7-1-2018

META-ANALYSIS OF STROKE EPIDEMIOLOGY IN ASIA

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Meta-analysis of stroke epidemiology in Asia

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Central Asia Journal of Medicine

Qab qilindi: 2018 y., yanvar
Chop etildi: 2018 y., iyul

Maqola to'g'risida ma'lumot

Максад: баъзиси Осиё мамлакатларинда инсульт эпидемиологияси бўйича сўнгга ёниларда маълумотлар шарқи, шу жумладан, додларги (юк бўлиши), регистры, ўлим ҳолатлари, тарқалганлиги, турлари ва ҳавф омилларининг мета-таҳлилини ўтказиши.


Натижа: Жаҳон соғлиқни сақлаш таҳлилоти, “Касалликларнинг глобал юқи” маълумотлари, Осиё мамлакатларининг сўнгга канонлари ва ўзимизнинг тадқиқотлари асосида Осиёда, шу жумладан, Ўзбекистонда инсульт ҳақида асосий эпидемиологик маълумотлар умумлаштирилди ва қиёсий урганилди.

Мамлакатларнинг “ри-вожланган мамлакат” статусида эркин маълумотлари донишдан артериал гипертензия, кандди диабет, гиперхолестеринемия, семизлик ва тақаки қечкини қаби ҳавф омиллар нега тарқалади ва инсулт ҳавфий ошиди.

Бироқ, ушбу риёвожланган мамлакатларда тиббий муссаса омиллар бошқарилган эътибори эмаслиги саваби, ўлим ҳолатлари ҳамда тарқалган қолган инфаркт миндаи кўп тақилишди. Ҳулоса: инсултнинг глобал юқи даражаси Осиё аҳолисининг жардоми қилиш ва шумадан, қолим қолиш ҳолатлари, инсульт тарқалганлиги материалларининг турлари ва ҳавф омиллари ўртасида бўйича қўрсатилади. Минёвий, инсултнинг глобал юқи ҳавфий ошиши ва инсулт тарқалганлиги мат ва ўлотларнинг қолиш мазкурда ўз илмий ҳолат мутабақатлиги натижасида ўтиши тўғрисида сўзлар истоқтасди. Осиё мамлакатларининг инсулт юқи қўшимча тўхтатилади, ёки борадади мажбур ҳарорат қиёси қилиш зарур.

Аннотация

Мақсад: баччи Осиё мамлакатларинда инсулт эпидемиологиясы бўйича сўнгга йилларда маълумотлар шарқи, шу жумладан, доларгий (юк бўлиши), регистры, ўлим ҳолатлари, тарқалганлиги, турлари ва ҳавф омилларининг мета-дахиллини ўтказиш.


Натижа: Жаҳон соғлиқни сақлаш таҳлилоти, “Касалликларнинг глобал юқи” маълумотлари, Осиё мамлакатларининг сўнгга канонлари ва ўзимизнинг тадқиқотлари асосида Осиёда, шу жумладан, Ўзбекистонда инсулт ҳақида асосий эпидемиологик маълумотлар умумлаштирилди ва қиёсий урганилди. Бу мамлакатларнинг “ри-вожланган мамлакат” статусида эркин маълумотлари донишдан артериал гипертензия, кандди диабет, гиперхолестеринемия, семизлик ва тақаки қечкини қаби ҳавф омиллар нега тарқалади ва инсулт ҳавфий ошиди.

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Калит сўзлар: Осиё мамлакатлари, Ўзбекистон, инсулт, юк, регистр, ўлим, касалланиш, тарқалганлиги.
Информация о статье

Принят: январь 2018 г.
Опубликовано: июль 2018 г.

Ключевые слова: страны Азии, Узбекистан, инсульт, бремя, регистр, смертность, заболеваемость, распространенность, подтипы инсульта, факторы риска.

Аннотация

Цель: мета-анализ обзора эпидемиологии инсульта в некоторых азиатских странах за последние годы, включая бремя, регистр, смертность, заболеваемость, распространенность, подтипы инсульта и факторы риска.

Материал и методы: проанализированы все публикации в базе данных PubMed, Medline, Scopus, ScienceDirect, Web of Science, EBSCO, Google Scholar с момента поступления в базу данных до марта 2018 г.

