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Distribution and Demographic Profile of Stroke Patients with Respect to Obesity: A Hospital-Based Cross-Sectional Study

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Abstract **Original Research Article**

Background: Stroke remains a leading cause of morbidity and mortality worldwide, with demographic and lifestyle factors influencing its occurrence and subtype distribution. This hospital-based cross-sectional study aimed to assess the demographic profile and obesity status of stroke patients, alongside other socio-clinical characteristics. ***Methods:*** This observational cross-sectional study was conducted in the Department of Medicine, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh, from July 2016 to January 2017. This study included 100 patients over 18 years old, of both genders, who were admitted to the medicine units of Shaheed Suhrawardy Medical College Hospital for stroke management and follow-up. ***Results:*** The mean age of patients was 58.37 ± 6.23 years, with most participants (54%) aged 41–55 years. Males comprised 64% of the cohort (male-to-female ratio 1.7:1). Urban residents accounted for 58% of cases, and housewives formed the largest occupational group (64%). Ischemic stroke was more common (62%) than hemorrhagic stroke (38%). The most frequent clinical manifestations were hemiplegia (89.47% in hemorrhagic vs. 48.38% in ischemic) and impaired consciousness (100% in hemorrhagic vs. 35.48% in ischemic). The 41–55-year age group had the highest incidence in both stroke types. Ischemic stroke was predominant among low-income patients (61.29%), whereas hemorrhagic stroke was more frequent in the middle-income group (68.42%). In terms of BMI, the normal range (18.5–23.0 kg/m²) was most common in both ischemic (38.7%) and hemorrhagic (50.0%) strokes, though overweight (>25.0 kg/m²) was more prevalent in ischemic cases. ***Conclusion:*** Stroke in this population predominantly affected middle-aged adults, with ischemic stroke being more frequent, especially among low-income and overweight individuals. These findings highlight the need for targeted prevention strategies focusing on modifiable risk factors, particularly in vulnerable socioeconomic groups.

Keywords: Stroke, Ischemic stroke, Hemorrhagic stroke, Body mass index, Demographic profile.

INTRODUCTION

Stroke is an increasingly significant global health problem, driven largely by a rising epidemic of atherothrombosis in low- and middle-income countries, which undermines the progress achieved in stroke and transient ischaemic attack (TIA) prevention and treatment in more affluent nations. Despite this, limited data are available from low and middle-income countries regarding demographics, clinical features, risk factor profiles, including the involvement of multiple arterial territories (cerebral, coronary, and peripheral), and management patterns of stroke and TIA patients [1].

Globally, stroke affects approximately 24–54% of the population and remains one of the leading causes of mortality and long-term disability. Each year, an estimated 15 million people suffer a stroke, with one third of them dying from it [2–4]. Age is a major non-modifiable risk factor; after the age of 55, the risk of stroke doubles with each successive decade. Sex differences have also been reported, with men more likely to be affected; however, this disparity disappears after the age of 70. Other established non-modifiable factors include environmental influences, socioeconomic status, genetic predisposition, and ethnicity [5–7].

While these factors are unchangeable, the prevention of stroke relies heavily on addressing modifiable risk factors. Among these, abdominal obesity stands out as one of the most significant, surpassed only by hypertension and smoking. Other key contributors include unhealthy dietary habits and sedentary lifestyles, with physical inactivity playing a major role. Collectively, these modifiable factors are present in over 80% of all diagnosed stroke cases [8–10].

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Obesity itself is a chronic disease and a global epidemic that poses a serious threat to public health. It is strongly linked to cardiovascular disease and reduced life expectancy [11]. Conversely, being underweight, as part of malnutrition, also carries adverse consequences, including an increased risk of atrial fibrillation (AF), ischaemic stroke (IS), myocardial infarction (MI), and mortality [11,12]. Obesity can be assessed using body mass index (BMI), which reflects overall body fat, and waist circumference (WC), which indicates visceral adiposity. AF and IS are two major cardiovascular conditions that share common metabolic risk factors, including obesity. AF is the most common sustained cardiac arrhythmia, affecting 2–4% of adults [13,14], and the incidence of both AF and IS increases with advancing age [11,14]. Although numerous studies have explored the relationship between various obesity measures and the risk of AF and stroke, data stratified by age remain limited, particularly in Asia, where mean BMI among children and adolescents has risen sharply since 2000 [11].

