

Volume 8 Number 1

May 2011

Indexed in Western Pacific Region Indicus Medicus (WPRIM), WHO

# MONGOLIAN JOURNAL OF HEALTH SCIENCES

*Biomedicine*  
*Dentistry*  
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# Mongolian Journal of Health Sciences

Volume 8 Number 1

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## MESSAGE FROM THE EDITOR-IN-CHIEF

### DEAR READERS,

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

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.

It has been passed 8 years since Mongolian Journal of Health Sciences was first published. It has been 66 years since the development of Mongolian medicine has pursued the policy of modern scientific medical approach. Alongside with active development of national health sector, medical practitioners and specialists have duly invested in the establishment of scholarly research team with capacity to conduct studies at contemporary level in the area of medicine.

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.

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

Editor-in-Chief

A handwritten signature in black ink, appearing to read "Ts. Lkhagvasuren", is positioned below the text "Editor-in-Chief". The signature is fluid and cursive.

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

## MONGOLIAN JOURNAL OF HEALTH SCIENCES

**The Mongolian Journal of Health Sciences was founded in 2003 to provide a means for the interchange of ideas among Mongolian medical professionals and foreign countries to advance the skill and knowledge of health sciences, based on a peer review process by the foremost authorities in all health sciences. The Mongolian Journal of Health Sciences will continue to provide information for the standard for health care.**

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# Effect of horse and goat meat on acute pulmonary edema induced by adrenalin hydrochloride in mice

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## ABSTRACT

Diet is one of four treatment methods of Traditional Mongolian Medicine (TMM) and it plays an important role in prevention and treatment of diseases. Traditional principles of disease treatment and prevention with diet can be combined with conventional medical practices and may lead to a possibility of developing new treatment and preventive strategies. In this study, the effect of horse meat which has a hot quality and goat meat which has a cold quality were examined on acute pulmonary edema induced by adrenalin hydrochloride in mice in the spring and autumn. Mice were given 2.85 g/kg of horse or goat meat for 14 days in the spring and autumn. Then acute pulmonary edema was induced in mice by injecting adrenalin hydrochloride at a concentration of 25 mg/kg. Euphillin (2.1 mg/kg) was used as a standard medicine for comparison. After administration of adrenalin hydrochloride, mice were sacrificed and lung tissues were removed for measurements of pulmonary surfactant stability coefficient, pulmonary index, and alveolar diameter. Histological analysis of the lung tissues were also performed.

Horse meat increased pulmonary surfactant stability coefficient and alveolar diameter in mice given adrenalin hydrochloride in both seasons. Horse meat had no significant effects on pulmonary index in the autumn, though it reduced it in the spring. Furthermore, histological analysis revealed that horse meat reduced pulmonary edema and improved the repair of alveolar structure in both seasons. However, goat meat had no effect on pulmonary surfactant stability coefficient and alveolar diameter in mice administered adrenalin hydrochloride in the autumn however, it increased in the spring. When compared to goat meat, horse meat decreases alveolar collapse and pulmonary edema in mice model of pulmonary edema induced by adrenalin hydrochloride.

**Key words:** horse meat, goat meat, pulmonary edema, pulmonary surfactant stability coefficient

## INTRODUCTION

Mongolians have an ancient history of treating diseases with diet. Diet is a part of Mongolian traditional treatment methods and plays an important role in preventing and treating diseases. In TMM, the human body is dependent on its environment and influenced by seasonal changes. This should be considered when treating and preventing diseases.<sup>1-6</sup>

In traditional medicine, food and beverages are generally classified by their quality into hot and cold. Food and beverages with hot qualities are used to treat diseases with cold qualities and food and beverages with cold qualities are used to treat diseases with hot qualities.<sup>1-4</sup>

Wind, bile, and phlegm are the main theoretical essences of TMM. The quality of the three essences should be equal in order to keep a person healthy. According to the theory of the three elements, each of body's organs have dominant

features of one of the three elements. For example, the lungs belong to phlegm dominant organs by their function and localization in the body. Sputum excretion during lung diseases is enhanced by the moisture of phlegm. Phlegm is accumulated in the winter and surged by influence of the spring's warmth.<sup>1-4</sup>

In this study, the effects of horse meat with hot quality and goat meat with cold quality were examined on adrenalin hydrochloride-induced pulmonary edema in different seasons.

## MATERIALS AND METHODS

Experimental procedures of the study were performed in research laboratories of the Scientific Research Center of Traditional Medical Science Technology and Production Corporation of Mongolia. The study protocol was approved by the Ethical Committee of the Health Sciences University of Mongolia and the care and handling of the animals were in accordance with the requirements of the Medical Guidelines for the Care and Use of Laboratory Animals (2007). Specific pathogen-free white mice weighing 20-30 g were used for the study and all were kept in similar conditions. For preparing horse and goat meat soup, thigh portions were taken from Mongolian horses and goats whole meat according to MNS 3201-1981

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standard. Adrenalin hydrochloride (25 mg/kg) was injected via the tail vein by a slow injection to induce acute pulmonary edema in mice. Horse and goat meat were given (2.85 g/kg) for 14 days before administration of adrenalin hydrochloride. Euphillin was administered orally twice a day for 5 days before the adrenalin hydrochloride injection. Immediately after administration of adrenalin hydrochloride the lung tissues were removed for further analysis. Sections of lung tissues were visualized under a microscope and alveolar diameter was determined by Pattle's method.<sup>7</sup> The following formula was used for determining pulmonary surfactant stability coefficient.

$$SC = \frac{(D_2)^2 (D_1)^2}{(D_1)^2 (D_2)^2}$$

SC-stability coefficient (surface activity)

D<sub>1</sub>-first measurement (diametrical sum of 10 alveoli)

D<sub>2</sub>-measurement after 20 min (diametrical sum of 10 alveoli)

Histological procedures were performed in the research laboratories of the Pathological Center and School of Biomedicine, HSUM using the Aristoplan microscope. Tissue sections were fixed in 10% formalin and subsequently dehydrated through a series of washes in increasingly high concentrations of ethanol followed by xylene washes. Then samples were embedded in paraffin. Serial sections were cut and stained with Hematoxylin and Eosin according to Bradbury (1996).<sup>8</sup> The experimental procedures were performed similarly in the spring and autumn.