Результаты: на основании данных ВОЗ, исследований Глобального бремени болезней, последних публикаций из стран Азии и наших собственных исследований мы обобщили и сравнили основные эпидемиологические данные об инсульте в Азии, в том числе в Узбекистане. При экономическом переходе этих стран к достижению статуса «развитой страны» факторы риска, такие как артериальная гипертензия, сахарный диабет, гиперхолестеринемия, ожирение и курение сигарет, станут более распространенными, что увеличит частоту инсульта. Однако из-за нехватки медицинских учреждений в этих развивающихся странах смертность будет высокой, будет расти число выживших инвалидов.

Выводы: по мере увеличения продолжительности жизни в связи со старением азиатского населения и снижением смертности от инфекционных заболеваний, а также ростом распространенности сосудистых факторов риска в странах с переходной экономикой бремя инсульта в Азии, несомненно, возрастет. Чтобы остановить эту растущую эпидемию правительствам и медикам необходимо объединить усилия.

Абстракт

Цель: Meta-analysis of review of the recent epidemiology of stroke in some Asian countries, including burden, registry, mortality, incidence, prevalence, stroke subtypes and risk factors.

Материалы и методы: We analyzed all the publications in the PubMed, Medline, Scopus, ScienceDirect, Web of Science, EBSCO, Google Scholar databases, from the time of entry into the database until March 2018.

Результаты: Based on data from the WHO, GBD study, recent publications from Asian countries and our own studies, we summarized and compared the main epidemiological data on stroke in Asia, including Uzbekistan. With the economic transition of these countries, towards achieving “developed country” status, risk factors such as hypertension, diabetes mellitus, hypercholesterolemia, obesity, and cigarette smoking will become more prevalent, raising the incidence of stroke. However, due to insufficient healthcare facilities in these developing countries, the mortality will be high, and the number of disabled survivors will also rise.

Выводы: The global burden of stroke has the largest contribution from Asia. As life expectancy increases, with the aging of Asian populations and reduction in mortality due to infectious diseases, and the rise in the prevalence of vascular risk factors among economies in transition, the stroke burden in Asia will surely rise. Governments and healthcare workers need to work together, with an informed public, to stem this growing epidemic.

Введение. Инсульт является особо серьезной проблемой в Азии, которая занимает более 60% от населения планеты, и многие из этих стран являются “развивающимися” экономиками [3]. Инсультная летальность выше в Азии, чем в Западной Европе, Америке и Австралии, за исключением некоторых стран, таких как
Japan [5]. Objective of this study is review of the recent epidemiology of stroke in some Asian countries, including burden, registry, mortality, incidence, prevalence, stroke subtypes and risk factors, based on data from the World Health Organization (WHO), Global Burden of Disease (GBD) study, and recent publications from Asian countries. A deeper understanding of the stroke burden in this part of the world could assist in the appreciation of the magnitude of stroke and its diversity, and help in healthcare planning and resource allocation [3].

Materials and Methods

We analyzed all the publications in the PubMed, Medline, Scopus, ScienceDirect, Web of Science, EBSCO, Google Scholar databases, from the time of entry into the database until March 2018. The WHO website, World Health Rankings, World Life Expectancy and specific countries journals were consulted. The search was limited to papers published in English, Russian, or Uzbek languages. The search terms used were “stroke” with the operator “and”, along with any (“or”) of the following terms: “burden”, “epidemiology”, “registry”, “mortality”, “incidence”, “prevalence”, “subtype”, and “risk factors”. The operator “and” was then used with the name of each Asian country. Data from European countries were excluded. The abstracts were reviewed for relevance, and data on stroke epidemiology were extracted. Where possible, the original papers were also obtained and reviewed. The most recent studies or review papers from each country, were preferred over older publications. Data on incidence and prevalence were obtained from community-based studies with wide age ranges and no upper limit. Data on the stroke subtypes and vascular risk factors among stroke patients were preferably from multi-center hospital collaborations with high brain scan rates. Data on stroke mortality and morbidity were obtained from the GBD study, and vascular risk factors in the community were obtained from the WHO database. The data were then tabulated, stratified according to geographical regions.

