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REVIEW

Ischemic heart disease among the general Mongolian population: a review of epidemiological studies

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Ischemic heart disease (IHD) is considered to be a pivotal health problem in Mongolia. To summarize the existing epidemiology of IHD in the general Mongolian population is crucial for primary prevention. The present review summarized population-based epidemiological data of IHD in Mongolia. When epidemiological studies were extracted from databases, very limited studies were available. The frequencies of IHD and IHD-attributable death rates appeared to be high and have an increased tendency in Mongolia. This could to be due to a gradually worsening state of potential IHD-related risk factors, such as smoking, hypertension, hypercholesterolemia, obesity and diabetes mellitus. This might indicate an urgent need of strategies for IHD and related risk factors. Anti-IHD strategies, such as more epidemiological studies and campaigns to increase awareness of IHD, at nationwide public health levels would be required in Mongolia for more effective prevention.

Keywords: Acute coronary syndrome, Angina pectoris, Cardiovascular disease, Ischemic heart disease, Mongolia, Myocardial infarction

Introduction

Cardiovascular diseases are a worldwide health problem and are recognized as one of the leading causes of mortality among adults in many countries.[1] Ischemic heart disease (IHD), a major pathology of cardiovascular diseases, is also thought to be a pivotal health problem in Mongolia and is reported to be the third leading mortality cause among total deaths in Mongolia.[2] According to WHO, Mongolia is ranked 10th in terms of IHD-related deaths among East-Asia and Pacific region.[3]

There is, thus, a critical need to strengthen primary prevention strategies for IHD in Mongolia. To provide an overview of epidemiological data would be useful for producing these strategies; however, to our knowledge, there have been no academic review papers about IHD in Mongolia. This paper aimed to summarize the existing population-based epidemiological data of IHD in Mongolia.

Review process

Epidemiological studies (from 1970 to February 2015) written in English language were extracted from Medline/PubMed and those written in Mongolian and Russian languages from the MongolMed and Mongolian library databases, using 'IHD' and 'Mongolia' as keywords for searches. We also used the keyword 'acute coronary syndrome' in the search (however, no studies for inclusion in this review could be obtained utilizing that search term). The searches were limited to general population-based epidemiological studies. The studies were included if the reports contained completed information regarding the years that the studies were conducted, their settings, sample sizes and demographic characteristics (e.g., age and gender). Clinical hospital-based studies on IHD were excluded because these studies could not reflect the national status of the disease. A manual search was also performed based on the citation references of searched articles, and the related articles were added.

Using such search criteria, a very limited number of studies were then obtained. About 20 papers were retrieved via Medline/PubMed and MongolMed search, but most papers were irrelevant to the purpose of this review. In adding the related articles from a manual search, one study[4] in Russian (abstract written in English) language and four studies[3,5-7] in English language were obtained (these were via Medline/PubMed). Three studies[8-10] in Mongolian language were obtained via MongolMed. Three studies[11-13] were obtained from a source of the library of the Mongolian National University of Medical Sciences (there is only one national medical school in Mongolia). Official documents as procured in the library[2,14-16] were also included as applicable information.

Table 1. Morbidity of ischemic heart disease in Mongolia

Year	Morbidity (%)	Study population	Reference
1973–1982	0.02%	Overall	Natsagdorj AU et al.[11]
1983–1992	0.13%	Overall	Natsagdorj AU et al.[11]
1988	8.3% (males only)	Aged 40–59 years	de Serjee YD[8]
1988	8.8%	Aged 30–65 years in Ulaanbaatar	Ts Muhar BS and Erdenechimeg B[13]
2009	16.2%	Aged over 40 year	Enkh-Oyun T et al.[7]

Morbidity of ischemic heart disease in Mongolia

A cross-sectional study reported that the prevalence of IHD was 8.3% in Mongolian males (n=60, aged 40–59 years) in 1988.[8] According to the WHO survey (a cross-sectional study in the capital city, Ulaanbaatar) in 1998, the prevalence was 8.8% (9.0% in males and 8.5% in females) among residents (n=604, aged 30–65 years).[13] The nationwide study conducted in 2009 reported that the prevalence of IHD was 16.2% (n=2280; 851 males and 1429 females; aged over 40 years).[7] The national morbidity and mortality reports of the Ministry of Health of Mongolia from 1973 to 1992 reported the morbidity of IHD to be 17 per 100 000 people between 1973 and 1982, and 129 per 100 000 people between 1983 and 1992.[11] The morbidity of IHD appears to have been trending upward in Mongolia (above data are summarized in Table 1).

