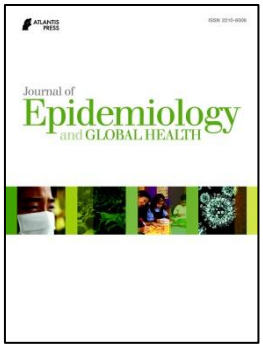

ATLANTIS PRESS

Journal of Epidemiology and Global Health

ISSN (Online): 2210-6014 **ISSN (Print): 2210-6006**
Journal Home Page: https://www.atlantis-press.com/journals/jegh

Prevalence of Lebanese stroke survivors: A comparative pilot study

Nathalie Lahoud, Pascale Salameh, Nadine Saleh, Hassan Hosseini

To cite this article: Nathalie Lahoud, Pascale Salameh, Nadine Saleh, Hassan Hosseini (2016) Prevalence of Lebanese stroke survivors: A comparative pilot study, Journal of Epidemiology and Global Health 6:3, 169–176, DOI:

https://doi.org/10.1016/j.jegh.2015.10.001

To link to this article: https://doi.org/10.1016/j.jegh.2015.10.001

Published online: 23 April 2019

Journal of Epidemiology and Global Health (2016) 6, 169–176

HOSTED BY

ELSEVIER

http:// www.elsevier.com/locate/jegh

Prevalence of Lebanese stroke survivors: A comparative pilot study

Nathalie Lahoud [a,b,*], Pascale Salameh [c], Nadine Saleh [d], Hassan Hosseini [a,e]

[a] Excitabilité Nerveuse et Thérapeutique, EA 4391, Université Paris Est, Créteil, France
[b] Lebanese University, Doctoral School of Sciences and Technology, Hadath, Lebanon
[c] Lebanese American University, School of Pharmacy, Byblos, Lebanon
[d] Faculty of Public Health, Lebanese University, Fanar, Lebanon
[e] Henri Mondor Hospital, AP-HP, Paris, France

Received 29 September 2015; accepted 8 October 2015
Available online 24 October 2015

KEYWORDS
Stroke;
Prevalence;
Epidemiology;
Lebanon;
Arab countries

Abstract Stroke is a leading cause of morbidity and mortality worldwide and its late burden has mainly been attributable to developing countries. Lebanon is one of these countries where epidemiological studies on stroke burden are scarce but necessary. Thus, the present study was conducted to assess the prevalence of stroke survivors among Lebanese inhabitants. A cross-sectional survey was carried out using randomly selected landline phone numbers on all governorates to retrieve data on stroke survivors and their sociodemographic characteristics. Results were then standardized over the Lebanese and the World Health Organization (WHO) world populations. A total of 6963 Lebanese inhabitants were included in the study; among these were 56 stroke survivors. This led to an adjusted stroke prevalence of 0.50% [95% confidence interval (CI) = 0.33—0.66%] and a world-standardized prevalence of 0.60% (95% CI = 0.42—0.78%). A significantly higher stroke prevalence was found among older age groups and more socioeconomically privileged areas. Overall, the study showed a relatively higher prevalence of stroke in this sample of Lebanese inhabitants when compared to other developing countries. However, larger community-based studies with a clinical assessment of stroke cases are needed to confirm our findings.

1. Introduction

Stroke is the second leading cause of death [1] and the third leading cause of disability-adjusted life

* Corresponding author at: Gebran Taouk Building 56, Maguy El Hajj Street, Bauchrieh 1203, Lebanon.
E-mail address: nathalie.lahoud@hotmail.com (N. Lahoud).

http://dx.doi.org/10.1016/j.jegh.2015.10.001
2210-6006/

years worldwide [2]. In fact, 5.9 million deaths and 102.2 million disability-adjusted life years, lost throughout the world, were attributable to stroke in 2010 [3,4].