Results and Discussion

The definition of stroke and its types. The WHO definition of stroke is: “rapidly developing clinical signs of focal (or global) disturbance of cerebral...
function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin”. By applying this definition transient ischemic attack (TIA), which is defined to last less than 24 hours, and patients with stroke symptoms caused by subdural hemorrhage, tumors, poisoning, or trauma are excluded. The pathological background for stroke may either be ischemic or hemorrhagic disturbances of the cerebral blood circulation.

**Stroke burden.** The best measure of stroke burden is the number of disability-adjusted life years (DALYs) lost because of stroke. Based on data from the GBD study, there was a wide range of age- and sex-standardized stroke DALYs lost in Asia, in 2010 [5]. The lowest rates are in Japan (706.6/100,000 people) and Singapore (804.2/100,000 people), with low rates also observed in Bangladesh and Bhutan. The highest rates are in Mongolia (4,409.8/100,000 people) and Indonesia (3,382.2/100,000 people), with high rates also observed in Myanmar, Lao PDR, North Korea, and Cambodia. As in the case of mortality, a range of the rates of DALYs lost are observed in all three regions, but the DALYs lost tend to be lower in high-income countries in East and South-East Asia. The DALYs lost reflect the net effects of mortality, incidence, and disability among prevalent cases, and the latter possibly indicates the effects of stroke severity and rehabilitative services [3, 9, 13, 28, 29].

**Incidence and Prevalence.** Stroke incidence data are available for most Asian countries, but only for some in the other regions. The lowest rate is observed in Malaysia (67/100,000 person-years). The highest rates are in Japan (422/100,000 person-years among men and 212/100,000 person-years among women) and Taiwan (330/100,000 person-years). Data on stroke prevalence are more readily-available than those on incidence [3, 23].

Variations in stroke epidemiology have been found within many countries. Studies in China have shown that the stroke incidence is higher in the northern regions compared to the south [20], with double the incidence along the stroke belt [27]. In India, on the contrary, the incidence is higher in rural areas [15]. In Thailand, the stroke prevalence is highest in the cities, and then, in a decreasing
fashion, in the central, south, north, and northeast regions of the country [22]. Similarly, stroke prevalence was found to be higher in cities and urban areas than in rural regions, in Indonesia [13]. These differences have been attributed to the differences in the risk factors between various regions in the same country. However, there is no difference in the age-standardized stroke mortality between the metropolitan cities of Korea and the other regions in the country [9].

The problem of stroke is very urgent for Central Asia with population over 70 million. In Kazakhstan, over 49 thousand people suffer stroke annually, 80% of them became fully or partly disabled [4]. Kyrgyzstan is the sixth in mortality from CVD in Eurasia, following Russia, Belarus, Ukraine, Kazakhstan and Moldova. In the Eurasian region, Kyrgyzstan ranks first in the standardized parameter of stroke mortality index of 88.5/100,000 population. The prevalence of stroke in Kyrgyzstan in 2014, according to the WHO Atlas of cerebrovascular diseases, was 139.1/100,000 population [24].

In Uzbekistan, the annual number of new stroke cases is about 209/100,000 people, among men stroke cases is about 1.95, while in women is 3.15/1000 people [2, 16, 17]. Gafurov B.G. (2009) reported 44.6% of deaths from stroke, of them 5.1% at early hospitalization (first 6 hours) that is 3-fold lesser than in late stages (14.7%). Disability affects 42.2% of stroke survivors, and no more 10.2% stroke patients could save their employability [7, 17, 19].

However, comparison of the results is difficult, as different study methods were used for case-finding, which were performed at different time points, and different age bands were studied. However, the observed variations may reflect differences in the risk-factor prevalence, screening/detection method and level of control.

According to the WHO database (DALYs/1000 capita, 2004), in Uzbekistan, the country rate of cardiovascular diseases, including stroke, was 4.9 per year, after diarrhoea (12), respiratory infections (6.6), other unintentional injuries (5.2), while the world’s highest country rate rank was 14 (Table 1).
Uzbekistan

Population 26.6 mio
GNI/capita 2 430 US$
% urbanization 37%
% people living in cities greater than 100 000 inhabitants 21%
Population below the poverty line (national) 28% (2000)
Population below the poverty line (international, <$1/day) NA

Under age 5 mortality rate 44/1000 live births (2006)
Life expectancy 68 years (2006)

