Introduction

Stroke is a common neurological disorder, the second commonest overall cause of death, and a major cause of disability in survivors ***(Menken et al., 2000; WHO, 2009).*** Cerebrovascular disease is globally the sixth commonest cause of an ongoing disease burden, but is expected to move to the fourth place by 2020 ***(Bonita et al., 2004).*** Over 65% of stroke deaths are reported from developing countries ***(Feigi, 2005).***

Stroke is largely preventable, so that knowledge of risk factors (which vary within populations) is essential to achieve reduction in the stroke rate and resulting disease burden ***(Benamir and Grosset, 2009).*** Examination of stroke incidence, prevalence, subtypes, risk factors and outcome in various countries is therefore an important foundation for evidence based prevention programs ***(Benamir and Grosset, 2009).***Such data are important for health policy makers to direct resources and implement preventive measures, especially in developing countries where stroke is still a true economic and health burden. Although epidemiologic studies on stroke were carried out in different parts of the world including some neighboring Arab countries, there were no published data from Egypt ***(Benamir and Grosset, 2009).***

There are two types of stroke surveillances as reported by ***Moore et al. (2008);*** Community based surveillance and hospital based surveillance.

Hospital based administrative data have often been used to identify stroke cases in the population, when clinical registries or medical charts were the gold standard ***(Yiannakoulias et al., 2003).***

The advantages of hospital based administrative data (clinical registry) include; (a) lower costs associated with establishment and maintenance of a surveillance system, (b) ability to monitor trends in prevalence, (c) opportunity to investigate associated co-morbidities and (d) data from hospital based registries that track outcome of stroke care can be used to guide hospital quality improvement interventions of stroke patients ***(Lix et al., 2006).***

Aim of the Study

This study aimed to recruit stroke patients admitted to Ain Shams University Hospitals with the following objectives, (a) to identify stroke subtypes, clinical picture, measure prevalence of related risk factors, and outcome after three months, and (b) to measure the prevalence of Intracranial Stenosis (ICS) in ischemic stroke Egyptian patients and its related risk factors.

Stroke Risk Factors and Classifications

Stroke is a clinically defined syndrome "characterized by rapidly developing clinical symptoms and/or signs of focal, and at times global loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin" ***(WHO MONICA investigators, 1988).***

The current World Health Organization definition of stroke introduced in 1970 and still used become obsolete. During the 40 years since this definition was formulated, advances have been made in knowledge about the nature, timing, clinical recognition of stroke and its mimics, and imaging findings that require an updated definition. Based on advances including modern brain imaging, the 24 hour inclusion criterion for cerebral infarction is inaccurate and misleading, because permanent injury can occur much sooner. Furthermore, global cerebral dysfunction is seldom caused by cerebrovascular disease ***(Sacco et al., 2013)***.

Warlow (1998) mentioned that Stroke is a heterogeneous disease entity that includes several pathologically different conditions. Stroke due to cerebral infarction, intracerebral hemorrhage (ICH), intraventricular hemorrhage, and most cases of subarachnoid hemorrhage (SAH) are thus included in the definition. SAH patients with headache but without abnormal

neurological signs are according to this definition not considered as stroke patients. By convention, subdural hemorrhage, epidural hemorrhage, retinal infarction, and infarction due to trauma, infection, or tumor masses are not classified as stroke ***(WHO MONICA investigators, 1988).***

Based on the medical history, the clinical examination, and diagnostic tests including brain imaging, a subclassification of a stroke is possible, e.g. cerebral infarction/ischemic stroke (IS) due to arterial dissection, vasculopathies, metabolic disorders, etc.***(Warlow, 1998; Johnsen et al., 2002).***

The burden of stroke

Frequency

Stroke has a huge impact on public health worldwide. There are about 700, 000 new cases of stroke in the USA, one million within the European Union, and 12, 000 in Denmark each year.The annual incidence of stroke in Egypt is about 2.1 per one thousand per year ***(Abdul Ghani,1994;Sudlow and Warlow, 1997).***

