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*Medicine*  
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# Mongolian Journal of Health Sciences

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## MESSAGE FROM THE EDITOR-IN-CHIEF

### DEAR READERS,

The beginning of a new year is both a time forward and for reflecting on past accomplishments. Each year in this space we offer our heartfelt thanks to the volunteer peer viewers who help ensure the quality and integrity of the Mongolian Journal of Health Sciences. We simply couldn't be successful in our jobs as editors without their continued dedication and commitment to the scientific community.

This issue is dedicated to the hundreds of qualified medical professionals, academic staff, graduate students and others, who are loyal readers and contributors.

Since the victory of the democratic revolution and economic transition from a centrally planned to a free market economy in 1990, the trend, content and goal of medical research has changed to a new scientific perspectives as well as remarkable improvement of researchers' knowledge and capacity.

Many of young promising medical scientists are successfully working in the modern scientific laboratories and research institutes of Mongolia as well as those of developed countries. Their research results are cited and published at the internationally recognized journals with high impact factor. Therefore, one of the goals of Mongolian Journal of Health Sciences is to disseminate and share our accumulated research achievements and experiences with international research colleagues and scholars.

We are proud that Mongolian Journal of Health Sciences was successfully registered to the WPRIM opening a door enormous opportunities to introduce our journal to the Asian Pacific Region Countries' academic colleagues. We do hope that the publication of MJHS will be a channel for future fruitful collaboration and lead us to the new unexplored areas of research horizon.

All the best wishes to the dear readers of Mongolian Journal of Health Sciences!

Editor-in-Chief



Academician, Professor Ts. Lkhagvasuren (M.D., Ph.D., D.Sc.)

## MONGOLIAN JOURNAL OF HEALTH SCIENCES

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# Identification of factors influencing women receiving antenatal care-seeking behaviour in Bangladesh

Mosiur Rahman<sup>\*1</sup>, Towhidul Islam Tarafder<sup>1</sup>

## ABSTRACT

Antenatal care is a key strategy for reducing maternal mortality, but millions of women in developing countries do not receive it. This paper is a report of a systematic review to identify and analyze the main factors influencing the utilization of antenatal care in Bangladesh. To reach our goal Bangladesh Demographic and Health Survey of 2004 data for last five years (N = 4873) has been used. Descriptive and multivariate logistic regression methods were employed in analyzing the data. An increasing trend of receiving sufficient ANC was observed. Sufficient ANC is defined at least three antenatal care visits from doctors, nurses or family welfare visitors. Only a small proportion of mothers have taken sufficient antenatal care during pregnancy between 2000-2004 and only 16.3% women received prenatal care visits 4 or more times even though the recommended number of visits is 10. Adolescents (<20 years) and middle aged mothers (20-29 years) have taken more proper antenatal care during pregnancy than older aged mothers ( $\geq 30$  years). This study elucidates that the rate of receiving sufficient antenatal care was lower among mothers living in rural areas than among mothers of urban areas. Muslim families show little interest in receiving health care during pregnancy. Restricted women reported less reception of proper antenatal care services than mothers who have no restriction to go outside alone. Multivariate logistic regression analysis shows that higher educated women were one and half time times more likely to receive sufficient antenatal care. The same is true of husband education. Women whose husbands had a lower status job were less likely to receive sufficient antenatal care. The other main contributing factors likely to affect reception of sufficient antenatal care were the mother's earning status, the mother's age at the last birth household quality and assets index, knowledge about pregnancy complications, where to go for pregnancy complication and the type of toilet facility. The results indicate several policy options. The high-risk group such as adolescents and higher aged women need special care and the existing health management system should be strengthened to create awareness among mothers of these groups for seeking appropriate measures from the beginning of pregnancy. There is need to ensure the availability of maternal health care centers that provide antenatal care and expand and improve the quality of normal delivery at home by trained providers and introduce post-partum visits. It is equally important that education for women is emphasized to bring about a lasting impact on the overall health condition of women. More qualitative research is required to explore the effect of women's satisfaction, autonomy and gender role in the decision-making process. Adequate utilization of antenatal care cannot be achieved merely by establishing health centers. Women's overall social, political and economic status needs to be considered.

**Key words:** ANC, Demographic Characteristics, Socio-economic characteristics, Logistic regression analysis, Bangladesh

## INTRODUCTION

W.H.O has recommended four strategic interventions or "four pillars" for safe motherhood. These include family planning, antenatal care; clean/safe delivery and emergency obstetric care. Antenatal care has been given the highest priority of these "four pillars" in the health system. The pregnancy period is the most vulnerable period of the entire life span. The risk is most serious if it has taken place when proper knowledge and treatment are not available. Different health related complications are exposed after

conception. More child bearing is a risk and often it will become maternal and child mortality. Proper antenatal care during pregnancy under hygienic conditions by trained personal significantly reduces the risk of maternal mortality and morbidity. UNFPA has estimated the lifetime risk of dying from pregnancy and childbirth related causes in Bangladesh as 1 woman in 21, which compares to 1 woman in over 4,000 in industrialized countries<sup>1</sup>. In Bangladesh, the current level of maternal mortality is very high, even by the standard of other developing countries<sup>2</sup>. Much of the maternal mortality and morbidity is largely preventable and improvement of maternal health considerably contributes to the health of general population. The maternal morbidity in Bangladesh considered unacceptable<sup>3</sup>. Antenatal Care

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(ANC), which is an acknowledged measure for reduction of maternal mortality and maternal morbidity<sup>4</sup>; is the care of women during pregnancy to achieve a healthy mother and a healthy baby at the end of pregnancy.

The International Conference on Population and Development (ICPD) in 1994 viewed reproductive health in a broader developmental context<sup>5</sup>. Under the safe motherhood initiatives, all pregnant women are expected to receive basic antenatal care. Implementation of the recommendations of ICPD Programme of Action however, was not simple and easy in most developing countries. The researcher and policy makers realized that the provision of expanded health services alone would not lead to increased utilization of antenatal care<sup>6</sup> as some women were more likely to use services than others. Socio-economic and other factors such as education, employment, household quality, access to mass media, communication, also influence the use of antenatal care<sup>7</sup>. In this article an effort is made to investigate the characteristics and trend of women receiving antenatal care over the last five years preceding the survey and finally to identify the factors that have influence on receiving antenatal care during delivery. Findings from this study are envisaged to provide important guidelines to improve the situation concerning the antenatal care services in Bangladesh

#### MATERIALS AND METHODS

This study utilizes the data extracted from 2004 Bangladesh Demographic and Health Survey (BDHS), which were conducted under the authority of the National Institute of Population Research and Training of the Ministry of Health and Family Welfare in Bangladesh. The study considered only the case for their last child. In order to fulfill our objectives the respondents who took delivery assistance during the different years were classified into five groups as 2000, 2001, 2002, 2003 and 2004. Bivariate analysis was performed to determine the differentials of modes of delivery assistance by explanatory variables. Pearson's Chi-square test of independence was performed to test the existence of significant association between categories of delivery assistance and selected risk factors. Considering

the fact that among multivariate techniques the Cox's linear logistic regression model is algebraically simple, computationally straightforward and efficient with acceptable degree of precision for a binary dependent variable, this study applied Cox's linear logistic regression model<sup>8</sup> for multivariate analysis.

#### RESULTS

Before going directly into the findings concerning utilization of antenatal care services, it is appropriate to examine trend analysis of antenatal care of last child. If we look at Table-1 we observe that about 49% mothers have taken sufficient antenatal care during pregnancy in the time interval 2000-2004. An increasing trend of receiving sufficient ANC is observed from 2000 to 2004, 42.7% percent mothers received sufficient ANC in the year 2000 followed by 48.8%, 49.0%, 51.8% and 55.5% mothers in 2001, 2002, 2003 and 2004. Table 1 also reveals that mother's tendency to check health status during pregnancy from doctor/nurse or family welfare visitor has gradually increased from 2004-2004.

**Sufficient:** *Received at least three antenatal care visits with first visit during the first three months of pregnancy from medically trained personnel (i.e. doctor, nurse & family welfare visitors).*

**Insufficient:** *Received antenatal care from other persons (i.e. trained & untrained TBA, other).*

**No care:** *Not receiving antenatal care*

It is also found from table 1 that about 78.5% mothers have taken first visit within six months during 2000-2004 and the number of antenatal care visits ( $\geq 4$  times) is found higher proportion in the year 2004 ( 17.9%) and lower in 2000 (13.5%).

Now we have discussed various impacts of some selected background characteristics on receiving ANC. Table 2 presents differentials of mother receiving sufficient, insufficient and ignoring the pregnancy care according to some selected demographic characteristics. Table 2 elucidates that adolescence ( $<20$  years) and middle aged mothers (20-29 years) have taken more proper antenatal care during pregnancy than older aged mothers ( $\geq 30$ ).

**Table 1:** Trend analysis of antenatal care for last child

	2000 N= 843	2001 N=1089	2002 N=1272	2003 N=1388	2004 N=280	2000-2004 N=4872
<b>Types of ANC received</b>						
Sufficient	42.7	48.8	49.0	51.8	55.5	49.0
Insufficient	7.0	6.6	7.7	7.8	5.1	7.2
No care	50.3	44.6	43.3	40.4	39.4	43.8
<b>ANC Provider Qualification</b>						
Doctor	25.73	32.7	33.7	34.7	28.7	31.6
Nurse & family welfare visitors	16.17	17.6	19.3	20.2	27.4	19.5
Other person	7.8	5.1	3.7	4.5	4.5	5.1
Some care	49.7	55.4	56.7	59.6	60.6	56.2
<b>No. of months pregnant at the time of first visits</b>						
<6 months	77.4	82.3	78.1	77.1	75.7	78.5
6-7 months	13.0	10.5	12.2	11.3	12.0	11.7
8+ months	9.6	7.2	9.7	11.5	12.3	9.8
<b>No. of antenatal visits</b>						
No visits	50.2	44.6	43.3	40.5	39.4	43.7
For 1 time	15.4	14.6	16.1	18.0	16.6	16.2
2-3 times	20.9	23.8	23.8	25.0	26.1	23.8
4 times or more	13.5	17.0	16.8	16.5	17.9	16.3

**Table 2:** Antenatal care by demographic characteristics for last child

Demographic & Health related Characteristics	Sufficient	Not-Sufficient	No Care	No. of cases
<b>Mothers' age at Last birth</b>				
<20 *	53.0	6.9	40.1	1655
20-29 ***	50.4	7.8	41.8	2148
30+	39.3	6.9	53.8	485
<b>Future fertility Intention</b>				
Wants ***	55.7	7.4	37.0	1962
Don't wants	44.3	7.1	48.7	2757
Undecided	51.3	6.7	43.0	149
<b>Ever used any Contraception</b>				
Yes **	51.5	7.1	41.4	4061
No	36.7	7.7	55.6	809
<b>Wanted last Child</b>				
Yes **	50.7	7.1	42.3	4131
No	40.1	7.8	52.1	739
<b>Told about Pregnancy Complications</b>				
Yes ***	81.1	8.9	10.0	1511
No	34.7	6.4	58.9	3359
<b>Told where to go about for Pregnancy Complications</b>				
Yes ***	82.7	8.8	8.5	1432
No	53.2	11.7	35.1	77

Significant level: \* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001

Results in our study imply that sufficient antenatal care has been taken by those women who want more children in future (55.7 %). It is also found that respondents who have ever used any type of contraception received more sufficient antenatal care (51.5%) than the respondents who never used any type of contraception. This paper shows that mothers who have knowledge about pregnancy complications and also knowledge for treatment facilities utilized more proper health care services during pregnancy

compared to their congruent counterparts (81.1% & 82.7 %) [Table 2].

Mothers living in urban areas have taken more sufficient antenatal care than those in rural areas (71.8%) [Table 3]. Non-Muslim mothers utilized more sufficient antenatal care than Muslim mothers in our study (55.8% versus 48.4%). Mother's and their husband's educational and earning status have an important impact on women receiving prenatal care.

**Table 3.** Antenatal care by socio-economic characteristics for last child

Socioeconomic Characteristics	Sufficient	Not-Sufficient	No Care	No. of Cases
<b>Place of Residence</b>				
Urban	71.8	4.2	24.0	999
Rural	43.2	8.0	48.8	3872
<b>Administrative division</b>				
Barisal	39.5	7.2	53.1	291
Chittagong	47.1	7.0	45.9	1017
Dhaka	48.8	7.8	43.4	1507
Khulna	55.7	6.8	37.5	546
Rajshahi	52.1	7.7	40.2	1144
Sylhet	43.8	4.1	52.1	365
<b>Religion</b>				
Muslim	48.4	7.1	44.4	4477
Non-Muslim	55.8	7.9	36.3	394
<b>Mothers education</b>				
No education	30.5	7.3	62.2	1777
Primary	47.3	8.1	44.6	1474
Secondary	66.4	7.0	26.5	1350
Higher **	93.7	2.6	3.7	269
<b>Mothers earning status</b>				
Not working	49.5	7.3	43.2	4001
Working for Cash	46.5	7.1	46.4	718
Others	50.0	3.3	46.7	150
<b>Husbands education</b>				
No education	35.0	8.5	56.5	1909
Primary	44.6	7.6	47.8	1302
Secondary	62.7	6.3	31.0	1179
Higher ***	83.5	3.1	13.3	480
<b>Husbands Occupation</b>				
Manual	45.9	7.3	46.8	3441
Not-manual ***	57.6	7.4	35.0	1236
Others	50.8	3.6	45.6	195
<b>Has permission to Go out sides alone</b>				
Unrestricted *	50.2	7.8	42.0	257
Restricted	44.4	7.9	47.6	126
No mobility	41.8	7.4	50.8	906
<b>Ownership of land</b>				
Yes	56.0	9.5	34.4	241
No	60.6	5.6	33.8	213
<b>Watching TV</b>				
Yes ***	62.7	5.8	31.5	2616
No	33.2	8.9	57.9	2253
<b>Listening Radio</b>				
Yes ***	57.7	6.4	35.9	2172
No	42.0	7.9	50.1	2696
<b>Reading newspaper</b>				
Yes ***	76.8	6.7	16.5	781
No	43.7	7.3	49.0	4090

Significant level: \* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001

Table 3 shows that higher educated mothers received more sufficient prenatal care than their congruent counterparts (93.7%). The same pattern is found in case of husband education. Restricted women reported less reception of proper antenatal care services than among the mothers who have no restriction to go outside alone (44.4% versus

50.2%). Our study shows that mothers having mass media exposure received sufficient prenatal care. Mass media has a great impact on mother's health care during pregnancy.

Table 4 presents' differentials of mother receiving sufficient, in sufficient and ignoring the pregnancy care according to some selected household related characteristics

**Table 4:** Antenatal care by household related characteristics for last child

Household Characteristics	Sufficient	Not Sufficient	No Care	No.of Cases
<b>Sources of drinking Water</b>				
Piped water **	81.2	2.1	16.7	329
Well water	46.8	7.6	45.6	44.9
Other sources	30.2	18.5	51.3	512
<b>Household has Electricity</b>				
Yes ***	68.7	4.7	26.7	1886
No	36.6	8.8	54.6	2980
<b>Type of toilet facility</b>				
No facilities	34.7	9.3	57.0	640
Modern facilities ***	58.3	6.7	35.0	2774
Open/Hanging/ Others	37.8	7.8	54.6	1457
<b>Household assets Index</b>				
Lower	31.0	8.3	60.7	2181
Middle*	49.2	9.3	41.5	964
Upper **	71.7	4.6	23.6	1726
<b>Household quality Index</b>				
Lower	41.2	8.6	50.8	2248
Middle	45.4	8.1	46.5	1900
Upper ***	83.9	2.5	13.6	707

Significant level: \* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001

From Table 4 we see that respondents who were using piped water supply for drinking purposes and using modern toilet facilities received more sufficient antenatal care (81.2% and 58.3% respectively) than their congruent counterparts. Table 4 also reveals that respondents falling below

the lower category of household assets and quality index received less sufficient antenatal care services than the respondents in the middle and upper category of household assets and quality index.

**Table 5:** Logistic regression estimates for significant characteristics of mother’s antenatal care during 2000-2004

Characteristics	Received Sufficient ANC		Received Insufficient ANC	
	Coefficient $\beta$	Odds ratio	Coefficient $\beta$	Odds ratio
<b>Mothers’ age at last birth</b>				
<20 <sup>®</sup>	.....	1.000	.....	1.000
20-29	- 0.570***	0.873	0.323*	1.724
30+	-0.267***	0.765	-0.366	0.694
<b>Told about pregnancy complications</b>				
Yes <sup>®</sup>	.....	1.000	.....	1.000
No	-1.212***	0.298	.077***	1.080
<b>Told about health facilities for pregnancy complications</b>				
Yes <sup>®</sup>	.....	1.000	.....	1.000
No	-0.667*	0.697	1.132**	3.102
Place of residence				
Urban <sup>®</sup>	.....	1.000	.....	1.000
Rural	-1.531	0.216	0.560*	1.751
Mothers education				
No education <sup>®</sup>	.....	1.000	.....	1.000
Primary	1.104***	2.332	0.485	1.226
Secondary	1.101***	2.332	-0.967***	0.380
Higher	1.663*	3.515	-1.278	0.079
<b>Mothers earning Status</b>				
Not working <sup>®</sup>	.....	1.000	.....	1.000
Working for cash	-0.353**	0.423	-0.203	0.225
Others	0.454**	1.575	-0.374*	0.454
Husband’s education				
No education <sup>®</sup>	.....	1.000	.....	1.000
Primary	0.106*	1.895	-0.048***	0.949
Secondary	1.318**	1.728	-0.180**	0.653
Higher	2.016	2.985	-0.399	0.280
<b>Husbands Occupation</b>				
Manual <sup>®</sup>	.....	1.000	.....	1.000
Not-manual	0.739***	1.478	0.572***	1.565
Others	1.073**	1.342	-0.333	0.717
<b>Mass media exposure</b>				
Yes <sup>®</sup>	.....	1.000	.....	1.000
No	- 0.765	0.090	-0.529***	0.592
<b>Household has Electricity</b>				
Yes <sup>®</sup>	.....	1.000	.....	1.000
No	-0.335*	0.398	0.262	1.769

**Sources of drinking Water**

Piped water ®	.....	1.000	.....	1.000
Well water	-0.524	0.689	0.577***	1.021
Other sources	-0.444**	0.642	1.287	2.298

**Type of toilet facility**

No facilities ®	.....	1.000	.....	1.000
Modern facilities	0.353**	1.823	-0.781***	0.458
Open/Hanging/others	0.454**	1.575	-0.209	0.811

**Household assets****Index**

Lower ®	.....	1.000	.....	1.000
Middle	1.180**	2.250	0.606**	1.546
Upper	1.908	2.403	-0.585	0.795

**Household quality****Index**

Lower ®	.....	1.000	.....	1.000
Middle	0.113**	1.889	-0.693	0.837
Upper	1.091***	2.913	-0.206	0.366

**Significant level:** \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$  and ®: Refers to reference category.

Table-5 shows the factors associated with the determinants of receiving antenatal care services among the study population. The analysis indicates that for all health care outcomes, lower maternal age at last birth is associated with increase utilization of ANC. Mothers whose age at last birth is within 20-29 years and mothers who were  $\geq 30$  years were 0.873 and 0.765 times less likely to receive sufficient antenatal care services than the adolescence mothers. Mother's who can't report their complications were less likely to receive sufficient ANC but more likely to receive insufficient ANC than those who can report about pregnancy complications.. Mothers who have completed higher, secondary and primary education were 2.3, 2.3 and 3.5 times more likely to receive sufficient ANC than mothers with no education. The opposite situation has found of mothers taking insufficient ANC care. Mothers who were working for cash were 0.4 times less likely to receive sufficient ANC than who were not working for cash. Mothers whose husbands were primary and secondary educated were 1.8 and 1.7 times more likely to receive sufficient ANC compared to mothers whose husbands were illiterate. Husband's education was found to have a negative effect on receiving insufficient ANC. Regarding the husband's occupation, women whose husbands were non-manual workers (i.e., doctor, engineer or other professional workers) were 1.4 times more likely to receive sufficient ANC than women's whose husbands were manual workers. Mothers who have no mass media exposure were reported 0.09 and 0.5 times less likely to receive sufficient & insufficient ANC than mothers who have such kinds of exposure.