Extensive research confirms a linear association between obesity and the overall risk of cardiovascular disease [15]. Findings from the Physicians' Health Study (PHS) indicated that individuals with a BMI < 23 kg/m² had half the risk of stroke compared to those with a BMI > 30 kg/m² [16,17]. However, BMI does not account for body composition, and some authors argue that it is insufficient as a sole measure for assessing stroke risk [18–20]. Therefore, it is essential to evaluate specific body mass components and investigate their relationship not only with stroke incidence but also with post-stroke recovery [21].

In the present study, we aimed to assess the demographic profile and obesity status of stroke patients, alongside other socio-clinical characteristics.

METHODOLOGY & MATERIALS

This observational cross-sectional study was conducted in the Department of Medicine, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh, from July 2016 to January 2017. This study included 100 patients aged 18 years or above, of both genders, who were admitted to the medicine units of Shaheed Suhrawardy Medical College Hospital for stroke management and follow-up.

These were the following criteria for eligibility as study participants:

Inclusion Criteria

- Patients aged ≥18 years, irrespective of gender.
- Clinically diagnosed cases of acute stroke, confirmed by CT or MRI brain imaging.
- Both ischemic and hemorrhagic stroke patients.
- Patients who provided informed consent.

Exclusion Criteria

- Patients with transient ischemic attacks (TIA) without radiological evidence of stroke.
- Patients with subarachnoid hemorrhage, cerebral venous sinus thrombosis, or other non-stroke neurological conditions.
- Patients with pregnancy.
- Patients with increased body weight due to Ascites and Oedema.

Data Collection Procedure:

All subjects were informed about the study objectives, potential risks and benefits, their right to participate voluntarily, and the assurance of confidentiality. Informed consent was obtained from each participant accordingly. Data were recorded using a pre-structured Case Record Form (CRF), completed by the study physician. Information collected included demographic details (age, sex, occupation, residence, income class), clinical presentation, relevant investigations, stroke classification, and anthropometric measurements (including BMI). Income status was classified into low, middle, and high-income categories based on self-reported monthly household income. BMI was calculated using the formula: BMI = Weight (kg) / Height (m)^2 and categorized according to WHO Asia-Pacific guidelines.

The researcher visited each patient every alternate day to monitor progress, repeat investigations when required, or arrange tests through external laboratories if clinically indicated. Patient outcomes were obtained from the hospital discharge register and documented in the CRF. All completed questionnaires were thoroughly reviewed to identify and correct any errors in data collection. The researcher personally supervised the technical aspects of editing, coding, and computerization to ensure accuracy and completeness.

Data Analysis:

All data were recorded systematically using a pre-formatted data collection form. Data processing included registration, editing, coding, computerization, preparation of dummy tables, and analysis. Quantitative variables were expressed as mean ± standard deviation, and qualitative variables were expressed as frequency and percentages. Data analysis was performed using SPSS version 16 (Statistical Package for the Social Sciences) for Windows. The study received ethical

approval from the Institutional Review Committee of Shaheed Suhrawardy Medical College Hospital.