About 25% of men and 20% of women can expect to suffer a stroke if they live to be 85 years ***(Bonita, 1992).*** Stroke is the third commonest cause of death in Europe and the USA, trailing only coronary heart disease and cancer, and is assumed to be related to one in ten of all deaths ***(Rothwell, 2001).***

The exact figures are not available for the developing countries, but the worldwide estimate of five million stroke related deaths in 1990 has been predicted to double by 2020, with most of the increase occurring in developing countries because of the expected major demographic and lifestyle changes, including increased prevalence of smoking, obesity and diabetes mellitus, in these countries ***(Bonita, 1992).***

Consequences

Stroke is also a major cause of chronic disability. After one year, about a third of all stroke survivors are functionally dependent in daily activities due to sequelae, including hemiparesis, aphasia, etc., making stroke the most common cause of severe disability in the developed countries ***(Murray and Lopez, 1996).*** Moreover, stroke is also associated with dementia, depression, epilepsy ***(Johnsen et al., 2002).***

Prevention

The importance of prevention is of particular importance in relation to stroke since there is currently no widely applicable treatment for these patients apart from supportive care and treatment of acute complications in specialized hospital units ***(Stroke Unit Trialists' Collaboration, 2001).***

Thrombolysis is a potential curative treatment for patients with IS ***(Wardlaw et al., 2001).*** However, although promising, widespread use of this treatment has proved to be difficult for a number of reasons including the short treatment

time window, i.e. within 3 hours from onset of symptoms, and the need for early expert assessment ***(Jergensen et al., 1999;Wardlaw et al., 2001).***

Difficulties in studying risk factors for stroke

Stroke is a multifactorial disease entity when looking at the etiology. Furthermore, the available knowledge about the pathophysiologic mechanisms is limited. This makes identification of factors causally related to the disease a challenge**.**Studies on stroke have furthermore been hampered by a number of problems ***(Johnsen et al., 2002).***

Crude classification of stroke events

The traditional approach to observational epidemiologic studies and randomized trials has been to lump all types of stroke together. This approach is unfortunate because it is likely to weaken or even obscure relationships between a potential risk factor and a particular type of stroke ***(Johnsen et al., 2002).***

A positive association between a potential risk factor and a specific type of stroke may not be identified if no association or even a negative association is seen for other types of stroke. An example of this problem, Consequently, epidemiological studies carried out before brain imaging and valid classification of patients were available should be interpreted with caution since the crude classification of the stroke event probably introduced bias in several studies ***(Johnsen et al., 2002).***

There has been increasing awareness of this issue within stroke epidemiology in recent years, and recognition of the need to use a more detailed classification of stroke.However, application of this new approach is not without problems, since the different classification systems rely on the availability of diagnostic tools that are sometimes missing.Furthermore, the validity of the stroke classification may in some situations be uncertain, e.g. due to coexisting causes of stroke, and splitting the cases in several subgroups may limit the sample size to such an extent that even large patient materials become inconclusive ***(Warlo,1998;Johnsen et al., 2002).***

Risk of selection bias

Stroke patients who do not survive long, e.g. patients with SAH or ICH, may have a lower chance of being included in a study. This situation, which is seen particularly in cross-sectional and case-control studies, may cause problems in relation to studies on putative risk factors, if exposure to the factor in question is related to the prognosis after stroke. Thus, if exposure to a factor causes the stroke to be rapidly fatal, the prevalence of the exposure will be low among cases, and the exposure will appear protective, even though the factor has no effect on disease risk ***(Johnsen et al., 2002).***

Risk of inverse causality

Stroke itself or the required treatment may in some situations change the risk factor, eg. A temporary increase in both blood pressure and blood glucose are often seen following a stroke, whereas plasma cholesterol falls ***(Warlow et al., 2001).***

Problems with data collection

Using the case-control study design it may be difficult or impossible to obtain information on past activities and habits, e.g. diet, smoking, and physical activity, because of the patient's confusion or aphasia ***(Warlow et al., 2001).***

