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RESEARCH ARTICLE

INCIDENCE AND RISK FACTORS PROFILE OF STROKE IN HEBRON- PALESTINE

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ABSTRACT

Background: The incidence and risk factor profile of stroke patients are known to differ for different populations. This information is important in order to address the impact of stroke. The aim of the study was to determine the incidence and risk factor profile of a Palestinian stroke sample from Hebron - Palestine.

Methods: A descriptive, case-controlled study was used to collect the data from a consecutively recruited sample of 139 first-ever stroke patients and from a randomly selected sample of 153 controls. Data were collected from medical records for the cases, as well as information collected during a community-based campaign and interviews for the controls. Data collected included age, gender, socio-economic status and risk profile. The crude incidence was calculated based on the projected population of the research setting, while the age-adjusted stroke incidence was calculated using the direct method. Logistic regression analysis was employed to investigate the stroke risk factors that might predict stroke. All the relevant ethical considerations were adhered to during the study.

Results: The mean age of the total sample was 66.39 years with median age of (69 years). The crude incidence rate was 24.48/100 000. The age-adjusted stroke incidence was 77.95/100 000. The strongest predictor of a stroke was diabetes, with an odds ratio of OR = 5.95. This was followed by hypertension; with an odds ratio of 2.069.The risk factors most associated with incidences of strokes were heart failure and diabetes. Those less likely to have a stroke were males who were younger than 60 years old

Conclusion: The age-adjusted incidence rate was less than what has been reported in a number of other developed and developing counties. Diabetes was a stronger predictor of stroke when compared to hypertension.

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INTRODUCTION

Stroke is a common cause of death and disability worldwide (Sutton *et al.,* 2010; Johnston *et al.,* 2009). Determining the incidence of stroke provides researchers with information relating to risk factors, burden of stroke and the outcomes of prevention. The incidence of stroke varies greatly between countries. These rates range from 41 per 100 000 of the population in one country to 316 per 100 000 of the population in another country, with rates varying between three to five-fold between some countries (Thrift *et al.,* 2014). Stroke incidences also differ between high, middle and low income countries (Feigin *et al.,* 2009). A stroke incidence of 27.5 to 63 per 100,000 of the population was reported in Arab countries (Benamer *et al.,* 2009). The incidence of stroke in Northern Palestine was reported as 51.4 per 100 000 (Sweileh *et al.,* 2008).

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In many studies, the following diseases were established as risk factors for strokes: large artery atherosclerosis, hypertension, diabetes mellitus, hyperlipidaemia, hypercholesterolemia, obesity, atrial fibrillation, high diastolic blood pressure and ischemic heart disease (Benamer *et al.,* 2009; Delbari *et al.,* 2011; Kotsaftis *et al.,* 2010).Three studies have investigated the risk of stroke in Palestine (Sweileh *et al.,* 2008; Baune *et al.,* 2005; Husseini *et al.,* 2009). A number of limitations exist with these studies. The study conducted by Baune *et al.,* 2004 (Baune *et al.,* 2005) only included stroke patients with hypertension; the results of the study can therefore not be generalised to other stroke patients. The limitation of the study conducted by Sweileh *et al.,* 2008 was that a control group was not included and therefore it cannotbe concluded that the risk profile was different to the rest of the population. The study conducted by Husseini *et al.,* 2009 compared known risk factors with the results of a nation-wide survey where information was not collected specifically to identify risk factors for cardiovascular disease. The current

study thus aimed to determine the incidence and riskfactors in stroke patients as compared with those of a control group in a Palestinian samplein order to assist with planning and implementation of appropriate preventative and rehabilitative interventions.

MATERIALS AND METHODS

Research Setting

The study was conducted in Hebron City which is the Southern part of Palestine. The Northern part of Palestine consists of Nablus and Jeneen. Hebron is a city with 600 364 inhabitants (Palestinian Central Bureau of Statistics, 2011). With only two general hospitals that manage stroke patients (Alia and Alahli hospital).