With respect to environmental indicators, women who were using water for drinking purposes from a well or other sources were reported less likely to receive sufficient ANC than who were using piped water. The opposite view has represented when mother takes insufficient ANC. Those who were using well water and others sources for drinking purposes were 1.0 and 2.2 times more likely to report receiving insufficient ANC than mothers using piped water. Table 5 also shows that mothers who were in middle and upper category in household assets and quality index were more likely to receive sufficient ANC than their counterparts belonging to lower category.

**DISCUSSIONS**

This study is designed to make an assessment to identify the factors associated with women's receiving antenatal health care services in Bangladeshi society. Although antenatal care is an important factor for health of mother and the newborn, our study reveals that a small proportion of mothers have taken sufficient antenatal care during pregnancy in the 2000-2004 time interval (49%). We have observed an increasing trend of receiving sufficient ANC from 2000 to 2004. In 2000 the rate was 42.7 percent but in 2004 it is on 55.5 percent, which is a good indication with respect to utilization of ANC services in Bangladesh.

Antenatal care from doctor/nurse is a rare event in our society. About three-fourths over population lives in village or rural areas where qualified doctors, nurse are not available for any health care of mother. Besides these fees of those persons are also more than traditional persons. Sometimes, Muslim families do not show any interest

about the health care during pregnancy because of *pardah-protha*. Consciousness is also a large factor for mother's prenatal care from appropriate persons. Our study reveals that only 51.1 percent mothers have a tendency to check health status during pregnancy from doctor/nurse or family welfare visitor. Pregnant mothers should take prenatal check at the right time from the right persons. At least three visits should be covered during the entire pregnancy. But it is easy to view that not everyone follows that rule. Although the number of antenatal care visits ( $\geq 4$  times) is found to be gradually increasing from 2000 to 2000 but this proportion is found to be very low, only 16.3% women visited for receiving antenatal care.

The observation that younger mothers received more proper antenatal care during pregnancy is probably due to the fact that younger mothers are more conscious about their health & pregnancy. A common scenario in our society is found that older age mothers are not very much conscious about their last child. Generally they think for their last child as they have done for their previous children.

Findings from this study indicate that urban mothers have taken more sufficient antenatal care than rural areas. This is likely to be attributed to unavailability of healthcare facilities in rural areas and that Doctor/nurse or FWA, are not available in rural/remote areas. Moreover, in Bangladesh, especially in rural areas, there is a problem of communication and transportation, which involves both, time and cost<sup>9</sup>. On the other hand, though government health services are financially not so expensive, organizationally and physically they may not be ideal to fulfill the demand of the clients. Knowledge of pregnancy related complications and also its treatment are not found in every woman in our country. Many women don't know where they can get proper health care. So most of the time they depend on their neighbors, relatives or other any unauthorized persons. That makes a very harmful situation during pregnancy or other times for the patient. This paper reveals that mothers who have knowledge about pregnancy complications and have knowledge of treatment facilities get more proper health care during pregnancy.

The observation that non-Muslim mothers received more antenatal care than Muslim mothers is most likely to be attributed to the religious beliefs. Traditional rules of modesty or *Islamic Purdah* (seclusion, wearing of a veil) is a social barricade of women for taking health care frequently in our society. Multivariate logistic regression analysis shows that parental education and mother's earning status have an important impact on women receiving prenatal care. Higher educated mothers are three and half times more likely to receive sufficient antenatal care than illiterate mothers. Educated mothers and husbands are always sincere to their self and families health care especially during pregnancy time. Educated couples always prefer small families and take more emphasis on proper health care.

Our study found that mothers having mass media exposure receive more sufficient prenatal care. In recent years, a number of governmental and non-governmental organizations have enriched their maternal and child health related programmes on television, radio and newspapers which is likely to have increased the mother's knowledge on safe motherhood. Household economic indices and hygienic conditions correatate with in seeking sufficient antenatal care from healthcare facilities. It has been shown that hygienic conditions such as use of potable water and type of toilet facilities are positive indicators of maternal health care system<sup>10</sup>. Interestingly, women who were using piped water for safe drinking purposes and using modern type of toilet facilities received more sufficient antenatal care.

The overall scenario of utilization of ante-natal health care services is not satisfactory. Still much work has to be done in this arena to attain more success in improving health situation of the mothers. The study therefore concludes that, Government should have to ensure available maternal health care center for providing ANC. Number of visits by FWV/FWA to women during pregnancy should be increased. Establishment of Union Health & Family Welfare Centers wherever needed and appointment of a doctor in these centers will be pursued in a phased manner to increase availability and access to quality care. This will improve the health condition of the women. Socio-religious prejudice is also a barrier to pregnant women about receiving treatment from male doctor, so female doctor should be appointed. Provide sufficient education for both urban and rural women, which will increase women's knowledge about reproductive health and her surroundings. Our present study was made under the basis of a particular time interval. Clearly more research is required for finding out of the factors that are associated with mother's receiving delivery assistance

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# Diabetic retinopathy in Ulaanbaatar

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## ABSTRACT

The objective of this study is establish the prevalence, severity, and risk factors for diabetic retinopathy in randomly selected type 2 diabetic patients in Ulaanbaatar. Two hundred forty six patients from 6 districts in Ulaanbaatar were included in this study. Participants provided a detailed medical and personal history and underwent an ocular examination including funduscopy and provided blood sample, from which the blood glucose was measured. The prevalence of diabetic retinopathy among people with type 2 diabetes was 29.2%. The prevalence of untreated, vision-threatening retinopathy was 2.4%. Retinopathy was positively associated with a longer reported duration of diabetes and with higher fractions of blood glucose ( $p < 0.01$ ). Loss of visual acuity correlated with progression of retinopathy ( $p = 0.003$ ). Retinopathy was not significantly associated with age, ethnicity, body mass index, and intake of alcohol or aspirin ( $p > 0.05$ ). Diabetic sight threatening retinopathy is common among patients with type 2 diabetes mellitus in Mongolia. People with diabetes should be encouraged to maintain strict glycaemic control and to undergo regular screening to delay or prevent and the development of retinopathy.

**Key words:** Diabetes mellitus, Diabetic retinopathy, prevalence.

## INTRODUCTION

In 2007, there are an estimated 246 million people with diabetes globally; this figure is predicted to rise to 380 million by 2025. Diabetes causes 3.8 million deaths a year, accounting for 6% of the total worldwide mortality. In patients with 20 or more years of diabetes, the majority have signs of diabetic retinopathy. Diabetes is the most common cause of blindness in people of a working age. In the USA, 1.6% of patients with Type 2 diabetes are legally blind. In England and Wales, 1000 patients with diabetes are registered blind or partially sighted every year<sup>1</sup>. The prevalence of diabetic retinopathy is much higher on diagnosis of Type 2 diabetes (6.7–30.2%). Diabetic retinopathy, the most frequent cause of blindness among adults in the U.S, affects >60% of people with type 2 diabetes during the first 2 decades of the disease<sup>2</sup>. Previous to 1993, studies had not proven that near-normal glycemia affects the development of retinopathy or other micro vascular or macro vascular complications of diabetes<sup>3</sup>.

Objective of this study is to establish the prevalence, severity, and risk factors for diabetic retinopathy in randomly selected type 2 diabetic patients in Ulaanbaatar.

Two hundred forty six patients were selected randomly for the study from the registered diabetes type 2 patients of 6 districts: Songino-Khairkhan, Sukhbaatar, Bayangol, Khan-Uul, Chingeltei and Bayanzurkh of Ulaanbaatar. The prevalence diabetic retinopathy was determined for this group.

At the test site, a full interview was conducted by trained interviewers. It elicited demographic details, a history of medical and ocular health, smoking and alcohol intake, and medication use. Body weight and height were assessed and body mass index (BMI) was calculated as weight (kg)/(height (m)<sup>2</sup>). The date of onset diabetes mellitus was established each study patient.

The date of each patients most recent dilated fundus examination was established. The identified of the examiner who performed the funduscopy examination also was obtained.

Participants underwent an extensive examination of each eye. Pupils were dilated with one drop of tropicamide (0.5%) and one drop of phenylephrine hydrochloride (10%) direct ophthalmoscopy was performed in each eye with careful attention to the optic disc and the fovea. Fundus examination from participants who reported having diabetes were evaluated by an ophthalmologist with retina sub specialist qualifications. This evaluation was used to determine the presence or absence of any diabetic retinopathy (DR), proliferative retinopathy, clinically significant macular oedema (as defined by the Early Treatment Diabetic Retinopathy Study (ETDRS)<sup>4</sup>, and previous retinal laser treatment. Levels of diabetic retinopathy were defined, according to the Academy of Ophthalmology in the United States, as mild non-proliferative, moderate non-proliferative, severe non-proliferative and proliferative DR<sup>5</sup>.

Dilated funduscopy was performed by an ophthalmologist with a 90 dioptre hand held fundus viewing lens used. The presence or absence of any DR, proliferative retinopathy, clinically significant macular oedema, or previous retinal laser treatment was recorded.

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One half of the participants agreed to provide a fingerprick blood sample. This was used to measure glycosylated haemoglobin percentages (HbA<sub>1c</sub>) via a Bayer DCA2000 HbA<sub>1c</sub> analyser (Bayer Co, Elkhart, IN, USA). This device has a measurable range of HbA<sub>1c</sub> from 5.5% to 24.4%

Statistical evaluation of the study was performed by SPSS12 software. A p value of <0.05 was considered to be statistically significant.

**RESULTS**

In total, 2460 participants were identified and 76 did not participate, giving a response rate of 96.9%.

The prevalence of diabetes was 29.2% (72/246). The prevalence of diabetic retinopathy in men was 41.7% (50/120), and was not significantly different from the prevalence in women of 39.7% (50/126) (p=0.22). The mean age of participants with diabetic retinopathy was 58.8 years (median 57.5 range 29-79). The mean age of participants with non diabetic retinopathy was 53.3 years (median 52.5, range 29-82). The prevalence of diabetic retinopathy did not vary significantly with age (p=0.15).

The prevalence of diabetic retinopathy in participants with diabetes diagnoses before the age of 30 was 66.6% (2/3). The prevalence of diabetic retinopathy in participants with diabetes diagnoses at the age of 30 or older was 40.3% (98/243). This difference was not statistically significant (p=0.18) Table1.

**Table1.** Prevalence of Diabetic retinopathy

Variable	N	Prevalence of retinopathy (%)	P value
Sex			
Female	50	39.7	0.22
Male	50	41.7	
Age at diagnosis (yr)			
<30	2	66.6	0.18
>30	98	40.3	

**Table 2.** Mean, median, range of Diabetic retinopathy and Non Diabetic retinopathy

Variable	Diabetic retinopathy	Non Diabetic retinopathy	P value
Age mean	58.8	53.3	0.15
median	57.5	52.5	
range	29-79	29-82	
Duration of diabetes			
mean	9.8	4.6	0.001
median	11.5	3.0	
range	1-27	1-27	

The mean reported duration of diabetes in participants with diabetic retinopathy was 9.85 years (median 11.50, range 1-27). The mean reported duration of diabetes in

participants non diabetic retinopathy was 4.61 years (median 3.0, range 1-27). This difference was statistically significant (p < 0.01). (Fig.1)

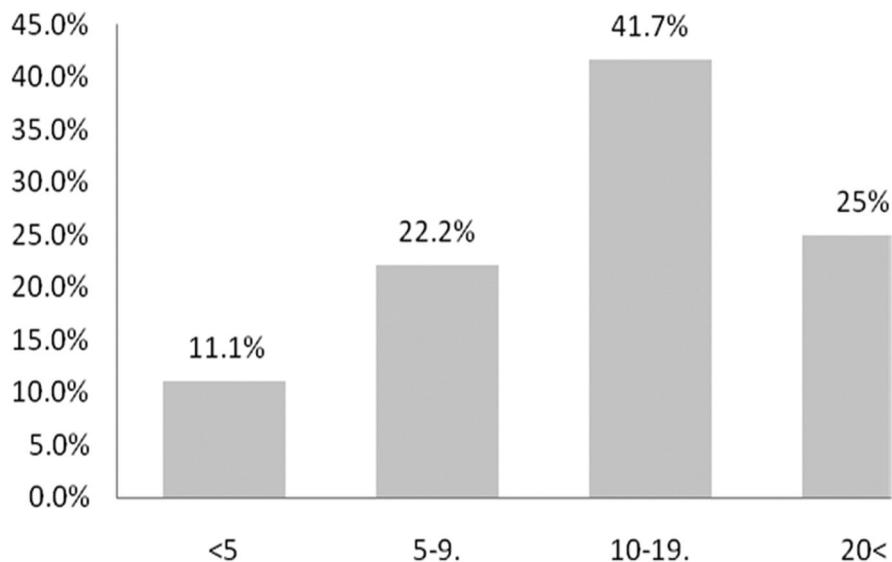


Figure 1. Diabetic retinopathy prevalence according to diabetes duration

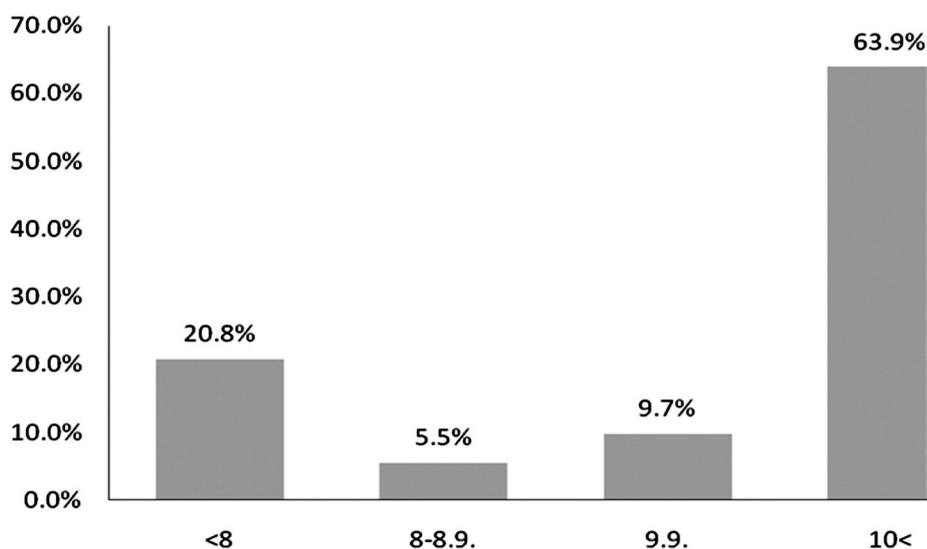


Figure 2. Prevalence of retinopathy by blood glucose level.

We obtained blood glucose measurements for 246 participants with diabetes and 72 of whom had diabetic retinopathy. The mean blood glucose in participants with diabetic retinopathy was 11.71% (median 12.05 range 5.3-28.2). The mean blood glucose in participants non diabetic retinopathy was 11.49% (median 11.7, range 4.5-20.8). This difference was statistically significant ( $p < 0.01$ ) (Fig.2)

Twelve of the 246 participants have laser treatment (4.8%) and this was bilateral in nine (3.6%), every people had clinically significant macular oedema (3.2%) and this was bilateral in five (2.03%). Untreated clinically significant macular oedema was found in five participants, including one person with *bilateral* untreated clinically

significant macular oedema and one person with treated macular oedema in the fellow eye.

There were nine people with proliferative diabetic retinopathy (3.6%) and this was bilateral in five (2.03%). Only one participant had untreated proliferative diabetic retinopathy. This participant had treated proliferative diabetic retinopathy in the other eye and did not have macular oedema. Combining this information gives six people (2.4%) with untreated, vision threatening diabetic retinopathy including one person with bilateral, untreated, vision threatening diabetic retinopathy (0.40%). The prevalence of mild, moderate and severe non-proliferative diabetic retinopathy was 6.5% (n=16), 8.1% (n=20), and 5.6% (n=14), respectively, and proliferative diabetic retinopathy was 8.9%(22).

The duration of diabetes diagnosis in the 8 participants with clinically significant macular oedema ranged from 4 years to 30 years with a median of 17.5 years and a mean of 17.7 years. The duration of diabetes diagnosis in the 22 participants with proliferative diabetic retinopathy ranged from 8 years to 27 years with a median of 15 years and a mean of 16 years.

Among participants who reported no previous diagnosis of diabetes, there were no signs of diabetic retinopathy found in any individual at the clinical eye examination.

## DISCUSSION

The prevalence of diabetic retinopathy among people with type2 diabetes in Ulaanbaatar Mongolia is 29.2%. This is similar to the prevalence found in other studies.

The Blue Mountain Eye Study (BMES)<sup>6</sup> found a DR prevalence of 32% among 253 people with diabetes aged 49 or older in western Sydney. This estimate included 38 people who were newly diagnosed with diabetes by the study group (fasting blood glucose >7.8).

The largest Australian study of DR to date is the Newcastle Diabetic Retinopathy Study<sup>7</sup> This was a longitudinal, clinic based study of people with diabetes of all ages, which was conducted over an 11 year period. An overall 35% prevalence of any signs of DR was reported at the conclusion of the study. The Newcastle Diabetic Retinopathy Study reported that among participants with diabetes but without retinopathy, 8% developed retinopathy each year<sup>7</sup>.

The Beaver Dam Eye Study (BDES)<sup>8</sup> from Wisconsin, USA, examined a population aged from 43 to 84 years. Their estimate for DR prevalence in 435 people with diabetes was 37%. This included 49 people who were newly diagnosed with diabetes by the study group (using HbA<sub>1c</sub> levels).

The Rotterdam study<sup>9</sup> was a population based investigation of people aged 55 years or older in Holland which included a glucose challenge test for participants who were not taking anti diabetes medications. Their estimate of the prevalence of DR among people with diabetes was 26%.

The Wisconsin Epidemiological Study of Diabetic Retinopathy (WESDR)<sup>10</sup> investigated people with diabetes of all ages who were identified by primary care physicians. They found diabetic retinopathy prevalence rates of 71 % (type1 diabetes) and 39% (type 2 diabetes). This group has also published a summary of diabetic retinopathy prevalence and incidence data from other population based studies conducted before 1989.