Data are presented as means ± SD. The results were compared using analysis of *t*-test. A level of *p*<0.05 was accepted as statistically significant.

## RESULTS

*Effects of goat and horse meat on pulmonary index in mice administered adrenalin hydrochloride.*

In the autumn, the pulmonary index was slightly reduced in mice treated with horse (1.17 fold) and goat (1.2 fold) meat respectively compared to the control. In the spring, horse and goat meat reduced pulmonary index 1.86 (*p*<0.05) and 1.51 fold respectively (Table 2). Euphillin reduced pulmonary index 1.26 fold in the autumn (Table 1) and 1.77 fold in the spring (Table 2).

*Effects of goat and horse meat on surfactant stability coefficient in mice administered adrenalin hydrochloride.*

Horse meat increased the pulmonary surfactant stability coefficient by 54.7% (*p*<0.05) in the autumn (Table 1) and by 69.66% (*p*<0.05) in the spring (Table 2) compare to the control. Goat meat had no effect on pulmonary surfactant stability coefficient in mice administered adrenalin hydrochloride in the autumn (Table 1) however, it increased that by 56.4% (*p*<0.05) in the spring (Table 2).

In the autumn, euphillin increased pulmonary surfactant stability coefficient by 64.5% (Table 1) and by 58.9% in the spring compared to the control (Table 2).

*Effects of goat and horse meat on alveolar diameter in mice administered adrenalin hydrochloride.*

In the autumn, horse meat increased alveolar diameter by 38.6% (*p*<0.05) at 20 min after adrenalin hydrochloride administration (Table 1). While in the spring, alveolar diameter was increased by horse meat treatment by 44.5% (*p*<0.05) 20 min after adrenalin hydrochloride administration (Table 2). In the autumn, goat meat had no effect on alveolar diameter in mice administered adrenalin hydrochloride (Table 1). However, it increased alveolar diameter 1.2 fold 20 min after the adrenalin hydrochloride injection in the spring (Table 2). In euphillin treated animals, alveolar diameter increased by 1.46 fold 20 min after adrenalin hydrochloride administration in the autumn (Table 1). In the spring, euphillin increased alveolar diameter by 1.5 fold 20 min after adrenalin hydrochloride injection (Table 2).

*Hystological analysis of adrenalin hydrochloride-induced pulmonary edema in mice treated with horse and goat meat.*

Histological analysis reveals a hemorrhagic fluid filling 70-80% of air spaces of the lung in animals administered adrenalin hydrochloride. Emphysema, mucosal edema of small and middle bronchiole, mixed infiltration (sputum, sloughed mucosal cells, erythrocytes), engorged alveolar capillaries, plasma proteins, and hemosiderin were also seen in alveolar lumen by histological analysis (Figure 2.B).

In the autumn, horse meat reduced alveolar infiltration by 30-40% in adrenalin hydrochloride treated animals. Repaired alveolar structure and macrophages were also seen (Figure 2.C). In the spring, pulmonary edema and alveolar ventilation decreased in horse meat treated animals compared to the control. In the spring, goat meat slightly improved alveolar structure and ventilation, though edema and patchy shedding of bronchial mucosa and alveolar infiltration with neutrophils were also detected (Figure 2.D). No detectable changes were observed in animals treated with goat meat in the autumn.

## DISCUSSION

In this study, we demonstrated that horse meat improved pulmonary surfactant stability and reduced alveolar collapse in animals given adrenalin hydrochloride.<sup>10-12</sup> These results support the concept of traditional medicine that diseases of the lungs are treated with diet, medicine, and behavior with warm and oily qualities. It can be further explained

by results of histological analysis of lung tissue showing that “horse meat + autumn” version of treatment reduced alveolar infiltration and improved the repair of alveolar structure, while “horse meat + spring” version of treatment reduced pulmonary edema and alveolar ventilation.

In the spring, more increases in pulmonary surfactant stability coefficient, pulmonary index, and alveolar diameter were observed in horse meat treated animals. This is consistent with the theory of traditional medicine that foods with hot quality are more effective in the phlegm accumulating and surging seasons such as winter and spring.

Food generates heat or coolness by its hot or cold qualities in order to make balance between hot bile or alpha type and cold phlegm or beta type diseases (Ambaga.M.1995).<sup>9</sup> New principles of healthy diet and food therapy can be developed by studying hot and cold qualities of food and their effects on hot and cold reactions that are carried out within the organism.

**Conclusion**

When compared to goat meat, horse meat has more effects on decreasing alveolar collapse and pulmonary edema in the mice model of pulmonary edema induced by adrenalin hydrochloride.

**Table 1**

1	Groups	Body weight	Alveolar diameter		Pulmonary index	Pulmonary surfactant stability coefficient
		/g/	/mm/	/mm/		
		M±m	0 min M±m	20 min M±m	M±m	M±m
1	Dis.water+Àd/h (Control)	30.82±5.003	5.28±1.02	4.32±0.63	0.016±0.001	0.67±0.06
2	Horse meat+Àd/h	27.76±5.07	5.86±1.78	7.04±2.61*	0.0136±0.005	1.48±0.05*
3	Goat meat+Àd/h	25.78±2.69*	6.16±1.02	4.92±1.54	0.0133±0.003	0.66±0.03*
4	Euphillin+Àd/h	28.24±2.1	4.8±1.9	6.34±2.36	0.0126±0.003	1.89±0.08*

Effect of horse and goat meat on adrenalin hydrochloride-induced changes in alveolar diameter, pulmonary index, and pulmonary surfactant stability coefficient determined in the autumn. Horse and goat meat were given 14 days