RESULTS

Table 1: Distribution of Patients by Age and Sex (n = 100)

Age Group (years)	Number	Percentage (%)
≤ 40	8	8.0
41–55	54	54.0
56–70	24	24.0
>70	14	14.0
Mean ± SD (years)	58.37 ± 6.23	
Sex		
Male	64	64.0
Female	36	36.0
Male-female ratio	1.7:1	

Table 1 shows that in this study involving 100 patients, the age distribution showed that the majority of participants (54%) were between 41 and 55 years. Patients aged 56–70 years comprised 24%, while those older than 70 years accounted for 14%. A smaller proportion (8%) were aged 40 years or younger. The mean age of the participants was 58.37 ± 6.23 years. Regarding sex distribution, males were 64% of the study population, and females accounted for 36%. The male-to-female ratio was 1.7:1 in this study.

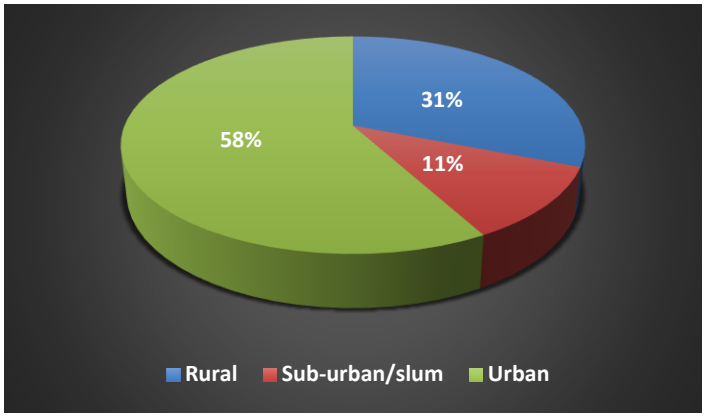

Figure 1: Distribution of patients according to residence (n=100)

The pie chart illustrates the distribution of patients based on their area of residence. The majority of respondents were from urban areas (58%), followed by those from rural areas (31%), while 11% of the participants resided in suburban or slum areas.

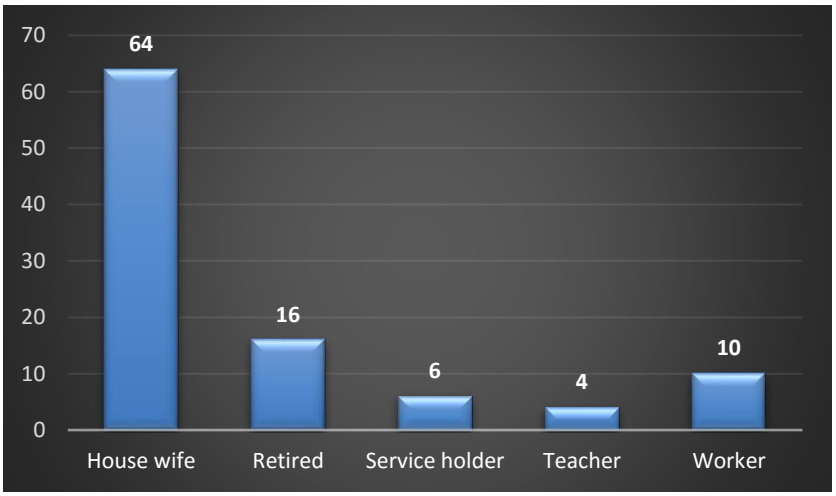

Figure 2: Distribution of the patients according to occupation (n=100)

Figure 2 shows that the majority were housewives, accounting for 64% of the total study population. Retired individuals comprised 16%, while workers made up 10% of the participants. Service holders represented 6%, and teachers constituted the smallest group at 4%.