Design and Sample

A descriptive, case-controlled study was used to collect the data relating to the risk factors of the participants. For the cases a consecutively selected sample of 139 new, first-ever stroke patients were recruited from Alia and Alhli hospitals in Hebron (Palestine).Patients with recurrent stroke, transient ischemic attack, or any other brain anomalies or injuries, were all excluded. In the majority of cases, the diagnosis of stroke was done using radiological imaging (CT scan or MRI) at the aforementioned hospitals. The control group consisted of a community-based sample who resided in the same geographical area. These participants were recruited through mosques and local communities. Individuals above 60 years of age were invited to participate in a campaign to evaluate the prevalence of stroke risks factors, by subjective assessment and confirmed by objective testing. Approximately 350 persons were recruited for the campaign, and a random sample of 153 participants was selected to be the control sample for this study. Thus the total sample for the study consisted of 292 participants. Data was collected between 1 August 2009 and 31 July 2010. The study was approved by the University of the Western Cape and the local Ministry of Health and the medical superintendents of the two general hospitals.

Assessments and Data Collection

A data capture sheet was designed to collect data from thecase patients' medical records and from the information collected during the campaign for the controls. In addition interviews were conducted with both the controls and the cases. The data capture sheet collected information relating to the participants' age, gender, socio-economic status and risk profile (Putman *et al.,* 2010). Risk factor information was obtained from participants in the control group by subjective report, and blood tests and blood pressure measurements; height and weight variables were measured with a tape measure. The German mercury sphygmomanometer (Riestercompany) was used in the testing of the blood pressure. Cholesterol, triglycerides, blood sugar and other tests were performed at the scientific laboratories of AlqudsUniversity at Alquds Nutrition and Health Research Institute (ANHRI).

Definition of risk factors

Age was calculated by subtracting the date of birth from the date of assessment. Hypertension was defined as patients with systolic blood pressure of 140 mmHg and above, and diastolic blood pressure of 90 mmHg and above (American Heart Association, 2012) subjective reporting was confirmed with objective testing and medical records confirmation.Diabetes was defined according to the World Health Organization (WHO) diagnostic criteria for diabetes as "fasting plasma glucose ≥ 7.0mmol/l (126mg/dl) or 2–h plasma glucose ≥ 11.1mmol/l (200mg/dl)" (13).Cholesterol values were defined as follows: less than 200 mg/dlas desirable; 200 – 240 mg/dl as border high risk, and above 240 mg/dl as high risk (World Health Organization, 1999). High triglyceride was defined as: less than 150 mg/DL as desirable, and 150 – 199 mg/DL as border high risk. More than 200 mg/dl was considered high risk for coronary artery diseases (Miller *et al.,* 2010).