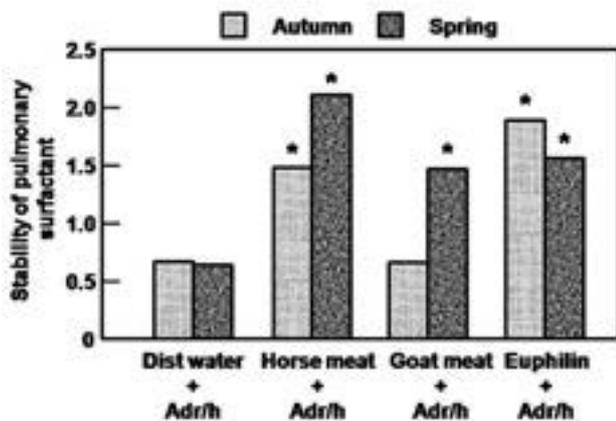
before adrenalin hydrochloride administration. Alveolar diameter was measured at the indicated times after adrenalin hydrochloride injection. Data are means ± SD of 10 animals. \*P<0.05 vs. control.

**Table 2**

1	Groups	Body weight	Alveolar diameter		Pulmonary index	Pulmonary surfactant stability coefficient
		/g/	/mm/	/mm/		
		M±m	0 min M±m	20 min M±m	M±m	M±m
1	Dis.water+Àd/h (Control)	32.76±4.07	5.86±0.81	4.56±0.93	0.0216±0.009	0.64±0.03
2	Horse meat+Àd/h	31.38±4.58	6.06±2.34	8.22±1.91*	0.0116±0.004*	2.11±0.9*
3	Goat meat+Àd/h	35.2±6.67	4.74±0.94*	5.48±0.68*	0.0143±0.005	1.47±0.64*
4	Euphillin+Àd/h	31.42±3.22	5.54±0.48	6.88±0.9*	0.0122±0.004	1.56±0.42*

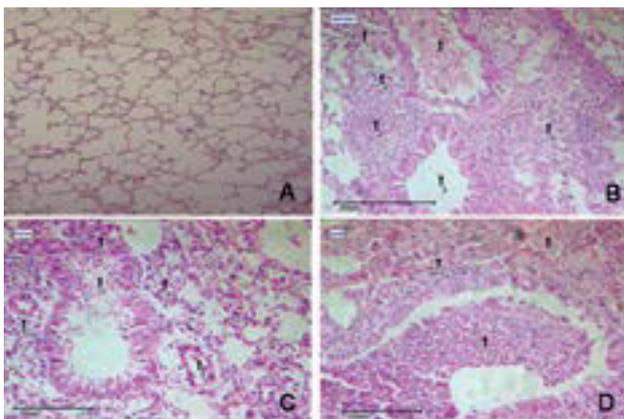
Effect of horse and goat meat on adrenalin hydrochloride induced changes in alveolar diameter, pulmonary index, and pulmonary surfactant stability coefficient determined in the spring. Horse and goat meat were given 14 days

before adrenalin hydrochloride administration. Alveolar diameter was measured at the indicated times after adrenalin hydrochloride injection. Data are means ± SD of 10 animals. \*P<0.05 vs. control.



**Figure 1**

*Effect of horse and goat meat on adrenalin hydrochloride induced increase in pulmonary surfactant stability coefficient determined in the spring and autumn.* Horse and goat meat were given 14 days before adrenalin hydrochloride administration. Surfactant stability coefficient was determined as shown in materials and methods. Data are means ± SD of 10 animals. \*P<0.05 vs. control.



**Figure 2**

*Effects of horse and goat meat on the pulmonary histopathological changes of mice with acute pulmonary edema.* Lung sections stained with hematoxylin-eosin after adrenalin hydrochloride administration revealed pulmonary histopathological changes. A. control group: normal structure. B. adrenalin hydrochloride group: 1. engorged vessels, 2. bronchospasm, 3. inflammatory infiltrates in interstitial tissues, 4 and 5. inflammatory infiltrates in alveolar lumen, 6. engorged vessels. C. Horse meat + adrenalin hydrochloride group: 1. edematous

bronchiol, 2. inflammatory infiltrates around blood vessel, 3 and 4. inflammatory cells in alveolar lumen, 5. vascular spasm. D. Goat meat + adrenalin hydrochloride group: 1. inflammatory infiltrates in bronchial lumen, 2. inflammatory infiltrates in interstitial tissues.

## REFERENCES

1. Tumbaa B. Four roots of medicine. Ulaanbaatar: State Printing; 1991. p.53-55,69-77,611-612. (In Mongolian).
2. Darammaaramba Luvsanchoidog. Altan Khadmal. Khukh Khot: People Printing Committee; 1984. p.693 (In Mongolian).
3. Ganbayar Ya, Tumurbaatar N. Theoretical basis of Traditional Mongolian Medicine. Ulaanbaatar: Bit service; 2003. p.24-26,43 (In Mongolian).
4. Jigmed B. Theoretical basis of Traditional Mongolian Medicine. Khukh Khot: People Printing Committee; 1984. p.169 (In Mongolian).
5. Khusekhui. Summary of food therapy. Ulaanbaatar: Erkhesh printing; 2005. p.106 (In Mongolian).
6. Batchimeg U. Study on basic principles of disease diagnosis, treatment, and prevention in traditional medicine. Doctor's thesis, Ulaanbaatar: National Medical University of Mongolia; 2003. p.65 (In Mongolian).
7. Pattle RE, Properties, function and origin of the alveolar lining layer, *Nature*. 1955;175:1125.
8. Bradbury P, Rae K. Connective tissue and stains. In Bancroft J, Stevens A, eds. Theory and practice of histological techniques. 4th ed, New York: Churchill Livingstone; 1996. 113-39.
9. Ambaga M, Sarantsetseg B, Bold Sh. Basis of oriental philosophy, knowledge, and science. Ulaanbaatar: Mongolian National University; 1996. p.96 (In Mongolian).
10. Rubenfeld GD, Herridge MS. Epidemiology and Outcomes of Acute Lung Injury. *Chest*. 2007;131:554-562.
11. Somer N, Dietrich A, Schermuly R.T, Chofrani H.A, et al. Regulation of hypoxic pulmonary vasoconstriction: basic mechanisms. *Eur Resp Journal*. 2008;32:1639-1651.
12. Matthay MA, Lee J. Beta 2 adrenergic agonist therapy may enhance alveolar epithelial repair in patients with acute lung injury. *Thorax*. 2008;63:189-190.