However, classification of causes of death and disability differs between high and low to middle-income countries (HICs and LMICs, respectively) [5], and changes dramatically over decades [1]. Studies have shown that stroke incidence in HICs has been always elevated compared with LMICs [6] until the past few decades, where incidence in LMICs has exceeded that of HICs by 20% [6,7]. These trends in incidence rates are accompanied by similar trends in mortality rates [6]. The expected effect of these changes, from 1990 to 2020, is an increase in stroke prevalence by 120—137% in LMICs compared to an increase of 30—60% in HICs [8].

Incidence and mortality rates of stroke are mainly affected by the prevalence of behavioral cardiovascular risk factors [9] and by the advances in its early diagnosis and management [8]. However, these factors are influenced by socioeconomic considerations (education, income, occupation) [10], which explains the difference in the epidemiology of stroke between countries of different incomes.

The Arab world is a region of 22 countries with wide socioeconomic disparities and unequal distribution of wealth, science, and technology [11,12], where trends of stroke are not precisely established [13]. However, many estimates about noncommunicable diseases (NCDs) exist mainly from studies conducted in HICs, such as Bahrain, Kuwait, and Saudi Arabia [13,14]. In 2008, 60% of all deaths in the region were attributable to NCDs, with large variations between countries: 27% in Somalia, an LIC, to 84% in Oman, an HIC [13]. Despite this, stroke is classified among the top five causes of death in all countries [12]. Furthermore, we find a high prevalence of physical inactivity (may reach 90% among women), smoking (38% in Lebanon), obesity (40% in the Arab Gulf countries), and diabetes (20% in the Arab Gulf countries) among Arab populations [15—18].

Lebanon is an Arab country of the Middle East region classified among LMICs, based on the 2008—2012 World Bank's country classification and the World Health Organization (WHO) classification, where available studies on NCDs have shown a high prevalence of cardiovascular risk factors (obesity 26% [19], diabetes 14% [20], and hypertension 36% [21]). Moreover, stroke is assumed to be the second leading cause of death in the country.

However, studies focusing on overall stroke prevalence or incidence rates are scarce among all Arab countries [14]. Thus, we conducted a pilot study to assess the prevalence of stroke survivors in Lebanon and provide a reliable set of data on stroke epidemiology for subsequent studies and analyses.

2. Materials and methods

We performed a cross-sectional study between January and March 2012 to detect persons living with a history of stroke (stroke survivors) among Lebanese inhabitants. We adopted a multistage sampling. First, we calculated the sample size needed to obtain a 95% confidence level. For this purpose, community-based studies from Arab countries were examined to fix the minimum expected stroke prevalence (0.2%; CI width = 0.2%) [22,23]. A total of 7600 participants were needed. Then, we examined the 2005 distribution of the Lebanese population among governorates and districts to establish our sample in a more or less proportionate way (see Table 1). A list of landline phone numbers of all households, provided by the government, was obtained to randomly select the households' sample among each governorate. Then, all members of the household were included in the study. We assumed that on average, four persons are found in each household. Thus, a total of 2000 calls were performed, allowing for a 10% nonresponse rate, which later resulted in 1779 answers more or less adequately distributed on all governorates.

After including all members of the household in the study, we obtained a total sample of 6963 participants. The interviewer explained the study objectives to the respondent, who was kept anonymous. After giving his oral consent, the respondent was asked a number of questions within 10 min. The questionnaire had two major sections; one related to sociodemographics, and one related to stroke identification. Each respondent was first asked about the number, sex, and age of inhabitants in his household and the number of rooms in the household (to later calculate the crowding index which is the number of persons per room, usually related to the socioeconomic status) [19].

Stroke cases were then identified with the question that raises the existence, among the house inhabitants, of a person having a history of ''*Jalta Dimaghiya*'' diagnosed by a physician (we asked 'Have you ever been told by a physician that you suffered a stroke?'). ''*Jalta Dimaghiya*'' is the Arabic synonym of stroke and the most familiar and specific term for the disease in Lebanon.

Table 1 The sample distribution between governorates compared to the 2005 Lebanese population distribution.