This problem can be avoided in follow-up studies and case-control studies based on prospectively collected data ***(Johnsen et al., 2002).***

Lack of blinding

Due to the frequent and often severe consequences of stroke, e.g: hemiparesis, aphasia and impairment of cognitive functions, it may be impossible to use blinding, typical of an interviewer, as a tool for reducing the risk of bias in studies on patients with stroke ***(Warlow et al., 2001).***

Some of these difficulties may be avoided by using prospectively collected data. However, availability of prospective data will not necessarily solve all problems since the issues of surveillance bias, exposure misclassification, and definition of the relevant exposure time window data will often be relevant ***(Johnsen et al., 2002).***

Use of administrative registers in stroke research

The considerable burden of stroke on the patients, their families and the society, and the development of improved diagnostic tools within the last decades have prompted an epidemiological effort to describe the incidence of stroke, to

examine risk factors, and to study the prognosis. A substantial part of this work has been done within large cohort studies in which at least some of the methodological problems mentioned above are more easily handled ***(Elkind and Sacco, 1998; Willett and Colditz, 1998)***.

In order to provide valid risk estimates for these cohort studies, it is essential to have complete follow-up or at least non-differential loss of follow up, and avoidance of surveillance bias, i.e. systematic errors in methods of ascertainment, diagnosis, or verification of outcome events. Use of hospital discharge and other disease registers for follow up of study participants has proved a valuable, cost efficient, and complete way of collecting data on stroke events ***(Bright et al., 1989; Lauderdale et al., 1993; Serensen et al., 1996).***

The registries have the advantage of readily available data, often completeness of registration of people in the target population, and reduced likelihood of some types of bias e.g. recall, non response, and effect on the diagnostic process caused by the research question, although surveillance bias may also occur in clinical practice and thus become affect routinely collected data. However, the fact that the collection and quality of the data are not under the control of the researcher may sometimes represent important disadvantages of registry data ***(Roos et al., 1990; Serensen et al., 1996; Warlow, 1998)***.

These disadvantages, which vary considerably from disease to disease, may have serious implications for the use of registry data in epidemiological research**.**Insufficient quality and completeness of data may be particularly troublesome when estimating absolute risk measures, whereas relative risk measures are usually less affected by non-differential Short comings in completeness and quality, although the misclassification will usually tend to bias the associations toward the null hypothesis ***(Johnsen et al., 2002)***.

Calibration studies, i.e. studies that evaluate the validity of data by comparison with independent external criteria, are essential to avoid invalid conclusions when using secondary data collected as part of routine daily clinical work ***(Goldberg et al., 1980).***

Sensitivity and specificity, i.e. the probabilities of correctly identifying diseased and non diseased persons, respectively, are important properties when classifying events or persons. However, it is rarely possible to establish these measures for secondary data sources since typically there are no available reference data to compare with. Alternatively, the validity of a data source, i.e. the extent to which the data measures what they are intended to measure, may be assessed through evaluation of the predictive value of a positive registration ***(Goldberg et al., 1980; Johnsen et al., 2002)***.

A number of studies have examined the data quality of stroke or transient ischemic attack (TIA) diagnoses in hospital discharge registers and official mortality statistics. The studies have primarily provided information on the positive predictive value of a stroke diagnosis, and seldom on the completeness of the data source ***(Iso et al., 1990; Lindblad et al., 1993; Leibson et al., 1994; Stegmayr and Asplund, 1994; Ellekjær et al., 1999; Leppala et al., 1999; Liu et al., 1999; Gaist et al., 2000; Mahonen et al., 2000).***

Although most studies have reported the positive predictive value of a stroke diagnosis as moderate to high, few studies have been able to provide information on the predictive value of diagnoses of specific types of stroke, including SAH, ICH, IS, and TIA. Furthermore, only few studies have provided information on the diagnostic tools used to ascertain the diagnoses ***(Lindblad et al., 1993; Ellekjær et al., 1999; Leppala et al., 1999; Liu et al., 1999; Gaist et al., 2000).***