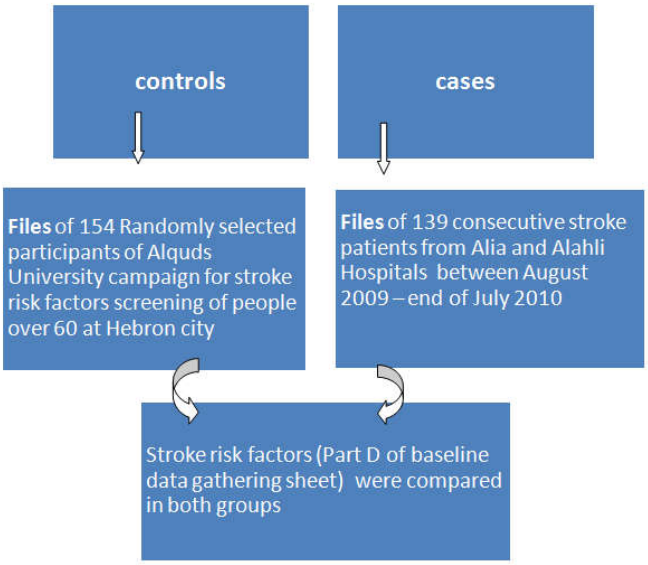

Figure 1. Process of data collection of the epidemiological study

The weight height ratio (W/Ht) was calculated to determine obesity among the patients and those in the control group. A cut off point of W/Ht≥0.5 was used to describe obesity (Browning *et al.,* 2010). The presence of cardiac diseases in the cases was determinedfrom the patients' medical records. The following types of cardiac disease were documented in the folders:atrial fibrillation, ischemic heart disease, valve pathology, cardiomyopathy and heart failure. Participants in the control group were asked if they had been diagnosed with any of the previously mentioned conditions. The presence of stress was determined by a nominal question with an answer of yes or nonparticipantsin both groups were asked if they had been subjected to a stressful event the week before the stroke. Examples of a stressful event were death of a relative or friend, fear and anxiety. Information relating to a previous transient ischemic attack, family history of stroke (first-degree relatives) and smoking, was also obtained from the participants in both groups. And was confirmed by medical records. Information about smoking habits included the average number of cigarettes smoked per day, the total number of years of smoking, and whether there had been a cessation period. Consumption of a fatty diet, which included items such as butter, white meat and animal fat products, was determined using a subjective scale of 4 points,starting from no consumption,to mild intake, moderate intakeand high intake. The amount of physical activity in which the participants were involved was determined using the number of days on which participants were physically active in a one-week period. Physical activity was referred to as continuous activity of 30 minutes in the past 7 days that increased the heart and

breathing rate (American Dietary guidelines for Americans 2005).

Data Analysis

SPSS version 17 was used for data capturing and analysis and double entry was used to prevent data entry errors. Descriptive statistics wereused to describe the demographic characteristics of the participants and the prevalence of risk factors in both groups. The crude incidence was calculated based on the projected population of Hebron Governorate mid-year of 2010,which was 600,364 (Palestinian Central Bureau of Statistics, 2011); the age-adjusted stroke incidence was calculated using the direct method as described by Ahmad *et al.,* (2000) . Multivariate analysis was performed, using logistic regression, to investigate the stroke risk factors that might predict strokes. This logistic regression analysis included all the abovementioned risks as potential risks (predictors) of stroke.

RESULTS

Socio-demographic data

The mean age of the total sample was 66.39 years, with the mean age for the cases being 67.64 years (SD=11.74), and a median age of 69. For the control group mean age was 65.26 years (SD=7.9) and a median age of (64), with amean difference of 2.37 years between the two groups. 56.2 % of the sample were males, and 43.8% were females (Table 1).

Table1. participant's demographics

Group	Median age	Mean Age	Std.	Gender	n	Percent	Total n
Control	64	65.3	7.9	Male	109.0	71.2	153.0
				Female	44.0	28.8	
Stroke	69	67.6	11.7	Male	55.0	39.6	139.0
				Female	84.0	60.4	

Incidence

One hundred and forty seven new stroke cases were reported over a one year period (August 2009 – July 2010), of which 139 patients agreed to participate in the study. The crude incidence rate per 100 000 can thus be postulated to be 24.48/100 000. The age-adjusted stroke incidence was 77.95/100 000.

Risk factors prevalence in cases and controls

The study found that the five most common risk factors for the cases were hypertension (77.7%), obesity (71.2%), diabetes (69.10%), a diet high in the consumption of fattyfoods (56.8) and a stressful event (49.6%). However, between the two groups, hypertension led the risk factors for the cases and hypercholesterolemiawas more prevalent in the control group. (See table 2). Risk factors were ordered according to their strength of association with the stroke incidence (based on their highest Odds Ratio) (see table3). From the table below it can be seen that the risk factors most strongly associated with stroke were heart failure (OR = 11.738), diabetes (OR = 6.939), atrial fibrillation (OR = 5.853), physical inactivity (5.80), stress (OR = 3.584), hypertension (OR = 2.974), ischemic heart disease (OR = 2.264), consumption of fatty foods (OR = 2.07) and obesity (OR = 1.686). A statistically significant difference in the mean average of cigarettes smoked per day was also found between cases and control (22.68 vs. 15.17, respectively), t= 1.933 (p = 0.03).