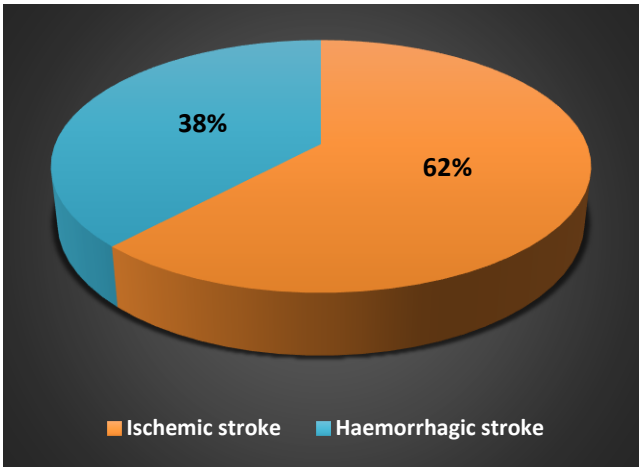

Figure 3: Types of strokes according to clinical and imaging findings (n=100)

In Figure 3, based on etiological classification, the findings revealed that the majority (62.0%) of strokes were ischemic, while 38.0% were identified as hemorrhagic strokes.

Table 2: Clinical presentation of stroke patients

Clinical manifestation	Ischemic stroke (n=62)	Hemorrhagic stroke (n=38)
Hemiplegia	30(48.38%)	34(89.47%)
Impaired consciousness	22(35.48%)	38(100.0%)
Dysphasia	8(12.90%)	16(42.10%)
Dysphagia	6(9.67%)	34(89.47%)
Headache	26(41.93%)	30(78.94%)
Vomiting	16(25.80%)	24(63.15%)
Sphincter problem	4(6.45%)	24(63.15%)
Facial nerve palsy	0	16(42.10%)
Convulsion	2(3.22%)	8(21.05%)

Table 2 shows that hemiplegia was observed in 48.38% of ischemic stroke cases and was more prominent in hemorrhagic stroke, affecting 89.47% of patients. Impaired consciousness was present in all hemorrhagic stroke patients (100.0%) compared to 35.48% in ischemic stroke. Dysphagia and facial nerve palsy were markedly more common in hemorrhagic stroke, affecting 89.47% and 42.10% of patients, respectively, while they were significantly less frequent or absent in ischemic stroke. Headache and vomiting were also more prevalent among hemorrhagic stroke patients (78.94% and 63.15%) than in ischemic cases (41.93% and 25.80%). Sphincter problems occurred in 63.15% of hemorrhagic stroke patients, but only 6.45% of ischemic stroke patients. Dysphasia and convulsions were more frequently reported in hemorrhagic strokes (42.10% and 21.05%) compared to ischemic strokes (12.90% and 3.22%).

Table 3: Prevalence of stroke in different age groups (n=100)

Age Group (years)	Ischemic Stroke n (%)	Hemorrhagic Stroke n (%)	Total
≤ 40	6 (9.67%)	2 (5.26%)	8
41–55	28 (45.16%)	26 (68.42%)	54
56–70	18 (29.03%)	6 (15.78%)	24
> 70	10 (16.12%)	4 (10.52%)	14
Total	62 (100%)	38 (100%)	100

Table 3 shows that among ischemic stroke patients, the highest proportion (45.16%) belonged to the 41–55-year age group, followed by 29.03% in the 56–70-year group. In contrast, the majority of hemorrhagic stroke cases (68.42%) were also observed in the 41–55-year group, making it the most affected age bracket in both types. Younger individuals (≤40 years) accounted for a smaller proportion of both ischemic (9.67%) and hemorrhagic (5.26%) strokes. Similarly, patients aged

over 70 years constituted 16.12% of ischemic and 10.52% of hemorrhagic strokes.