# Prevalence of respiratory allergies among children in Ulaanbaatar, Mongolia

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## ABSTRACT

Asthma is the most common chronic disease among children in developed countries and requires a considerable amount of health and social resources, as it is a heavy burden both for patients and their families and society. In recent years, there is no scientific epidemiological data about prevalence of respiratory allergies among children in Mongolia. The aim of this study was to investigate the prevalence of respiratory allergies in children aged 6-7 years in Ulaanbaatar, Mongolia. 401 children were randomly chosen aged 6-7 years who live in different districts of Ulaanbaatar city. This cross-sectional study followed the methodology of the International Study of Asthma and Allergies in Childhood (ISAAC). The parents and legal guardians of children were interviewed using a modified questionnaire of ISAAC. Gender distribution of children 6-7 years old were similar (49.6% boys, 50.4% girls). 32.9 % (n=131) presented wheezing or whistling ever and 21.4% (n=86) reported wheezing or whistling in the last 12 months of all children. The prevalence of current asthma revealed no significant difference between boys and girls (p=0.466). The prevalence of physician-diagnosed asthma was found in 2.5% (n=10). The prevalence of current asthma, allergic rhinitis, and rhinoconjunctivitis was 21.4% (95% CI, 17.4-25.5), 28.4% (95% CI, 24.0-32.9), and 19.0% (95% CI, 15.1-22.8) among 6-7-year-old children in Ulaanbaatar, respectively. The low prevalence of physician-diagnosed asthma suggests that asthma continues to be underdiagnosed and consequently undertreated.

**Key words:** Prevalence, respiratory allergies, children, Ulaanbaatar

## INTRODUCTION

Bronchial asthma affects around 300 million people throughout the world<sup>1</sup>. Over the past 20 years, the morbidity and prevalence of asthma have increased in different parts of the world<sup>2</sup>. Asthma is the most common chronic disease in children in developed countries and requires a considerable amount of health and social resources, as it is a heavy burden both for patients and their families and society<sup>3</sup>.

A clinical study conducted from 2004 to 2006 on asthma management and patient/parent education in Belgrade, Serbia showed that children diagnosed with asthma missed 25 days of school attendance on average within one school year. The same study reported that 70% of the children diagnosed with asthma were hospitalized at least once a year due to asthma attacks, with an average of 2.85 days per hospitalization stay<sup>4</sup>.

Asthma has a worldwide distribution and its expression varies between countries and different areas within the same country<sup>5</sup>. Thus, in the nineties, the International Study of Asthma and Allergies in Childhood (ISAAC) was designed to compare the prevalence of asthma and allergic diseases in different parts of the world<sup>6</sup>. It was the first

international multicenter study to assess the prevalence and severity of these conditions in 2 age groups (6-7 years and 13-14 years) using standardized validated questionnaires.

Rhinitis is defined as acute or chronic, infectious, allergic, or irritative inflammation of the nasal mucosa and is characterized by anterior or posterior rhinorrhea, sneezing, nasal obstruction, and nasal pruritus<sup>7</sup>. Symptoms begin in childhood or adolescence and persist in adulthood. Rhinitis is the most common allergic disease in the world<sup>8</sup>.

In 1993, N.Radnaakhand reported the prevalence of bronchial asthma was 7.0±0.9 in 1000 children in Mongolia<sup>9</sup>. In 1999-2000, Mongolian-Finland researchers mentioned the prevalence of asthma and allergic rhinoconjunctivitis was 1.1-2.4%, 9.3% among subjects aged 10-60 years in Mongolia<sup>10</sup>.

In recent years, there is no scientific epidemiological data about prevalence of respiratory allergies among children in Mongolia. The aim of this study was to investigate the prevalence of respiratory allergies in children aged 6-7 year in Ulaanbaatar, Mongolia following the standardized ISAAC methodology.

## MATERIALS AND METHODS

We randomly chose 401 children aged 6-7 years who live in different districts of Ulaanbaatar city. This city was

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chosen because it is the most populated city in Mongolia, and so that a high response rate could be obtained.

The cross-sectional study was followed the methodology of the International Study of Asthma and Allergies in Childhood. The parents and legal guardians of children were interviewed using a modified questionnaire of ISAAC from June to July 2009. Data was collected using written questionnaires from 3 groups with 26 questions.

The criteria for current asthma was met by a “Yes” response to question “Has your child had wheezing or whistling in the chest in the last 12 months?”. Allergic rhinitis and rhinoconjunctivitis were defined as present if the parents responded positively to following questions: “In the past 12 months, has your child had a problem with sneezing or a runny or blocked nose when he or she did not have a cold or the flu?”, and “In the past 12 months, has this nose problem accompanied by itchy-watery eyes?”.

Completed questionnaires were scanned and exported to SPSS version 17. Comparisons by gender were performed using the  $\chi^2$  test. Ninety-five percent confidence intervals were calculated. P-values ( two-sided ) less than 0.05 were regarded as statistically significant. The study was

approved by the Medical Ethics Control Committee of the Ministry of Health, Mongolia.

## RESULTS

The study was conducted from June to July of 2009. The gender distribution of children 6-7 years old were almost equal (49.6% boys, 50.4% girls).

The prevalence of asthma and related conditions is shown in Table 1. The results are stratified by gender and overall comparisons.