Our data indicates an association between longer duration of diabetes and increased prevalence of retinopathy. The WESDR has shown that non-proliferative retinal

lesions, macular oedema, and proliferative DR each have a prevalence that is strongly associated with the duration of diabetes diagnosis<sup>10</sup>. Other large epidemiological studies have also supported such associations<sup>6,8,10,11</sup>.

Our findings also demonstrate a correlation of lower HbA<sub>1c</sub> levels with a lower prevalence of diabetic retinopathy. An association between tighter diabetes control and lower diabetic retinopathy prevalence has been consistently found in other large epidemiological studies<sup>9,10,12,14</sup>.

The WESDR found that higher HbA<sub>1c</sub> levels were positively associated with prevalence rates for non-proliferative lesions, proliferative diabetic retinopathy, and macular oedema and that HbA<sub>1c</sub> predicts both the incidence and progression of retinopathy<sup>18,19</sup>.

The strongest available evidence comes from the Diabetes Control and Complications Trial (DCCT) This was a large, randomised clinical trial of participants with young onset insulin dependent diabetes mellitus (IDDM). It showed that the risk and progression of retinopathy can be reduced by intensive diabetic therapy, aiming to maintain near normal serum glucose levels. A 10% lower HbA<sub>1c</sub> (for example, 8% versus 7.2%) was associated with a 43% to 45% lower risk of progression of retinopathy. The study concluded that there was no level of HbA<sub>1c</sub> below which the risk of diabetic retinopathy was completely eliminated. However, Warram et al used DCCT and WESDR data to suggest that in patients with IDDM, there may be a threshold value of HbA<sub>1c</sub> of around 8.5%, above which the risk of diabetic retinopathy progression increases rapidly<sup>19</sup>.

Currently, there are only two available methods for preventing blindness from retinopathy in people with diabetes. Firstly, glycaemic control should be kept as strict as possible so that the development and progression of retinopathy can be delayed. Blindness prevention should be discussed along with treatment of hypertension and hyper lipidaemia with patients as the strongest incentives to achieve strict control. Secondly, regular screening of people with diabetes is required to identify vision threatening retinopathy as early as possible so that timely laser treatment can be given. In Ulaanbaatar we have identified that there is a small but important number of people in the community with known diabetes who

have untreated, vision threatening retinopathy. The necessity of regular screening must be emphasised to all people with diabetes so that this number is kept to an absolute minimum.

## CONCLUSIONS

Diabetic sight threatening retinopathy is common among patients with type 2 diabetes mellitus in Mongolia. People with diabetes should be encouraged to maintain strict glycaemic control and to undergo regular screening to delay or prevent and the development of retinopathy.

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# Study on different processing technology of Mongolian medicine, radix aconiti kusnezoffii.

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## ABSTRACT

Carry out a research to confirm the traditional processing technology of Mongolian medicine, Radix Aconiti Kusnezoffii, which was recorded in Mongolian medicine Materia Medica. In order to standardize the processing of this Mongolian medicine, we have chosen the safest and the most effective way of processing technology by comparing and elucidating its effectiveness and security through scientific experiments. The variation of total alkaloids and ester-alkaloid contents were used as the criterion for comparing the quality of different traditional processed products; the experiment was established by the orthogonal experimental design for the selection of optimum factors. The result of our investigation notes that during all other processing methods, the content of Ester-alkaloid had stepped down in different degrees except Fructus Chebulae method. We selected traditional fumigation and steaming method, which was analyzed by the "Simple Testing Technique with Multiple Indicators". The results of this research showed that the optimum conditions for preparing samples included the following steps: slicing the moistened material into piece of 2 - 4 mm thickness; and drying at 110° C for 2-4 hr. We observed that the most important factor on reducing the content of Ester-alkaloid is temperature (P < 0.05). On the basis of our research it can be concluded that the method, where the moistened medical material is sliced has better-effect, a shorter cycle, without any adjuvant, convenient and suitable for industrialized mass production. The results of this experiment can be applied for the processing technology specification of Mongolian medicine, Radix Aconiti Kusnezoffii.

**Key words:** Mongolian Medicine, Radix Aconiti Kusnezoffii, Processing Technology

## INTRODUCTION

*Radix Aconiti Kusnezoffii*. (*Akr*) obtained from dried root of *Ranunculaceae* plant of *Aconitum kusnezoffii* Reichb and has long been used in traditional Mongolian medicine. It has acrid flavor, light potency, warm-natured, and extremely poisonous. It has many pharmacological effects, such as drying "XieRi- -WuSu" and relieving pain and also used for influenza, acute and chronic intestinal pain, carbuncle boils, erysipelas, diphtheria, anthrax, neck stiffness and can be used as well as for "Tao Lai", "HeRuHu", joint pain, hemiplegia, and heart "HeYi" etc. In general, it has good- performance [1]. Furthermore, it has been included in 57.14% of Mongolia prescriptions in treating "XieRiWuSu" and 45% of prescriptions in removing "Nian". For instance: *Radix Aconiti Kusnezoffii* has been a main principal component of "ShanWeiNaRu" pills, "15YunFeng" pills, and "5Feng" pills etc.

There are records about *Radix Aconiti Kusnezoffii* processing in the classical documents of the "The Four Section Medical Dictionary" as stated "fumed for seven days" [2]. The "Blue Glass" cited: "do not hurt its root, smoke

for seven days, and use for treating anthrax" [3], Further, the "Traditional Mongolian Medicine Synopsis" records: "When preparing Akr venom, choose the root which size is just like musk deer dung and immerse in the wine for a day and night" [4]. In the same time the "Four Portion Sweet Dew" records: "If *Akr* is not used together with *Chebule*, it will be fierce as Tigers..., and because of the toxicity of the peels of roots, the peels should be abandoned" [5]. The "All Pharmaceutical Products" records: "Dig up *Akr* in autumn, then remove the soil and fibrous roots and soak in boys'urine after dried out" [6]. Further the textbook "Processing Technology of Mongolian Medicine" records: 1. Use cleaned and dried. 2. Clean and soak in the *Chebule* soup for 1 to 3 days (per 10 kg *Akr*, 3 kg *Chebule* 30 L) until to slightly benumbed-tongue, dry out and use. 3. Clean, then immerse in urine for 2 to 3 days (per 10 kg *Akr* with boys' urine 30 L) until to slightly benumbed-tongue, finally wash and dry with a small amount of water, and this processing method can improve the function of removing "Nian" [7]. Additionally, it has been written in the "Inner Mongolia, Mongolian Medicine standards": "soak in *Chebule*-soup or Licorice-soup for 2 to 3 days, change the soup every day" [8]. The active compounds of *Akr* are total alkaloids, from which the toxic compounds are diterpenes diester-alkaloids. In the present study, we analyzed the total alkaloids and Ester-alkaloid contents of the following

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processed products such as Chebule product, boys' urine product, wine product, Madzoon product, removing peels and tips product, stirring to rust product, smoked product, and others. Thus we provided a scientific basis for standardized processing technology of Mongolian medicine "Akr".

## MATERIALS AND METHODS

### Adjuvant

- The boys'urine were collected in Mongolian primary schools (gathered from eight-years-old healthy boy in the morning);
- Madzoon, the distillate spirit (Grassland Liquor Factory 60%) and yellow rice wine (HuiJiShanHuaDiao 16.5%) were purchased from the market.

### Drugs And Reagents

- Akr obtained from dried root of *Ranunculaceae Aconitum kusnezoffii Reichb* from Ximeng Ebagaqi and were identified by the Inner Mongolia Drug Inspection Institute.
- Prepared *Kusnezoff Monkshood Root* by "Pharmacopoeia varieties"
- *Chebule* were obtained from dried ripe fruit of *Combretaceae* plant of *Terminaliachebula Retz.*
- The standard preparation of Aconitum (No. 110720-200410) was provided by the Chinese Medicine and Biologic Product standardization Institute.

### Chemical Reagents

All the solvents were of AR.

### Preparation of Reagents

- The control solution of ester-alkaloids: the sample was dissolved in anhydrous ethanol after precisely weighed, then diluted into a certain concentration.
- The test solution of alkaline hydroxylamine hydrochloride: 12.5 g of sodium hydroxide was dissolved in 100ml anhydrous methanol with heating and recirculation. Two solutions were balanced mixed and filtered before being used.
- The perchloric acid test solution: take 13 ml of 70 % perchloric acid and 500 ml of water; adjust precisely to pH 0.5 with 70 % perchloric acid. The perchlorate iron test solution: add slowly 0.8 g of iron powder into 10 ml of 70 % perchloric acid, heat it gently so as to be dissolved, cool and dilute to 100 ml with anhydrous ethanol. Before use, add 6 ml of 70% perchloric acid into 20 ml of this solution, then dilute to 500 ml with anhydrous ethanol.

### Laboratory Apparatus

The apparatuses used for this experiment include the following: UV-1601 UV Spectrophotometer (SHMADZU CORPORATION), AL204 Electronic Balance, etc.

## 2. Traditional Processing and Component Analysis

### Traditional processing

- ❖ **The crude Akr:** clean and cut into 2 ~ 4 mm chip.
- ❖ **The Chebule product:** Chebule soup preparation: mix the sufficient coarse powder of Chebule with water according to 1:100 (g: ml), and decoct twice, no filtering until water was evaporated to 2 / 3, then combine these filtrates. Soak with the Chebule soup for three days until numbed-tongue, stir once a day [7], then take the Akr out and wash with water, and finally obtain the preparation from the dried material at low-temperature.
- ❖ **The boys' urine product:** soaked for 3 days with the boys'urine until to numbed-tongue [7], stirred once a day. After flushed with a small amount of water, the preparation was obtained from the dried material at low-temperature.
- ❖ **The madzoon product:** the plant material was processed as above [9].
- ❖ **The oven-dried product:** the chips of Akr was dried for 3 h or 7h at 110° C after moistening with water (four times a day for 48 h, until no water at the bottom of containers as the standard) [2].
- ❖ **The wine product:** the chips of Akr was soaked with the distillate spirit and the rice wine for 24h and stirring once during this period. Other procedures are the same as above.
- ❖ **The rusted product:** the coarse powder of Akr, which was prepared in a container made with cast-iron, was soaked with the boys'urine adequately, stirring several times, until the powder changes into black (3 days). Finally the product was dried at low-temperature [10].
- ❖ **The product with removed peels and tips:** the appropriate Akr was scraped off peels and removed off the root tips for 0.5 cm [5].

### Component Analysis

**Determination of ester-alkaloids:** the ester-alkaloids content was determined according to the ultraviolet - visible spectrophotometer method recorded in the 2005 edition of "People's Republic of China Pharmacopoeia"(primary part), under the Radix Aconiti item, in which says: determine the absorption in the 520 nm wavelength and read the Aconitum Alkali content directly comparing with the standard curve.

**The determination of total alkaloids:** according to the method recorded in the 2005 edition of "People's Republic of China Pharmacopoeia"(primary part) under the Radix Aconiti item [11].

**According to the literature [12],** analyze every processed products by the "Multiple Indicator Test" analyze, so as to evaluate their good and bad.

**The optimization of Akr processing technology**

Take sufficient quantum Akr sample, moisten it with water to have no dry part, then slice it. The orthogonal design had been done according to oven-dried method, which considers drying temperatures, drying time and the slice thickness as main three factors, and each of these factors was chosen for three levels<sup>[13]</sup>.

**The verification test of the best processing conditions**

Three groups of Akr were processed according to the best processing conditions, then verified by analysis of variance.

**RESULTS**

The results of the total alkaloids and ester-alkaloids of all samples were shown in table 1.

**Table 1.** The quantified results of the total alkaloids and ester-alkaloids in the traditional Akr processed products

Samples	The total alkaloids content (%)	The ester-alkaloids content (%)	The loss of total alkaloids (%)	The loss of ester-alkaloids (%)
The crude Akr	1.12	0.2850	—	—
The Chebule product	0.46	0.2858	56.90	0
The boys'urine product	0.74	0.1162	33.93	59.22
The distillate spirit product	0.64	0.1232	42.86	56.77
The Yellow Rice wine product	0.62	0.1045	44.64	63.33
The rusted product	1.04	0.1679	7.14	41.09
The madzoon product	0.63	0.1302	43.75	54.32
The product removed peels and tips	1.04	0.1793	7.14	37.09
The oven-dried 3h product	1.13	0.1057	0	62.91
The oven-dried 7 h product	1.11	0.1077	0.89	62.11
Pharmacopoeia varieties	0.33	0.0699		

From table 1, it can be seen that the Ester-alkaloid content of the processed products decreased in different degrees except for one with Chebule. The oven-dried products had loss not only the total alkaloid, but also decreased the Ester-alkaloid to 60% or more. Analyzing with "The Simple Testing Method with Multiple Indicator", we consider that the best processed products was oven-dried one for 3h, ester-alkaloids content of which decreased 62.91%, at the same time the total alkaloids almost did not change. The products have met the requirements for benumbed-tongue.

According to the Multiple Indicator Test the best one was the sample oven-dried 3 h, scored 2.8182, followed by the oven-dried 7 h, the rusted, the removed peel and tip, the boys'urine one, the yellow rice wine, the distillate spirit, the madzoon, the Chebule sample obtained the lowest scores of -3.3647.

According to the result of the orthogonal experiment, it was suggested that the best preparative techniques was the conditions/procedures as following: slicing the moistened medical material into pieces of 2-4 mm thickness; baking at the temperature of 110° C for 4 hr. Herein, the tem-

perature had significant effect only on the Ester-alkaloids content (P < 0.05).

The verification test of the best processing conditions

It is showed that this processing technology is stable and reliable, where the RSD (%) of the total alkaloids content is 0.49 and the RSD of the Ester-alkaloids content is 1.02.

**DISCUSSION**

Radix Aconiti Kusnezoffii is considered to be superior poisonous, so it should be processed in order to be used clinically<sup>[14]</sup>. The main purpose of the processing is to reduce its toxicity, then increase its curative effect<sup>[7]</sup>. It can be seen from this experiment that these methods, except the Chebule product, decrease the ester alkaloids content in different degrees. The experiment scientifically proves effectiveness of above mentioned traditional methods of processing, among which the oven-dried method is more upgraded and advanced method of the traditional smoking method. The main advantage of the oven-dried method is that higher temperature promotes hydrolysis of the aconitum, which contains a lot of water; consequently, it reduces the toxicity. In this method the crude Akr has to be avoided

to contact with a lot of liquid, so it is not only preserves alkaloids, but also reduces the toxic components significantly.

Study<sup>[13]</sup> on optimization of the processing technology shows the optimal conditions with A1B3C2 as following: the temperature 110° C, time 4 h, slice thickness is 4 mm, the influence order is A> C> B. Finally, it is found that the optimum processing technology is wetting the material completely, followed by oven-dried, and where baking temperature is 110° C, time is 4 h, slice thickness is 2 ~ 4 mm. The verification test further proves that the optimized conditions were accurate and stable. These studies present some new evidence for the processing technology of Akr.

According to production practices, the Chebule and other methods recorded in “Drug Standard of Ministry of Public Health of the People’s Republic of China”<sup>[15]</sup> were fallibility<sup>[16]</sup>. It was testified that the processing with chebule was less effective in this study.

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# Item analyzes of the integrated exam for the first year medical students

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## ABSTRACT

Health Sciences University of Mongolia (HSUM) has been taking integrated examination (IE) on pre-medical subjects since academic year of 2008-2009. The purpose of the study was to analyze the integrated exam items for freshman students of Medical School, HSUM. The study design was descriptive, cross sectional. The study focused on the midterm grades of 5 different pre-medical subjects and results of 150 test items with 5 variations that were based on curriculum of the subjects. Furthermore, it focused on integration exam grades in which 343 students involved and the questionnaire results of the students who re-examined. Kuder-Richardson (KR20) formula was used to determine reliability coefficient and statistical method to determine discrimination index, the difficulty level. Collected data were analyzed using "SPSS-11.01". Reliability coefficient of each subject's exam in IE is varied 0.85-0.9 and according to the difficulty level (P-value) 21.3-35.3% of test items were categorized as an easy, 51-56%-moderate and 13.3-14.7%-difficult. Regarding to discrimination index of test items, 92-97.3% of them have positive discrimination index, which shows most of the items can discriminate examinees by their performance. The mean score of students in re-examination was higher than first exam. In the re-examination difficulty level was decreased and in the third it increased comparing to the re-exam test items. We concluded that IE is reliable; its test items can determine student's performance and difficulty level in re-examination test items lower than the first exam. Based on the conclusion we recommend taking re-examination only once.

**Key words:** Hofsteeen method, discrimination index, difficulty level, reliability coefficient.

## INTRODUCTION

It was underlined in the student guidebook by World Medical Education Association, that test items should be based on the curriculum; to take both of midterm and final examinations as less often as possible.<sup>14</sup> It also suggested that curriculum contents should be summarized by the examination results and to focus on current advantages in medical education development.<sup>8</sup>

HSUM has introduced integrated examination for freshmen medical students on pre-medical subjects since the academic year 2008-2009. Totally 5 subjects are included in the integrated exam and 150 test items were developed based on curriculum content.

The purpose of the study was to analyze the integrated exam items through internationally recognized criteria.

## MATERIALS AND METHODS

The study design was descriptive cross sectional, focused on the midterm grades of 5 different pre-medical subjects and results of 150 test items with 5 variations that were based on curriculum of 5 subjects. Furthermore, it focused on IE scores in which 343 students involved and the questionnaire results of the students who re-examined.

KR-20 formula was used to determine reliability and statistical method to determine discrimination index, the difficulty level. Collected data were analyzed by "SPSS-11.01" statistical software program.

## RESULTS

Totally 343 medical freshmen students of the 2008-2009 academic year were divided into 2 groups: those who met program requirements on time (Group 1) and those who didn't fulfill required criteria on time (Group 2). The purpose of the integrated summative exam was to evaluate students' general knowledge on pre-medical disciplines and compare it with formative evaluation results on involved exam disciplines respectfully. The exam conducted by the medical education department, grade "C" was set as the minimum required point, which is equal to 70% criterion referenced evaluation. According to KR-20 formula, reliability coefficient of each subject exam in IE is varied 0.85-0.91, which proves reliability of the examination.

The first exam consists of easy test items -29.3-35.3%; moderate -51-56% and difficult 13.3-14.7%, taken by both 2 groups. On the re-examination, percentage of difficult test items was decreased, easy tests items were increased up to 40-60.7% and percentage of difficult test items was decreased up to 5.3-8.0% accordingly, for the third examination, percentage of easy tests failed up to 24%. It shows that the previously taken examinations had successfully determined the students' knowledge.

According to item analysis 92-97.3% of test items on each subjects in IE had positive discrimination index and third re-examination discrimination index was 83.3%, which resulted in the number of the examinees.

When build pass score by Hofsteeen method, which considers both absolute and relative limitations, the Hofsteeen score of group 1 appeared to be 58%. It means that the

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students hadn't prepared for the examination and weren't able to verify their midterm grades at the final examina-

tion. Hofstee score of the following examinations, which were composed of tests with similar content, was 68-69% (Table 1).