Lebanese governorates[a]	2005 estimates[b] (n = 4,589,482)	Study households (n = 1779)	Study sample (n = 6963)
Mount Lebanon	1,683,964 (36.7)	622 (35)	2363 (33.9)
Beirut	583,287 (12.7)	496 (28)	1850 (26.6)
North Lebanon	998,187 (21.8)	256 (14)	1156 (16.6)
South Lebanon	709,561 (15.5)	203 (12)	753 (10.8)
Bekaa	595,132 (13)	202 (11)	841 (12.1)
Mount Lebanon districts	2005 estimates (n = 1,683,964)	Study households (n = 622)	Study sample (n = 2363)
Baabda	549,007 (32.6)	238 (38.2)	908 (38.4)
Metn	548,791 (32.6)	222 (35.7)	838 (35.5)
Chouf	176,849 (10.5)	9 (1.5)	39 (1.7)
Aley	146,393 (8.7)	9 (1.5)	37 (1.6)
Keserwan	186,955 (11.1)	101 (16.2)	362 (15.3)
Jbeil	95,330 (5.7)	43 (6.9)	170 (7.2)

[a] Lebanon is divided into five governorates, with Mount Lebanon being the largest one. Population size is provided in numbers n (percentages).
[b] The 2005 Lebanese population distribution by governorates and districts provided by the United Nations and the Lebanese ministry of social affairs.

Then, we followed the WHO criteria for the definition of stroke to eliminate false positive responses: stroke is defined as ''rapidly developing clinical signs of focal (or global) disturbance of cerebral functions, lasting more than 24 h or leading to death (not in our study), with no apparent cause other than that of vascular origin'' [24]. For that, when a case was found, the interviewer asked for the acute symptoms that occurred and led to the ultimate diagnosis of stroke by a physician, especially face, arms, and speech signs. At the end, the list of medications administered for the stroke patient was requested to further confirm the case.

Interviews were done in the presence of two interviewers (a pharmacist and a nurse) to better ensure the quality of the interview. Data entry was performed by two persons unaware of the study objectives. A total of 50 questionnaires were checked for errors by a third person and the error rate was <1%; thus, the entry was considered adequate.

Statistical analysis was performed using SPSS software, V. 18.0. A weighting was performed according to the number of inhabitants by age group and sex in each governorate, as described by the official 2005 estimates (local age-standardization), to obtain representative results of the Lebanese population. We also performed an age standardization to the WHO standard world population estimates for 2000–2025 [25] to allow comparisons with other countries.

Stroke prevalence was calculated representing the number of stroke survivors at the time of data collection over the total number of the sample. Estimates of stroke prevalence were also calculated for each governorate for comparative purposes. Proportions were compared using Pearson's Chi-square test, with further standardized residuals' two-by-two comparisons. Means were compared using the analysis of variance (ANOVA) test with Bonferroni correction on *post hoc* tests. A p value <0.05 was deemed statistically significant.

The study was conducted for observational purposes with no participants' traceability. Thus, no ethical approval was found to be necessary by the Lebanese University ethics committee.

3. Results

Among the 6963 inhabitants included in the study (mean age 36.8 ± 21.2 years; 48.6% males), 56 persons had suffered a stroke, which provided a crude prevalence of 0.80% (95% CI = 0.60–1.00%). Adjusted prevalence decreased to 0.50% (95% CI = 0.33–0.66%) and 0.60% (95% CI = 0.42–0.78%) after standardization to the local and world populations, respectively. Stroke patients had a mean age of 63.2 ± 15.8 years and 21 (60%) were males. Among those aged >40 years, adjusted stroke prevalence was 1.83% (95% CI = 1.20–2.46%).

Most commonly reported stroke symptoms were sudden headache (40%), facial weakness (40%), and arm weakness (37%).

No significant difference was found for stroke prevalence between males and females (p = 0.21). Significant differences were found among age

groups and governorates, stroke prevalence being significantly lower in ''North Lebanon'' [0.13% (95% CI = 0.05—0.31%) vs. 0.61% (95% CI = 0.40—0.82%) in all other governorates; $p = 0.021$]. Moreover, stroke prevalence was significantly higher among less crowded households (crowding index ⩽1 vs. >1, 0.64% vs. 0.28%; $p = 0.025$). When examining ''North Lebanon'' characteristics, population mean age was significantly lower compared to all other governorates (26.2 ± 19.7 vs. 29.5 ± 20.3 years; $p = 0.000$). Furthermore, the mean crowding index was significantly higher in ''North Lebanon'' vs. other governorates (1.7 ± 0.9 vs. 1.2 ± 0.6; $p = 0.000$).