Table 2. Stroke risk factor prevalence (%) in stroke and control groups (n=139)

Risk	Case (%)	Control (%)	Mean Dif. (%)
Hypertension	77.70	53.90	23.8
Obesity	71.2	59.5	11.7
Diabetes	69.10	24.30	44.8
Consumption of fatty diet	56.8	38.8	18
Stress	49.60	21.60	28
Hypercholesterolemia	44.00	51.00	-7.00
Family history of stroke	41.70	35.90	5.8
Triglycerides	40.90	42.50	-1.60
Physical inactivity	37.4	10.5	26.9
History of TIA	24.50	42.50	-18.00
Quit smoking	15.15	30.90	-15.75
Ischemic heart disease	13.7	6.5	7.2
Current smoking	13.70	17.60	-3.90
Cardiomyopathy	7.9	14.4	-6.5
Heart failure	7.2	0.7	6.5
Atrial fibrillation	7.2	1.3	5.9
Cardiac valves pathology	3.6	2.0	1.6

Table 3. Stroke risk factors with statistically significant positive association with stroke (n=139)

Risk	OR	CI	X2	P
Heart failure	11.783	1.488 - 93.282	8.595	.003
Diabetes	6.939	4.141-11.629	58.519	0.000
Atrial fibrillation	5.853	1.259 – 27.199	6.405	.011
Stress	3.584	2.155- 5.962	25.251	0.000
Physical inactivity	5.800	2.729-9.459	29.303	0.000
Hypertension	2.974	1.784 - 4.958	18.073	0.000
Ischemic heart disease	2.264	1.014- 5.055	4.143	.042
Consumption of fatty diet	2.070	1.300 - 3.314	9.454	0.002
Obesity	1.686	1.034-2.749	4.221	0.036

Table 4. Logistic regression model (predictors of stroke)

				95% C.I. for Exp(B)	
Predictors of stroke	B	P	Exp(B)	Lower	Upper
Diabetes	1.784	0	5.956	3.094	11.464
Hypertension	0.727	0.036	2.069	1.048	4.083
Inactivity	0.715	0.048	2.043	1.005	4.153
Consumption of a fatty diet	0.822	0.018	2.276	1.155	4.486
Stress	1.097	0.002	2.995	1.482	6.051
Age under 60	-0.727	0.039	0.483	0.243	0.963
Male gender	-1.262	0.003	0.283	0.124	0.647

However, the only risk factors that had a statistically negative significant association (their presence decreased the incidence of stroke) was previous smokers who had ceased smoking. Using multivariate logistic regression, the variables that were included in the model were age and gender and the statistically significant associated factors as determined in the bivariate analysis. The best logistic multivariate model was achieved (X^2 = 7.621) with a significance of p = 0.471 in the Hosmer-Lemeshow test of goodness of fit of the model. From the logistic regression (Table 4) it can be seen that the strongest predictor of a stroke was diabetes, with diabetics being approximately six times more likely to develop a stroke compared to non-diabetics (OR = 5.95). This was followed by hypertension, which caused hypertensive people to be twice as likely to develop a stroke compared to non-hypertensive people (OR = 2.069). Physically inactive people were twice as likely to develop a stroke compared to physically active people

(OR = 2.043) and a recent stressful event doubled the likelihood of developing a stroke compared to non-stressed people (OR = 2.995). Predictors of a lower possibility of developing a stroke included age category: people under 60 had a 50% (OR= 0.483) decreased likelihood toof developing a stroke compared to people over 60. Previous TIA (OR= 0.295) was responsible for a 20% decrease in the possibility of developing a stroke compared to TIA history-free patients. Finally, malesreflected approximately a 28% less likelihood of developing a stroke (OR= 0.282) than females.