**Table 1.** Results of integrated examination

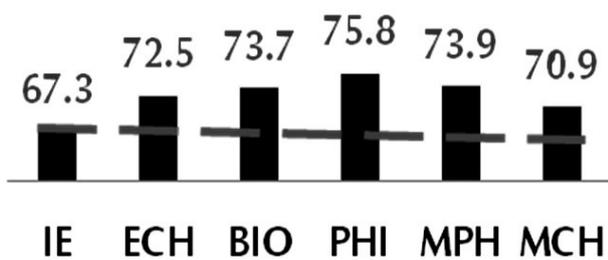
Study group	Difficulty level (P-value)			Percentage of test items with positive Discrimination index	Reliability coefficient (KR-20)	Hofstee score	Highest score	Lowest score
	Easy	Moderate	Difficult					
Group 1*	29.3	56.0	14.7	96.0	0.9	58%	131	47
	60.7	34.0	5.3	97.3	0.88	68%	135	67
Group 2*	35.3	51.3	13.3	92.0	0.85	68%	123	41
	40.0	52.0	8.0	94.0	0.9	69%	133	53
Group 3*	24.0	67.3	8.7	83.3	0.91	68.5%	119	29

Group 1:\* Students, who passed midterm examination successfully and met the program requirements on time.

Group 2:\* Students, who failed midterm examination, but re-examined successfully and had IE.

Group 3:\* Students, who didn't pass IE, after taking second time.

The mean performance score of students in formative evaluation on each subjects, that was included in the IE, namely Theory of Economics (ECH), Biology (BIO), Philosophy (PHI), Physics (MPH), and Chemistry (MCH) were compared with the results of IE. The mean performance score of students on each subject's formative assessment were: ECH 72.5%, BIO 73.7%, PHI 75.8%, MPH 73.9% and MCH 70.9% respectively, which is higher than performance score in IE (67.3%)



**Figure 1.** Mean scores of integrated summative and formative exams

In order to find out the reasons for students' failure in the IE, we conducted a questionnaire survey among students who re-examined; 78% of participants replied that teaching methodology and students' learning activity were good, 73% of them replied that contents of the examination fit curriculum, whereas 83% criticized themselves for not preparing for the exam well or that the examination assignments were difficult. They also mentioned on the survey, that they didn't have enough time to prepare for it, which doesn't fit evaluation of the test questions.

**DISSCUSSION**

MCQs for student evaluation in medical undergraduate training in Mongolia have been used since 1980 and the first MCQs collection in field of medical genetics and clinical neurology written by I.Purevdorj and G.Tsagaankhuu were published.<sup>5,6</sup> After that clinical tests on pediatrics were published.<sup>2,4</sup> Since that time MCQs were used more widely in training and MCQs data bases used in medical undergraduate training. Researcher J.Gombojav, Ch.Bayarsaikhan and Ts.Sukhbaatar used MCQs format in computer to evaluate student knowledge<sup>3</sup>. Since 2001 item analysis has being done for improvement tests items and development of test items is going to next stage to create unified data base of test items.

The study covers test items used in 2009 integrated exams in which special electron calculating machine "Scantron-ES 2010" was used.

**Average score and median.**

In 2009 freshman 343 medical student were evaluated, the highest score was 90.0 %, the lowest 19.3 %, average 54.6 %.

**Type of MCQs.**

According to type of MCQs 62.4 % of them are the best answer questions (A-type), 31.3 % - complex (K-type), 6.6 % E-type items. One best answer type items were dominated in MCQs. It was similar to other researchers' conclusion. (S.M.Case, D.B.Swanson 1996, R.Gyaneshwor 2002, T.M.Haladyna, S.M.Downing 1989, J.P.Hubbard 1978).<sup>9-12</sup>

In the study performed by Sweden researcher P.Krebs 22.4 % of MCQs were k-type items and our case it was 31.3 %.<sup>13</sup>

#### **Reliability.**

Reliability coefficient of each subject's exam in IE is varied 0.85-0.9. One of the main requirements for exam is reliability coefficient should be over 0.8. (A.Anastasia 1982, D.Vanchigsuren, Ch.Sanjmyatav 2002).<sup>7,1</sup>

#### **Difficulty.**

Regarding to difficulty level 13.3-14.7 % of test items belonged to difficult, 51-56 % -moderate and 21.3-35.3%-easy category on 2009. According to other researchers' conclusion (S.M.Case, D.M.Swanson 1996, R.Gyaneshwor 2002) average difficulty was between 50 and 70, so comparing with those our test items were relatively easy.<sup>9,10</sup>

#### **Discrimination index.**

Regarding to discrimination index of test items, 92-97.3% of them have positive discrimination index, which shows most of the items met requirements, because positive discrimination index in main criteria. Test items with negative and 0 discrimination index have to be revised.

#### **CONCLUSION**

We concluded that IE is reliable (KR20= 0.86-0.9), its test items can determine students' performance (92.3% of whole tests items have positive discrimination index) and difficulty level in re-examination test items lower than the first exam. Based on the conclusion we recommend that the integrated exam should be taken twice.

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# Relationship between geographical distributions of population morbidity and Climatic extremes in Mongolia

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## ABSTRACT

The study of relationship between climatic extremes and morbidity is considered one of the key problems of environmental healths. The problem has not lost its topical significance for Mongolian population. Population based, and descriptive study designs were applied in this survey. We have determined average total morbidity of the Mongolian population based on international 10<sup>th</sup> classification of diseases.<sup>1</sup> Average climatic extremes in year has been calculated by the index of Bodmen. Relationship between average yearly climatic extremes of Mongolia and average total morbidity of Mongolian population has been discovered by the geographical method. It has been observed that there are two zones where high climatic extremes in the Mongolian landscape. Statistically significant correlations appeared in the corridors of longitudes: 92°-93°, 94°-100°, 101°-105°, 106°-107°, 108°-111°, 113°-114°, 116°-117°, and in the corridors of latitudes: 42°-43°, 44°-45°, 46°-47°, 48°-51° between average yearly climatic extremes of Mongolia and average total morbidity of the Mongolian population.

**Key words:** medicine environmental, environmental healths, environmental exposure, medical geography, morbidity

## INTRODUCTION

Elements in an environment – including climate, vegetation, miasmas, weather, moisture, heat, winds disease-carrying organisms, precipitation, or urban pollution affect the health of the local population. From this study derives medical topography, which has come to use mapping as a central conceptual tool in discussing the health/environment relationships in a given area.<sup>2</sup> Medical geography and epidemiology share the common goal of understanding disease processes and improving methods of health interventions. Medical geography differs from epidemiology in its underlying focus on applying the concepts and methods of geography to investigate health-related topics.<sup>3</sup> Frank Barret, associate professor of geography at Toronto's York University told the symposium at Queen's University in Kingston, Ont., that the relationship between disease and place, and other important aspects of medical geography, were recognized by at least 10 ancient Greek, and Roman writers. The earliest example cited in his paper was "Airs, Waters, Places", a treatise attributed to Hippocrates. Hippocrates recorded links between disease and local climate, air quality water supply, social habits and occupational characteristics.<sup>4</sup>

Whether the result of cyclical atmospheric changes, anthropogenic activities, or combination of both, authorities now agree that the earth is warming from a variety of climatic effects, including the cascading effects of greenhouse gas emissions to support human activities.<sup>5</sup> The problem of climatic change is posed in quite a different aspect since 1990s in the world. Studies of climatic change of Mongolia have been extended supporting that concept.<sup>6-7</sup> Mongolia has severe continental climate because of far-away location from seas, surrounding by high mountains, and standing over 1500 m above sea level. Air temperature fluctuation is high, caused by big differences between the four seasons.<sup>8</sup> A study of climatic extremes influence to the population health of Mongolia still remains open.

This study has been carried on with the aim of creating geographical distribution maps of average yearly climatic extremes of Mongolia and average morbidity in Mongolian population, and demonstrating relationship between average morbidity and average yearly climatic extremes.

## MATERIALS AND METHODS

### *Data on climate extremes and morbidity*

Measurements of air temperature and wind speed by 1995 to 2005 were used as parameters to calculate climatic extremes of Mongolia. Mongolian population's morbidity statistics by the 1996 to 2005 were applied as illness data.<sup>1</sup>

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**Calculation of climatic extremes**

Climatic extremes of Mongolia were calculated by the index of Bodmen (S), as follows:

$$S=(1-0.04 t_B) (1+0.272 V_B)$$

$t_B$  - Air temperature

$V_B$  - Wind speed

**Geographical distribution's mapping and statistical analysis**

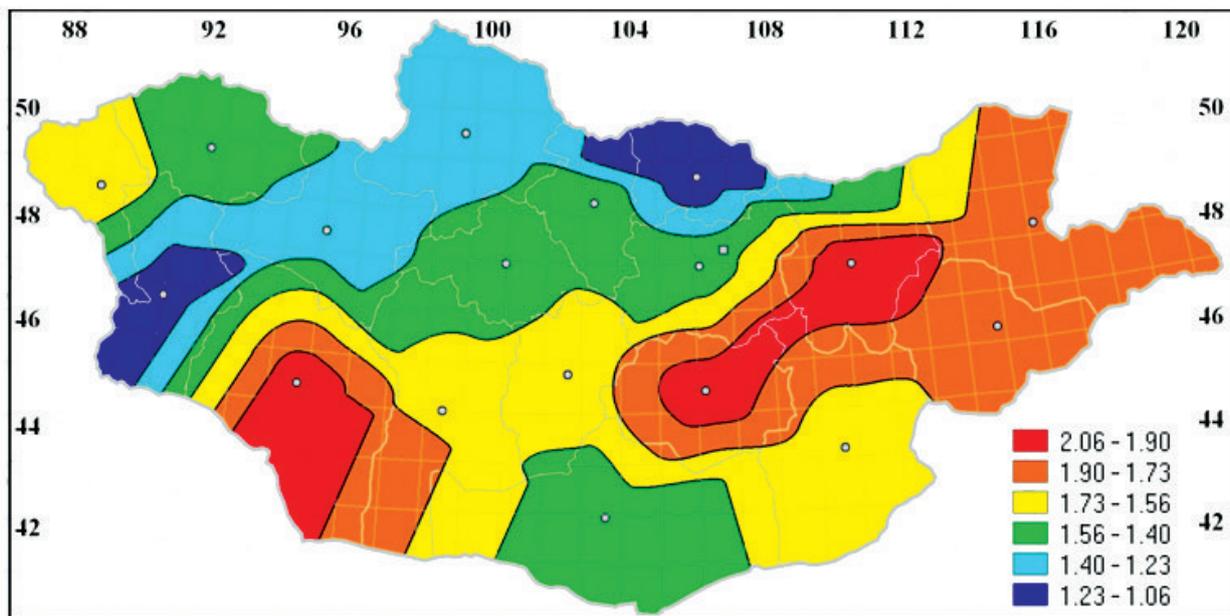
Maps of geographical distributions of average yearly climatic extremes and average total morbidity have been created with linear interpolation method using specially invented computer programs. The mean values of average yearly climatic extremes and average total morbidity

in each unit gradus-square of Mongolian landscape were calculated based on mathematic approximation.

Partial correlation analysis between average yearly climatic extremes and average total morbidity have been estimated along 27 corridors of longitudes and 9 corridors of latitudes in Mongolia. Regression analysis between those 2 factors have been explored along longitudes, latitudes, and in the combined zones of longitudes with latitudes using Statistica 6.0 software.

**RESULTS**

Two zones with high climatic extremes have been described in Mongolia including Dornogobi, Hentii, Dundgobi, and Gobi-Altai provinces (Figure 1).



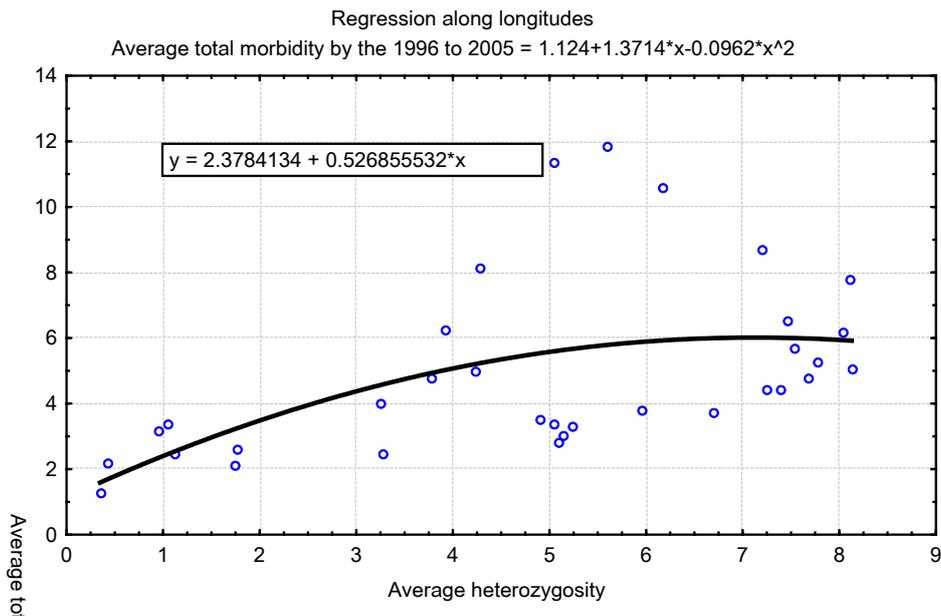
**Figure 1.** Geographical distribution of average yearly climate extremes

Epi-center of average total morbidity by the 19 group-diseases exists in eastern south of Mongolia, and then average total morbidity decreases from there gradually to western north.<sup>1</sup>

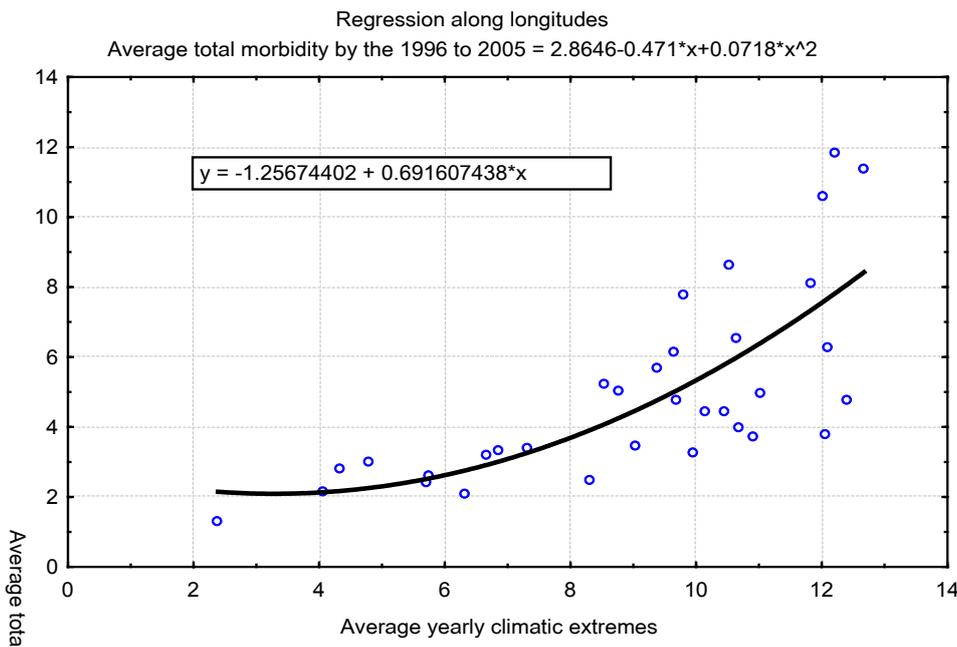
Partial correlation coefficients between geographical distributions of average yearly climatic extremes and average total morbidity have varied values along 27 corridors of longitudes and 9 corridors of latitudes. Whereas partial correlation coefficients which reject the null hypothesis

higher above the level of 95% probability between geographical distributions of average yearly climatic extremes and average total morbidity appeared in the corridors of longitudes: 92°-93°, 94°-100°, 101°-105°, 106°-107°, 108°-111°, 113°-114°, 116°-117°, and in the corridors of latitudes: 42°-43°, 44°-45°, 46°-47°, 48°-51° in Mongolia.

The regression analysis show that when the average yearly climatic extremes increases along longitudes, average total morbidity grows gradually (Figure 2).



**Figure 2**  
 Along latitudes, average total morbidity increases to definite level of average yearly climatic extremes, then stabilizes (Figure 3).



**Figure 3**  
 In the combined zones of longitudes with latitudes the average total morbidity has risen by the growth of average yearly climatic extremes weakly (Figure 4).

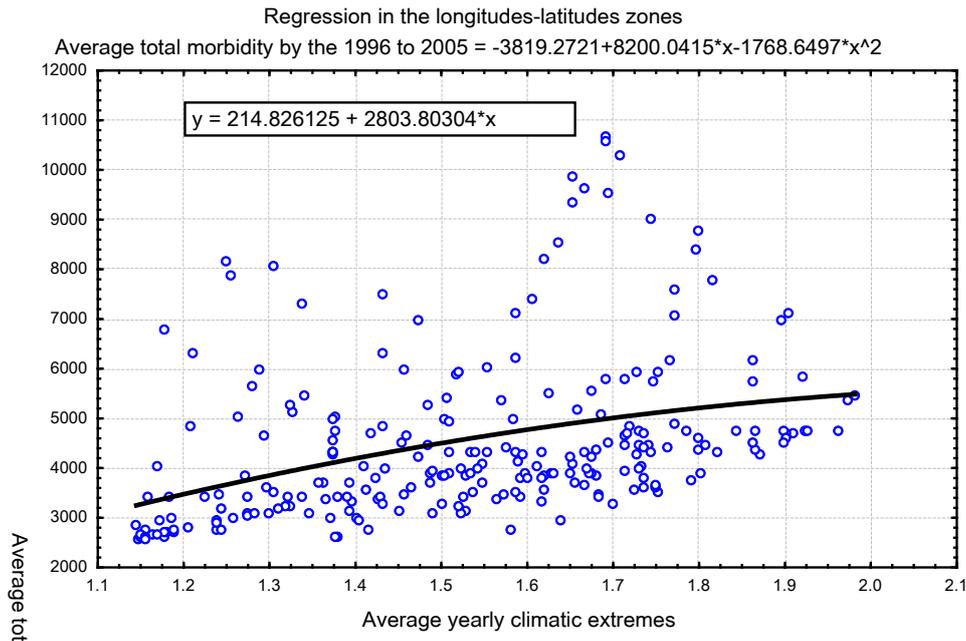
**DISCUSSION**

The results obtained from the geographical distribution maps of average yearly climatic extremes and average total morbidity<sup>1</sup> show that high values of average yearly climatic extremes in eastern south of Mongolia lead to the appearance of high level of average total morbidity in those areas.

Statistically significant different associations of aver-

age yearly climatic extremes with the average morbidity along longitudes and latitudes can be explained by the influence of local geographical conditions.

Summarizing the results of the regression analysis we come to the conclusion that increasing of average yearly climatic extremes of Mongolia has been illustrated as a negative impact on average total morbidity of Mongolian population.



