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Effect of Body Mass and Smoking on Development of Stroke In Gaza Strip: Retrospective Study

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Abstract: The aim of the present study was to elucidate the effect of Body Mass (BM) and smoking on the development of stroke in a representative retrospective design among men and women in Gaza strip (GS). **Methods:** We analyzed a data base of 200 men and women aged between 35-70 years and selected by convenience sample. Those patients have been diagnosed with stroke and history of hypertension only and the diagnosis of stroke has been confirmed with physician and computed tomography scan. Self report structure interview was used to collect data by trained interviewers in Arabic language for ease of comprehension by the patient and family. Statistical Package of Social Science (SPSS) was used to analyze the obtained data. **Results:** There was a significant difference of BM (overweight and obesity) on the development of stroke as evidence by (Chi-square test 40.6 and P value 0.000) while there was no significant difference of smoking on development of stroke as evidence by (Chi-square test .98 and P value 0.322). On the other hand, our finding revealed a significant difference of smoking on development of stroke only among male smokers after adjustment of female gender (Chi-square test 39.1 and P value 0.000). **Conclusions**: BM was associated with the development of stroke in general among men and women but smoking was associated with development of stroke among smokers' men only. Further study is recommended to identify the effect of BM in different subtypes of stroke (ischemic, thrombus and hemorrhagic). Therefore, smoking cessation and reducing body weight programs should be an important strategy for reducing the burden of stroke in GS.

Key words: BM Cigarette smoking Stroke Retrospective study.

أثر كتلة الجسم والتدخين على حدوث الجلطة الدماغية في قطاع غزة: دراسة ذات الأثر الرجعي

ملخص: هدفت هذه الدراسة إلى معرفة تأثير كل من كتلة الجسم والتدخين على حدوث الجلطة الدماغية، وشملت العينة مائتي 200 مريض مصاب بارتفاع ضغط الدم والجلطة الدماغية تتراوح أعمارهم من 35-70 سنة. وجمعت العينة من خلال المقابلة وتعبئة استبانة باستخدام منهجية الدراسة ذات الأثر الرجعي. واستخدم الباحث أساليب إحصائية منها النسب والتكرارات والاختبارات اللابرامتريه (مربع كاي) عن طريق استخدام البرنامج الإحصائي في تحليل البيانات، وقد تم استخدام مربع كاي نظراً لتوزيع البيانات على هيئة رتب ونسب مئوية، وعدم تحقق الشروط المطلوبة للاختبارات البرامتريه. وتوصلت الدراسة إلى وجود فروق ذات دلالة إحصائية بين كتلة الجسم(البدانة البسيطة والبدانة الواضحة) وحدوث الجلطة الدماغية، وأظهرت الدراسة أنه لا توجد

فروق ذات دلالة إحصائية بين التدخين وحدوث الجلطة الدماغية بين الرجال والنساء، ولكن أثبتت الدراسة أنه يوجد فروق ذات دلالة إحصائية بين التدخين وحدوث الجلطة الدماغية عند الرجال المدخنين فقط بعد ضبط متغير الجنس. وخلصت الدراسة إلى أن كتلة الجسم (البدانة البسيطة والواضحة) والتدخين عند الرجال فقط مرتبط بقوة بحدوث الجلطة الدماغية. ويوصي الباحث بإعداد برنامج تثقيفي لتوضيح مخاطر التدخين والسمنة الزائدة على حدوث الجلطة الدماغية.

