Journal of the Neurological Sciences xxx (2010) xxx–xxx

Contents lists available at ScienceDirect

Journal of the Neurological Sciences

journal homepage: www.elsevier.com/locate/jns

The epidemiology of stroke in the Middle East and North Africa

Jackie Tran [a], Masoud Mirzaei [b,*], Laurie Anderson [c], Stephen R. Leeder [a]

[a] Menzies Centre of Health Policy, Victor Coppleson Building (D02), University of Sydney, Australia
[b] Yazd Cardiovascular Research Centre, Shahid Sadoughi University, Iran
[c] Centers of Disease Control and Prevention , USA

ARTICLE INFO

Article history:
Received 14 March 2010
Accepted 17 May 2010
Available online xxxx

Keywords:
Stroke
Epidemiology
Middle East
North Africa

ABSTRACT

Stroke is the second leading cause of death in the world. In the Middle East and North Africa stroke is increasingly becoming a major health problem, with projections that deaths from it will nearly double by 2030. This systematic review aims to bring together age-adjusted epidemiological data of stroke in this region. A literature review of five databases was conducted. Twenty-three papers met the criteria. The incidence of stroke varied extensively among studies. Studies reported rates from 29.8 per 100 000 people in Saudi Arabia to 57 per 100 000 people in Bahrain. Furthermore, the 28-day case mortality rate also differed among studies, ranging from 10% in Kuwait to 31.5% in Iran. The rates are comparable with those in the Western world; however, the population of the region is younger. The Middle East and North Africa are lacking in data on the epidemiology of stroke. There is an urgent need to develop strategies to prevent and better care for stroke patients in the Middle East and North Africa.

1. Introduction

The World Health Organization (WHO) has estimated that stroke caused 5.7 million deaths in 2004 which accounted for 9.7% of deaths in the world [1]. Of these deaths, more than 85% occurred in low-income and middle-income countries [2]. With these trends in mind, the current epidemiology profile of stroke is of interest.

The Middle East and North Africa region faces a double burden of disease due to decreasing rates of communicable diseases and increasing rates of non-communicable disease [3]. The Middle East and North Africa region was defined by the Global Burden of Disease Study. Additionally, these countries lack reliable, regularly updated and population-based statistics on the major cause of morbidity and mortality [4]. Benemar et al. recently published a systematic review on epidemiology of stroke in the region. However, they did not report age-standardised rates of the data. Age standardisation helps regional health authorities and policy makers to compare the current situation in different countries.

This systematic review aims to bring together epidemiological data (incidence, prevalence, case fatality, and mortality) in this region and provide age-standardised rates of stroke in the Middle East and North Africa.

2. Methods

The initial Medline search was performed using the Medical Subject Heading (MeSH) term "stroke" and a series of terms ensuring inclusion of all global and regional stroke epidemiology publications. English language and non-English papers were included and years were restricted to 1980 to 2007 with no age limits applied.

After the initial Medline search was validated, the search was expanded to other primary databases in order to retrieve abstracts which were not identified in Medline. In addition, papers were found by a manual search using references cited in original study papers and reviews.

The final list of abstracts was prepared for review by downloading search results from each database to Reference Manager 12 (Thomson Reuters, New York City, New York).

Abstracts were then sorted by GBD region to facilitate screening and coding.

From the initial list of studies produced from the electronic search, a smaller subset was included for coding if the abstract met the criteria. The first stage of inclusion was based on screening titles and abstracts. Specifically, titles and abstracts were included if the study was population-based and examined incidence, prevalence, case fatality or mortality and was published in a peer review journal.

Incidence rates were age standardised to the world population using the direct method as described by Ahmed et al. [11].

3. Results

From the initial electronic search 10 785 papers were identified. After an abstract review, the papers were catalogued into regions

* Corresponding author. Tel.: +98 351 8239980; fax: +98 351 7214102.
E-mail address: mirzaeim@med.usyd.edu.au (M. Mirzaei).

0022-510X/$ – see front matter © 2010 Elsevier B.V. All rights reserved.
doi:10.1016/j.jns.2010.05.016

according to the Global Burden of Disease study. The most relevant abstracts were identified and full texts of them were reviewed. The Middle East and North Africa produced 36 papers. Following secondary screening, which involved reviewing the full papers to confirm that the paper strictly meets the inclusion criteria, 16 papers were eliminated, leaving 17 papers, which could be coded and included. Additional review of papers in the reference lists of included papers found nine further papers, giving a final set of 26 papers from 11 different countries from the Middle East and North Africa region. These studies reported on data collected from 1983 to 2007.

3.1. Incidence

The search yielded 17 papers on the incidence of stroke in the Middle East and North Africa. The majority of papers reported on all strokes irrespective of type. One study from Qatar [5] reported only on subarachnoid hemorrhage and a paper from Saudi Arabia [6] documented all incident cases of non-traumatic hemorrhagic stroke both and by age in the young. Two studies [7,8] from Iran examined ischemic stroke cases.

