-value) for mean age of female patients (67.79) diagnosed with lacunar stroke compared with male patients (68.47) is -0.69. A negative t-value

signifies no significant difference between the two groups. From independent t-test, we can simplify that the mean age of patients admitted to UMMC, diagnosed with lacunar stroke between male and female are nearly equal.

## Conclusion

In conclusion, men do have more lacunar strokes in the general population. Both middle age and older age among male patient shows higher percentage of lacunar stroke incidence compared to female patients. Old age patients for each gender shows higher percentage of lacunar incidence compared to middle-aged patients. The information guide and improve the positive results of targeted interventions to manage and avoid stroke and its risk factors specifically among populations at risk, through implementing healthy lifestyles changes, improving treatment seeking behavior and medication adherence to manage medical risk factors.

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