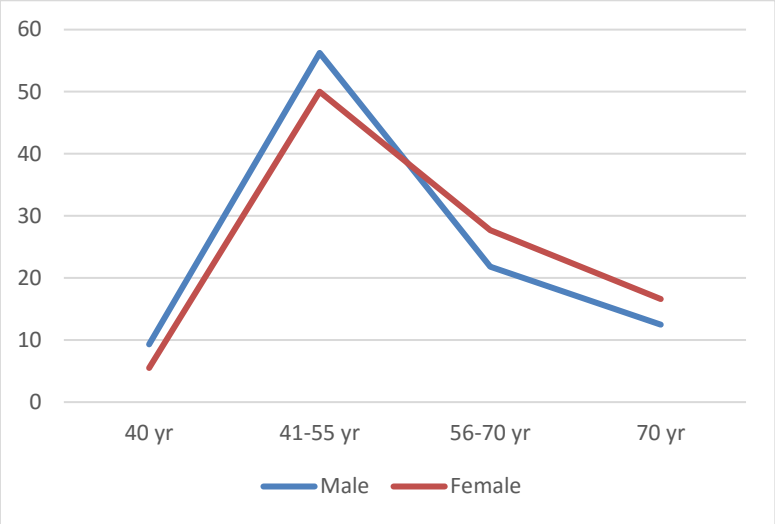

Figure 4: Overall demographic characteristics of study population (n=100)

Figure 4 demonstrates that the frequency of the disease increases progressively with age. The highest incidence for both males and females was observed in the 41–55-year age group. Additionally, female patients were comparatively more prevalent in the older age groups.

Table 4: Socioeconomic status (SES) of study population (n=100)

Income Class	Ischemic Stroke n (%)	Hemorrhagic Stroke n (%)	Total
Low-income class	38 (61.29%)	6 (15.78%)	44
Middle-income class	22 (35.48%)	26 (68.42%)	48
High-income class	2 (3.22%)	6 (15.78%)	8
Total	62 (100%)	38 (100%)	100

Table 4 shows the distribution of stroke types across different income classes. Among ischemic stroke patients, the majority (61.29%) belonged to the low-income group, followed by 35.48% from the middle class, and only 3.22% from the high-income group. In contrast, most hemorrhagic stroke cases (68.42%) were from the middle-income group, while both low and high-income classes accounted for 15.78% each.

These findings suggest that ischemic stroke was more common among low-income individuals, whereas hemorrhagic stroke was predominantly observed in the middle-income group.

Table 5: Association of obesity in different types of strokes (n=100)

BMI (kg/m²)	Ischemic Stroke n (%)	Hemorrhagic Stroke n (%)	Total
18.5–23.0	24 (38.7%)	19 (50.0%)	43
23.1–25.0	18 (29.0%)	13 (34.2%)	31
>25.0	20 (32.2%)	6 (15.7%)	26
Total	62 (100%)	38 (100%)	100

In Table 5, the distribution of stroke types based on Body Mass Index (BMI) categories shows that most patients are in the normal BMI range (18.5–23.0 kg/m²). Among ischemic stroke patients, 38.7% had a BMI of 18.5–23.0, 29.0% had a BMI of 23.1–25.0, and 32.2% had a BMI over 25.0. In patients with hemorrhagic stroke, 50.0% had a BMI in the 18.5–23.0 range, followed by 34.2% in the 23.1–25.0 range, and only 15.7% had a BMI above 25.0. Overall, normal BMI was the most common category in both types of strokes, with overweight individuals (>25.0) more frequently seen in ischemic than hemorrhagic stroke patients.

DISCUSSION

In the present study of 100 patients, the majority (54%) were between 41 and 55 years of age, with a mean age of 58.37 ± 6.23 years. Males accounted for 64% of the study population, while females comprised 36%, resulting in a male-to-female ratio of 1.7:1. Khan et al. reported a mean patient age of approximately 60 years, with a male-to-female ratio of roughly 1:1 in both

ischemic and hemorrhagic stroke groups [22], findings that are in close agreement with those of Haque et al. [23]. Similarly, Alam et al. found that over one-third (36.2%) of stroke patients were aged over 60 years, compared to around 45% in the present study [24]. Rahman et al., however, reported a slightly lower mean age of 55.5 years [25].

Globally, the peak mortality for both males and females occurs in the 75–79-year age group, reflecting the impact of population growth and aging. As life expectancy increases, the absolute number of stroke-related deaths continues to rise. The risk of stroke approximately doubles with each decade after the age of 55 [26], a trend attributed to the physiological changes of aging, reduced immune function, and the accumulation of vascular risk factors [27].