**Environmental burden of disease for selected risk factors, per year**

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Exposure</th>
<th>Deaths /year</th>
<th>DALYs /1000 cap /year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water, sanitation and hygiene (diarrhoea only)</td>
<td>Improved water:</td>
<td>82% 8 600</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Improved sanitation:</td>
<td>67%</td>
<td></td>
</tr>
<tr>
<td>Indoor air</td>
<td>SFU% households:</td>
<td>72% 6 200</td>
<td>7</td>
</tr>
<tr>
<td>Outdoor air</td>
<td>Mean urban PM10: 81 ug/m3</td>
<td>3 800</td>
<td>1.2</td>
</tr>
<tr>
<td>Main malaria vectors</td>
<td>No transmission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main other vectors</td>
<td><em>Phlebotomus caucasi; P. sergenti</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Environmental burden of disease (preliminary), per year**

<table>
<thead>
<tr>
<th>Disease group</th>
<th>World’s lowest country rate</th>
<th>Country rate</th>
<th>World’s highest country rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhoea</td>
<td>0.2</td>
<td>12</td>
<td>107</td>
</tr>
<tr>
<td>Respiratory infections</td>
<td>0.1</td>
<td>6.6</td>
<td>71</td>
</tr>
<tr>
<td>Malaria</td>
<td>0.0</td>
<td>0.0</td>
<td>34</td>
</tr>
<tr>
<td>Other vector-borne diseases</td>
<td>0.0</td>
<td>-</td>
<td>4.9</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>0.0</td>
<td>0.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Other cancers</td>
<td>0.3</td>
<td>1.0</td>
<td>4.1</td>
</tr>
<tr>
<td>Neuropsychiatric disorders</td>
<td>1.4</td>
<td>2.1</td>
<td>3.0</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>1.4</td>
<td>4.9</td>
<td>14</td>
</tr>
<tr>
<td>COPD</td>
<td>0.0</td>
<td>0.5</td>
<td>4.6</td>
</tr>
<tr>
<td>Asthma</td>
<td>0.3</td>
<td>0.9</td>
<td>2.8</td>
</tr>
<tr>
<td>Musculoskeletal diseases</td>
<td>0.5</td>
<td>0.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Road traffic injuries</td>
<td>0.3</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>Other unintentional injuries</td>
<td>0.6</td>
<td>5.2</td>
<td>30</td>
</tr>
<tr>
<td>Intentional injuries</td>
<td>0.0</td>
<td>0.6</td>
<td>7.5</td>
</tr>
</tbody>
</table>

**Other indicators**

| Use of leaded gasoline | No (2008) |
| Overcrowding | NA |
| Malnutrition (% stunting) | 20% (2006) |

**Stroke registry.** The objectives of a stroke population-based register is to (a) evaluate the frequency, distribution and prognosis of the disease providing indicators such as attack rate, incidence rate, prevalence and case fatality; (b) compare trends in different countries; (c) evaluate trends and changing pattern,
outcomes and treatment effectiveness; and (d) monitor disease prevention programmes. Focusing on the general population, a stroke registry may provide a comprehensive picture of stroke in the community, highlight problem areas and suggest where there are population groups at high risk and where treatment facilities are most in need of improvement. It may provide information needed to plan healthcare services and to develop and test which methods are most useful as a basis for preventive action (The EUROCISS Project, 2007).

The WHO Stroke Register was the first attempt to collect data on stroke in the community in a uniform manner from countries with different social, cultural, and environmental background. It lasted from May 1971 to September 1974 and was a joint undertaking of WHO and 15 collaborating centres in 10 countries from Asia, Africa and Europe. About 2 million people were under surveillance and data was obtained from 6,395 new cases of stroke (3,270 men and 3,125 women) (EUROCISS Project, 2000).

Besides existing registries in America (GWTG, CSR/CCP, PCNASR, RCSN et al.) and Europe (WHO MONICA, EUROCISS, EROS, ECHIM, HDR, ASTRAL, PERFECT, ESO, SITS, GP’s register et al.), including National, Regional Population- or Hospital-based registers, there are several Asian stroke registries: Khorasan Stroke registry (KSR), Khorasan posterior circulation stroke registry (KPCSR), Khorasan Pediatric Stroke registry (KPSR), Khorasan stroke in young adults registry (KSYAR), Chinese acute ischemic stroke treatment outcome registry (CASTOR), Kyoto Stroke Registry, Stroke Acute Management with Urgent Risk-factor Assessment and Improvement (SAMURAI) rt-PA Registry, Japan Standard Stroke Registry Study (JSSRS), Japan Multicenter Stroke Investigators’ Collaboration (J-MUSIC), Yonsei Stroke Registry and many others.