Introduction

Stroke is a leading cause of death and disability all over the world. Although obesity is an established risk factor for coronary heart disease, its role as a risk factor for stroke remains controversial. According to Disability Adjusted Life Years (DALYs), cerebrovascular disease in 1990 was the sixth leading cause of DALYs, but they expected to be the fourth leading cause of DALYs in the year of 2020 after ischemic heart disease, unipolar major depression and road traffic accident. According to the 15 leading causes of death in the world, cerebrovascular disease was the second leading cause of death in 1990 and they expected to be the same cause of death in the year of 2020 after ischemic heart disease **[1].** There is a consistent evidence from published studies showing a positive relationship between body mass index (BMI) and stroke mainly for ischemic stroke **[2,3,4]**. Other study showed that BMI is a risk factor for both ischemic and hemorrhagic stroke **[5].** Whereas, Zhou M, et al (2008) indicated a strong association between high BMI and stroke mortality only among men who were overweight or obese **[6].** In addition, other studies showed that the direction and strength of association between BMI and stroke are varied according to the type of stroke and age group. The risk of ischemic stroke showed a strong and progressive linear relationship with an increase in the BMI, while the relationship was less linear for hemorrhagic stroke. The association between the risk of stroke and BMI was modified by age, with a weaker association at higher ages **[7].**

Moreover, there was a study conducted about BMI and risk of stroke mortality among a random sample of Japanese adults and showed a U-shaped association between BMI and the mortality of cerebral infarction. Participants with the highest BMI categories (BMI $\geq$ 30.0) showed a significantly highest hazard ratio for cerebral infarction. The excess risk at the lower extreme of the BMI was confined to men **[8].** On the other hand, other studies mentioned that there is no relationship exists between BMI and development of stroke **[9]** or even reported negative association **[10].** Winter Y, et al (2008) showed that there is a positive association between BMI and cerebrovascular risk which became non-significant after adjustment of physical inactivity, smoking, hypertension, and diabetes **[11].** Many studies

have been reported a significant relationship between smoking and vascular disease, but the association between cigarette smoking and increase incidence of stroke are not well understood. A study about cigarette smoking and risk of stroke and its subtypes among middle-aged Japanese men and women showed that smoking raises risks of total stroke and subarachnoid haemorrhage for both men and women and risk of stroke, either lacunar or large artery occlusive infarction for men **[12].** Another study conducted about cigarette smoking and risk of stroke in the Chinese adult population showed a positive relationship between cigarette smoking and risk of stroke **[13].** Golditz GA, et al (1998) supported a strong causal relationship between cigarette smoking and stroke among young and middle aged women **[14].** In contrast, a study conducted about ischemic stroke risk, smoking and the genetics of inflammation in a biracial population demonstrated that cigarette smoking may modulate stroke risk through a gene – environment interaction **[15].** The aim of the present study was to elucidate the effect of BM and smoking on the development of stroke in a representative retrospective design among men and women in GS.

Materials and methods

Study design: The study was questionnaire based retrospective analysis. This design is the most useful design for identifying the risk factors of disease, inexpensive, can provide analytic clues, and enables the researcher to collect needed data over a short period of time. Although retrospective design has a disadvantage of recall bias but it is useful in making a causal relationship.

Setting and study sample

All available patients who had been hospitalized in the three main governmental hospitals in GS (Shefa, Nasser, and European hospital] between June 2006 and May 2007 were screened for patients with stroke by using non-probability convenience sample. The response rate was 89%. The total number of patients was 225 patients with stroke and history of hypertension. All people who fulfilled the inclusion criteria were included in the study sample. The inclusion criteria were patients of age between 35 to 70 years old, who had been diagnosed with stroke and history of hypertension only where the diagnosis of stroke had been confirmed with computed tomography scan. Twenty five patients were excluded from the study, 10 patients who participated in the pilot study, 9 dead and 6 patients refused to participate in the study.

Data collection

The data collection tool was self reported structure interview. The questionnaire was administered by trained interviewers in the Arabic language for ease of comprehension by the patient and family. The trained interviewers received explanation and training from the researcher about the study's aim, objectives, and clarifications about the filling of the questionnaire. To ensure the validity of the instrument face and content validity were done by a panel that has appropriate experience in this field. To ensure the reliability of the instrument, a pilot study was done by using a small scale sampling test consisting of 10 patients from different locations across the three governmental hospitals in GS to have a clear idea about the length, suitability and clarity of the questionnaire. Some modifications and alterations were done after piloting and the 10 individuals were excluded from the study to prevent threatening of external validity by pre and post-test effect.