**Figure 4**

In recent years great attention has given to the study of global climatic changes focusing on earth's warming and health care. But calculation climatic extremes (parameters: air temperature and wind speed) by many years' mean and its association with the population average morbidity have not been studied yet. Climate change and rising average global temperatures threaten to disrupt the physical, biological and ecological life support systems on which human health depends. An article about those problems over-viewed the evidence for human induced climate change, the predicted health impacts, and the role of primary health care professionals in managing these impacts.<sup>9</sup> The Fourth Assessment Report of the Intergovernmental Panel on Climate Change suggests that North America will experience marked changes in weather patterns in coming decades, including warmer temperatures and increased rainfall, summertime droughts and extreme weather events (e.g., tornadoes and hurricanes). A study based on this statement described the nature and direction of changes in infectious disease epidemiology that are likely to accompany global climate change, focusing on Canada and the United States, including the Arctic regions of North America, where the effects of global climate change are likely to be most severe.<sup>10</sup> The relationship between precipitation and waterborne diseases has been determined, using the complete database of all reported waterborne disease outbreaks in the United States from 1948-1994. In the result of this study statistically significant association found between rainfall and disease in the United States.<sup>11</sup> One of the major concerns with a potential change in climate is that an increase in extreme events will occur. Model output has been analyzed that shows changes in extreme events for future climates, such as increases in extreme high temperatures, decreases in extreme low temperatures, and increases in

intense precipitation events.<sup>12</sup>

Finally, we studied for the first time relationship between geographical distributions of average yearly climatic extremes and average total morbidity in Mongolia. The results of this study gave us general background about relationship between geographical distributions of climatic extremes and diseases, in future we will study association of average yearly climatic extremes with each group of diseases.

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# Prevalence of diabetes risk factors

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## ABSTRACT

In this study we aimed to detect main risk factors for diabetes in Mongolia and obtain data we used WHO – STEP survey modified questionnaire. Survey data were obtained from 3411 valid participants aged 15-64 years. 1104 participants aged 25 – 64 years have randomly been selected. Participants who were pregnant, less than 25 years old and no check for fasting glucose level were excluded from the survey in order to determine the risk factors of diabetes. Our study result shows the main risk factors of diabetes were physical inactivity, overweight and obesity, alcohol and tobacco use and lack of vegetable and fruit consumption. According to our study results, 3.62% of the surveyed population were identified having no diabetes risk factors, 62.5% were at risk, 34.3% were in higher risk for diabetes by the WHO criteria. Early diagnoses of diabetes were 2 times higher in urban population comparing to rural population.

**Key words:** Noncommunicable disease, BMI, WHR,

## INTRODUCTION

According to WHO report, the prevalence of noncommunicable diseases such as cardiovascular diseases, diabetes and cancer were taking 43% of morbidity and 60% of mortality. By the year 2020, it will increase to 60% of morbidity and 73% of mortality. In 2000, 194 million people will be diagnosed and living with diabetes in the world.<sup>1</sup>

The transition to urban environments, greater economic affluence with changes in physical activity, dietary patterns and obesity in the young population are increasing the risk factors for diabetes.<sup>2</sup>

WHO expected that prevalence of diabetes will increase to 150 million people by the year 2025 and to 335 million people by the year 2030.<sup>3,4</sup>

In 2006, 34000 people were diagnosed with diabetes in Mongolia and following the WHO prognosis calculation method it will increase to 81000 newly diagnosed diabetes patients in Mongolia.<sup>1</sup> Detection of risk factors for diabetes is very important to prevent the morbidity.<sup>5,6</sup>

In this study, we aimed to detect main risk factors for diabetes in Mongolia, which help us to decrease the morbidity and mortality of diabetes.

## MATERIALS AND METHODS

In the initial screening study, data were obtained from 3411 subjects aged 15-64 years by WHO –STEP survey modified questionnaire. Among participants 1737 were male and 1674 were female and we studied risk factors as like as alcohol, tobacco usage, diet and inactivity.

In the survey, we excluded participants who were pregnant, less than 25 years old and no check for fasting glucose level and left 1104 eligible person and invited to undergo a more extensive medical examination.

The selected 1104 person answered a questionnaire, underwent a physical examination including assessment of physical activity, height, weight, waist and hip circumfer-

ence and their ratio (WHR), body fat, arterial blood pressure. WHO criteria for WHR female >0.85, male >0.90 cm were considered as a risk factor for diabetes.

At the third stage of the study, we performed laboratory examination for capillary blood glucose level, cholesterol and triglyceride level measurements by Accutrend GCT equipment. Diagnosis of diabetes was defined according to WHO criteria which is between 5.6-6.9, considered as Impaired fasting glucose tolerance and above 7.0 were considered as diabetes.

Overweight and obesity were defined according to WHO criteria as body mass index (BMI) between 25-30 kg/m<sup>2</sup> and greater than or equal to 30 kg/m<sup>2</sup>, respectively.

## RESULTS

The prevalence of obesity and overweight of urban men in 35-44, 45-54 and 55-64 age groups were 66%, 59.7% and 52.3%, respectively. These numbers in urban women in 25-34, 35-44, 45-54 and 55-64 age groups were 34.1%, 52.7%, 50.7% and 62.5%.

The prevalence of obesity and overweight in rural men in 25-34, 35-44, 45-54 and 55-64 age groups were 26.1%, 51.5%, 69.4% and 52.3%, respectively. In rural women in 25-34, 35-44, 45-54 and 55-64 age groups were 35.5%, 58.3%, 58.8% and 47.4%, respectively.

In general, the prevalence of obesity and overweight were common in all groups, especially higher in men from urban and rural areas in their 45-54 ages. Study shows that percentage of the obese and overweight people are increased up to 51.1%.

The mean body mass index (BMI) was 25.21 kg/m<sup>2</sup> in Mongolian men and 26.49 kg/m<sup>2</sup> in women. It shows us that the proportion of overweight and obese females were relatively higher as compared to overweight and obese males in Mongolia. In addition, the proportion of overweight and obese participants tended to increase with increased age.

Peripheral blood glucose level was normal in subjects with BMI 26.28±0.56, but 20% of the subjects with normal

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blood glucose level were obese. Blood glucose level was higher in subjects with BMI 28.63±2.32 and 36% of them were obese.

Our study result shows that 89.63% are regular smokers, 33.7 % are living in the smoking environment and 10.37% are occasional smokers. Regarding the sex distribution, 56.5% of men and 9.2% of women were smokers. The average start smoking age of tobacco-users was 21.6

years old. Long duration of smoking is a one of high risk factors for regular smokers.

From 1104 people 873 (80.6%) had normal level of blood glucose, 14.9% (165) had abnormal level and 3.4% (37) had diabetes. There was significant difference between physiological measurements of patients with diabetes and healthy people. (Table1)

**Table1.** Comparison of physiological measurements

	Healthy	IFG	Đ
Body weight	65.2sm	78.2sm	<0.01
Waist circumference	83.9sm	96.1sm	<0.01
Hip circumference	96.6sm	101.7sm	<0.01
Waist hip ratio	0.87sm	0.94sm	<0.01
BMI	25.3êg.i²	29.1êg.i²	<0.01
Smoking	29.2%	43.2%	<0.01

Overall, consumption (under 5 serving sizes) of fruit and vegetables were low among the participants. Also there were big difference between sex and ethnic groups. It was interesting to admit that the consumption of fruit and vegetables tended to decrease with increased age.

70% of the population did not consume the products containing whole grain, which means the intake of fibre-rich whole grain is very low among Mongolians. And the consumption of the products containing whole grain tended to decrease with increased age.

Physical activity was assessed based on intensity, duration and work-related activities and 21.8% of the participants were physically inactive.

The prevalence of diabetes of the population (3.4%) in our study was higher by 0.3% as compared to the prevalence of diabetes from 1999 (3.1%).

In our study, the prevalence of impaired fasting glucose (IFG) in capillary blood vessels (14,9%) was higher

by 5.7% as

compared to the prevalence of impaired glucose tolerance (IGT) from 1999 (9.2%).

According to J.Suvd's research conducted in 1999, 9.2% of the people identified IGT were had diabetes.

There are five major risk factors for developing diabetes such as tobacco and alcohol use, overweight and obesity, lack of vegetable and fruit consumption and physical inactivity.

We studied risk factors for diabetes in 165 patients with abnormal IFG. There were 32 woman and 25 man from the city and 66 man and 42 woman from countryside. Also 17 man and 4 woman with diabetes from the city and 9 man and 7 woman from countryside. (table 2)

From the table it is significant that physical inactivity, hypertension, overweight, regular smoking use and consuming less than 5 serving sizes of vegetables and fruits have strong correlation (OR>1).

**Table 2** Risk correlation

Risks	OR	95 %CI	P
Physical Inactivity	3.5	1.746 - 6.649	<0.05
Hypertention	3.1	1.580 - 6.111	<0.05
Overweight	2.0	0.992 - 4.013	<0.05
Smoking	1.8	0.909 - 3.470	<0.05
Consuming less than 5 serving sizes of vegetables and fruits	1.1	0.463 - 2.467	<0.05

If none of the five common risk factors were present, a participant was classified as being at low risk, with less than 3 risk factors out these five classified as at risk and

with 3 or more risk factors classified as having high risk for developing diabetes.(Table 2)

**Table 3.** Risk assessment

Risk	Blood Glucosae Level*		
	Normal	Abnormal	Diabetes
Non risk	4,21	1,76	--
With 1 risk	26,17	14,12	3,85
With 2 risks	38,91	38,82	30,77
With 3 risks	22,98	30,59	42,31
With 4 risks	7,17	10,59	11,54
With 5 risks	0,57	4,12	11,54
Total	100	100	100

\*P.S: To assess risk factors we excuded patients with diabetes.

### CONCLUSION

1. In Mongolia, common risk factors of diabetes were obesity and overweight, higher cappillar blood glucose level, physical inactivity, tobacco use and lack of vegetable and fruit consumption. Among participants of our study, 51.1% of the subjects were obese and overweight, 7.6% has higher blood glucose level. 56.56% of men and 9.22% of women were smokers. 98.7% and 54.8% the subjects consumed under 5 serving sizes per day of vegetable and fruit, respectively. Over 70% did not take a whole grain intake. 76.1-79.35 % of the subjects were physically inactive.
2. The prevalence of the distribution of risk factors of diabetes by age, gender, tobacco use and the consumption of the vegetable and fruit were equal in urban and rural places, but the people aged 35-44 in urban area and the people aged 45-54 in rural area were at higher risk than other age and local groups. The participation in blood glucose level test was 2

times higher in urban participants than the participants from rural area, which improves the early diagnosis of diabetes. Blood glucose level, WHR and BMI of men and women tended to increase in urban and rural area with increased age.

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# Association between job stress and health risks in sample of Mongolian government administrative employees

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## ABSTRACT

A number of studies demonstrated that an adverse psychosocial work environment is associated with health risk outcome. However these studies are mainly based on samples from developed western or rapidly developing countries. Whether similar results are found in post-communist societies in transition, such as Mongolia is still unclear. We study this question in a Mongolian sample using two established job stress models, demand-control and effort-reward imbalance. The analyses are based on a sample of employees of government service in Ulaanbaatar, Mongolia (n=315). The psychosocial work factors were measured by original scales of the two models. Indicators of well-being were used: self-reported health and depressive symptoms (CES-D), hypertension, obesity and serum lipids. In addition, socio-demographic and socio-economic variables were included. Following descriptive analyses, multivariate logistic regressions models were estimated. Having assessed psychometric properties of the Mongolian version of the work stress scales, findings demonstrate for each model poorer well-being in the presence of work stress. However, when testing the two models simultaneously, significant odds ratios (OR) are observed for effort-reward imbalance, with OR for self-rated health = 2.83 and OR for depressive symptoms = 2.51 and for job strain with OR for obesity = 2.83. These results indicate that the two models of job stress can be applied to a working population in Mongolia.

**Key words:** Psychosocial factors at work, job stress models, health risk outcome, government employees

## INTRODUCTION

For the last decades, occupational health research in developed countries has been conducted on psychosocial factors of work place beyond occupational disease. Research on job stress and health is part of a medical sociology that aims to understand social and psychological factors to human health and disease.

More specifically, protective and damaging effects on health produced by peoples' behaviours, cognitions and emotions through core social roles in adult life (work role, civic roles, family roles etc.) are analyzed using a specific theoretical and methodological approach.<sup>1</sup> The stressful characteristics of psychosocial factors are more appropriately assessed by using self-report data obtained from questionnaires and interviews. But, these measurements need to be based on theoretical model. While several theoretical models of job stress have been developed<sup>2,3</sup> two models have received more attention in recent past years: Demand- Control model and model of Effort-Reward imbalance.<sup>4</sup>

The Demand Control model was introduced by Karasek (1979) and further developed by Karasek and Theorell

(1990). By this model, stressful experience at work results from job task characteristics defined by 2 dimensions: psychological demands put on working person and degree of control available to person to perform the required tasks (Figure 1). Low level of control or decision latitude manifest itself in 2 ways: first, as lack of decision authority and second, as low level of skill utilization as defined by monotonous and repetitive work. Jobs with high level of psychological demand in combination with a low control are stressful because limit the individual's autonomy and sense of control while generating continued pressure (high job strain). This condition may affect adversely physical and mental health which is documented in number of studies. In other hand, jobs defined by high challenging demand and high degree of decision authority and learning opportunities are likely to evoke feeling of mastery, which makes active. Active jobs may stimulate healthy functioning and buffer the adverse effect of stress at work.<sup>5</sup>

The effort-reward imbalance model developed by Siegrist (1996), is concerned with the stressful features of work contract. This model builds on the notion of distributive justice or social reciprocity. Social reciprocity assumes employment contract which is operated efforts spent by employees and rewards in turn from employers. Rewards are defined by money, esteem and career opportunities including job security. The effort reward imbalance model claims that lack of reciprocity between the costs and gains

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(high effort and low reward condition) elicits strong negative emotions with sustained autonomic and neuroendocrine activation and adverse long term consequences for health (Figure 2). These two models complement each other by focusing on job task profiles and employment contract respectively. They offer opportunities for combining information on job stress and health as conditions of low control and low reward often occur in the same work environment.<sup>6</sup>

A number of studies demonstrated that an adverse psychosocial work factors is associated with less favourable well being and health outcomes. However these studies are mainly based on samples from developed western or rapidly developing countries. In Mongolia, research on occupational health has developed in 1960s focusing mainly on the relationship between the condition of a work place and morbidity, restricted to occupational diseases. We conducted first time in Mongolia a cross sectional study to link

an adverse psychosocial work factors to increased health risk in sample of government administrative employees who represented a big social group of Mongolian working population using two established job stress models, demand-control and effort-reward imbalance.

The objective of the study was to explore the associations between psychosocial job stressors and health risks in a population of Mongolian government administrative employees. This paper addresses the three following research questions in frame of the study:

- (1) How is prevalence of the health risk in the study population?
- (2) How much is the burden of job stress in the study population?
- (3) Are significant associations observed between psychosocial job stressors and health risks (e.g. cardiovascular risk factors, depression, and self-rated health)?

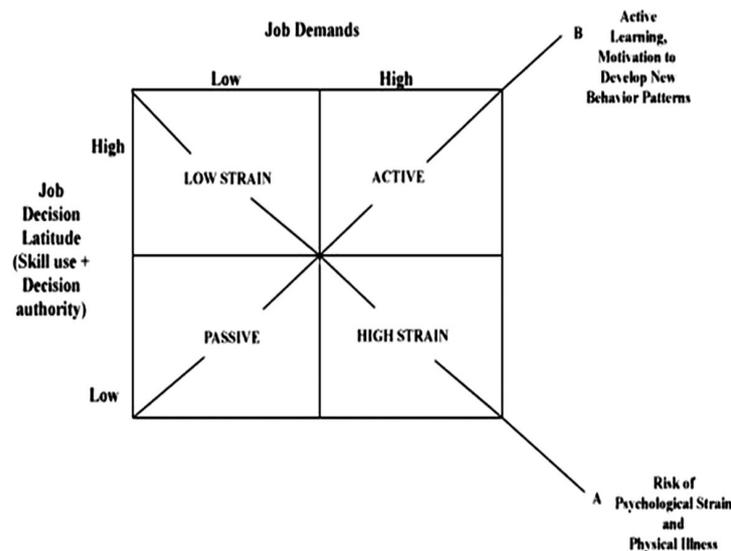


Figure 1. Demand-Control Model (R.Karasek, 1979, 1990)

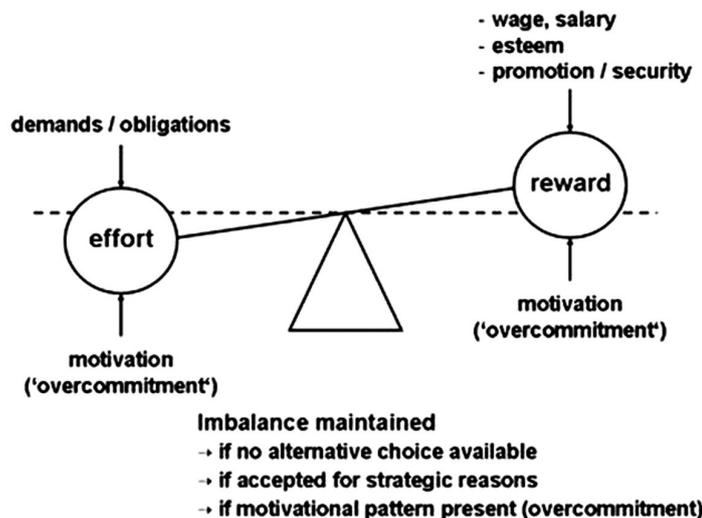


Figure 2. Effort-Reward Imbalance Model (J.Siegrist, 1996)

## MATERIALS AND METHODS

A Cross-sectional study was conducted among 315 employees from 10 Central and 4 Local Mongolian governor offices in 2005-2006. The study protocol was approved by the biomedical research ethics committee of Health Sciences University of Mongolia. Data were collected by self administered questionnaire comparable to the Health, Alcohol and Psychosocial factors In Eastern Europe (HA-PIEE) study. Self-administered questionnaire included the 2 models measuring psychosocial factors: Demand Control and Effort reward imbalance models. By Demand Control model, 2 dimensions were used: psychological demands (6 items) and control (6 items). The scores and subscores were constructed following recommendations of Karasek, and dichotomized at the median of total sample for use in the analysis.<sup>7</sup> Two dimensions of Effort- Reward imbalance model were included: effort (5 items, Cronbach's alpha coefficient 0.83), reward (11 items, Cronbach's alpha coefficient 0.81). To measure effort-reward imbalance, a effort reward ratio was calculated according to standard procedures.<sup>8</sup> For the analysis, effort, reward scale as two separate variables and ratio as dichotomized variable upper tertile were used.

Indicators of health outcome were included self rated health, depressive symptom, arterial hypertension, body mass index and serum lipids.

Blood pressure was measured on the left arm 2 times with 1-2 minutes interval between measurements using sphygmomanometer. Blood samples were collected in work place. Serum total cholesterol, HDL, LDL, triglyceride were measured using automatic analyser. Self-rated health was measured by a standard 5-point Likert scale item 'very good', 'good', 'fair', 'poor' and 'very poor' with less than good indicating poor health.<sup>9</sup> Depressive symptoms were measured by the Centre for Epidemiological Studies Depression scale (short version of CES-D scale).<sup>10</sup> Short version of CES-D consists of 10 self-reported items (4-point likert). For the analysis we used upper tertiles. Height and weight were measured using standard procedures. Body mass index (BMI) calculated as weight in kilograms divided by height and meters squared.