The registry includes all cases in a defined population, whether treated at home or in hospital, in whichever season of the year or time of the day they may occur, and would also include rapidly fatal cases unable to reach the medical service.
Mortality. As per the GBD study, the age- and sex-standardized mortality in Asia has a wide range [5]. The lowest rates are observed in Japan (43.4/1,000,000 person-years and Singapore (47.9/100,000 person-years), followed by Bangladesh, Papua New Guinea, and Bhutan. The highest rates are observed in Mongolia (222.6/100,000 person-years) and Indonesia (193.3/100,000 person-years), followed by Myanmar and North Korea. All three regions show a range of mortality values, although, in general, they are lower in South Asia and high-income countries in East Asia. These varying rates may reflect the differences in stroke incidence, disease severity, and quality of healthcare. Competing causes of death such as coronary artery disease may provide a falsely low mortality value attributable to stroke [3, 8, 9, 11, 13, 23, 28, 29].

According to the WHO (2017), stroke deaths in Afghanistan reached 18,204 or 7.78% of total deaths, while this rate is 14,315 (8.13%) in Iraq, 109,165 (8.96%) in Pakistan, 890 (10.02%) in Kuwait, 130,159 (12.12%) in Japan, 42,356 (13.06%) in Iran, 8,809 (14.55%) in Azerbaijan, 3,385 (18.09%) in Mongolia, 2,098,609 (22.46%) in China, 49,241 (22.51%) in North Korea.

Among 33 Asian countries, the latest Stroke death rate rankings (2017) showed top 10 countries with high death rate (in decreasing order): Indonesia, Mongolia, North Korea, Turkmenistan, Russia, Muanmar, Afghanistan, Georgia, Tajikistan, and Kyrgyzstan. Among Asian countries, the lowest death rates were in South Korea, Japan and Singapore (WHO, Age Adjusted Death Rates Estimates: 2017).

In 2017, by the stroke death rate, Uzbekistan is on the 20th place after Kazakhstan among 33 Asian countries, having the lowest death rate among Central Asian countries. The highest rank had Turkmenistan, then Tajikistan and Kyrgyzstan. Uzbekistan is on the latest place in this ranking. In Uzbekistan, stroke deaths reached 16,641 or 9.85% of total deaths, while this rate is reached 14,871 (10.86%) in Kazakhstan, 5,012 (14.27%) in Kyrgyzstan, 5,347 (12.51%) in Tajikistan and 5,737 (15.06%) in Turkmenistan (Table 2).
Table 2. Stroke deaths ranking in Central Asia (WHO, 2017).

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
<th>Deaths of strokes</th>
<th>%</th>
<th>The age adjusted death rate/100,000 population</th>
<th>World Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uzbekistan</td>
<td>30,932,878</td>
<td>16.641</td>
<td>9.85</td>
<td>83.74</td>
<td>90</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>17,067,216</td>
<td>14.871</td>
<td>10.86</td>
<td>90.99</td>
<td>84</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>8,628,742</td>
<td>5.347</td>
<td>12.51</td>
<td>140.11</td>
<td>21</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>5,940,743</td>
<td>5.012</td>
<td>14.27</td>
<td>137.56</td>
<td>25</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>5,817,285</td>
<td>5.737</td>
<td>15.06</td>
<td>170.80</td>
<td>6</td>
</tr>
</tbody>
</table>

**Comparative epidemiology.** Heart disease and stroke are competing causes of mortality. Generally, stroke-associated mortality, as a percent of total mortality, is lower than ischemic heart disease-related mortality, in most parts of the world [10]. This could be explained by the higher prevalence of diabetes mellitus and hypercholesterolemia among those with ischemic heart disease, than stroke patients. However, in some countries, the converse is true, wherein the stroke-related mortality exceeds the mortality caused by ischemic heart disease (in China by 11.9%, Korea by 9.9%, Mongolia by 8.0%, Thailand by 6.6%, etc.). Yet, the stroke mortality in Asia is higher than in North America or Europe [11].