More details among subgroups are provided in Table 2.

The age- and sex-specific prevalence estimates of stroke in the 10-year age groups are shown in Table 3. In general, the prevalence increased with age for both males and females with a prevalence reaching 9.38% (95% CI = 2.24—16.52%) in the group aged 80 years and older. No stroke cases were found among males aged <50 years whereas six female cases were found ($p < 0.05$). There was also a significant sex difference in the age group (60—69) years, where stroke prevalence was higher among males than females (3.53 vs. 0.56%; $p = 0.039$).

4. Discussion

According to our findings, age-adjusted prevalence of stroke survivors among a sample of Lebanese inhabitants on March 31, 2012 was estimated to be 0.50% (95% CI = 0.33—0.66%) and 0.60% (95% CI = 0.42—0.78%) for the local population and the WHO world population standardizations, respectively. However, epidemiological inference to the Lebanese population may be difficult to obtain in our study settings, although results were age- and sex-standardized, due to our data collection method and the relatively small sample size. In fact, our sample was chosen among Lebanese inhabitants that possess a landline phone number. This group may be of a relatively higher socioeconomic status or include more aged participants. Moreover, telephone interviews may have slightly underestimated the real prevalence in the country. However, many studies have shown that telephone interviews have a high validity and reliability when compared to face to face interviews [26,27] and that there is a moderate to substantial agreement

Table 2 Stroke prevalence (weighted results).

Study sample	Population *n* (%)	Stroke patients *n* (%)	*p*[a]
Overall Mean age (y) 28.8 ± 20.2 Males 49.4%	6963	35 (0.50)	
Sex			0.210
Males	3442 (49.4)	21 (0.60)	
Females	3521 (50.6)	14 (0.40)	
Age (y)			0.000
<40	5213 (74.9)	3 (0.06)[b]	
40—49	640 (9.2)	3 (0.50)	
50—59	501 (7.2)	10 (2.00)[b]	
60—69	347 (5.0)	7 (2.02)[b]	
70—79	198 (2.8)	6 (3.03)[b]	
⩾80	64 (0.9)	6 (9.38)[b]	
Governorate			0.075
Mount Lebanon	2585 (37.1)	18 (0.70)	
Beirut	883 (12.7)	4 (0.45)	
North Lebanon	1519 (21.8)	2 (0.13)[b]	
South Lebanon	1073 (15.4)	4 (0.37)	
Bekaa	903 (13.0)	6 (0.66)	
Crowding index[c]			0.025
⩽1	3101 (46.3)	20 (0.64)	
>1	3590 (53.7)	10 (0.28)	

[a] A Chi-square test was used for comparison between groups (likelihood ratio for small proportions).
[b] Significant difference (standardized residuals comparison).
[c] Number of inhabitants per room (3.9% missing values).

Table 3 Stroke prevalence among men and women.

Age (y)	Women		Men		p^a
	Total *n*	Stroke cases *n* (%)	Total *n*	Stroke cases *n* (%)	
<40	2621	3 (0.11)	2593	0	0.042
40—49	334	3 (0.90)	306	0	0.048
50—59	260	4 (1.54)	241	7 (2.90)	0.297
60—69	177	1 (0.56)	170	6 (3.53)	0.039
70—79	102	2 (1.96)	97	5 (5.15)	0.215
⩾80	27	2 (7.41)	35	3 (8.57)	0.867

[a] A Chi-square test was used for comparison between groups (likelihood ratio for small proportions).

between self-reported questionnaire data and clinical examinations for chronic diseases [28]. Hence, the interview survey in our study may be considered more or less valid and may have some advantages over other collection methods such as higher response rates and lower cost of study materials.

