ORIGINAL ARTICLE

Acute Stroke Patients with High BMI are Less Likely to have Severe Disability at Initial Presentation

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SUMMARY

This is a prospective study to determine the severity of disability and prognosis of acute stroke patients related to their Body Mass index (BMI). A total of 79 consecutive CT-scan-proven acute stroke patients who were admitted to Hospital Tuanku Ja'afar, Seremban between November 2006 and April 2007 were recruited (male:female 49:30; mean age 62.7 years; ischemic stroke 70, intracerebral bleed 9). The patients were divided according to BMI less than 25 (Group A) and equal or greater than 25 (Group B). Severity of disability was measured between 24-48 hours by modified Rankin's score. Patients were followed up after one month. Thirty-seven patients had severe disability (Rankin Score 5). Twenty-nine patients had adverse outcomes including 11 deaths and 18 rehospitalizations or prolonged hospital/nursing home stay. 34.3% of Group B had severe disability compared to 56.8% of Group A (χ^2 P=0.046). Conversely 42.9% of Group B had adverse events at one month compared to 31.8% of Group A (χ^2 P=0.312). There were no statistical differences between high- and low-BMI groups for gender ratio, smoking, hypertension, diabetes, prior cardiovascular disease, mean age, mean lipid profile and blood pressure. When comparing patients with Rankin Score 1-4 versus 5, age and BMI were statistically significant between the two groups. By multivariate analysis only age is independent predictor for severe disability (P < 0.05). The results of this pilot study should be confirmed in larger prospective multicentre trial.

KEY WORDS:
Stroke, Body Mass Index (BMI), Rankin's score, Disability, Adverse outcomes

INTRODUCTION

Stroke is the fourth most common cause of death after septicemia, cancer and ischemic heart disease in the Malaysian Ministry of Health hospitals, and accounts for severe disability in adults. Globally, it is the second commonest cause of death. Stroke survivors will require treatment and rehabilitation. The average incidence of stroke is 2:1,000. The incidence rate doubles every decade after the age of 50. A study was done at Kuala Lumpur Hospital in 1995 among patients with first stroke. Acute mortality (within 2 weeks) was 29%. At discharge, 47% were bedridden, 22% were wheelchair-bound, 86% had feeding problems, 36% had speech problems and 32% had bladder problems[1].

Obesity is an independent risk factor for cardiovascular events. The prevalence of obesity and overweight is endemic in much of the Asia-Pacific region[2]. It is a significant risk factor for stroke and confers poor prognosis following myocardial infarction. However it is not known if being overweight confers a poor prognosis after acute stroke because the excess fat may protect against malnutrition yet hinder physiotherapy. The primary objective of this project is to determine if obesity and being overweight is a prognostic factor in stroke.

MATERIALS AND METHODS

The study done was a prospective study, using a structured questionnaire. It was carried out in all four medical wards of Hospital Tuanku Jaafar, Seremban involving consecutive patients that were admitted due to cerebrovascular disease between November 2006 and May 2007.

The study population consisted of a total of 79 CT-scan-proven acute stroke patients (49 men, 30 women) admitted into the medical wards. A further 14 patients who presented with features of stroke and recovered within 24 hours or did not have evidence of stroke on CT scan, were excluded from the study.

Patients were to complete a questionnaire based interview. The questionnaire included demographic data (age, sex, race, and name), risk factors (smoking, cholesterol, hypertension, diabetes) and past medical history (cardiovascular disease, angina, previous stroke, angioplasty, coronary artery bypass graft). Also, the disability severity of the stroke outcome was assessed between 24-48 hours using the modified Rankins scale[3]. Baseline information was self reported as given in the patient files. Manual measurements were taken, including waist and hip circumference, height, weight, BMI and waist hip ratio (WHR). Investigation results done in the hospital were obtained such as lipid profile, fasting blood glucose and blood pressure reading within 24 hours of admission.

Patients were then assessed on discharge (dead, alive at home, nursing home, rehabilitation ward). After one month, participants were followed up and enquired about any newly diagnosed conditions including recurrent stroke, myocardial infarction, sepsis, any hospitalizations or death.