According to the DALYs lost, the stroke burden is lower than that associated with ischemic heart disease. However, in terms of mortality, the stroke burden exceeds the ischemic heart disease burden in the same countries in which an excess stroke mortality is observed – China, Mongolia, and Thailand. [14].

According to Age Standardized death rate, in 2010, the top 10 causes of death in Uzbekistan were: coronary heart disease (37.41%), stroke (9.85%), hypertension (6.05%), liver disease (4.70%), diabetes mellitus (3.34%), Influenza and pneumonia (4.35%), kidney disease (3.25%), low birth weight (3.12%), congenital anomalies (2.28%), and birth trauma (2.12%).

Ischemic stroke occurs more frequently (75-90%) than hemorrhagic stroke in much of the world. However, the incidence of hemorrhagic stroke (15-40%) is
much higher in Asia, notably in China, than most developed countries in North America and Western Europe [12].

**Stroke subtypes.** Information on stroke subtypes is also available in most countries, as derived from hospital-based stroke registries. In general, ischemic stroke (75-90%) occurs more commonly than hemorrhagic stroke, except in India and Vietnam, where the converse is observed. Subarachnoid hemorrhage is uncommon. Cerebral venous sinus thrombosis may also cause stroke, especially among young women [3].

In Uzbekistan, using the TOAST classification, Vereschagin-Suslina’s criteria and computed program of the Russian National Stroke Center to determine subtypes of ischemic stroke [1, 21, 25], were determined the following most frequent ischemic stroke subtypes: atherothrombotic stroke (42%), lacunar stroke (41%), and cardioembolic stroke (17%) [17]. Later on, additionally using a new method of differential diagnosis of pathogenic subtypes of ischemic stroke (Invention Patent No.04956, 2014) [18], it has been possible to determine the frequency of the following stroke subtypes: 40.4% of atherothrombotic stroke, 39.1% of lacunar stroke, 12.3% of cardioembolic stroke, 3.6% of stroke of other determined or mixed etiology, and 4.6% of cryptogenic stroke.

Stroke subtyping can have different purposes, e.g. describing patients’ characteristics in a clinical trial, grouping patients in an epidemiological study, careful phenotyping of patients in a genetic study, and classifying patients for therapeutic decision-making in daily practice. Regarding the 4 main categories of aetiologies of ischemic stroke (i.e. atherothrombotic, small vessel disease, cardioembolic, and other causes), the classification should reflect the most likely aetiology without neglecting the vascular conditions that are also found [16].

**Vascular risk factors.** Data on the vascular risk factors among stroke patients are available for a number of countries. These are derived from hospital-based stroke registries. Increasing age, sex (male), and genetics are non-modifiable risk factors for stroke. The modifiable stroke risk factors are well known and presented in the WHO database. These were derived from community-based cross-
sectional surveys. Similar criteria were used for diagnosis, which makes the studies comparable.

Hypertension remains the most common medical risk factor for stroke, whereas current smoking and inactivity are the most predominant among lifestyle-related risk factors. In most countries, high or low frequencies of occurrence are observed consistently across all risk factors for that country, compared to other countries. There is a range of frequencies within each region. A high prevalence of hypertension is seen in Mongolia and Pakistan (low in Korea and Singapore); diabetes mellitus in Papua New Guinea, Pakistan, and Mongolia (low in Vietnam, Timor Leste, and DPR Korea); hypercholesterolemia in Japan, Singapore and Brunei (low in Nepal, Timor Leste, and DPR Korea); inactivity in Malaysia (low in Nepal and Lao PDR); obesity in Brunei, Papua New Guinea, and Mongolia (low in Timor Leste, Cambodia, and Bangladesh); tobacco smoking in Indonesia (low in India). In general, hypertension, diabetes mellitus and tobacco smoking tend to be more prevalent among men, whereas hypercholesterolemia, inactivity and obesity tend to be more prevalent among women [3, 9, 11, 13, 23, 28, 29].

According to Tashkent-hospital based studies, hypertension was the most prevalent risk factor for ischemic stroke (89%). The other most frequent aetiological factors were atherosclerosis in 73%, including their combinations in 36%, diabetes mellitus in 32%, and heart diseases in 36%. Physical inactivity was prevalent in 64% of patients. Stress was one of the main risk factors (67%), especially in men and in atherothrombotic (76.2%) and lacunar strokes (65.8%). Sleep disorders contributed to stroke in 49%, independently of sex [16, 17].