DISCUSSION

The aim of the study was to determine the incidence of stroke in a selected Palestinian community. In addition the study aimed to determine the risk factor profile of Palestinian stroke patientswhen compared to a control group from a similar community. The increased percentage of females in the smaple, may be attributed to the prevelence of more eisk factors in them , One of the reasons behind this difference of percentage of females compared to males might be that the females had higher scores on other factors. They were one year older than males, they had a 20 cm higher waist circumference than males, 9% more cardiac diseases, higher DM and HTN. The crude incidence of 24/100 000, as found in the current study, is less than what has been reported in a number of other developed and developing countries. The crude incidence found in the current study was closest to that of other Arab countries (Benamer, 2009) but was lower than what was reported for a Northern Palestinian sample (Sweileh *et al.,* 2008), this difference may be due to the presence of 13% more hypertension and 27% mor DM in hebron than in nablus, in addition the geographical and period difference between the two studies, that may have affected the diference in incidence. When the age-adjusted incidence is considered the findings are, however, different. The age-adjusted incidence is higher than what was reported for other Arab countries, Tanzania and Northern Palestinian samples. Age-adjusted-prevalence is a more reliable and accurate calculation of incidence as it takes into accountthe age distribution of the population being considered. The difference between the crude incidence and age-adjusted incidence results for the current population is highlighted by the average age of the population. The Palestinian population is young with only 4.29% being older than 60 years;thus the crude incidence will be low as the incidence of stroke is higher in peopleolder than 60 (Palestinian Central Bureau of Statistics, 2011). In the preceding results data relating to the risk factor profile were determinedin three different ways. Firstly, the percentage of prevalent risk factors wasdetermined. The researchers then determined the strongest associated risk in terms of odd ratio magnitude, based on bivariate analysis, and lastly the risk factors predicting stroke in the study sample were determined using a multiple regression analysis.

The most common risk factors in the case group were hypertension, obesity, diabetes, high consumption of a high fatty diet, history of stress, high cholesterol levels, family history of stroke, high intake of triglycerides, physical inactivity and history of previous TIA .The strongest associated risk in terms of odd ratio magnitude, based on the bivariate analysis, was, in order of priority: heart failure, diabetes, atrial fibrillation, physical inactivity, stress, hypertension, current amount of cigarettes smoked before the stroke, consumption of a fatty diet, ischemic heart disease, and obesity. Following the regression analysis only diabetes, hypertension, inactivity, consuming a fatty diet and stress were found to be predictors of stroke in the cases. Age<60 years and TIA were found to be negatively associated with occurrence of stroke in the current population. There was a significant difference in the prevalence of diabetes, which was diagnosed in almost 70% of the cases, compared to less than 25% of the controls. In the current study, diabetes is third after obesity and hypertension on the list of most common risks and is a number one risk in the multivariate risks analysis model. Given that the participants reported a high consumption of fatty diet, obesity and decreased engagement in physical activity, might have contributed to the high percentage of participants with diabetes. Kahn, Hull, and Utzschneider (2006) (Kahn *et al.,* 2006) highlighted that obesity and increased BMI is a major contributor to stroke incidence through its relation with the development of type 2 diabetes. These findings strongly support the results that consider diabetes as an equivalent risk to cardiovascular disease (Ottenbacher *et al.,* 2004). A limitation of the current study was, however, that it did not differentiate between the two types of diabetes in terms of risk-information that could have contributed to a better understanding of the actual relationship between stroke incidence and the subtype of diabetes (Alajbegovic *et al.,* 2009).

Hypertension was found to be the second strongest predictor of a stroke in the multivariate analysis, with a prevalence of nearly 80% for the stroke patients compared to nearly 54% of the controls. Although this seems to be a high prevalence in both groups, the fact that both populations were elderly people whose average age was 66.4 years must be considered. The findings of the current study are consistent with Suzuki *et al.* (2011) and Takahashi *et al.* (2011) which both proposed hypertension as a significant risk factor for stroke. Consumption of a fatty diet was found to be the third strongest predictor of stroke in the current study. This finding was expected, as the type of food consumed by the population in the current setting includes the use of animal fat oil when cooking, and butter and milk products are part of the daily menu of the Palestinian rural community. These are often home-made products from the family's goats, sheep or cows. Consumption of fatty foods was higher in the cases than in the controls (56.8% vs. 38.8) respectively. Prevalence of a fatty diet was high in both control and stroke groups , although the control group had higher cholesterol and triglyceride results despite their lower use of a fatty diet. The whole community should therefore be made aware of the risk of cardiovascular diseases that could predispose them to strokes.