Thus, our findings may be valuable to draw hypotheses on stroke burden in the country for future analyses. They may also add valuable epidemiological data on stroke burden in the Arab and Middle East countries where studies are found to be scarce [18].

Studies on stroke prevalence are relatively limited compared to studies on stroke incidence and mortality rates. However, available data show that high prevalence estimates are found mainly in developed countries where a history of stroke is present among >1% of the general population [29—32]. The lowest prevalence is found in Africa, South Asia, and Arab countries, although two studies from Egypt showed prevalence estimates as high as the one in developed countries (0.98% and 1.22%; age-adjusted to WHO world populations) [33,34]. Our study prevalence is two to five times lower than that of developed countries [29—32], but higher than many other studies from developing countries [35—37]. However, it could be compared to South American and South Asian countries [38,39]. For example, one study from India (Kolkata) has given an age-standardized prevalence to world standard population of 0.54% [35], very similar to our result. Nevertheless, comparisons between countries should be interpreted with caution due to differences in study design, stroke definition, and time of data collection.

A review by Benamer and Grosset [17] on stroke epidemiology in Arab countries shows a prevalence of 0.04—0.07% in 10 Arab countries, a percentage 10 times lower than that of our study. However, most studies were hospital-based and long-established, which makes comparison slightly difficult. Nevertheless, there were two community-based studies that also showed lower prevalences: in Tunisia (Kelibia), age-adjusted prevalence according to the WHO world population was 0.07% [23], whereas stroke crude prevalence was 0.2% in Saudi Arabia (Thugbah community, Eastern Province) [22]. However, most studies from Arab countries were restricted to certain regions or governorates and may not be representative of the whole country.

Stroke incidence rates are reported to be increasing in Arab countries [4] and with the high prevalence of cardiovascular risk factors, we expect a higher prevalence of stroke at the present time. However, population aging in Lebanon is higher than in any other Arab country and life expectancy has reached an average of 80 years and more [40,41]. Moreover, Lebanon has the highest smoking rates [13] and current smokers constitute almost one third of its adult population [13,42]. Other risk factors, especially alcohol consumption (one fifth of the Lebanese population [42]), are also highly prevalent. In these settings, we expect that stroke prevalence would be still higher in Lebanon even if some other risk factors are higher in other Arab countries, especially the Arabian Gulf oil-rich countries (a review by Rahim et al. [13] shows that obesity and sedentary lifestyle are more or less higher in Arab countries compared to Lebanon). On another side, Lebanon has the highest number of physicians per inhabitants among all Arab countries, which with its advances in the medical and technological fields may have reduced stroke mortality in recent years [11]. However, these hypotheses should be tested in future analyses.

Two studies have reported stroke prevalence in Lebanon: the study by Jurjus et al. [43] and the study by Farah et al. [44]. However, the first one was not a community-based study, although projections to the general population were made. It was based on physicians' reported data on stroke (3.9%) and prevalence of transient ischemic attacks

(1.3%) among patients aged 30 years and older. The second study reported an adjusted prevalence of 3.6% (95% CI = 2.3—4.9%) of a self-reported stroke history among people aged 40 years and older (note that the confidence intervals of Farah et al. [44] and our study (95% CI = 1.20—2.46%) for the age group >40 years slightly overlap).

For age influence on stroke, our results were similar to many other studies where stroke prevalence clearly increases with age [33,45]. Moreover, our study resulted in a higher stroke prevalence among men than women (ratio 1.5:1) with a significant difference for those aged 60—70 years. Similar results for males' predominance were found in many countries, such as Egypt [33] and Australia [46]. Studies from Kuwait [47] and South Asia [48] have, however, led to contrary results. Moreover, all cases found in the sample group aged <50 years were females, a finding that may be correlated to the higher incidence of subarachnoid hemorrhage among relatively younger females [49].

Another major finding is discrepancies between governorates. In fact, a higher stroke prevalence in our sample is found in Beirut and other governorates compared to North Lebanon, a governorate more or less distant from the capital. This may reflect a lower incidence of stroke or a higher mortality rate in North Lebanon. When examining stroke prevalence among different crowding index groups, we found a lower prevalence in more crowded households which are more frequent in North Lebanon. Thus, we might associate the socioeconomic status correlate ''crowding index'' to the lower prevalence found in North Lebanon in our sample. Moreover, a significantly younger population was found in North Lebanon compared to other governorates, which might indicate lower incidence rates.