Ethical considerations

Consent form was obtained from all patients before conducting the study. An explanation was clearly provided to each patient on the goal and objectives of the study before requesting the consent form to be signed off. A Questionnaire was presented to all patients by the same way to prevent bias. The study was approved by ethical review committee. The information about patients' identity was not included with the other data and only principal investigator has access to this information. No reference to the patients' identity was made at any stage during data analysis.

Anthropometric assessment

Height (in meters) and current weight (in Kg) were used to calculate BMI [weight (kg)/height (m^2)] with a standardized data collection instrument. Body weight and obesity was classified into four classes, healthy (BMI 18.5-24.9kg/m^2) class 1, overweight (25-29.9 kg/m^2) class 11, obese (30-39.9 kg/m^2) class 111 and very obese (40-60 kg/m^2) classV1. BMI was chosen as a simple measurement of body weight in relation to height because it is in principle easier to measure at the population level than body fat.

Statistical analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS). The questionnaire was pre-coded and all data was entered and checked twice by two different investigators. Means and Standard Deviations (SD) computed for the continuous numeric variables. Advanced statistical analysis Chi-square was used to examine potential differences

between categorical variables with a significance level set at $p < .05$. Stroke was considered as dependent variables and other variables (BMI and smoking) were regarded as independent variables.

Results

This part of the study presents the results of the work carried out in GS. The study sample consists of 200 patients with stroke and history of hypertension only. Approximately 48% of the patients were treated at Sheaf hospital, 32% at European hospital and 20% at Nasser hospital. The sources of results were obtained by administered a structure questionnaire (closed ended questions). Interviewing was done to the patient and/or family, speaking with the team caring for the patients and reviewing the medical record in the department in which the patient was hospitalized. Systematic reviews of documents in the medical record in the department and emergency ward of the hospitals were made concomitantly to detect any missed patients.

Table (1): Distribution of the study population by gender

Gender	Frequency	Valid percent
Male	140	70
Female	60	30
Total	200	100.0

Table (1) showed that 70% of the study population were males and 30% were females. Approximately more than two third of the study sample were males.

Table (2): Distribution of the study population by age

Age group	Frequency	Valid percent
40-46	19	9.5
47-53	36	18.0
54-60	46	23.0
61-67	50	25.0
Over 67	49	24.5
Total	200	100.0

Table (2) showed that about 10% of the subjects were between the ages of (40-46) years, 18% between (47-53), 23% between (54-60), 25% between (61-67) and about 25% subjects over 67 years. Approximately more than two third of the subjects were over 54 years old. This result was expected because stroke mainly affects old people.

Table (3): Distribution of the study population by BMI

Classification of BMI	Frequency	Valid percent
18.5-24.9 (healthy)	48	24.0
25-29.9 (Overweight)	67	33.5
30-39.9 (Obese class)	71	35.5
40-60 (Very obese)	14	7.0
Total	200	100.0

Healthy = Class 1, Overweight = class 11, Obese = Class 111, Very obese = 1V

Body mass index was calculated as weight divided by height squared (weight (kg)/height (m^2), and the degree of obesity classified according to Framingham formula. A total 48 (24%) among the participants had healthy weight, about 34% overweight, 36% obese and 7% over obesity. This indicates that about 70% of the stroke patients' weight ranges between overweight and obese **(Table 3).**

Table (4): Distribution of the study population by smoking

Smoking	Frequency	Percent
Yes	107	53.5
No	93	46.5
Total	200	100.0

As shown in **table (4)**, the percentages of smoker patients were about 54% in comparison with about 47% nonsmoker. The study sample consist of 60 females participants and all of them were nonsmokers due to cultural reason.