There also appear to be differences in IHD morbidity correlated with age. The nationwide study conducted in 2009 reported that the prevalence of IHD was 9.9% in those aged 40–44 years compared to 17.7% in those aged over 60 years.[7] There were data specific for myocardial infarction, that is, the national statistics of 1998–2007 reported the morbidity of acute myocardial infarction to be 212 per 100 000 people aged 45–64 years and 501 per 100 000 people aged over 65 years.[10]

There could a be a geographic difference in the morbidity of IHD. A cross-sectional study was conducted in 1986 among Aboriginal males (n=1357, aged 20–59 years), living in four different regions of Mongolia.[4] While the existence of IHD was based on the ischemic features of electrocardiography (e.g., residents with nonspecific T wave changes were included as having IHD), that study reported residents with IHD to be 21.9% of the Khangai region (a high-altitude region), 14.6% of the Gobi-Altai region (a high-altitude region), 6.0% in people living in a middle-altitude region, and 4.0% in people living in a low-altitude region.[4] Another cross-sectional study based on the ischemic features of electrocardiography was done for the relatively older residents (n=1000, aged over 60 years) in one district of Ulaanbaatar.[9] The prevalence of IHD was 658 per 100 000 people (641 in males and 670 in females).[9] Based on these studies, the development of IHD might be associated with not only age but also with geographic factors in Mongolia. The geographic factors are unclear in detail, but can include not only an altitude-related physical condition but also genetic, lifestyle, socioeconomic and healthcare-system aspects under the respective regional environments.

Mortality of ischemic heart disease in Mongolia

The Central area data from 1994 reported the mortality rates caused by IHD to be 56 per 100 000 in males and 42 in females.[6] An ecological study in 2004 reported that the mortality of IHD was 93 per 100 000.[5] The Global Burden of Disease and Mortality by WHO Global Infobase Report described that the mortality of IHD was 95.2 per 100 000 (141.6 in males and 58.3 in females) in 2002 and 92.8 in 2004 (139.6 in males and 55.5 in females).[15] In a published book entitled *Global Atlas on Cardiovascular Diseases Prevention and Control*, the age-standardized mortality of IHD was described to be 75.7 per 100 000 in 2008.[16] WHO examined the mortality of IHD between 1995 and 2009 in Mongolia when the mortality was 110 per 100 000 in 2008.[3] In 2008 WHO announced that the mortality of IHD reached 9.1% of total mortality.[2] The national statistics of 2013 described IHD as the leading cause of all mortality causes (125 in 100 000) for people aged over 65 years.[14] When the data were assessed specifically for myocardial infarction, the mortality caused was 87 per 100 000 in 2009 and 94 in 2012.[14] From the overall data, the mortality of IHD appears to have an increasing tendency in Mongolia (above data are summarized in Table 2).

The mortality of IHD seems to be associated with aging and male gender. The study using national data between 1973 and 1992 reported that the mortality of IHD was 5.8% of all mortality in the age group from 30–49 years, 49.8% in 50–69 years and 44.4% in those over 70 years of age.[11] The mortality of IHD was higher in males (64.9%) than in females (35.1%).[14]

There could also be geographic differences in the morbidity of IHD. When the data were reviewed specifically for acute myocardial infarction, the national statistics of 1998–2007 reported the mortality of myocardial infarction to be higher in Ulaanbaatar City and lower in an Eastern region.[12]

In addition to the upward trend in mortality of IHD in Mongolia, we can see the comparative statistics obtained from the *Global Atlas on Cardiovascular Diseases Prevention and Control*. This described the comparative data of the age-standardized mortality of IHD in 2008 among Asian countries.[16] The mortality was 75.7 per 100 000 in Mongolia, and the level appeared similar to that of China (79.7) and Thailand (87.1), while this level was higher than that of Japan (31.2) and Korea (34.7).[16] A similar trial to compare the mortality of IHD among countries was conducted using the data of 2004 and revealed that the mortality was 93 per 100 000 in Mongolia, 63 in China, 44 in Thailand, 40 in Korea and 32 in Japan.[5] Although the classification of IHD was defined, caution is necessary to interpret the data since

Table 2. Mortality of ischemic heart disease in Mongolia

Year	Mortality (%)	Study population	Reference
1994	Males 0.06%; Females 0.04%	Overall in Central area	Moore MA et al.[6]
2002	0.1% (Males 0.14%; Females 0.06%)	Overall	WHO[15]
2004	0.09%	Overall	Kim AS and Johnston SC[5]
2004	0.09% (Males 0.14%; Females 0.06%)	Overall	WHO[15]
2008	0.08%	Overall	Mendis S[16]
2008	0.11%	Overall	Finegold JA et al.[3]
2013	0.13%	Aged over 65 years	State Implementing Agency of Health[14]

these statistics could have limitations (e.g., problems of availability of source dataset and data collection methods across countries, leading to inaccurate estimates).[5] Even so, the comparative statistics would be an implication of the burden of IHD in Mongolia.

Factors correlated with ischemic heart disease

A relatively high and upward trend in the death rates associated with IHD in Mongolia illustrates the need to analyze factors correlated with IHD in Mongolia. Traditional risk factors derived from the Framingham Heart Study are age, family history of IHD, smoking, hypertension and hypercholesterolemia.[17] In Mongolia, the comprehensive surveys of the risk factors in relation to IHD have rarely been conducted.