Our findings match with the real socioeconomic situation of the country as available national data show that poverty is not equally distributed in the country, the North being the most deprived [50].

5. Conclusions

Although the study results could not be epidemiologically inferenced to the Lebanese population, they shed lights on some important findings. Stroke prevalence might be high in Lebanon, especially among older groups. However, the relatively high prevalence might be associated to a high incidence of stroke in the country much more than a reduced mortality rate. Moreover, it is clear from existing data that some governorates are less privileged than others, and stroke prevalence differences found in the present study, among governorates, may also reflect this situation and trigger further attention on stroke mortality in less privileged areas.

Thus, it is urgent to implement further studies to understand the disease burden in Lebanon, and establish strong control procedures on cardiovascular risk factors (smoking), especially with further demographic transition and urbanization of the population.

Conflicts of interest

All authors have no conflicts of interest to declare.

References

[1] Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of disease study 2010. Lancet 2012;380:2095—128.

[2] Murray CJL, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990—2010: a systematic analysis for the global burden of disease study 2010. Lancet 2012;380:2197—223.

[3] Hankey GJ. The global and regional burden of stroke. Lancet Global Health 2013;1:e239—40.

[4] Feigin VL, Forouzanfar MH, Krishnamurthi R, Mensah GA, Connor M, Bennett DA, et al. Global and regional burden of stroke during 1990—2010: findings from the global burden of disease study 2010. Lancet 2014;383:245—54.

[5] Sousa RM, Ferri CP, Acosta D, Albanese E, Guerra M, Huang Y, et al. Contribution of chronic diseases to disability in elderly people in countries with low and middle incomes: a 10/66 dementia research group population-based survey. Lancet 2009;374:1821—30.

[6] Feigin VL, Lawes CMM, Bennett DA, Barker-Collo SL, Parag V. Worldwide stroke incidence and early case fatality reported in 56 population-based studies: a systematic review. Lancet Neurol 2009;8:355—69.

[7] Lackland DT, Roccella EJ, Deutsch AF, Fornage M, George MG, Howard G, et al. Factors influencing the decline in stroke mortality a statement from the American Heart Association/American Stroke Association. Stroke 2014;45:315—53.

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

[9] O'Keefe JH, Bhatti SK, Bajwa A, DiNicolantonio JJ, Lavie CJ. Alcohol and cardiovascular health: the dose makes the poison. . .or the remedy. Mayo Clin Proc 2014;89:382—93.

[10] Slark J, Sharma P. Risk awareness in secondary stroke prevention: a review of the literature. JRSM Cardiovasc Dis 2014;3. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3930156/>. Cited 03/03/2014.

[11] WHO Regional Office for the Eastern Mediterranean. Demographic, social and health indicators for countries of the Eastern Mediterranean 2013. Cairo: World Health Organization Regional Office for the Eastern Mediterranean; 2013.