### Statistical analysis:

Descriptive and analytic statistics were carried out according to the research questions. Study objectives are met by applying appropriate bivariate and multivariate statistical techniques. Psychosocial work stressors (effort-reward imbalance, job strain) were entered into the model to predict poor self rated health, depression, CVD risk factors (hypertension, obesity, high total cholesterol, high LDL, high triglycerides,) controlling other covariates such as age, sex, marital status, salary, working years, position rank and material deprivation status.

All analyses were performed using SPSS 12 statistical package.

## Results:

Mean age of the study population was 44.7 (SD6.9, range 34-61) years and mean duration of work experience in civil service was 17.5 (SD 9.6, range 1-39) years. Of the subjects, 39.7% were men, 60.3% were women, 18.1% were managerial and 81.9% were executive staff. However, men dominated in a managerial position (77.2%), whereas women were more frequent in executive position (68.6%,  $\chi^2=40.9$ ,  $p=0.000$ ). Regarding the marital status 81.3 % of the participants were married and 18.7 % single.

42.9 % of subjects rated their health to be in good, 55.2 % in average, 1.9 % in poor condition, in other words 57.1 % are not satisfied with their health. The average CESD score was 6. 28.6% of men, 33 % of women were depressed as measured by CESD.

According to the health outcomes, the prevalence of hypertension among government employees aged 35-60 years was 37.8%. In regard to sex, prevalence of hypertension was 49.6 % for men, 30 % for women ( $p<0.001$ ), thus one in every 2 males has arterial hypertension (table 1.). Prevalence of hypertension is increased with age. Mean value of systolic and diastolic pressure varies in range of normal level (table 2.). Arterial hypertension was observed higher by 16 % for employees in managerial position compared to in executive position ( $p<0.05$ ).

Prevalence of obesity was 19.4%, it is increased with age. In regard to gender, the difference was statistically significant that 28.8 % of males and 13.2 % of females were accordingly obese. By occupational status, obesity were observed higher among employees in managerial than in executive position (36.8 %, 15.5 % respectively).

The prevalence of high cholesterol (above 220 mmol/l) was observed 25.45% among subjects. This risk is increased with age. Regarding gender, prevalence of hypercholesterolemia was 35.2 % for men and 18.9 % for women thus cholesterol risk was 2 times higher in males as compared to females. Risk of high triglycerides (above 150 mmol/l) was 5 times higher in males than in females. In regard to occupational position, the proportion of triglyceridemia was 36.8 % for men.

Prevalence of LDL above 130 mg/dl was 16% of surveyed participants. In regard to gender, prevalence for both sexes is relatively same (18.4 %; 14.7 %).

Table 2. shows that women reported high effort condition more than men. The similar prevalence of low control was reported by both genders. Hence, high job strain was found similarly in men and women. Subjects aged 40-49 years reported high demand but subjects above 50 years reported low demand at work. In regards to control, lowest control was reported by employees aged 35-39 years, and similar prevalence of low control was found in age groups of 40-49 and above 50 years. Lowest prevalence of job strain was found in subjects aged above 50 years.

By occupational status, employees in managerial position work with high demand and high control. High

prevalence of low control was among employees in low occupational position. Accordingly, subjects in the lowest employment grade work with high job strain. Regarding work experience in government service, employees in 10-19 working years work in high demand and low control condition. Therefore, high job strain was found in employees of this group.

In bivariate analysis between components of Effort-Reward Imbalance and socio-demographic indicators women work under high effort and low reward condition (Table 2.). So, high prevalence of effort –reward imbalance was found among women. Employees aged 35-49 years reported high effort at work as compared to other age group. High reward was increased with age. There is statistically significant association observed between high reward and increased age. This can be related to their working years, work experience and also satisfaction with their salary, supervisor’s and colleagues’ esteem. High effort- reward imbalance was more prevalent among subjects aged 35-39.

Effort reward imbalance was in low grade of occupational position, reported by 36.6 % compared with 28.6% in highest grade. Therefore, employees in executive position are working in adverse psychosocial work environment more than in managerial position. Highest prevalence of effort reward imbalance was found in group with working

experience of 10-19 years. Similar tendency are observed in both models, Demand-control and Effort reward imbalance.

In the logistic regression analysis when testing the two models simultaneously, significant odds ratios (OR) are observed for effort-reward imbalance only, with OR for self-rated health = 2.83 and OR for depressive symptoms = 2.51 (Table 3.). The result shows the risk of obesity was related to high job strain (OR=2.83, 95% CI=1.09-7.33) but there is no associations observed with other health outcomes. Although not statistically significant, effort reward imbalance showed a tendency to be associated with high prevalence of high total cholesterol (OR=1.79, 95% CI=0.99-3.23). Generally, adverse psychosocial factors at work was not associated with cardiovascular risk factors as elevated serum lipids.

Observed associations between material deprivation and reduced well being ( poor self rated health and depression) in bivariate analysis, has become weaker in logistic regression analysis. Obesity were significantly associated with increased age and with high occupational position. In logistic regression results shows that elevated total cholesterol and tryglicerids are consistently associated with increased age and high prevalence in males.

**Table 1.** Association between socio-demographic, socio-economic indicators and health outcome.

Variable		Health outcome									
		Hypertension		Obesity		High total cholesterol		High LDL		High triglyceride	
		%	p	%	p	%	δ	%	δ	%	δ
<i>Gender</i>	Male	49.6	0.00	28.8	0.00	35.2	0.00	18.4	0.39	40.0	0.00
	Female	30.0		13.2		18.9		14.7		8.4	
<i>Age group</i>	35-39	19.8	0.00	9.9	0.03	16.0	0.01	13.6	0.46	8.6	0.004
	40 – 49	36.5		20.9		24.3		18.9		23.0	
	50 +	57.0		25.6		36.0		14.0		29.1	
<i>Marital status</i>	Married	38.3	0.70	23.0	0.00	24.6	0.50	15.6	0.57	23.0	0.06
	Sinlgle	35.6		3.4		28.8		18.6		11.9	
<i>Income</i>	Low	31.7	0.09	13.4	0.23	18.2	0.07	19.5	0.61	20.7	0.59
	Medium	37.1		21.9		24.5		14.6		23.2	
	High	48.6		22.9		34.3		15.7		17.1	
<i>Material deprivation</i>	Deprived / MDI ≥4 /	42.7	0.23	18.2	0.68	20.9	0.20	18.2	0.42	19.1	0.53
	Not deprived /MDI= 0-3.99/	40.7		20.1		27.5		14.7		22.1	
<i>Occupational position</i>	Managerial	50.9	0.02	36.8	0.00	28.1	0.61	24.6	0.06	36.8	0.001
	Executive	34.9		15.5		24.8		14.3		17.4	
<i>Working experience in civil service</i>	Up to 10 years	24.4	0.00	14.6	0.08	27.1	0.06	20.7	0.22	15.9	0.29
	10 – 19 years	32.4		16.4		24.3		11.7		19.8	
	20 +	51.2		25.6		31.4		17.4		24.8	

Table 2. Association between socio-demographic variables and job stress measures

Variables	Low demand	High demand	High control	Low control	Low strain	High strain	Low effort	High effort	High reward	Low reward	Effort reward balance	Effort reward imbalance
<i>Gender:</i>												
Male	74.8	25.2	65.3	34.7	89.4	10.6	67.2	32.8	72.8	27.2	68.8	31.2
Female	65.6	34.4	67.0	33.0	89.3	10.7	65.1	34.9	64.5	35.5	62.2	37.8
$\delta$ -value		0.08		0.75		0.97		0.69		0.12		0.23
<i>Age:</i>												
35-39	70.4	29.6	65.0	35.0	87.5	12.5	65.0	35.0	51.9	48.1	57.7	42.3
40-49	64.4	35.6	66.7	33.3	86.9	13.1	63.5	36.5	70.5	29.5	63.7	36.3
50+	46.5	23.5	67.1	32.9	95.3	4.7	70.9	29.1	77.9	22.1	73.3	26.7
$\delta$ -value		0.15		0.95		0.11		0.50		0.001		0.10
<i>Occupational status:</i>												
Managerial	64.3	35.7	77.2	22.8	92.9	7.1	68.4	31.6	75.0	25.0	71.4	28.6
Executive	70.3	29.7	63.9	36.1	88.6	11.4	65.4	34.6	66.3	33.7	63.4	36.6
$\delta$ -value		0.37		0.05		0.34		0.66		0.20		0.25
<i>Working experience:</i>												
$\leq 10$ years	74.1	25.9	67.9	32.1	90.0	10.0	74.1	25.9	67.9	32.1	90.0	10.0
10-19	64.5	35.5	64.5	35.5	87.2	12.8	64.5	35.5	64.5	35.5	87.2	12.8
$\geq 20$ years	70.8	29.2	66.7	33.3	90.8	9.2	70.8	29.2	66.7	33.3	90.8	9.2
$\delta$ -value		0.33		0.88		0.65		0.33		0.88		0.65

## DISCUSSION

The cross-sectional study showed that psychosocial factors at work measured by 2 job stress models were risk factors for some health outcomes. For instance, the strongest association was observed between effort reward imbalance and subjective health outcomes such as poor self rated health and depressive symptoms. Job strain was a risk factor for obesity.

Our findings are in accordance with those of the cross-sectional studies by Pickart et al., who reported that effort reward imbalance was associated with depression<sup>11</sup> and poor self rated health<sup>12</sup>, by Tsutsumi et al<sup>13</sup>, who found that effort reward imbalance was risk factors for depression, by Dragano et al<sup>14</sup>, who confirmed that effort-reward imbalance was associated depression in population, by Niedhammer et al.,<sup>(15)</sup> who reported associations between effort reward imbalance and depressive symptoms and with other studies with results on associations between effort-reward imbalance and poor self rated health.<sup>16-20</sup> In our study, findings on job strain was not consistently with the studies on association between job stain and health outcomes.

Our research did not fully support the hypothesis that an adverse psychosocial work stressors are associated with cardiovascular risk factors.

In covariates, we found that increased health risk is more associated with socio-demographic indicators such as age and occupational position. Specifically, the higher the position and higher the health risk.

As a cross sectional studies, some limitations need to be discussed. First, a causal relationships was not determined by these results. Second limitations is possible reporting bias. Third, there could be potential selection bias. Our sample is restricted to civil servants in administrative post in Ulaanbaatar, so they would not represent whole population. Forth limitation related to statistical analysis. Evidence indicates that effects based on continuous variable on ratio are most convenient statistical approach in future studies.<sup>8</sup>

## CONCLUSION

1. Health risk such as overweight, obesity and hypertension was prevalent among civil servants, especially among men. There is inverse association between occupational status and health outcomes. The high prevalence of participants reported their health less than good so they are not satisfied with their health and it could predict health risk.
2. Having assessed psychosocial factors at work, prevalence of employees who work in adverse psychosocial job condition is relatively low. Psychosocial factors at work are related to age, working experience and occupational position.
3. This study provides first evidence of adverse effect of psychosocial factors at work on mental and physical health in sample of mongolian working population. These results indicate that the two models of job stress can be applied to a working population of Mongolia.

**Table 3.** Association between psychosocial job stressors and health risks among government employees: Result of fully adjusted logistic regression analysis

Variables	Poor self-rated health			Depression			Hypertension			Obesity			High total cholesterol			High triglyceride			High LDL		
	OR <sup>a</sup>	95% CI <sup>b</sup> Lower	Upper	OR	95% CI Lower	Upper	OR	95% CI Lower	Upper	OR	95% CI Lower	Upper	OR	95% CI Lower	Upper	OR	95% CI Lower	Upper	OR	95% CI Lower	Upper
<i>Effort-reward imbalance</i>	2.83***	1.63	4.89	2.51***	1.44	4.35	0.78	0.45	1.35	0.92	0.47	1.81	1.79	0.99	3.23	0.51	0.25	1.05	1.05	0.53	2.06
<i>Job strain</i>	1.56	0.62	3.89	1.32	0.55	3.15	1.23	0.51	2.92	2.83*	1.09	7.33	0.61	0.22	1.71	1.92	0.66	5.61	1.69	0.64	4.45
<i>Occupational status: Executive</i>	1.04	0.53	2.03	1.30	0.58	2.09	0.65	0.33	1.27	0.33*	0.16	0.69	1.46	0.69	3.09	0.60	0.28	1.29	0.57	0.25	1.30
<i>Income: Medium</i>	1.41	0.67	2.95	1.20	0.55	2.61	0.68	0.34	1.39	0.73	0.29	1.82	0.48	0.22	1.06	2.60	1.00	6.78	1.43	0.59	3.43
<i>Low</i>	1.06	0.59	1.97	1.47	0.73	2.97	0.74	0.40	1.38	1.46	0.69	3.08	0.61	0.31	1.17	2.55*	1.09	5.93	1.04	0.46	2.36
<i>Material deprivation:</i>																					
<i>Deprived</i>	1.15	0.65	2.04	1.83	1.00	3.35	0.89	0.49	1.59	1.04	0.51	2.12	0.70	0.36	1.37	1.14	0.55	2.35	1.28	0.62	2.64
<i>Age:</i>																					
<i>40-49</i>	1.16	0.63	1.2.1	0.84	0.44	0.58	2.03*	1.07	3.85	2.86**	1.21	6.74	1.63	0.79	3.34	3.55*	1.42	8.90	1.39	0.64	3.01
<i>50 +</i>	1.51	0.77	2.96	1.00	0.48	2.06	4.00***	1.99	8.04	2.59*	1.04	6.43	2.17	1.00	4.70	2.92*	1.12	7.61	1.02	0.41	2.53
<i>Gender :</i>																					
<i>Female</i>	1.51	0.89	2.63	0.18	0.59	1.95	0.65	0.37	1.12	0.28	0.30	1.15	0.43	0.24	0.80	0.15	0.07	0.31	0.21	0.44	1.83

Reference categories: managerial position, high income, not deprived, 35-39 years, male.

<sup>a</sup>Odds ratio

<sup>b</sup>95% Confidence Interval

\* p<0.05 \*\*p<0.01\*\*\* p<0.001, all variables were simultaneously entered into the model.

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# The current situation of the non-communicable diseases in Mongolia

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## ABSTRACT

According to the WHO estimation, 43% of all diseases and 60% of all deaths are due to chronic diseases including cardiovascular diseases, diabetes mellitus and cancer. The prevalence of noncommunicable diseases (NCDs) are constantly increasing with 77% of all deaths and 85% of the global disease burden occurring in the Western Pacific Region of WHO of which Mongolia forms a part. The objective of this analysis was to determine the current situation of noncommunicable diseases and injuries in Mongolia. We used a retrospective descriptive study design to determine the current situation of morbidity and mortality of the non communicable diseases. Nationally representative data have been used from the related resources. While significant progress has been made in decreasing the mortality of infants and children, adult mortality has been increasing with rapid force. Main causes of death are diseases of the circulatory system, cancer, injury and poisoning, diseases of the digestive system and respiratory system. Ischemic heart diseases, cerebrovascular diseases and hypertension are the main causes morbidity and mortality due to the CVDs. Deaths due to the CVD and cancer accounted for 8% and 5% of total population in 1980, but they have increased to 36% and 21% in 2008, respectively. As of 2008, the injuries have been more than doubled compared to previous years. The prevalence of CVD is predominating among male and has been the 4th main cause among age group of 20-44 years and the 1st leading cause among age group of 45-64 years. The most common cancers are liver, stomach, lung, oesophagus and cervix uteri cancers and they account for 78% of all cancer. There are 135.5 new cases of cancer per 100 000 people per year. The highest incidence rate occurs in the age groups 40-55 years mainly affecting people with at work age. It is noticeable that 78.3% of newly diagnosed patients are already at the late stages of cancer, and 67.1% of the newly diagnosed cases of cancer die within a year after the diagnosis. NCDs are the crucial health problem in Mongolia that have been steadily increasing during the last 20 years particularly among working age groups. Primary prevention of the NCDs are urgently required in order to decrease morbidity and mortality rates in Mongolia.

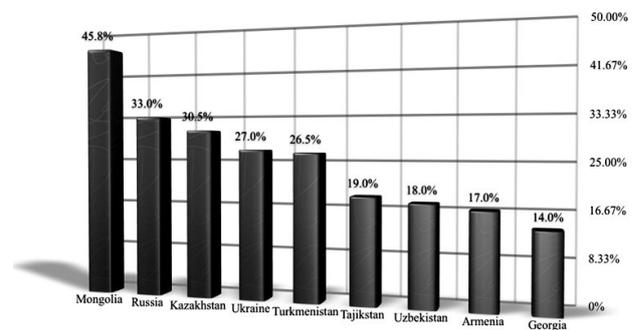
**Key words:** non communicable disease, incidence, mortality, prevention

## INTRODUCTION

Located in the northern part of central Asia, Mongolia is a landlocked country bordered by Russia to the north and China to the south. By the end of 2008, of the total population, 61.4 percent is living in cities, and the remaining 38.6 percent resides in rural areas. Moreover, 1071.7 thousand people reside in Ulaanbaatar city.<sup>1</sup>

The WHO estimates that the healthy life expectancy is 53 years for males (full life expectancy is 61 years) and 58 years for females (full life expectancy is 69 years)<sup>2</sup>. Thus, many Mongolians not only die during their productive years, but are also unable to work effectively and have a healthy life for as much as 14% of their lives<sup>3</sup>. While significant progress has been made in decreasing the mortality of infants and children, adult mortality has been increasing with rapid force. According to official statistics of the

Ministry of Health, 46% of population above 15 years of age die before age 60 in Mongolia, a rate that is one of the highest in the world (Figure 1).



**Figure 1.** Percentage of population above 15 years of age who die before age 60

Sources: WHO. The World Health Report 2003-Shaping the future and the Health Indicators 2003 by the Directorate of Medical Services, Government Implementing Agency of Mongolia

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**Table 1.** Selected demographic indicators in Mongolia in comparison with selected countries (Estimates: 2005-2010)

Country	Popula- tion growth rate (%) <sup>a</sup>	CBR <sup>a</sup>	CDR <sup>a</sup>	GDP* <sup>b</sup>	IMR <sup>a</sup>	Below 5 mortality <sup>a</sup>	TFR <sup>a</sup>	Life Expectancy <sup>a</sup>		
								Male	Female	Total
Mongolia	1.15	19.0	6.7	3223	42.1	44.0	2,02	63.2	69.8	66.4
China	0.63	13.5	7.0	2604.2	22.9	29	1.77	71.3	74.8	73.0
Japan	-0.07	8.2	9.1	34224.7	3.2	4	1.27	79.0	86.2	82.7
Republic of Korea	0.39	9.5	5.5	19840.5	4.4	6	1.22	75.9	82.5	79.4
Norway	0.93	12.3	8.7	82464.6	3.5	5	1.89	78.3	82.8	80.6
Sweden	0.49	11.7	10.1	49873.2	3.1	4	1.87	78.7	83.0	80.9
Kazakhstan	0.72	19.8	11.3	6753.0	25.6	30	2.31	59.0	71.2	64.9
Kyrgyzstan	1.22	22.4	7.4	704.4	37.3	46	2.56	64.1	71.6	67.8

**Legend:**  
 CBR Crude birth rate (per 1000 births)  
 CDR Crude death rate (per 1000 births)  
 IMR Infant mortality rate (per 1000 population)  
 TFR Total fertility rate (per woman)  
 \*GDP Gross domestic product by 2007 /USD/  
 ... No data available

*Sources:* Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2008 Revision, <http://esa.un.org/unpp>, Monday, October 12, 2009; 10:11:52 PM.<sup>a</sup>; United Nations Statistics Division. World Statistics Pocketbook. <http://data.un.org/CountryProfile>. Tuesday, October 13, 2009: 12:32:50 PM<sup>b</sup>

According to the United Nations Organization statistics, average life expectancy in Mongolia 66.4 years which is much shorter than that of other Asian countries such as South Korea (79.4 years) and China (73.0 years).<sup>4</sup> The objective of this analysis was to determine the current situation of noncommunicable diseases and injuries in Mongolia.