Mild and moderate disability is defined as Modified Rankins Score of 1-4/5 and severe disability is defined as Modified

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Table I: Comparison between high- and low-BMI group in 79 stroke patients

Group	BMI < 25	BMI ≥ 25	P value
Number of Patients	44	35	
Mean Age (years)	64.8 ± 14	60.1 ± 13	0.13
Mean BMI	21.5 ± 2.5	29.6 ± 5.8	0.001
Mean Waist Circumference (cm)	82.3 ± 12.2	93.3 ± 14.2	0.001
Mean Waist-Hip Ratio	0.93 ± 0.07	0.94 ± 0.11	0.387
No. of Patients with Adverse Outcome at one Month	14 (31.8%)	15 (42.9%)	0.312
No. of Patients with Severe Disability at Initial Assessment	25 (56.8%)	12 (34.3%)	0.046
Gender Male: Female	27:17	22:13	0.892
Smoking	38 (86.4%)	33 (94.3%)	0.246
Dyslipidaemia	11 (25%)	14 (40%)	0.154
Hypertension	32 (72.7%)	30 (85.7%)	0.163
Diabetes	18 (40.9%)	16 (45.7%)	0.668
Cardiovascular Disease	15 (34.1%)	12 (34.3%)	0.986
Mean Systolic Blood Pressure (mmHg)	158 ± 31	168 ± 35	0.28
Mean LDL-Cholesterol (mmol/L)	2.9 ± 1.3	3.4 ± 1.0	0.21

Table II: Comparison between severe and non-severe disability group

Group	Modified Rankin Score 1-4	Modified Rankin Score 5 (Severe Disability)	P
Number of Patients	42	37	
Mean Age (Years)	59.3 ± 14	66.5 ± 12	0.018
Mean BMI	26.3 ± 7.1	23.7 ± 3.7	0.05
No of patients with BMI ≥ 25	23 (54.8%)	12 (32.4%)	0.046
Mean Waist Circumference (cm)	86.9 ± 16.9	87.5 ± 10.5	0.875
Mean Waist-Hip Ratio	0.92 ± 0.10	0.94 ± 0.07	0.286
Gender Male: Female	25:17	24:13	0.625
Smoking	36 (85.7%)	35 (94.6%)	0.192
Dyslipidaemia	4.8 ± 1.5	5.1 ± 1.3	0.659
Hypertension	157.9 ± 8.5	160.9 ± 9.0	0.131
Diabetes	8.2 ± 4.2	7.0 ± 2.8	0.179
Cardiavascular disease	12 (28.6%)	15 (40.5%)	0.263
Mean Systolic Blood Pressure (mmHg)	158 ± 33	1678 ± 32	0.231
Mean LDL-Cholesterol (mmol/L)	3.0 ± 1.2	3.1 ± 1.2	0.801

Rankins Score of 5/5. Adverse outcomes include death, rehospitalizations for any cause or prolonged hospital/nursing home stays.

WHR was calculated as waist circumference in centimeters divided by hip circumference in centimeters. BMI (kg/m^2) was calculated as weight in kilograms (kg) divided by height square (m^2). Overweight was defined as BMI ≥ 25. We divided patients according to BMI less than 25 (Group A) and equal or greater than 25 (Group B). All patients were asked to give an informed consent before baseline and follow up.

Results were analysed using SPSS statistical analysis. Continuous variables were expressed as mean ± 1 standard deviation and calculated by T-test. Discrete variables were calculated by chi-square (χ^2) test.

RESULTS

Seventy-nine consecutive CT scan-proven stroke patients' data were analyzed. There were 70 patients with ischemic stroke and 9 patients with intracerebral bleed. The cohort comprised 49 men and 30 women. We compared them according to their BMI and also the severity of their initial disability. Tables I and II below show the final results of our study, followed by our interpretations of our research findings.