[12] Mokdad AH, Jaber S, Aziz MIA, AlBuhairan F, AlGhaithi A, AlHamad NM, et al. The state of health in the Arab world, 1990—2010: an analysis of the burden of diseases, injuries, and risk factors. Lancet 2014;383:309—20.
[13] Rahim HFA, Sibai A, Khader Y, Hwalla N, Fadhil I, Alsiyabi H, et al. Non-communicable diseases in the Arab world. Lancet 2014;383:356—67.
[14] Thrift AG, Cadilhac DA, Thayabaranathan T, Howard G, Howard VJ, Rothwell PM, et al. Global stroke statistics. Int J Stroke 2014;9:6—18.
[15] Mehio Sibai A, Nasreddine L, Mokdad AH, Adra N, Tabet M, Hwalla N. Nutrition transition and cardiovascular disease risk factors in Middle East and North Africa countries: reviewing the evidence. Ann Nutr Metab 2010;57:193—203.
[16] Aljefree N, Ahmed F. Prevalence of cardiovascular disease and associated risk factors among adult population in the Gulf region: a systematic review. Adv Public Health 2015;2015:e235101.
[17] Benamer HT, Grosset D. Stroke in Arab countries: a systematic literature review. J Neurol Sci 2009;284:18—23.
[18] Behrouz R, Powers CJ. Epidemiology of classical risk factors in stroke patients in the Middle East. Eur J Neurol 2015. http://dx.doi.org/10.1111/ene.12742. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26041584>. Cited 07/15/2015.
[19] Chamieh MC, Moore HJ, Summerbell C, Tamim H, Sibai AM, Hwalla N. Diet, physical activity and socio-economic disparities of obesity in Lebanese adults: findings from a national study. BMC Public Health 2015;15. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4373105/>. Cited 05/22/2015.
[20] Tohme RA, Jurjus AR, Estephan A. The prevalence of hypertension and its association with other cardiovascular disease risk factors in a representative sample of the Lebanese population. J Hum Hypertens 2005;19:861—8.
[21] Matar D, Frangieh AH, Abouassi S, Bteich F, Saleh A, Salame E, et al. Prevalence, awareness, treatment, and control of hypertension in Lebanon. J Clin Hypertens 2015;17:381—8.
[22] Al Rajeh S, Bademosi O, Ismail H, Awada A, Dawodu A, al-Freihi H, et al. A community survey of neurological disorders in Saudi Arabia: the Thugbah study. Neuroepidemiology 1993;12:164—78.
[23] Attia Romdhane N, Ben Hamida M, Mrabet A, Larnaout A, Samoud S, Ben Hamda A, et al. Prevalence study of neurologic disorders in Kelibia (Tunisia). Neuroepidemiology 1993;12:285—99.
[24] Aho K, Harmsen P, Hatano S, Marquardsen J, Smirnov VE, Strasser T, et al. Cerebrovascular disease in the community: results of a WHO collaborative study. Bull World Health Organ 1980;58:113—30.
[25] Ahmad OB, Boschi-Pinto C, Lopez AD, Murray CJL, Lozano R, Inoue M. Age standardization of rates: a new WHO standard, Available at: <http://wwwlive.who.int/entity/healthinfo/paper31.pdf>; 2001. Cited 03/08/2014.
[26] Kargman DE, Sacco RL, Boden-Albala B, Paik MC, Hauser WA, Shea S. Validity of telephone interview data for vascular disease risk factors in a racially mixed urban community: the Northern Manhattan stroke study. Neuroepidemiology 1999;18:174—84.
[27] Grande ED, Fullerton S, Taylor AW. Reliability of self-reported health risk factors and chronic conditions questions collected using the telephone in South Australia, Australia. BMC Med Res Methodol 2012;12:108.
[28] Okura Y, Urban LH, Mahoney DW, Jacobsen SJ, Rodeheffer RJ. Agreement between self-report questionnaires and medical record data was substantial for diabetes, hypertension, myocardial infarction and stroke but not for heart failure. J Clin Epidemiol 2004;57:1096—103.
[29] Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al. Heart disease and stroke statistics–2015 update a report from the American Heart Association. Circulation 2015;131:e322—9.
[30] British Heart Foundation. Cardiovascular Disease Statistics 2014. Available at: <http://www.bhf.org.uk/~/media/files/publications/research/bhf_cvd-statistics-2014_web_2.pdf>. Cited 06/20/2015.