The diagnostic strategy and management of stroke patients have undergone important changes during the last decades, e.g. increased use of imaging procedures and formation of specialized stroke units. These changes presumably have implications for the diagnostic work up and validity of cerebrovascular diagnoses, including stroke and TIA. Thus, there is a need for up to date studies on the validity of cerebrovascular discharge diagnoses due to the extensive possibilities of record linkage ***(Serensen, 1997; Frank, 2000)***

Risk Factors for Stroke

A number of factors have consistently been shown to be associated with an increased risk of stroke. The association with stroke for these factors is supported by a large body of experimental and epidemiological scientific work. Although the indications for associations are therefore strong for these factors, the question of whether the associations are causal remains open for some of the factors ***(Johnsen et al., 2002)***.

These well documented risk factors for stroke are usually divided into modifiable and non modifiable factors, i.e. factors that are amenable for intervention and factors that are not **(Table 1)** ***(Elkind and Sacco, 1998; Warlow et al., 2001).***

Table (1): Modifiable and Non modifiable Risk Factors for stroke ***(Johnsen et al., 2002).***

Non modifiable risk factors:
Age
Gender
Ethnicity
Modifiable risk factors:
Hypertension (HTN)
Smoking
Alcohol intake
Diabetes mellitus (DM)
Atrial fibrillation (AF)
Other cardiac diseases
Carotid artery stenosis

Age

The risk of stroke rises significantly with age. After 55, it more than doubles with each passing decade. Each year, about 1 percent of people between ages 65 and 74 have a stroke and 5 to 8 percent of people in that age group who have had a TIA go on to stroke. Although risk associated with advancing age cannot be changed, it is an important factor in assessing stroke risk and planning preventive therapies ***(Daroff et al., 2012).***

Gender

Male gender is a risk factor for stroke but overall, due to their greater life expectancy and the greater importance of age as a risk factor, more women will suffer stroke during their lifetime. The excess risk seen in men is less than that seen in ischemic heart disease ***(Daroff et al., 2012).***

Smoking

Smoking facilitates atherosclerosis and appears to be an independent risk factor for strokes that result from a clot. It also seems to be a risk for strokes that result from cerebral hemorrhage ***(Shinton and Beevers, 1989; Bonita et al., 1999; Daroff et al., 2012).***

Men in Framingham, Massachusetts a community studied extensively for cardiovascular disease who smoked more than 40 cigarettes a day had twice the stroke risk of men who smoked fewer than 10. In a large Harvard Medical School study of women, the number of cigarettes smoked was found to be directly related to stroke risk. Women smoking more than

2cigarettes a day had a 2.7 times greater risk of stroke from a clot or embolus and a 9.8 times greater risk of a hemorrhagic stroke ***(Wolf et al., 1991; Rundek & Sacco, 2008).***

Data from both the Framingham Heart Study and the Honolulu Heart Study indicate that one can significantly reduce stroke risk by stopping smoking. Five years after they stop, ex-smokers have a stroke risk equal to that of non smokers ***(Wolf et al., 1991; Fagerstrom, 2002; Rundek and Sacco, 2008).***

Hypertension

Hypertension is a major risk factor common to both coronary heart disease and stroke. High blood pressure is present in 50 to 70 percent of stroke cases, depending primarily on the type of stroke. The long term effects of the increased pressure damage the walls of the arteries making them more vulnerable to thickening or narrowing (atherosclerosis) or rupture.There is no specific blood pressure reading that is considered normal, but rather a range. Most experts agree, however, that a reading greater than 140 /90mmHg is abnormal, and anyone with such a reading should see a physician. But even mild elevations in blood pressure are associated with an increased risk for stroke ***(Daroff et al., 2012).***

It is well established that blood pressure lowering is effective for the primary prevention of stroke and other cardiovascular disorders. It has taken longer to prove that blood