Physical inactivity was found to be the fourth strongest predictor of strokes in the multivariate analysis of stroke risks. In the control group only 11 participants, compared to 37 in the case group, were inactive for seven days of the week, making it the fourth strongest risk in terms of strength of association with stroke incidence in the bivariate OR analysis (OR= 5.80), and the ninth on the list of most prevalent risk factors. These findings regarding the difference in physical activity between the groups support the results of other studies in the literature about the importance of physical activity as a preventative measure against the incidence of stroke (Blair and Sierverdes, 2010; Diep *et al.,* 2010; Goldstein *et al.,* 2010). Phsical inactivity contributes to the obesity is also leading to further stroke risks (Goran *et al.,* 1999). The most interesting finding was the statistically significant difference in the number of

cigarettes currently smoked by cases and controls, which was 23 for the case group and 16 for the control group. At the same time, the median number of cigarettes smoked by the case group was more by 4.5 cigarettes. It seems that being a current smoker did not significantly increase the odds of developing a stroke, nor did the total years of smoking. What significanlty increased the odds of a stroke incidence was the intensity of current smoking. The results found in this study support the bulk of the literature in this field, which has highlighted the cigarete smoking – dose-associated risk of stroke (Kelly *et al.,* 2008; Mannami *et al.,* 2004; Wolf *et al.,* 1988; Shinton and Beevers, 1989). Alcohol consumption was not found to be significant in either the case or control groups, which indicates the risk profile difference in terms of cultural and religious variations in Palestine. Alcohol was considered a risk for haemorrhagic strokes for heavy consumers (Daniel and Bereczki, 2004). Alcohol was irrelevant to the sample of this study. Even those who might drink alcohol would consume very low amounts and most likely, would not report it in a highly conservative Muslim community. The current study identified three factors that were associated with a lower risk for strokes, namely previous transient ischemic attacks (TIA), being younger than 60 years old, and being a male. The last two predictors were not surprising, as being female has been associated with a higher risk for strokes than being male (Appelros *et al.,* 2003) and older age (Béjot *et al.,* 2010), has been associated with a greater risk of stroke in the literature in most of the studies. TIA was not found to be a predictor of strokes, as there was more history of TIA in the control group than in the case group in the current study. This is in contrast with what was previously stated that those patients who sustained TIA had an increased risk of developing a stroke (Gladstone *et al.,* 2004; Wu *et al.,* 2007). The method of capturing the data relating to TIA could have influenced the results of the current finding. This finding should therefore be confirmed by objective testing. As previous TIA patients may have much more motivation to participate in risk assessment campaign than people without history of TIA (which may have increased their percentage in the control, and also they still are candidates for future stroke, this why it is advised to make a 5 years follow up to see how many of this sample have already had a stroke.

In conclusion, when calculating the levels of risk factors for strokes in a priority list, the multivariate analysis of priority of stroke predictors seems to be the most qualified basis for a future intended preventative plan or health promotion campaign to decrease the incidence of stroke in Southern Palestine. As the strength of association and contribution of a given risk is always relative to other risk factors where gender, age and other coexisting comorbidities might all be present, it is likely to be the complex of multidimensional interaction between the pool of risk factors and personal socio-economic variables that could be the most accurate predictive factors for stroke. Becausethe risk priorities vary between different types of analysis, namely univariate analysis (% of prevalence of risks), bivariate (Odds Ratios), and multivariate analysis (logistic regression), this would mean that ifthe priorities of a preventative plan are based on bivariate analysis it could be inaccurate. This is the main criticism of many studies that have made stroke prevention recommendations on the basis of univariate and bivariate analysis. Although the crude incidence was lower than what is found in other countries, the age-adjusted incidence was higher.The risk factors most associated with incidences of strokes were heart failure and diabetes. Those less likely to have a stroke were males who were younger than 60 years old, with a history of Transient Ischemic Attack (TIA).

Limitation of the study

The Authors of this study identified declares some limitations that is highly recommended to be identified in further research studies, part of these limitations are the better match of controls to the cases, in terms of gender and age distribution, and the possibility of concurrent controls, which will lead to a better results in further studies.

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Authors Contribution

The article was developed from AA PhD thesis. AR, JF and ZA all acted as thesis supervisors at some stage during the thesis development. Therefore providing input into the development of the thesis at different stages. LA provided input into the data analysis and finalization of the thesis. All the authors also commented on the drafting and finalization of the paper. There was no external funding for this research beyond the personal expenses that was covered by the Authors.