Incidence rates for all strokes ranged from 11.7 per 100 000 in Qatar [9] to 63 per 100 000 in Libya [10]. Incidence rates for hemorrhagic stroke were 2.7 per 100 000 in Qatar, [5] 1.9 per 100 000 in Saudi Arabia [6] and 10.4 per 100 000 in Iran [7]. The two incidence rates for ischemic stroke in Iran were vastly different. One was reported for the young [8] at 8 per 100 000 and the other included all ages,[7] finding an incidence rate of 43.2 per 100 000.

3.2. The young

There were two other papers by Ghandehari in Iran [8] and El-Zunni in Libya [11] in addition to Awada's paper from Saudi Arabia [6] which estimated the incidence of stroke in the young. The definition of young for Awada's paper was <45 whereas the definition of young for both Iranian [8] and Libyan papers [11] was aged 15–45 years.

3.3. Sex

All but three incidence papers reported that males demonstrated more stroke cases than women. In Iran, [12] Palestine [13] and Bahrain, [14] the incidence of stroke was higher in women, with the largest variance in Palestine (35 per 100 000 in women and 26 per 100 000 in men) [13].

3.4. Age-standardised incidence rates

Crude incidence rates from seven studies [10,12–17] could be age standardised and reported with 95% CIs. The seven studies came from seven different countries, Kuwait, Libya, Qatar, Iran, Saudi Arabia, Palestine and Bahrain (Fig. 1 and Table 1).

The lowest age-standardised incidence rate of stroke was in Saudi Arabia (38.5 per 100 000, 95%CI 30.8–46.2) and the highest in Qatar (123.7 per 100 000, 95%CI 100.6–127.7). The remaining five countries had rates around 84 per 100 000.

4. Discussion

The incidence rate from studies available from the Middle East and North Africa region indicate the crude incidence of stroke to be lower than that in most developed countries [18]. The Middle East and North Africa have a comparable younger population, with more than 40% of the region's population under 15 and only 4% over the age of 65 [19]. After adjusting for age, the incidence rate of stroke was also lower than the age-adjusted incidence of total stroke in other studies mostly conducted in Western countries [18].

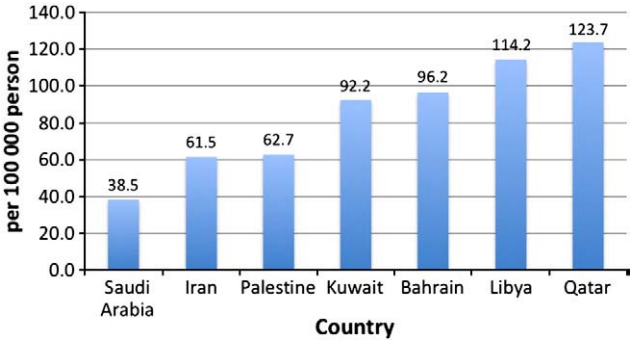

Fig. 1. Age-standardised incidence rates of stroke in the Middle East and North Africa 1980–2007.

The seven studies that had available age-specific data for age standardisation came from seven different countries. Kuwait, [15] Qatar, [16] Saudi Arabia [17] and Bahrain [14] are considered high-income countries by the World Bank [20]. The age-adjusted stroke incidence rates in high-income countries in a systematic review of 56 population-based studies worldwide [18] decreased from 163 per 100 000 in 1970–79 to 94 per 100 000 in 2000–08. The four high-income countries in the Middle East and North Africa reviewed in this study was conducted in the 1990s and produced age-adjusted stroke incidence rates ranging from 38.5 per 100 000 in Saudi Arabia [17] to 123.7 per 100 000 in Qatar [16].

Comparing the age-adjusted stroke incidence rates of high-income countries between 1990 and 1999 [18], the Middle East and North Africa rates are in range. Libya [10] and Iran [21] are considered upper middle and lower middle-income countries by the World Bank [20]. Palestine is a non-member state of the UN. Its GDP per capita was estimated to be $2900 US [1]. This means it would be classified as a lower middle-income country. Iran [21] and Palestine [13] reported age-adjusted stroke incidence rates of 61.5 and 62.7 per 100 000 respectively. Libya [10] documented a rate of 114.2 per 100 000. The study conducted in Libya was in 1984 and the studies from Iran and Palestine were in the 2000s. Comparing it to low to middle-income countries which were reviewed by Feigin et al. [18] in the 1980–89 and 2000–08, the age-adjusted stroke incidence rates in these countries are lower than worldwide reports.

The limitations of this study include selection bias and lack of epidemiologic studies produced in the region. Additionally, 'grey literature' such as conference proceedings and books are not typically ascertained via electronic searching [22].

5. Conclusion

The younger population of the Middle East and North Africa indicate that in the future, the impact of stroke will increasingly become a burden. There is an urgent need to develop strategies to prevent and better care for stroke patients in this region. With this vital information on stroke, more valuable policies may be developed

Table 1
Age-standardised incidence rates of stroke in the Middle East and North Africa 1980–2007.