In the present study, the prevalence of wheezing or whistling ever was 32.9% (n=131), which in the ISAAC study is considered representative of the cumulative prevalence of asthma, the prevalence of wheezing or whistling in the last 12 months (prevalence of current asthma) was 21.4% (n=86), and the prevalence of physician-diagnosed asthma was 2.5% (n=10). Prevalence of current asthma presented no significant difference between boys and girls (p=0.466). The prevalence of allergic rhinitis and rhinoconjunctivitis found in this study was 28.4% and 19.0% of the population. Prevalence of allergic rhinitis and rhinoconjunctivitis revealed no significant difference between boys and girls (p=0.121), (p=0.489). These data are shown in Table 2.

**Table 1. Prevalence of asthma symptoms**

Symptom	Overall, % (95%CI)	Boys, % (95%CI)	Girls, % (95%CI)	p value
Wheezing or whistling ever	32.9 (28.3-37.5)	31.1 (24.6-37.6)	34.6 (28.0-41.2)	0.830
Wheezing or whistling in the last 12 months	21.4 (17.4-25.5)	23.1 (17.2-29.0)	19.8 (14.2-25.3)	0.466
Number of wheezing or whistling in the last 12 months:				0.634
0	75.6 (67.2-79.5)	73.3 (67.2-79.5)	77.7 (71.9-83.5)	
1-3	20.4 (14.6-25.8)	21.6 (15.8-27.3)	19.3 (13.8-24.7)	
4-12	3.5 (0.9-6.1)	4.5 (1.6-7.4)	2.5 (0.3-4.6)	
More than 12	0.5 (0.5-1.5)	0.5 (0.5-1.5)	0.5 (0.5-1.5)	
Number of sleep disturbance due to wheezing during the last 12 months :				0.743
0	87.0 (67.2-79.5)	85.4 (80.5-90.3)	88.6 (84.2-93.0)	
1-3	4.5 (1.6-7.4)	12.0 (7.5-16.6)	9.9 (5.7-14.0)	
4-12	1.5 (0. -0)	2.0 (0.04-4.0)	1.0 (0.3-2.4)	
More than 12	0.5 (0.5 -1.5)	0.5 (0.5 -1.5)	0.5 (0.5 -1.5)	
Wheezing that has limited speech in the last 12 months	6.9 (4.3-9.4)	5.3 (2.0-8.5)	8.4 (4.4-12.4)	0.239
Wheezing associated with exercise in the last 12 months	14.7 (11.2-18.2)	9.1 (5.1-13.1)	20.3 (14.7-25.9)	0.001
Nocturnal dry cough in the last 12 months	24.7 (20.4-28.9)	28.3 (21.9-34.6)	21.3 (15.6-26.9)	0.132
Physician-diagnosed asthma	2.5 (0.9-4.0)	3.0 (0.6-5.4)	1.9 (0.04-3.9)	0.541

Abbreviation: CI, confidence interval.

**Table 2. Prevalence of Allergic Rhinitis and Rhinoconjunctivitis**

Symptom	Overall, % (95%CI)	Boys, % (95%CI)	Girls, % (95%CI)	p value
Allergic rhinitis in the last 12 months	28.4 (24.0-32.9)	32.2 (25.6-38.7)	24.7 (18.7-30.7)	0.121
Symptoms when did not have cold or the flu in the past 12 months:				
Sneezing	26.4 (22.1-30.8)	29.6 (23.3-36.0)	23.3 (17.4-29.1)	0.147
Runny nose	30.2 (25.7-34.7)	31.6 (25.1-38.1)	28.7 (22.4-35.0)	0.521
Blocked nose	31.0 (26.4-35.5)	34.7 (28.0-41.3)	27.2 (21.0-33.4)	0.107
Rhinoconjunctivitis in the last 12 months	19.0 (15.1-22.8)	17.6 (12.3-23.0)	20.3 (14.7-25.9)	0.489

The prevalence of nocturnal dry cough in the last 12 months, without associated infection was 26.3% in Khan-Uul district and 8.1% in Sukhbaatar district ( $p=0.013$ ) (Table 3).

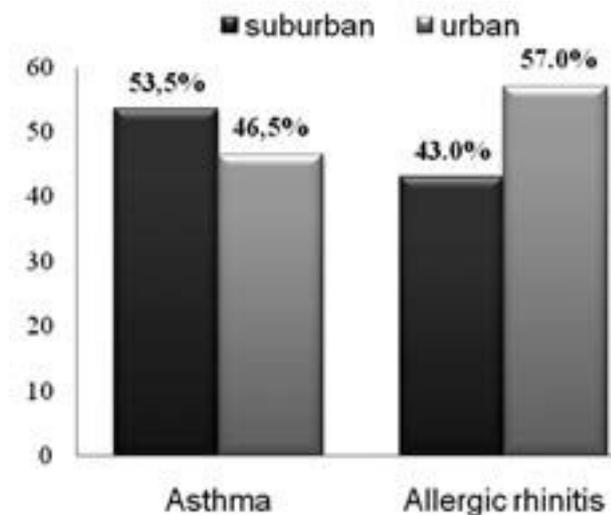
**Table 3. Prevalence of asthma symptoms, by districts**

Symptom	Khan-Uul	Chingeltei	Bayan zurkh	Sukh baatar	Bayan gol	p value
	n(%)	n(%)	n(%)	n(%)	n(%)	
Wheezing or whistling ever	28 (21.4)	28 (21.4)	23 (17.6)	32 (24.4)	20 (15.4)	0.131
Wheezing or whistling in the last 12 months	20 (23.3)	15 (17.4)	16 (18.6)	20 (23.3)	15 (17.4)	0.705
Wheezing that has limited speech in the last 12 months	7 (26.9)	5 (19.2)	4 (15.4)	5 (19.2)	5 (19.2)	0.721
Wheezing associated with exercise in the last 12 months	17 (28.8)	11 (18.6)	6(10.2)	14 (23.7)	11 (18.6)	0.088
Nocturnal dry cough in the last 12 months, without associated infection	26 (26.3)	21 (21.2)	26 (26.3)	8 (8.1)	18 (18.2)	0.013
Physician-diagnosed asthma	3 (30.0)	2 (20.0)	2 (20.0)	2 (20.0)	1 (10.0)	0.923

Abbreviation: CI, confidence interval.