Age

The effect of age on IHD is strong in both genders.[3,7] There was an approximately two-fold higher prevalence of IHD in males aged over 55 years than in those aged 40–44 years (as a reference group), and there was a more than two-fold higher prevalence of IHD in females aged over 50 years than in those aged 40–44 years (as a reference group).[7] In Mongolia, age over 50 years is considered to be a risk factor of IHD, regardless of gender. Of note, Mongolia is facing a gradual transition to the challenges of an aging society with the modernization of the nation; this situation is not specific to Mongolia.

Family history

The role of family history of IHD is known as a risk factor of IHD.[18] However, there have been no studies on this subject in Mongolia.

Smoking

The prevalence of people with a smoking habit was 31.7% (49.4% in males and 9.4% in females) in Mongolia in 1988.[19,20] A national survey reported that the prevalence of smokers remained unchanged or gradually increased from 24.2% (43.1% in males and 4.1% in females) in 2005 to 27.6% (48.0% in males and 6.9% in females) in 2009.[21] Although the trend of percentages of smokers did not appear to be unidirectional (it might be partially due to the methods of survey),[19-21] it is pertinent to recognize that the actual prevalence of smokers, in males in particular, remains high in Mongolia. A recent nationwide study reported a significant association between smoking (as former and current smokers) and the existence of IHD in males in particular.[7] Currently, public health campaigns to decrease tobacco use among the general population are not robust in Mongolia.

Hypertension

In a cross-sectional study conducted in 1982–1984 (n=3100, aged 31–64), the prevalence of hypertension was 19.9%.[22] According to data from WHO in 2010, the age-standardized mortality rate attributable to hypertension was higher than in other countries (40.9 per 100 000 people).[2]

According to the national study, the knowledge, attitudes and practices related to noncommunicable diseases (NCDs) among the Mongolian general population (n=3450) in 2010, one-fifth of people reported having never heard the term 'blood pressure'.[23] This absence of health knowledge was significantly higher in males, particularly in younger males.[23] On the other hand, urban people better recognized high blood pressure to be a threat to health, suggesting that there are age-based and region-based differences in terms of lack of awareness of hypertension as a health issue.[23]

Hypercholesterolemia

The national surveys reported that prevalence of hypercholesterolemia was clearly increasing, with 23.9% in 2005, 41.7% in 2009 and 61.6% in 2013.[21,24,25] However, factors such as increased awareness and repeated surveillance could partially affect the increased percentages identified.

Other factors

We consider it imperative to take other known risk factors of IHD into consideration. Metabolic conditions, such as obesity and diabetes mellitus, are among these factors. The national surveys reported that obesity was increasing, with rates of 10.2% in 2005, 12.2% in 2009 and 19.7% in 2013.[21,24,25] A recent nationwide study showed that the prevalence of diabetes mellitus was 2.9% in 1999 and had increased to 6.5% in 2009 in Mongolia.[26] One in five of the general population had never heard the term 'diabetes mellitus' prior to the national study conducted in 2010.[27]

Socioeconomic status has also come to be seen as a risk factor of IHD.[7] A nationwide study (n=2280, 851 males and 1429 females) in 2009 reported that a lower education level was positively associated with IHD in females in Mongolia.[7] Whether drinking alcohol can increase the risk of IHD or not remains to be clarified, while a nationwide study reported that a high consumption of alcohol was associated with a higher prevalence of IHD in Mongolian women.[7]

Summary

Urbanization is generally associated with a worsening state of risk factors of IHD, such as behavioral and cardiometabolic factors (i.e., smoking, hypertension, hypercholesterolemia, obesity, diabetes mellitus).[3] Mongolia seems to have this situation, while there are limited data to see comprehensively the risk factors in relation to IHD in Mongolian people. It is important to identify fully these risk factors and monitor the trends, as well as for establishing the strategies for IHD.

Strategies for ischemic heart disease

In addition to the administration of medications aimed at reducing blood pressure, cholesterol or blood glucose, anti-IHD strategies with behavioral interventions targeting primary prevention of IHD are required in Mongolia.[28] With this in mind, the National Programme on Prevention and Control of NCDs, including IHD, was approved in 2005.[29] In 2010, Millennium Challenge Account Mongolia and WHO launched the project 'Stroke and Heart Attack' to improve the care delivery framework for IHD (although this is not the only primary preventive strategy against IHD). The effects of the project remain to be determined.

In addition to such activities, from our review, we would like to advocate the need for more population-based epidemiological studies, especially cohort studies and national surveys, to identify and monitor the IHD-related risk factors, as well as public health campaigns to increase awareness of IHD, for effective primary prevention in Mongolia.

Conclusions

While there are currently limited population-based epidemiological studies on IHD in Mongolia, a significant burden of IHD is suggested in Mongolia based on our review. Anti-IHD strategies, such as more epidemiological studies and campaigns to increase awareness of IHD, are necessary on a nationwide basis in Mongolia for effective prevention.

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