## MATERIALS AND METHODS

**Study design:** We used a retrospective descriptive study design to determine the current situation of morbidity and mortality of the non communicable diseases.

**Data sources:** In this analysis nationally representative data have been used from the following resources. Yearly statistical reports, and original data file from the Health Statistics Office of the Department of Health, and the National Cancer Center. In addition data sources from National Statistical Office, websites of the World Health Organization are used where needed.

In this report morbidity and mortality of cardiovascular diseases, cervix uteri and breast cancers and diabetes are shown based on the data of last five years. However, leading causes of population morbidity and mortality describes data of last 30 years or since 1979 and 1980 in order to show the trends and changes in the population morbidity and mortality.

**Statistical analyses:** Morbidity of the population are described as prevalence and incidence (per 10000 population). Mortality data are shown as number and death rates per 100000 population. In order to compare the current situation of morbidity and mortality due to the noncommunicable diseases in Mongolia, statistical data of some Asian (Korea, China, Japan and etc.) and European (Kirgizstan, Kazakhstan) countries have been used.

## RESULTS

### Noncommunicable diseases morbidity

According to the statistics estimated by WHO, 43% of all diseases and 60% of all deaths are due to chronic diseases including cardiovascular diseases, diabetes mellitus and cancer. The prevalence of NCDs is constantly increasing with 77% of all deaths and 85% of the global disease burden occurring in the Western Pacific Region of WHO of which Mongolia forms a part. Most cases of NCDs occur in low and middle income countries and the Western Pacific Region (out of 6 WHO Regions) is ranked third

after Europe and America in relation to disease burden and mortality rate.

During the last few decades the mortality and incidence of noncommunicable diseases has risen gradually. Consequently, circulatory system diseases, now called “life style and behavior dependent diseases”, cancer, and inju-

ries causing morbidity have become the leading causes of morbidity and mortality. Prevalence of CVD has increased from 91.3 in 1980, to 645.6 in 2008 per 10000 populations (Figure 2). As of 2008, the injuries have been more than doubled compared to previous years.

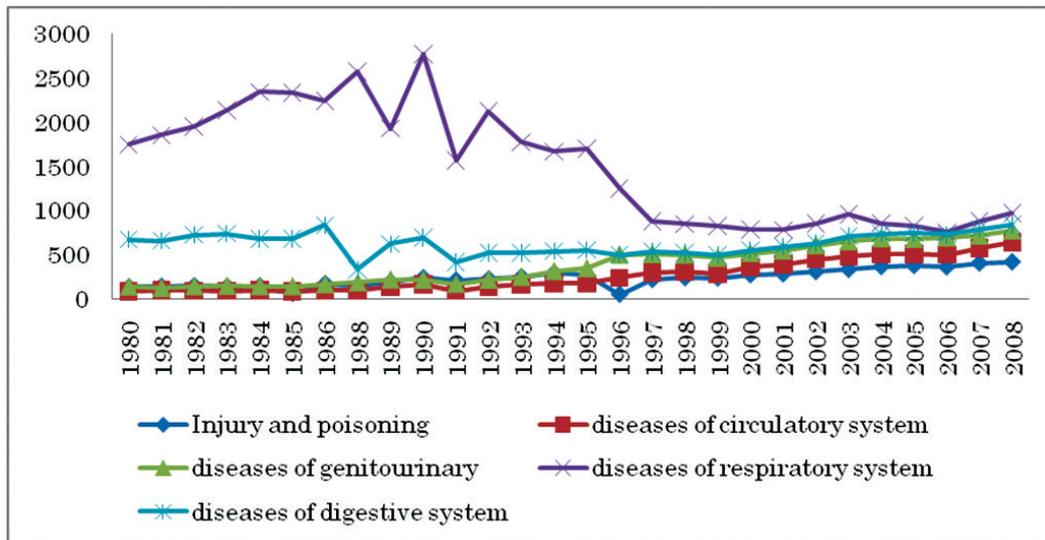


Figure 2. Leading causes of population morbidity in Mongolia, 1980-2008 (per 10000)

Compared to other regions, the prevalence rates of diseases of the digestive system were highest in the central and eastern regions, rates of diseases of the genitourinary system were highest in the western and central regions, rates of diseases of the circulatory system were highest in the central and khangai-gobi regions, and rates of injuries and poisonings were highest in the central and eastern regions.<sup>1</sup>

**Noncommunicable disease mortality**

During the last few decades, Mongolia has experienced a gradual epidemiological transition from a preponderance of infectious diseases towards non-communicable and degenerative diseases. The main causes of death among population are diseases of the circulatory system, cancer, injury and poisoning, diseases of the digestive system and respiratory system. Nowadays 2800-3000 people or one in five die annually because of circulatory diseases, and cancer, trauma, poisoning or other external factors respectively<sup>1,5,6</sup>.

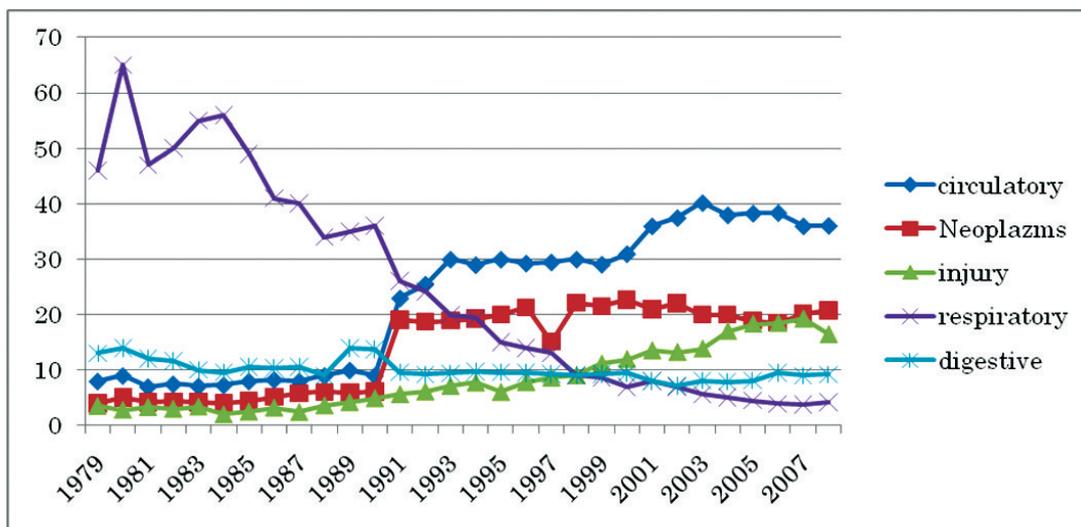
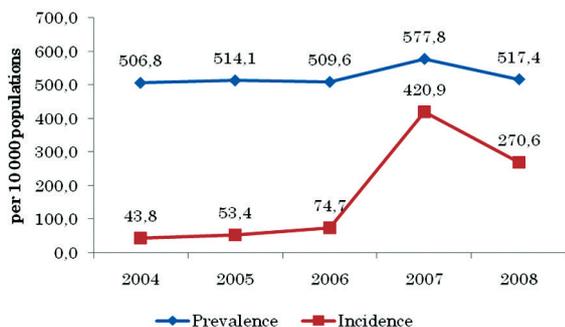


Figure3. Leading causes of population mortality in Mongolia, 1979-2008 (proportion)

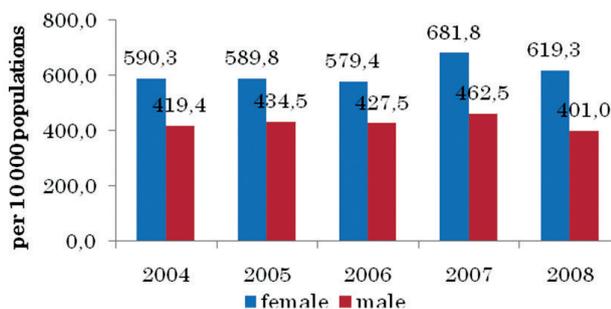
**Incidence, prevalence and deaths of Cardiovascular Diseases**

During the last decades prevalence and incidence of CVDs have been increasing in Mongolia. According to the health statistics, in 2008 the CVD related mortality rate was 20.54 per 10000 population or 22.02 per 10000 males and 18.76 per 10000 females. The prevalence rates of diseases of the circulatory system as well as the related mortality rates were highest in the central and khangai-govi regions<sup>1</sup>. The prevalence of CVD is predominating among male and has been the 4<sup>th</sup> main cause among age group of 20-44 years and the 1<sup>st</sup> leading cause among age group of 45-64 years.

In last the 5 years, the prevalence of CVD were registered as 506.8-577.8 per 10000 populations. The incidence of CVD has steadily increased from 43.8 in 2004 to 270.6 in 2008. The high incidence of CVD in 2007 could be caused by the screening conducted during the “Healthy Mongolia” project<sup>7</sup>.

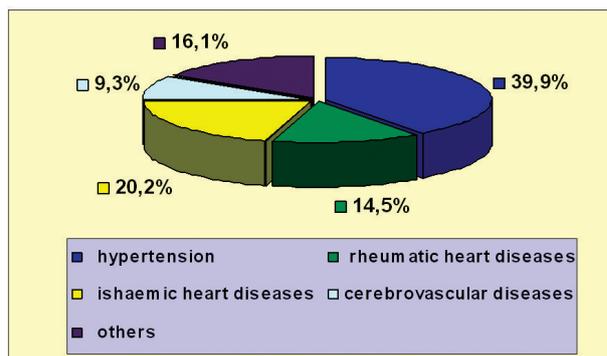


**Figure 4.** CVD prevalence and incidence, per 10 000 populations, 2004-2008



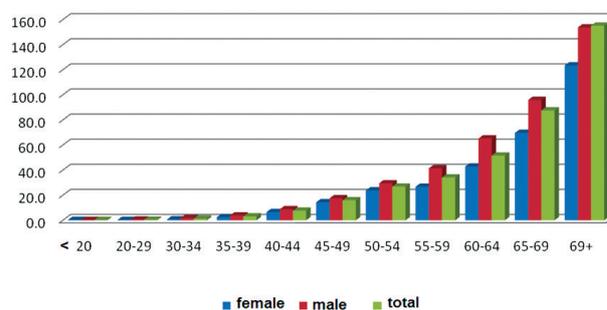
**Figure 5.** CVD prevalence by sex, 2004-2008, per 10000 populations

According to the statistical data, CVD prevalence is predominating among female and has been the 4<sup>th</sup> main cause of morbidity among age group of 20-44 years and the 1<sup>st</sup> leading cause among age group of 45-64 years<sup>7</sup>.



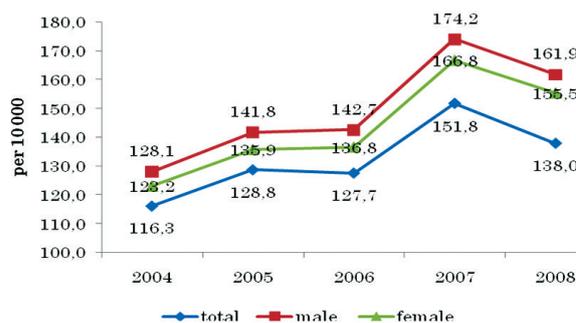
**Figure 6.** The structure of CVD prevalence (%)

According to the deaths due to stroke, the rates of death increased by age and the highest death rates occurred among people aged over 60 years of age.



**Figure 7.** Deaths due to the stroke, by age and sex (per 10 000)

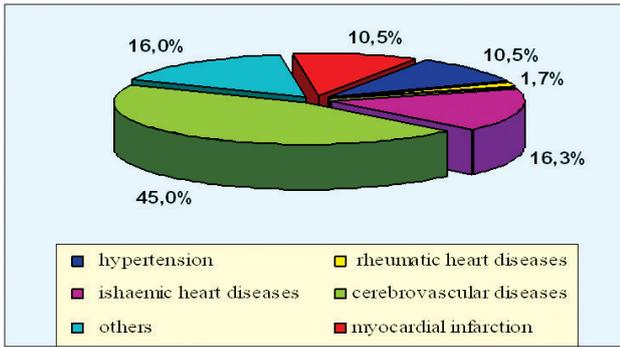
Deaths due to ischemic heart diseases also have a tendency to increase by age and occur predominantly among people aged over 65 years.



**Figure 8.** Prevalence of ischemic heart diseases, 2004-2008, by sex, per 10 000

The prevalence of ischemic heart diseases for both males and females has been increased during the last five years.

Hypertension and ischaemic heart diseases are the leading causes of CVDs in Mongolia, that accounted for more than 60% of CVDs related morbidity in last 5 years.

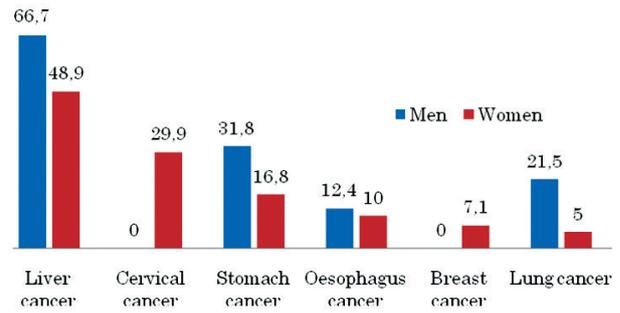


**Figure 9.** Structure of cardiovascular disease mortality (proportion)

Every year between 5500 and 6000 deaths occur due to diseases of the circulatory system. Cerebrovascular diseases, hypertension and the myocardial infarction are the main contributors of CVD related deaths that accounted for 65% of CVD related mortality among the population.

**Leading causes of cancer in Mongolia**

The second major contributor to excess mortality is cancer. The highest rates are seen for liver cancer, thought to be the result of high rates of hepatitis virus infections and alcohol intake<sup>8</sup>.



**Figure 10.** Leading causes of cancer in Mongolia by sex, 2000-2008 (per 100 000 population)

For men liver stomach and lung cancers are dominating whereas for women the leading cancers are liver cancer followed by cervical uteri cancer.

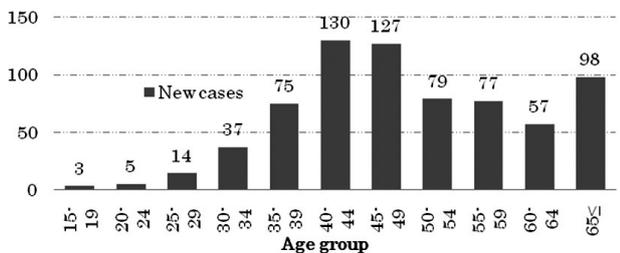
The incidence of breast cancer is relatively low. However, mortality from breast cancer is unexpectedly high, indicating an opportunity for achieving better outcomes with improved diagnosis and management.

The incidence of breast cancer was 5.8 in 2002 and 7 in 2008, whereas the mortality increased from 2 to 2.5 during 2002 and 2008.

**Table 2.** Cervical and breast cancer incidence and mortality of several countries in 2007 (100.000 pop)

Country	Female breast cancer incidence per 100.000	Female breast cancer mortality Per 100.000	Female cervix cancer incidence per 100.000	Female cervix cancer mortality Per 100.000
Kazakhstan <sup>a</sup>	38.31	20.27	15.35	7.93
Kyrgyzstan <sup>a</sup>	17.97	14.3	15.34	9.98
Norway <sup>a</sup>	113.9	20.79	12.53	2.65
Sweden <sup>a</sup>	146	21.76	9.59	1.96
Mongolia <sup>b</sup>	3.4	1.1	12.3	3.7

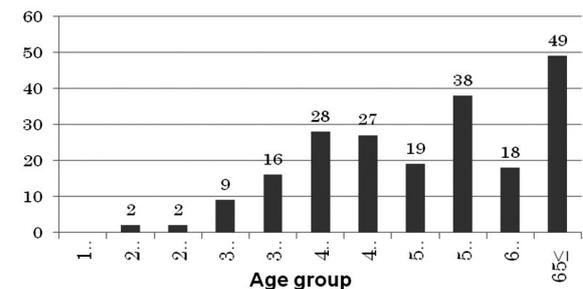
According to the comparison of cervical and breast cancer, incidence of cervical cancer is higher than in Sweden but lower compared to Norway, Kazakhstan and Kyrgyzstan.



**Figure 11.** New cases of breast cancer, 2000-2008, by age group (100.000 populations)

Source: Database of the National Cancer Center. 2000-2008years

Incidence of breast cancer is the highest among age groups of 40-49 and over 65 years in Mongolia. But the mortality from breast cancer is increasing by age.



**Figure 12.** Deaths due to breast cancer, 2002-2008 by age group (100.000 pop)

Source: Database of the National Cancer Center. 2002-2008years

Unfortunately more than 80% of the new cases of breast cancer are diagnosed in their late or 3<sup>rd</sup> and 4<sup>th</sup> stage.

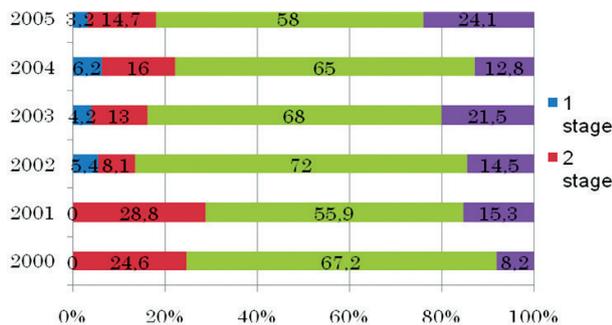


Figure 13. Breast cancer by stage of diagnosis, 2003-2005 years (100.000 pop)

The provinces Umnugovi and Darkhan provinces have higher incidence of breast cancer compared to other provinces and cities, the cause of which remains unclear. Mortality rate is leading in the following provinces: Gobi Altai 2.2, Dornod 2.1, Khentii 1.4 Selenge 1.1 and Ovorkhangai 0.2. aimags. Cervical cancer is mainly occurring among women aged 35-54 in Mongolia<sup>1,5,6,8</sup>.