The prevalence of current asthma and allergic rhinitis was compared between suburban and urban subjects. There was no statistical significant difference of prevalence of current asthma and allergic rhinitis between suburban and urban subjects of Ulaanbaatar ( $p=0.549$ ), ( $p=0.054$ ) (Figure 1).

**Figure 1. Comparison between urban and suburban subjects**



### DISCUSSION

In our study, the prevalence of current asthma among 6-7-year-old children was 21.4%. This rate is similar to the rate of 18.4% found in the Canary Islands<sup>11</sup> and higher than the 12.0%, 6.0% reported in the study conducted in Hong Kong<sup>12</sup>, in the city of Beijing, China<sup>13</sup>. The prevalence of current asthma was found to be 22.0% among students between 6 and 7 years of age in the city of Londrina, Brazil<sup>14</sup>. This result is similar to our rate.

In the present study, the prevalence of physician-diagnosed asthma was 2.5%, which is lower than the 10.4% reported in the study conducted in the city of Londrina, Brazil. In 1993, N.Radnaakhand reported the prevalence of bronchial asthma was  $7.0 \pm 0.9$  in 1000 children in Mongolia. This is lower than the current studies results.

The prevalence of allergic rhinitis and rhinoconjunctivitis found in this study was 28.4% and 19.0% of the population. Worldwide,<sup>15,16</sup> this prevalence ranged from 1.5% to 41.8% and from 0.8% to 14.9%.

### CONCLUSIONS

1. The prevalence of current asthma and physician-diagnosed asthma was 21.4% (95% CI,17.4-25.5), 2.5% (95% CI,0.9-4.0) among 6-7-year-old children in Ulaanbaatar, respectively.
2. The low prevalence of physician-diagnosed asthma suggests that asthma continues to be underdiagnosed and consequently undertreated.

3. The prevalence of allergic rhinitis and rhinoconjunctivitis was 28.4% (95% CI, 24.0-32.9), 19.0% (95% CI, 15.1-22.8) among 6-7-year-old children in Ulaanbaatar, respectively.

### REFERENCES

1. Braman SS. The global burden of asthma. *Chest*. 2006;130:4S-12S.
2. Downs SH, Marks GB, Sporik R, Belosouva EG, Car NG, Peat JK. Continued increase in the prevalence of asthma and atopy. *Arch Dis Child*. 2001;84:20-23.
3. Sennhauser FH, Braun-Fahländer C, Wildhaber JH. The burden of asthma in children: a European perspective. *Paediatr Respir Rev*. 2005;6:2-7.
4. Zivkovic Z, Radic S, Smiljanic S, Micic-Stanojevic M, Cerovic S, Jovic-Stojanovic J. Asthma education intervention in children and their parents. *Vaiku pulmonologija ir alergologija* 2008;11:3756-3765.
5. Weinmayr G, Weiland SK, Björkstén B, Brunekreef B, Büchele G, Cookson WO, Garcia-Marcos L, Gotua M, Gratziau C, van Hage M, von Mutius E, Riiikjäv MA, Rzehak P, Stein RT, Strachan DP, Tsanakas J, Wickens K, Wong GW; ISAAC Phase Two Study Group. Atopic sensitization and the international variation symptom prevalence of asthma in children. *Am J Respir Crit Care Med*. 2007;176:565-574.
6. Asher MI, Keil U, Anderson HR, Beasley R, Crane J, Martinez F, Mitchell EA, Pearce N, Sibbald B, Stewart AW, Strachan D, Weiland SK, Williams HC. International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. *Eur Respir J*. 1995;8:483-491.
7. Bousquet J, Khaltaev N, Cruz AA, Denburg J, Fokkens WJ, Togias A, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA(2)LEN and AllerGen). *Allergy*. 2008;63 Suppl 86:8-10.
8. Li Y, Baudoin T. Prevalence of allergic rhinitis and related diseases. Review. *Acta Clin Croat*. 2004;43:61-65.
9. Раднааханд.Н. Бронхиальная астма у монгольских детей. Автореферат диссертаций на соискание учёной степени кандидата мед. наук. УБ хот. 1993
10. Viinanen A, Munhbayarlah S, Zevgee T, Narantsetseg L, Naidansuren Ts, Koskenvuo M, Helenius H, Terho E. O. Prevalence of asthma, allergic rhinoconjunctivitis and allergic sensitization in Mongolia. *Allergy* 2005; 60: 1370-1373
11. Sanchez-Lerma B, Morales-Chirivella FJ, Penuelas I, Blanco Guerra C, Mesa Lugo F, Aguinaga-Ontoso

- I, Guillen-Grima F. High prevalence of asthma and allergic disease in children aged 6 and 7 years from the Canary Islands: The International Study of Asthma and Allergies in Childhood. *J Investig Allergol Clin Immunol.* 2009; 19(5):383-390.
12. Leung R, Wong G, Lau J, Ho A, Chan JK, Choy D, Douglass C, Lai CK. Prevalence of asthma and allergy in Hong Kong schoolchildren: an ISAAC study. *Eur Respir J.* 1997;10(2):354-360.
13. Zhao T, Wang HJ, Chen Y, Xiao M, Duo L, Liu G, Lau Y, Karlberg J. Prevalence of childhood asthma, allergic rhinitis and eczema in Urumqi and Beijing. *J Paediatr Child Health.* 2000;36(2):128-133.
14. Luci Keiko Kuromoto de Castro, Alcindo Cerci Neto, Olavo Franco Ferreira Filho. Prevalence of symptoms of asthma, rhinitis and atopic eczema among students between 6 and 7 years of age in the city of Londrina, Brazil. *J Bras Pneumol.* 2010;36(3):286-292
15. Solé D, Camelo-Nunes IC. A dimensão do problema da asma e da rinite alérgica no Brasil: prevalência, hospitalizações e mortalidade. *Gaz Med Bahia.* 2008;78 (Suppl 2):3-10.
16. Strachan D, Sibbald B, Weiland S, Aït-Khaled N, Anabwani G, Anderson HR, et al. Worldwide variations in prevalence of symptoms of allergic rhinoconjunctivitis in children: the International Study of Asthma and Allergies in Childhood (ISAAC). *Pediatr Allergy Immunol.* 1997; 8(4):161-165.