**Trends.** Globally, between 1990 and 2013, there was a rise in the number of deaths, survivors, and events associated with stroke. However, the significant increase in the associated deaths and DALYs lost were not significantly different between developing and developed countries [6]. Stroke-related mortality has been decreasing in East-Asian countries such as Japan, Korea, Taiwan, and the urbanized areas of China [11]. This may be due to the better risk factor control and
stroke care in these countries. However, the age-standardized stroke incidence, in general, has remained relatively constant.

In Uzbekistan, according to the WHO (2014), cardiovascular diseases accounted 54% of total mortality 184,000, especially in males (Figure 1).

**Uzbekistan**

**Total population:** 28,541,000  
**Income Group:** Lower middle

<table>
<thead>
<tr>
<th>Age-standardized death rates</th>
<th>Proportional mortality (% of total deaths, all ages, both sexes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>males</td>
<td>females</td>
</tr>
<tr>
<td>700</td>
<td>500</td>
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</tbody>
</table>

**Premature mortality due to NCDs**

The probability of dying between ages 30 and 70 years from the 4 main NCDs is 31%.

**Adult risk factors**

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>males</td>
<td>females</td>
<td>total</td>
<td>males</td>
</tr>
<tr>
<td>22%</td>
<td>3%</td>
<td>13%</td>
<td>7.9</td>
</tr>
<tr>
<td>12.8%</td>
<td>17.4%</td>
<td>15.1%</td>
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</tr>
</tbody>
</table>

**National systems response to NCDs**

- Has an operational NCD unit/branch or department within the Ministry of Health, or equivalent: Yes
- Has an operational multisectoral national policy, strategy or action plan that integrates several NCDs and shared risk factors: No
- Has an operational policy, strategy or action plan to reduce the harmful use of alcohol: No
- Has an operational policy, strategy or action plan to reduce physical inactivity and/or promote physical activity: No
- Has an operational policy, strategy or action plan to reduce the burden of tobacco use: No
- Has an operational policy, strategy or action plan to reduce unhealthy diet and/or promote healthy diets: No
- Has evidence-based national guidelines/protocols/standards for the management of major NCDs through a primary care approach: Yes
- Has an NCD surveillance and monitoring system in place to enable reporting against the nine global NCD targets: No
- Has a national, population-based cancer registry: No


Figure 1. Non-communicable diseases Uzbekistan Profiles (WHO, 2014)
In South-Asian countries such as India, Pakistan, and Bangladesh, and in developing countries in South-East Asia, such as Cambodia, Indonesia, Lao PDR, and Malaysia, with the better control of infectious diseases, life expectancy will be prolonged. With the economic transition of these countries, towards achieving “developed country” status, risk factors such as hypertension, diabetes mellitus, hypercholesterolemia, obesity, and cigarette smoking will become more prevalent, raising the incidence of stroke. However, due to insufficient healthcare facilities in these developing countries, the mortality will be high, and the number of disabled survivors will also rise [3]. The decrease in high mortality, incidence and morbidity, observed predominantly in high-income countries, reflects the significant impact of the economic status of a country on health. This pattern of high incidence and falling mortality is likely to raise the prevalence of stroke in those countries. This problem may be compounded by the presence of fewer caregivers, as these countries also have low birth rates [3].

**Conclusions**

Stroke remains a devastating disease in the world despite major improvements in management over recent decades, which has contributed to better outcomes in patients. Although the incidence has been stable or has decreased, the ageing population will lead to a dramatic increase in the absolute number of stroke cases.

The global burden of stroke has the largest contribution from Asia, as in these countries, there are disparities in the healthcare provisions, and this will continue to pose a challenge to disease control. As life expectancy increases, with the aging of Asian populations and reduction in mortality due to infectious diseases, and the rise in the prevalence of vascular risk factors among economies in transition, the stroke burden in Asia will surely rise. Governments and healthcare workers need to work together, with an informed public, to stem this growing epidemic.

Based on the up-to-date reliable data from the excellently-performed GBD study and WHO, as well as large, recently-conducted studies from most Asian
countries and our own studies, this paper summarizes and compares the main epidemiological data on stroke in Asia, including Uzbekistan, that could be helpful to clinicians, researchers and healthcare workers.

References