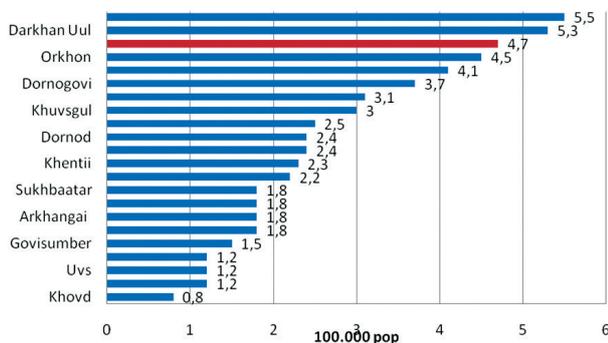


Figure 14. Breast cancer prevalence in 2000-2008 years (100 000 pop)

Source: Database of the National Cancer Center. 2000-2008years

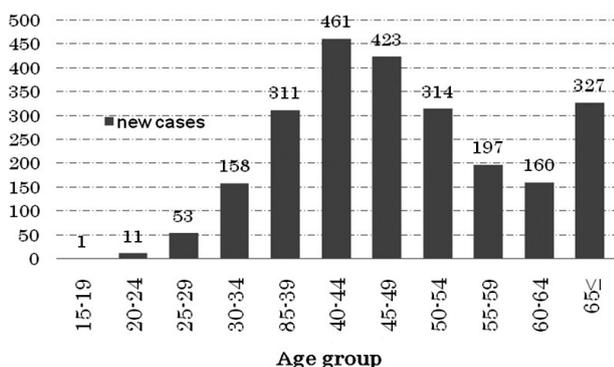


Figure 15. New cases of cervical cancer, 2000-2008 by age group (100000 pop)

Source: Database of the National Cancer Center. 2000-2008years

Deaths due to cervical cancer have a tendency to increase by age and were highest among women aged over 65.

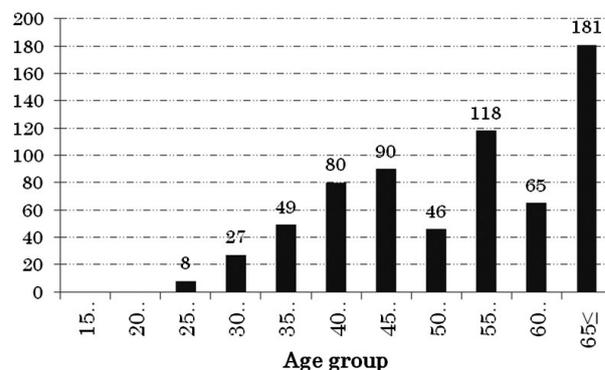


Figure 16. Deaths due of cervical cancer, 2000-2008 by age group (100.000 pop)

Source: Database of the National Cancer Center. 2000-2008years

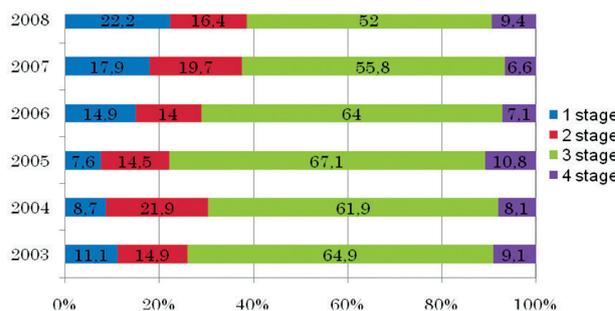


Figure 17. Cervical cancer by stage of diagnosis, 2003-2008 years (100.000 pop)

According to the last 5 years, cervical cancer incidence is different by province and cities. Interestingly Umnugovi has the highest incidence of cervical cancer. It is more than twice higher than in the capital Ulaanbaatar city. Far western provinces of Uvs, Zavkhan and Bayanulgi have the lowest incidence of cervical cancer in Mongolia. These differences could be related to the screening programs in the provinces. Mortality rate is leading in the following provinces: Dornod 16.3, Darkhan 15.4, DornoGovi 13.6,

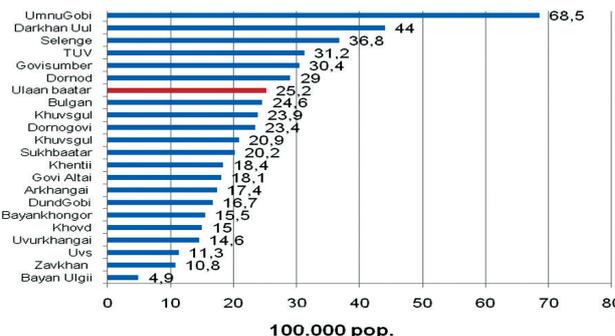


Figure 18. Cervical cancer prevalence in 2000-2008 years (100 000 pop)

## DISCUSSION

It is projected that by 2020, NCDs will account for 60% of the global burden of disease and 73% of all deaths. Many factors contribute to the wide spread of NCDs. As defined in the World Health Report 2002, 10 common risk factors such as unhealthy diet, physical inactivity, smoking, alcohol use, tobacco use, overweight, raised blood pressure, raised total cholesterol levels and raised blood sugar are the most prevalent risk factors among the world population. WHO projected that a total of 106 million people will die from NCDs over the next 10 years in the countries of the Western Pacific Region which means that deaths from NCDs will increase by 20% percent as compared to the current situation<sup>9</sup>.

According to the Mongolian NCD steps survey (2005), it is indicated that prevalence of smoking is 28%, and that there is a high consumption of alcohol and low consumption of fruit and vegetables among the Mongolian population. About 23% of the surveyed population showed a low level of physical activity, 34% and 30% of the surveyed population did not engage in vigorous and moderate physical activity accordingly at work and recreational settings.<sup>10</sup>

Prevalence of cholesterol risk or hypercholesterolemia (cholesterol level in capillary blood above 5.2 mmol/l) was 7% in both genders. The prevalence of increased hypercholesterolemia (blood cholesterol level above 6.5 mmol/l) was 0.8% and with regards to gender, the proportion in males (1.1%) was 2 times higher as compared to females (0.5%). The proportion of people with hyper-triglyceridemia (triglyceride level in capillary blood above 2.26 mmol/l) was higher in males (13%) as compared to females (9%).<sup>10</sup>

The prevalence of hypertension among Mongolians aged 15-64 years was 28.1%. With increased age, the prevalence of hypertension tended to increase in both sexes. The prevalence of newly diagnosed hypertension was higher by 17.8% as compared to that of the previously diagnosed but uncontrolled and being on medication.<sup>10</sup>

## ACKNOWLEDGMENT

This study was conducted with the financial support from the Millenium Challenge Account of Mongolia.

## CONCLUSIONS

NCDs are the crucial health problem in Mongolia that have been steadily increasing during the last 20 years. CVDs and cancers account for almost 60% of total population deaths. Ischemic heart diseases, cerebrovascular diseases and hypertension are the main causes morbidity and mortality due to the cardiovascular diseases in Mongolia. The leading five cancers including cervical and breast cancers account for around 80% of total cancer related deaths among the population. However, it is noticeable that 88.2% of patients diagnosed with neoplasm are in the late stages, and 60-65% of the newly diagnosed cases of cancer die within a year after the diagnosis.

## RECOMMENDATIONS

1. Statistical data on NCD provided from the Department of Health and National Statistical Office have been different according to our current analysis. Therefore these data are need to be revised carefully and merged to each other in the above mentioned national statistical centers in order to provide correct data on NCD situation in Mongolia.
2. Not only the summary of statistical data but the detailed statistical information on NCD should be open to researchers and decision makers through their web sites in order to be used widely since these are the emerging health issues in the country.
3. Health education on the risk factors for noncommunicable diseases such as obesity, lack of physical activity, unhealthy diet, smoking and alcohol consumption should urgently be conducted among the population in order to decrease an incidence and mortality due to the cardiovascular diseases in Mongolia.
4. Early diagnosis of cervical and breast cancers are urgently required since 60% to 82% of newly diagnosed cancers are in their late stages.

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**Top 130 journals listed by Impact Factor of 2007**

No.	Abbreviated Journal Title	ISSN	2007 Total cites	Impact Factor	Immediacy Index
1	CA-CANCER J CLIN	0007-9235	6021	9.026	26.238
2	NEW ENGL J MED	0028-4793	186402	52.589	11.962
3	ANNU REV IMMUNOL	0732-0582	15507	47.981	11.111
4	REV MOD PHYS	0034-6861	22606	38.403	6.333
5	ANNU REV BIOCHEM	0066-4154	16587	31.19	5.242
6	CELL	0092-8674	136514	29.887	6.402
7	PHYSIOL REV	0031-9333	17051	29.6	7.212
8	NAT REV CANCER	1474-175X	15764	29.19	4.45
9	NATURE	0028-0836	417228	28.751	7.385
10	LANCET	0140-6736	135949	28.638	8.636
11	NAT REV IMMUNOL	1474-1733	13331	28.3	5.084
12	NAT MED	1078-8956	45986	26.382	6.342
13	SCIENCE	0036-8075	382472	26.372	6.387
14	NAT IMMUNOL	1529-2908	22562	26.218	6.485
15	ANNU REV NEUROSCI	0147-006X	9652	26.077	2.409
16	NAT GENET	1061-4036	57100	25.556	8.671
17	JAMA-J AM MED ASSOC	0098-7484	103620	25.547	7.965
18	NAT REV NEUROSCI	1471-0048	13082	24.52	3.581
19	CANCER CELL	1535-6108	10890	23.858	5.5
20	ANNU REV CELL DEV BI	1081-0706	7867	23.545	1.32
21	NAT REV DRUG DISCOV	1474-1776	8055	23.308	4.458
22	CHEM REV	0009-2665	63207	22.757	3.274
23	NAT REV GENET	1471-0056	10943	22.399	5.765
24	ANNU REV PHARMACOL	0362-1642	6262	21.696	8.333
25	PROG MATER SCI	0079-6425	2803	20.846	2.52
26	ANNU REV ASTRON ASTR	0066-4146	5894	20.29	1.667
27	PHYS REP	0370-1573	16335	20.263	3.339
28	NAT MATER	1476-1122	13606	19.782	5.278
29	IMMUNITY	1074-7613	23873	19.266	3.843

30	ANNU REV PHYSIOL	0066-4278	7174	18.875	6.542
31	PHARMACOL REV	0031-6997	8701	18.823	1.643
32	ANNU REV PLANT BIOL	1040-2519	8714	18.712	2.8
33	ENDOCR REV	0163-769X	11635	18.493	2.29
34	ANNU REV GENET	0066-4197	4889	18.302	0.318
35	ANNU REV BIOPH BIOM	1056-8700	4298	17.757	2.409
36	BEHAV BRAIN SCI	0140-525X	4721	17.462	3.5
37	CELL METAB	1550-4131	2778	17.148	2.772
38	J CLIN INVEST	0021-9738	83472	16.915	2.984
39	B AM MUS NAT HIST	0003-0090	1856	16.385	1.167
40	ACCOUNTS CHEM RES	0001-4842	24129	16.214	1.736
41	ARCH GEN PSYCHIAT	0003-990X	31309	15.976	1.811
42	CLIN MICROBIOL REV	0893-8512	7954	15.764	2.387
43	J NATL CANCER I	0027-8874	33111	15.678	3.566
44	NAT NEUROSCI	1097-6256	26368	15.664	2.98
45	J EXP MED	0022-1007	65842	15.612	2.861
46	ANN INTERN MED	0003-4819	40783	15.516	4.056
47	J CLIN ONCOL	0732-183X	81338	15.484	3.571
48	NAT METHODS	1548-7091	3973	15.478	2.865
49	TRENDS BIOCHEM SCI	0968-0004	14884	14.994	2.5
50	NAT REV MICROBIOL	1740-1526	4460	14.959	2.577
51	NAT NANOTECHNOL	1748-3387	688	14.917	3.453
52	TRENDS ECOL EVOL	0169-5347	15166	14.797	1.596
53	GENE DEV	0890-9369	50192	14.795	2.389
54	NAT PHYS	1745-2473	2533	14.677	4.364
55	MICROBIOL MOL BIOL R	1092-2172	6652	14.629	1.375
56	MAT SCI ENG R	0927-796X	3114	14.4	0.167
57	ANNU REV MICROBIOL	0066-4227	6322	14.362	0.63
58	NAT CHEM BIOL	1552-4450	1990	13.683	3.691
59	PLOS BIOL	1544-9173	9223	13.501	2.855
60	ANNU REV MED	0066-4219	3829	13.415	2.879

61	NEURON	0896-6273	50707	13.41	2.906
62	ANNU REV PSYCHOL	0066-4308	5425	13.4	3.583
63	MOL CELL	1097-2765	32259	13.156	3.01
64	CHEM SOC REV	0306-0012	9202	13.082	3.406
65	ANNU REV NUCL PART S	0163-8998	1767	12.885	0.6
66	PROG POLYM SCI	0079-6700	6256	12.809	2.698
67	CIRCULATION	0009-7322	134158	12.755	2.646
68	PLOS MED	1549-1277	3725	12.601	2.705
69	TRENDS NEUROSCI	0166-2236	15499	12.479	1.737
70	DEV CELL	1534-5807	10735	12.436	3.037
71	LANCET ONCOL	1470-2045	4916	12.247	2.301
72	LANCET INFECT DIS	1473-3099	4117	12.058	2.785
73	ALDRICHIM ACTA	0002-5100	814	11.929	4.625
74	SURF SCI REP	0167-5729	3031	11.923	1.25
75	CYTOKINE GROWTH F R	1359-6101	3404	11.816	0.784
76	GASTROENTEROLOGY	0016-5085	51135	11.673	2.595
77	ANNU REV BIOMED ENG	1523-9829	1629	11.567	0.684
78	REP PROG PHYS	0034-4885	6871	11.366	1.553
79	GENOME RES	1088-9051	18495	11.224	1.858
80	PROG LIPID RES	0163-7827	2565	11.194	0.938
81	AM J HUM GENET	0002-9297	31921	11.092	2.311
82	NAT STRUCT MOL BIOL	1545-9985	16577	11.085	3.025
83	MOL PHARM	1543-8384	3216	11.03	4.253
84	PSYCHOL BULL	0033-2909	19678	10.905	1.841
85	MOL PSYCHIATR	1359-4184	7900	10,09	1.91
86	MASS SPECTROM REV	0277-7037	2667	10.896	2.486
87	BLOOD	0006-4971	116789	10.896	2.458
88	ANNU REV PHYTOPATHOL	0066-4286	3760	10.778	0.353
89	HEPATOLOGY	0270-9139	36232	10.734	1.685
90	ANNU REV GENOM HUM G	1527-8204	1328	10.722	0.688

91	ANNU REV ENTOMOL	0066-4170	5641	10.68	2.727
92	CURR BIOL	0960-9822	30816	10.539	2.407
93	IMMUNOL REV	0105-2896	9097	10.536	1.5
94	PROG NEUROBIOL	0301-0082	8385	10.467	0.927
95	ANNU REV ECOL EVOL S	1543-592X	9832	10.34	0.242
96	LANCET NEUROL	1474-4422	4291	10.169	2.938
97	CURR OPIN STRUC BIOL	0959-440X	8278	10,15	0.802
98	CURR OPIN GENET DEV	0959-437X	7620	10,15	1.436
99	ANGEW CHEM INT EDIT	1433-7851	117993	10.031	2.271
100	GUT	0017-5749	26196	10.015	1.808
101	MOL SYST BIOL	1744-4292	757	9.954	1.651
102	TRENDS GENET	0168-9525	10104	9.729	1.657
103	BRIT MED J	0959-8146	62151	9.723	6,21
104	CIRC RES	0009-7330	38737	9.721	2.152
105	PLANT CELL	1040-4651	27508	9.653	1.579
106	NANO LETT	1530-6984	26246	9.627	1.599
107	TRENDS PHARMACOL SCI	0165-6147	9179	9.61	1.489
108	P NATL ACAD SCI USA	0027-8424	394223	9.598	1.724
109	ADV PHYS	0001-8732	3703	9.571	5.636
110	TRENDS IMMUNOL	1471-4906	6001	9.48	1.4
111	ANNU REV FLUID MECH	0066-4189	4329	9.471	2.471
112	ANNU REV PHYS CHEM	0066-426X	4698	9.439	3.296
113	MOL CELL PROTEOMICS	1535-9476	6623	9.425	1.589
114	TRENDS COGN SCI	1364-6613	7525	9.389	1.513
115	PLOS PATHOG	1553-7366	1538	9.336	1.406
116	CURR OPIN IMMUNOL	0952-7915	7737	9.325	1.929
117	FEMS MICROBIOL REV	0168-6445	5051	9,25	1
118	CURR OPIN PLANT BIOL	1369-5266	5800	9.189	0.854
119	AM J PSYCHIAT	0002-953X	38989	9.127	1.963
120	AM J RESP CRIT CARE	1073-449X	40181	9.074	2.492

<b>121</b>	TRENDS PLANT SCI	1360-1385	7855	8.995	0.962
<b>122</b>	ANNU REV PUBL HEALTH	0163-7525	2131	8.978	0.955
<b>123</b>	CURR OPIN NEUROBIOL	0959-4388	9197	8.958	1.115
<b>124</b>	CRIT REV BIOCHEM MOL	1040-9238	2074	8.933	0.857
<b>125</b>	BIOL REV	1464-7931	3711	8.833	0.593
<b>126</b>	ANN NEUROL	0364-5134	26880	8.813	1.679
<b>127</b>	SYSTEMATIC BIOL	1063-5157	6645	8.802	0.676
<b>128</b>	PLOS GENET	1553-7390	2634	8.721	1.569
<b>129</b>	ANNU REV NUTR	0199-9885	3467	8.689	0.636
<b>130</b>	EMBO J	0261-4189	74734	8.662	2.086
<b>131</b>	COORDIN CHEM REV	0010-8545	17502	8.568	2.421

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The Mongolian Journal of Health Sciences publishes articles in basic and clinical health sciences. The Editorial Board welcomes contributions in the form of original research reports, review articles, brief communications, case reports, commentaries, clinical practice materials, and letters to the editor, medical memoranda. The Journal also publishes review of books and audiovisual materials, and other (medical) educational materials; socioeconomic, political and legal matters related to medical practice; conference and workshop reports and other categories including medical news.

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**Acknowledgments.** Authors must declare all financial support for the research and conflicts of interest, including directorships, stock holdings, and contracts. The Journal of Epidemiology would not wish the authors to be embarrassed if any undisclosed conflicts of interest were to emerge after publication. Aid with technical issues, statistical analyses, photography, or stenography and advice from colleagues can be acknowledged.

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Maellaro E, Dominici S, Del Bello B, Valentini MA, Pieri L, Perego P, Supino R, Zunino F, Lorenzini E, Paolicchi A, Comporti M, Pompella A. Membrane-glutamyl transpeptidase activity of melanoma cells: effects on cellular H<sub>2</sub>O<sub>2</sub> production, cell surface protein thiol oxidation and NF-κB activation status. *J Cell Sci.* 2000;113:2671–2678.
2. Standard journal article in non-English  
Alimaa D, Nymadawa N. Pathogenic agents and epidemiologic features of acute and chronic hepatitis, primary liver cancer. *Mongolian Medical Sciences* 1995;2:23-28. (in Mongolian).
3. Book  
Murray PR, Rosenthal KS, Kobayashi GS, Pfaller MA. *Medical microbiology*. 4th ed. St. Louis: Mosby; 2002.
4. Book chapter  
Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in human solid tumors. In: Vogelstein B, Kinzler KW, editors. *The genetic basis of human cancer*. New York McGraw-Hill; 2002. p. 93-113.
5. Homepage/ Website  
Cancer-Pain.org [homepage on the Internet]. New York: Association of Cancer Online Resources, Inc.; Available from: <http://www.cancer-pain.org/> [Accessed on 16 May 2002].

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