# A Morphological study on the hard tissue facial profile of Harmonious Mongolian females

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## ABSTRACT

Cephalometric analysis is used to identify the patient's deviation from so-called normal values. These normal values are derived from an untreated sample of subjects from the same racial or ethnic group. Regardless of the type of comparative samples used, a major drawback of cephalometric diagnosis is the use of isolated craniofacial parameters, without taking into account their possible interdependence. Even though the cephalometric measurements of subjects lie beyond one standard deviation from the population norm, measurement can still be considered acceptable if certain relationships are maintained. The objective of our study is to establish normative data of cephalometric analysis for Mongolian female adults. From 96 young Mongolian females 36 adults were selected for the study (mean age 20.16). Mongolian adults were selected based on the following criteria: well-balanced profile, ideal or near ideal occlusion and no craniofacial deformity or history of orthodontic treatment. The selected subjects were Mongolians (by nationality) born and living in Mongolia. The cephalograms were traced on matted acetate tracing papers and digitized for the micro-computer analysis. Downs, Northwestern, Steiner, Tweed, and Wylie analysis were used for measuring. Descriptive statistics (mean, standard deviation, and ranges) were calculated for all measured variables. Student's t tests were performed to assess the interracial differences. Mongolian females had more hyperdivergent proclined mandibular incisors compared to Caucasian females. Maxillae were retrognathic and incisors were lingually inclined compared to Korean females revealing that Mongolian females had a straighter profile than Korean females. When compared to Japanese females, Mongolian females had prognathic mandible and more lingually inclined incisors. Upper facial height and size were greater in Mongolian females than Japanese.

**Keywords:** facial profile, lateral roentgen analysis, Mongolian female,

## INTRODUCTION

The primary purpose of orthodontic treatment is to obtain a balanced occlusion with a harmonious facial profile. Angle (1907)<sup>1</sup> stated, "The study of orthodontia is indissolubly connected with that of art as related to the human face." Therefore, an artistic mind is necessary for orthodontists in treating orthodontic patients.

Tweed<sup>2</sup> pointed out the objectives of orthodontic treatment as follows: (1) The best balance and harmony of facial lines that is possible, (2) Stability of the denture after treatment, (3) Healthy oral tissues, and (4) An efficient chewing mechanism. Concerning the treatment goal, he gave the highest priority to the balance and harmony of the facial line. The patient's concern about orthodontic treatment is also facial appearance. Then, it is possible to say that the correction of the facial profile is one of the important objectives of orthodontic treatment.

It is difficult to establish the criteria of harmony or beauty in the facial profile. The soft and hard tissues which consist of the craniofacial complex have individual differences. And

the evaluation of the facial profile changes individually, racially, and with time.

Since the roentgenographic cephalometry which was developed by Broadbent<sup>3</sup> and Hofrath<sup>4</sup> was introduced to orthodontic field, a number of authors (Brodie, et al.<sup>5</sup>, Brodie<sup>6</sup>, Tweed<sup>7</sup>, Wylie<sup>8,9</sup>, Downs<sup>10,11</sup>, Steiner<sup>12,13</sup>, Bjork<sup>14,15</sup>, Riedel<sup>16</sup>, Graber<sup>17,18</sup>, Ricketts<sup>19,20</sup>, Kayukawa<sup>21,22</sup>, Iizuka<sup>23</sup>, Iizuka, et al.<sup>24,25</sup>, Sakamoto<sup>26</sup>, Sakamoto, et al.<sup>27</sup>, Nakago<sup>28</sup>, Yamauchi, et al.<sup>29</sup>) made progress in the study of growth and development, and the morphological study of craniofacial complex with this method. The roentgenographic cephalometry has also been applied to clinical orthodontics such as diagnosis, treatment planning, and the evaluation of treatment results.

However, many researchers conducted studies with the skeletal and denture pattern of the face in the lateral head films. The assessment of the soft tissue profile was neglected. Soft tissue profile varies with the changes of skeletal and denture pattern in growth and development or orthodontic treatment. Therefore, soft tissue analysis is necessary for the assessment of the facial profile.

Changes of the soft and hard tissue profile induced with the growth and development and orthodontic treatment have been studied by a number of researchers.

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Recently, adult orthodontics is becoming popular due to the technical progress in the orthodontic materials and orthodontic treatment. In adult orthodontics there are two types of treatment procedures: Ordinary orthodontics and surgical orthodontics. The objectives of these treatment procedures are a beautiful soft tissue profile and a balanced hard tissue profile.

Before orthodontic treatment the doctor should have objectives which are achievable with their techniques. In this connection, the standard which guides treatment objectives should be established.

The purposes of this study are to analyze the hard tissue of Mongolian females who have a pleasing faces and to establish the standard for orthodontic treatment objectives.

### MATERIALS AND METHODS

The oral examination and evaluation of the facial profiles of the 96 young Mongolian females with most pleasing face (most of them are fashion models) has been conducted. Out of the above mentioned females, 36 females were selected based on the following criteria: well-balanced profile, ideal or near ideal occlusion (Class I molar relationship, Class I canine relationship, normal overbite and overjet, mild or no crowding or spacing), no craniofacial deformity or history of orthodontic treatment and the facial profile, eliminating personal preference of the selectors.

These 36 subjects consisted of 18-year to 25-year-old females. The mean age was 20.16 years. The selected subjects were Mongolians (by nationality) born and living in Mongolia and of Mongolian descent. From the head

films of the selected 36 subjects, 30 head films were chosen for the study.