In this study, regarding clinical manifestations, hemiplegia was present in 48.38% of ischemic stroke patients but was more prevalent in hemorrhagic stroke (89.47%). Dysphagia and facial nerve palsy were markedly more frequent in hemorrhagic stroke, affecting 89.47% and 42.10% of patients, respectively, but were rare or absent in ischemic stroke. Headache and vomiting were also more common in hemorrhagic stroke (78.94% and 63.15%) compared to ischemic stroke (41.93% and 25.80%). Khan et al. noted hemiplegia as the second most common reason for admission after coma, with vomiting being more frequent in hemorrhagic stroke, while seizures were more common in ischemic stroke. Most patients in both groups maintained normal blood pressure and pulse. Arif et al. reported hypertension in 67% of stroke patients, a higher proportion than in the present study [22]. In contrast, Mannan and Haque documented hemiplegia in 100% of cases in a study conducted at IPGMR [23], whereas rates in Western European centers were reported at less than 50% [28].

When examining BMI, we found that among ischemic stroke patients, 38.7% fell within the normal range (18.5–23.0 kg/m²), 29.0% were in the 23.1–25.0 kg/m² range, and 32.2% had a BMI over 25.0. In the hemorrhagic group, 50.0% had a BMI between 18.5–23.0 kg/m², 34.2% between 23.1–25.0 kg/m², and only 15.7% exceeded 25.0 kg/m². Overall, a normal BMI was the most common category in both stroke types, with overweight individuals (>25.0 kg/m²) being more frequent in ischemic stroke.

Interestingly, the risk of stroke mortality associated with elevated BMI in the 80–84-year age group appeared to decline with advancing age, a finding that contrasts with earlier studies and brings attention to the so-called “obesity paradox” [27]. Several studies suggest that a higher BMI may confer a survival advantage following a stroke [29]. For instance, Gu et al. found that obese ischemic stroke patients experienced less fatigue during the acute phase, potentially due to greater energy reserves [30]. Likewise, Chaudhary et al. reported that overweight and obese ischemic stroke patients had significantly lower one-year mortality compared to those of normal weight [29]. A cross-sectional study in Korea also demonstrated that obesity was inversely associated with adverse outcomes in all stroke patients, though the obesity paradox may differ by stroke subtype [31,32]. According to the World Health Organization’s 2015 report, adult obesity rates in Europe were 21.5% for males and 24.5% for females [33].

Substantial clinical and epidemiological evidence indicates that obesity is associated with a broad spectrum of cardiovascular diseases (CVDs), contributing directly and indirectly to their increased incidence and mortality [34]. Both socioeconomic and biological determinants significantly influence stroke risk, severity, and outcomes. The observed decline in stroke mortality among patients with elevated BMI, alongside the obesity paradox, highlights the need for a nuanced, individualized approach to stroke prevention and management.

Limitations of the study

This study was a single-center study and was conducted on a relatively small sample size, which may limit the generalizability of the findings to the wider population. As it was a cross-sectional study, causal relationships between obesity, demographic factors, and stroke type could not be established. Data on lifestyle factors, diet, physical activity, and comorbid conditions were not comprehensively collected, which may have influenced the observed associations.

CONCLUSION AND RECOMMENDATIONS

This study highlights that demographic and clinical differences between ischemic and hemorrhagic stroke patients with obesity. Ischemic stroke was more common among low-income individuals and those with higher BMI, whereas hemorrhagic stroke predominated in the middle-income group and among patients with normal BMI. The majority of strokes occurred in the 41–55-year age group, with females showing a higher prevalence in the older age categories. These findings underscore the need for targeted preventive strategies, including early screening and risk factor modification, particularly in high-risk populations.

Further study with a prospective and longitudinal study design, including a larger sample size, needs to be done to validate the findings of this study.

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Ethical approval: This study was ethically approved

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