[31] D'Alessandro G, Gallo F, Vitaliano A, Del Col P, Gorraz F, De Cristofaro R, et al. Prevalence of stroke and stroke-related disability in Valle d'Aosta, Italy. Neurol Sci 2010;31:137—41.
[32] de Peretti C, Grimaud O, Tuppin P, Chin F, Woimant F. Prévalence des accidents vasculaires cérébraux et de leurs séquelles et impact sur les activités de la vie quotidienne: apports des enquêtes déclaratives handicap-santé-ménages et Handicap-santé-institution, 2008—2009. Bulletin Epidémiologique Hebdomadaire 2012;10(1). Available at: <http://handicap.foxoo.com/_internautes/0000006120/photos/beh%201%20janvier%202012%20170112.pdf>. Cited 09/03/2014.
[33] Khedr EM, Elfetoh NA, Al Attar G, Ahmed MA, Ali AM, Hamdy A, et al. Epidemiological study and risk factors of stroke in Assiut Governorate, Egypt: community-based study. Neuroepidemiology 2013;40:288—94.
[34] Khedr EM, Fawi G, Abdela M, Mohammed TA, Ahmed MA, El-Fetoh NA, et al. Prevalence of ischemic and hemorrhagic strokes in Qena Governorate, Egypt: community-based study. J Stroke Cerebrovasc Dis 2014;23:1843—8.
[35] Das SK, Banerjee TK, Biswas A, Roy T, Raut DK, Mukherjee CS, et al. A prospective community-based study of stroke in Kolkata, India. Stroke 2007;38:906—10.
[36] Adeloye D. An estimate of the incidence and prevalence of stroke in Africa: a systematic review and meta-analysis. PLoS ONE 2014;9:e100724.
[37] Nicoletti A, Sofia V, Giuffrida S, Bartoloni A, Bartalesi F, Bartolo MLL, et al. Prevalence of stroke a door-to-door survey in rural Bolivia. Stroke 2000;31:882—5.
[38] Saposnik G, Brutto OHD. Stroke in South America: a systematic review of incidence, prevalence, and stroke subtypes. Stroke 2003;34:2103—7.
[39] Wasay M, Khatri IA, Kaul S. Stroke in South Asian countries. Nat Rev Neurol 2014;10:135—43.
[40] Mehio Sibai A, Rizk A, Kronfol NM. Aging in Lebanon: perils and prospects. J Med Liban 2015;63:2—7.
[41] United Nations, World Population Prospects: The 2015 Revision. The Demographic Profile of Lebanon. Available at: <http://esa.un.org/wpp/unpp/p2k0data.asp> Cited 08/15/2015.
[42] Rady A. Is lifestyle affecting the risk of non-communicable diseases in Lebanon. Hum Health 2010;13:15—7.
[43] Jurjus AR, Tohme RA, Ephrem G, Hussein IAH, Jurjus R. Incidence and prevalence of circulatory diseases in Lebanon: a physician's inquiry. Ethn Dis 2009;19:1.
[44] Farah R, Zeidan RK, Chahine MN, Asmar R, Chahine R, Salameh P, et al. Prevalence of stroke symptoms among stroke-free residents: first national data from Lebanon. Int J Stroke 2015. http://dx.doi.org/10.1111/ijs.12563. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26178607>. Cited 09/05/2015.
[45] Zhang Y, Chapman A-M, Plested M, Jackson D, Purroy F. The incidence, prevalence, and mortality of stroke in France, Germany, Italy, Spain, the UK, and the US: a literature review. Stroke Res Treat 2012;2012. Available at: <http://

www.hindawi.com/journals/srt/2012/436125/abs/>. 08/28/2013.
[46] Marsden DL, Spratt NJ, Walker R, Barker D, Attia J, Pollack M, et al. Trends in stroke attack rates and case fatality in the Hunter region, Australia 1996—2008. Cerebrovasc Dis 2010;30:500—7.
[47] Al-Shammri S, Shahid Z, Ghali A, Mehndiratta MM, Swaminathan TR, Chadha G, et al. Risk factors, subtypes and outcome of ischaemic stroke in Kuwait — a hospital-based study. Med Princ Pract 2003;12:218—23.
[48] Banerjee TK, Mukherjee CS, Sarkhel A. Stroke in the urban population of Calcutta — an epidemiological study. Neuroepidemiology 2001;20:201—7.
[49] Appelros P, Stegmayr B, Terént A. Sex differences in stroke epidemiology a systematic review. Stroke 2009;40:1082—90.
[50] Laithy H, Abu-Ismail K, Hamdan K. Poverty, growth and income distribution in Lebanon, 13. IPC; 2008.