Of the 79 patients, 44 were in the low BMI group and 35 were in the high BMI group. Thirty-seven patients had severe disability when assessed within 24 hours of admission (Modified Rankin Score=5/5). During the one month follow up, 29 patients had adverse outcomes, including 11 deaths and 18 rehospitalizations or prolonged hospital/nursing home stay.

Table I shows a comparison between the stroke patients with a BMI of less than 25 and those with BMI of 25 and above. 56.8% of those with BMI<25 had severe disability compared to only 34.3% of those with BMI≥25. (P=0.046). It was statistically significant that more patients in low BMI group had severe disability. 31.8% of the low BMI group had adverse outcomes, compared to 42.9% of the high BMI group (P=0.312). The difference calculated using the χ^2 test however, was not statistically significant. There were no statistical differences between high- and low-BMI groups for gender ratio, smoking, hypertension, diabetes, prior cardiovascular disease, mean age, mean lipid profile and blood pressure.

Table II shows the comparison of the 79 patients by the severity of their initial disability. Forty-two patients had mild and moderate disability (Modified Rankin Score=1-4/5) and 37 patients had severe disability (Modified Rankin Score=5/5).

The mean age for patients with mild and moderate disability was 59.3 ± 14, while that of the patients with severe disability was 66.5 ± 12. (χ^2 P=0.018) When comparing the disability severity, 54.8% of patients from the high BMI group had mild to moderate disability whereas only 32.4% of patients with BMI ≥ 25 had severe disability following an acute stroke (P=0.046). Both age and BMI were statistically found to play a significant role in determining the degree of disability after an acute stroke. However, using multivariant analysis, only age was an independent predictor of severe disability (P<0.05).

DISCUSSION

Our findings found that fewer patients in the high BMI group had severe disability. Obesity was defined as being overweight, the cut off point being a BMI of 25 or more. Obesity protects against malnutrition and provides the necessary metabolism and nutrition to the brain in the days following the acute stroke[4]. This could have cushioned the initial disability they presented with.

The result also showed a greater number of patients in the high BMI group had adverse outcomes. Obesity can hinder mobilization and physiotherapy in the long term, thus leading to prolonged hospital stay and predispose to sepsis[5]. Therefore the high BMI group had more adverse events occurrences. However, in our final result this did not show significance statistically. This may be due to our incorporation of the data belonging to haemorrhagic stroke patients in our final data analysis. It is known that ischemic and haemorrhagic strokes have different etiology and risk factors[6]; therefore obesity may influence these two groups of stroke in a different manner. However, Song *et al* confirmed the importance of BMI (≥23 kgm^{-2}) as a risk factor for both types of stroke, exerting its effect through BP, blood glucose and cholesterol, indicating that obesity effects stroke in part through those mechanisms[7].

Regional cross country study showed that the population attributable fractions due to overweight and obesity (BMI≥25 $kg\ m^{-2}$), ranged from 0.2%-2.9% for haemorrhagic stroke mortality and 0.9%-10.2% for ischaemic stroke mortality[2].

We stated that age was an independent predictor of severe disability in our findings. In a retrospective study done by Varona *et al,* they also found that the elderly had a higher mortality and recurrent stroke rates and poorer functional recovery. They concluded long-term prognosis (over 27 years) for the ischemic stroke in the young is better than in the elderly[8]. Carmine *et al* found that young patients had more prevalence of haemorrhagic stroke, and subarachnoid hemorrhage yield the highest proportion of good recovery (60%), and intracerebral hemorrhage had the highest mortality (44%), whereas patients with cerebral infarction had the highest proportion of severe disability (47%)[9].

Obese stroke patients may have higher disability and adverse events but these patients with highest disability and worst prognosis do not make it to the hospital or into the medical wards for inclusion into this study. On the contrary, lower BMI in stroke patients were a significant risk factor for death after stroke in the Hisayama Study[10].

CONCLUSION

Obesity has been linked with poor prognosis in many conditions and can lead to higher morbidity. However, patients with high BMI are less likely to have severe disability following acute stroke but there is no difference in short-term outcomes. The results of this pilot study should be confirmed in larger prospective multicentre trial.

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