Conflict of interest

There are no known conflicts of interest.

REFERENCES

Ahmad O, Boschi-Pinto C, Lopez A, Murray C, Lozano R, Inoue M. 2000. Age standardization of rates: a new WHO standard. In GPE Discussion Paper Series: no31. World Health Organization.

Alajbegovic S, Alajbegovic A, Resic H. 2009. Diabetes mellitus as a risk factor for stroke at the neurology clinic of clinical center of sarajevo university. *Health Med.,* 3(3):286-291.

American Dietary guidelines for Americans 2005. http://www.health.gov/dietaryguidelines/dga2005/document/html/chapter4.htm:.http://www.health.gov/dietaryguidelines/dga2005/document/html/chapter4.htm.

American Heart Association, 2011. American Heart Association, 2012. risk factors of stroke. http://www.heart.org/HEARTORG/General/Risk-Factors_UCM_319118_Article.jsp

Appelros P, Nydevik I, Viitanen M. 2003. Poor outcome after first-ever stroke: Predictors for death, dependency, and recurrent stroke within the first year. Stroke (00392499), 34(1):122-126.

Baune B, Aljeesh Y, Bender R. 2005. Factors of non-compliance with the therapeutic regimen among hypertensive men and women: A case-control study to investigate risk factors of stroke. *Eur J Epidemiol.,* 20(5):411-419.

Béjot Y, Rouaud O, Jacquin A, Osseby G, Durier J, Manckoundia P, et al. 2010. Stroke in the very old: Incidence, risk factors, clinical features, outcomes and access to resources – A 22-year population-based study. *Cerebro Dis.,* 29(2):111-121.

Benamer HTS, Grosset D. 2009. Stroke in Arab countries: A systematic literature review. *J Neuro Sci.,* 284(1-2): 18-23.

Blair SN, Sierverdes JC. 2010. Active voice: Physical activity reduces stroke risk: Research bolsters EIM. Sports Medicine Bulletin, 1-1.

Browning LM, Hsieh SD, Ashwell M. 2010. A systematic review of waist-to-height ratio as a screening tool for the prediction of cardiovascular disease and diabetes: 0•5 could be a suitable global boundary value. *Nutr Res Rev.,* 23(2):247-69.

Daniel S, Bereczki D. Alcohol as a risk factor for hemorrhagic stroke. Ideggyogy Sz., 57(7-8):247-256.

Delbari A, Roghani RS, Tabatabaei SS, Rahgozard M, Lokk J. 2000. Stroke epidemiology and one-month fatality among an urban population in Iran. Int J Stroke 2011; 6: 195.

Diep L, Kwagyan J, Kurantsin-Mills J, Weir R, Jayam-Trouth A. 2010. Association of physical activity level and stroke outcomes in men and women: A meta-analysis. *J Womens Health,* 19(10):1815-1822.

Feigin V, Lawes CMM, Bennett DA, Barker-Collo SL, Parag V. Feigin V, Lawes CMM, Bennett DA, Barker-Collo SL, Parag V. 2009. Worldwide stroke incidence and early case fatality reported in 56 population-based studies: A systematic review. *Lancet Neurol.,* 8:335–69.

Gladstone DJ, Kapral MK, Fang J, Laupacis A,Tu JV. 2004. Management and outcomes of transient ischemic attacks in Ontario. *CMAJ*, 170(7):1099-1104.

Goldstein LB. 2010. Physical activity and the risk of stroke. *Expert Rev Neurother,* 10(8):1263-1265.

Goran M, Reynolds K, Lindquist C. 1999. Role of physical activity in the prevention of obesity in children. *Int J Obes Relat Metab Disord.,* 23(3):S18-33.

Husseini A, Abu-Rmeileh NM, Mikki N, Ramahi TM, Ghosh HA, Barghuthi N, et al. 2009. Cardiovascular diseases, diabetes mellitus, and cancer in the occupied Palestinian territory. *The Lancet.,* 373(9668):1041-1049.

Johnston SC, Mendis S, Mathers CD. 2009. Global variation in stroke burden and mortality: estimates from monitoring, surveillance, and modelling. *Lancet Neurol,* 8:345–54.