Country	Age-standardised rate	Lower 95% CI	Upper 95% CI
Saudi Arabia	38.5	30.8	46.2
Iran	61.5	48.3	74.8
Palestine	62.7	51.1	74.4
Kuwait	92.2	69.6	114.8
Bahrain	96.2	77.5	115.0
Libya	114.2	100.6	127.7
Qatar	123.7	103.0	144.3

Please cite this article as: Tran J, et al, The epidemiology of stroke in the Middle East and North Africa, J Neurol Sci (2010), doi:10.1016/j.jns.2010.05.016

and more efficient methods of prevention and management can be conceived.

There is great diversity between epidemiologic measures of stroke in the region. With this information WHO and Ministries of Health in the region are able to make more accurate and applicable polices to improve care of stroke and foremost, prevent stroke in the region.

References

[1] WHO. Burden of Disease Statistics. Geneva, Switzerland: World Health Organization. http://www.who.int/healthinfo/bod/en/index.htmlMay 12, 2009.
[2] Lopez AD, Matters MD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. Lancet 2006;367:1747–57.
[3] Akala FA, El-Saharty S. Public-health challenges in the Middle East and North Africa. Lancet 2006 Mar 25;367(9515):961–4.
[4] Maziak W, Maziak W. Health in the middle East. BMJ Oct. 21,2006;333(7573): 815–6.
[5] Nogueira GJ. Spontaneous subarachnoid haemorrhage and ruptured aneurysms in the Middle East. A myth revisited. Acta Neurochir 1992;114(1–2):20–5.
[6] Awada A, Daif A, Obeid T, al Rajeh S. Nontraumatic cerebral hemorrhage in the young: a study of 107 cases. J Stroke Cerebrovasc Dis 1998;7(3):200–4.
[7] Ghandehari K, Izadi-Mood Z, Moud ZI. Khorasan stroke registry: analysis of 1392 stroke patients. Arch Iran Med 2007;10(3):327–34.
[8] Ghandehari K, Moud ZI. Incidence and etiology of ischemic stroke in Persian young adults. Acta Neurol Scand 2006;113(2):121–4.
[9] Bener A, Kamran S, Elouzi EB, Hamad A, Heller RF. Association between stroke and acute myocardial infarction and its related risk factors: hypertension and diabetes. Anadolu Kardiyol Derg 2005;6(1):24–7.
[10] Radhakrishnan K, Ashok PP, Sridharan R, el-Mangoush MA. Incidence and pattern of cerebrovascular diseases in Benghazi, Libya. J Neuro Neurosurg Psychiatry 1986;49(5):519–23.
[11] EL-Zunni S, Ahmed M, Prakash PS, Hassan KM. Stroke: incidence and pattern in Benghazi, Libya. Ann Saudi Arabia 1995;15(4):367–9.
[12] Janghorbani M, Hamzehiee-Moghadam A, Kachoiee H. Epidemiology of non-fatal stroke in Kerman, Iran. Hamdard Medicus 1997;40(3):89–98.
[13] Sweileh WM, Sawalha AF, Al-Aqad SM, Zyoud SH, Al-Jabi SW, Sweileh WM, et al. The epidemiology of stroke in northern palestine: a 1-year, hospital-based study. J Stroke Cerebrovasc Dis Nov–Dec 2008;17(6):406–11.
[14] Al-Jishi A, Mohan P. Profile of stroke in Bahrain. Neurosciences 2000;5(1):30–4.
[15] Abdul-Ghaffar NU, el-Sonbaty MR, el-Din Abdul-Baky MS, Marafie AA, al-Said AM. Stroke in Kuwait: a three-year prospective study. Neuroepidemiology 1997;16 (1):40–7.
[16] Hamad A, Sokarb TEO, Momeni S, Mesraoua B, Lingren A. Stroke in Qatar: a one-year hospital based study. J Stroke Cerebrovasc Dis 2001;10(5):236–41.
[17] al-Rajeh S, Larbi EB, Bademosi O, Awada A, Yousef A, al-Freihi H, et al. Stroke register: experience from the eastern province of Saudi Arabia. Cerebrovasc Dis 1998;8(2):86–9.
[18] Feigin VL, Lawes CM, Bennett DA, Barker-Collo SL, Parag V. Stroke incidence and early case fatality reported in 56 population-based studies: a systematic review. [see comment]. Lancet Neurol 2009 Apr;8(4):355–69.
[19] Omran AR, Roudi F. The Middle East population puzzle. Popul Bull 1993 Jul;48(1): 1–40.
[20] Poungvarin N. Stroke in the developing world. Lancet 1998;352(Supplement 3): S19–22.
[21] Ahangar AA, Ashraf Vaghefi SB, Ramaezani M. Epidemiological evaluation of stroke in Babol, northern Iran (2001–2003). Eur Neurol 2005;54(2):93-7.
[22] Dickersin K, Dickersin K. Systematic reviews in epidemiology: why are we so far behind? Int J Epidemiol 2002 Feb;31(1):6–12.

Please cite this article as: Tran J, et al, The epidemiology of stroke in the Middle East and North Africa, J Neurol Sci (2010), doi:10.1016/j.jns.2010.05.016