Table (5): Effect of BM on the development of stroke

Stroke / BM	18.5-24.9 (Healthy)	25-29.9 (Overweight)	30-39.9 (Obese)	40-60 (Very obese)	Total
Frequency	48	67	71	14	200
Chi-squar	40.6				
P value	0.000				

Healthy = Class 1, Overweight = class 11, Obese = Class 111, Very obese = 1V

To study the effect of BM on development of stroke, nonparametric test (Chi-square) was used because our data consist merely of ranking BMI. According to **table (5),** there is a significant difference of BM for (overweight and obesity) on development of stroke as evidence by Chi-square test (40.6) and p value less than 0.05.

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Table (6): Effect of smoking on the development of stroke

Stroke / Smoking	Smoker	Non-smoker	Total
Frequency	107	93	200
Chi-square	.98		
P value	.322		

As indicated in **table (6)**, there is insignificant difference of smoking on the development of stroke as evidence by Chi-square test .98 and p value more than .05. This result was expected because about one third of our study sample were females who were not smokers due to cultural reason. Meanwhile, there was a significant difference of smoking on development of stroke (x^2= 39.1, p value = 0.000) only among male smokers after adjustment of female gender **table (7).**

Table (7): Effect of smoking on development of stroke among males after adjustment of female gender

Stroke / Smoking	Smoker	Non-smoker	Total
Frequency	107	33	140
Chi-square	39.1		
P value	0.000		

Discussion

The aim of this study was to elucidate the effect of BM and smoking on the development of stroke. The study results showed significant differences of BM {overweight (25-29.9) and obesity (30-39.9)} on development of stroke (x^2 = 40.6, p value = 0.000). This result is consistent with other studies which demonstrated a positive relationship between BMI and stroke mainly ischemic stroke **[2,3,4].** It was also reported that BMI is a risk factor for both Ischemic and hemorrhagic stroke **[5]**. Similar to our findings, strong association between high BMI (over weight or obesity) and stroke mortality among men was reported **[6]**. In contrast, Ji and his colleagues revealed that the direction and strength of association between BMI and stroke are varied according to the type of stroke and age group **[7].** Also, they mentioned that the risk of ischemic stroke showed a strong and progressive linear relationship with an increase in the BMI, while the relationship was less linear for hemorrhagic stroke. Moreover, they reported that the association between the risk of stroke and BMI was modified by age, with a weaker association at higher ages. On the other hand, our results are inconsistent

with a study showed that there is no relationship exists between BMI and development of stroke **[9]**. Also, Singh and his colleagues demonstrated that there is a negative association between BMI and development of stroke **[10]**. In addition, an inverse relationship between BMI and hemorrhagic stroke was documented **[16].** This controversial between our results and previous mentioned studies are probably due to differences in sample size, design and age of patients.

Our study found insignificance difference of smoking on development of stroke (x^2=.98 p value= 0.322). This finding is inconsistent with other study which reported that smoking raises risks of total stroke and subarachnoid haemorrhage for both men and women **[12].** Also, a positive relationship between cigarette smoking and risk of stroke was reported **[13].** On the other hand, our result is inconsistent with another study who reported that cigarette smoking may modulate stroke risk through a gene environment interaction **[15]**. On the other hand, our study found a significant difference of smoking on development of stroke among men only with adjustment of female gender. This finding is in accord with other study which reported positive relationship between cigarette smoking and risk of stroke **[13]** and inconsistent with other study which revealed that smoking raises risks of total stroke and subarachnoid haemorrhage for both men and women **[12].** This controversial between our result and others may be due to cultural aspect.

Conclusions

The study demonstrated a significant difference of BM on development of stroke among men and women and at the same time it showed a significant difference of smoking on development of stroke among male smokers only with adjustment of female gender.

Recommendations

According to the results of the study, there is an urgent need to find better ways of reducing the trend towards growing obesity in GS. A health education program is needed at primary and secondary levels to increase people knowledge and awareness about the importance of smoking cessation and weight reduction in reducing the incidence and burden of stroke in GS. In addition, other study should be done regarding the association between smoking and BM in different subtypes of stroke (ischemic, thrombus and haemorrhagic).

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