Kahn , S. E., Hull, R. L. and Utzschneider, K. M. 2006. Mechanisms linking obesity to insulin resistance and type 2 diabetes. *Nature*, 444(7121), 840-846. doi:10.1038/nature 05482

Kelly TN, Gu D, Chen J, Huang J, Chen J, Duan X, et al. 2008. Cigarette smoking and risk of stroke in the Chinese adult population. *Stroke*, 39(6):1688-1693.

Kotsaftis P, Ntaios G, Savopoulos C, Kiparoglou R, Agapakis D, Baltatzi M, et al. 2010. Trend in incidence of cardiovascular risk factors in elderly and over-aged stroke patients between 2003 and 2007 in Greece. *Arch Gerontol Geriatr.,* 50(3): e31-e35.

Mannami T, Iso H, Baba S, Sasaki S, Okada K, Konishi M, et al. 2004. Cigarette smoking and risk of stroke and its subtypes among middle-aged Japanese men and women: The JPHC study cohort I. Stroke., 35(6):1248-1253.

Miller EL, Murray L, Richards L, Zorowitz RD, Bakas T, Clark P, et al. 2010. Comprehensive overview of nursing and interdisciplinary rehabilitation care of the stroke patient. *Stroke*., 41(10): 2402-2448.

Ottenbacher KJ, Ostir GV, Peek MK, Markides KS. 2004. Diabetes mellitus as a risk factor for stroke incidence and mortality in MexicanAmerican older adults. Journals of Gerontology Series A: *Biological Sciences & Medical Sciences,* 59A(6):640-645.

Palestinian Central Bureau of Statistics [PCBS], 2011. Projected Mid -Year Population for Hebron Governorate by Locality,. http://atlas.pcbs.gov.ps/Atlas_Update_10/ Population/Pop_Hebron_pop10

Putman K, Horn S, Smout R, Dejong G, Deutscher D, Tian W, Hsieh CH. 2010. Racial disparities in stroke functional outcomes upon discharge from inpatient rehabilitation facilities. *Disabil Rehabil.,* 32(19): 1604-1611.

Shinton R, Beevers G. 1989. Meta-analysis of relation between cigarette smoking and stroke. *BMJ*, 298:789–794.

Sutton CJ, Mardens J, Watkins CL, Leathly MJ, Dey P. 2010. Changing stroke mortality trends in middle-aged people: An age-period-cohort analysis of routine mortality data in persons aged 40 to 69 in England. *J Epidemiol Community Health,* 64(6):14-4.

Suzuki K, Izumi M, Sakamoto T, Hayashi M. 2011. Blood pressure and total cholesterol level are critical risks especially for hemorrhagic stroke in Akita, Japan. *Cerebro Dis.,* 31(1):100-106.

Sweileh WM, Sawalha AF, Al-Aqad SM, Zyoud SH, Al-Jabi SW. 2008. The epidemiology of stroke in northern Palestine: A 1-year, hospital-based study. *J Stroke Cerebrovasc Dis.,* 17(6): 406-411.

Takahashi I, Geyer SM, Nishi N, Ohshita T, Takahashi T, Akahoshi M, et al. 2011. Lifetime risk of stroke and impact of hypertension: Estimates from the adult health study in hiroshima and nagasaki. *Hypertens Res.,* 34(5):649-654.

Thrift AG, Cadilhac DA, Thayabaranathan T, et al., 2014. Global Statistics. *Int J Stroke.,* 9:6-18.

Wolf PA, D'Agostino RB, Kannel WB, Bonita R, Belanger AJ. 1988. Cigarette Smoking as a Risk Factor for Stroke: The Framingham Study. *JAMA*, 259(7):1025-1029

World Health Organization, 1999. Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications: Report of a WHO Consultation. Part 1. Diagnosis and Classification of Diabetes Mellitus. Geneva, World Health Org.

Wu CM, McLaughlin K, Lorenzetti DL, Hill MD, Manns BJ, Ghali WA. 2007. Early risk of stroke after transient ischemic attack: a systematic review and meta-analysis. *Arch Intern Med.,* 167(22):2417-22.

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