The cephalograms were traced on matted acetate tracing papers and digitized for the micro-computer analysis.

For the hard tissue analysis Downs, Northwestern, Steiner, Wylie, Tweed and dimensional linear analysis analysis were used for measuring. Descriptive statistics (mean, standard deviation and ranges) were calculated for all measured variables. Student's t tests were performed to assess the intergender differences.

### RESULTS

For the hard tissue analyses following were performed on Mongolian adult females and compared to that of Korean and Japanese adult females with harmonious facial tissues:

1. Downs analysis
2. Northwestern analysis
3. Steiner analysis
4. Wylie analysis
5. Tweed analysis
6. Dimensional liner analysis

The mean values and standard deviations were calculated. Comparisons were made between the present subjects and the groups of subjects used in the original research of analysis mentioned above, Korean adult females reported by Lee, and Japanese normal occlusion subjects.

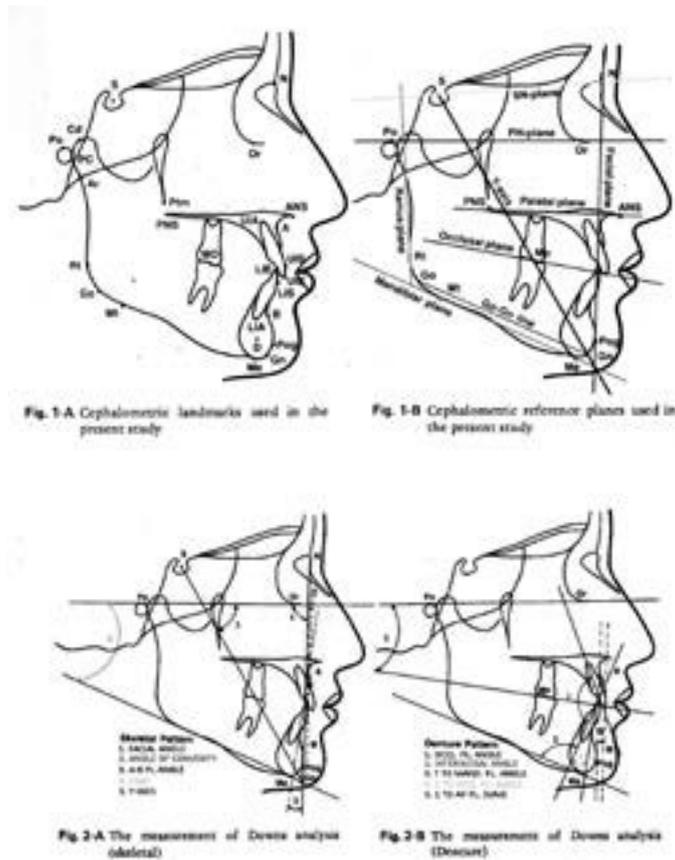
#### 1. Downs analysis

Fig. 2A, B show the items of Downs analysis for skeletal and denture patterns. The maximum, and mean values for the present subjects were calculated and comparisons were made between the Mongolian females and the subjects used in the Downs' study<sup>10</sup> (Table 1).

**Table 1: Comparison of Mongolian female standard and Downs' study (Caucasian)**

Down's measurements	present study				by Downs'			p
	Max.	Min.	Mean	S.D.	Mean	S.D.	T-value	
Facial angle	89.32	83.88	86.60	2.72	87.8	3.57	1.32	-
Angle of convexity	6.32	-1.64	2.34	3.98	0	5.09	1.78	-
A-B pl. angle	-2.13	-6.17	-4.15	2.02	-4.6	3.67	0.55	-
FMA	34.00	16.00	26.71	4.47	21.9	3.24	4.06	*
Y-axis	66.23	60.33	63.28	2.95	59.4	3.82	3.96	*
Occl. pl. angle	12.48	6.68	9.08	3.4	9.3	3.83	0.21	-
Interincisal angle	137.32	124.10	130.71	6.61	135.4	5.76	2.53	*
l to mand. Pl. angle	95.61	85.67	90.64	4.97	91.4	3.78	0.57	-
l to occl. Angle	23.29	13.25	18.27	5.02	14.5	3.48	2.86	*
l to AP pl. (mm)	7.17	3.93	5.55	1.67	2.7	1.80	5.71	*

\* significant at 0.05 level



The values for the mandibular plane angle, Y-axis angle, 1 to occlusal plane angle, and 1 to A-P plane angle were significantly greater in the present subject group ( $p < 0.05$ ). The value for the interincisal angle was significantly smaller in Mongolian females ( $p < 0.05$ ).

These results indicated that the mandible of the Mongolian females was more retrognathic, and the maxillary and mandibular incisors were inclined more labially than those of Caucasians.

Table 2 shows the comparison of the measurement values in the Mongolian subjects and the normal Japanese subjects used in the study of Iizuka and Ishikawa<sup>25</sup>.

In the present subjects, the mandible was prognathic and the maxillary and mandibular incisors were inclined lingually, resulting in a significantly greater facial angle and interincisal angle ( $p < 0.05$ ), and smaller angle of convexity, occlusal plane angle, 1 to mandibular plane angle, 1 to occlusal plane angle, and distance 1 to A-P plane ( $p < 0.05$ ).

**Table 2. Comparison of Mongolian and Japanese female standard (by Iizuka and Ishikawa) of Down's analysis.**

Down's measurements	present study		by Iizuka et al			P
	Mean.	S.D.	Mean.	S.D.	T-value	
Facial angle	86.60	2.72	84.83	3.05	2.58	*
Angle of convexity	2.34	3.98	7.58	4.95	4.86	*
A-B pl. angle	-4.15	2.02	-4.81	3.50	0.93	-
FMA	26.71	4.47	28.81	5.23	1.81	-
Y-axis	63.28	2.95	65.38	5.63	1.87	-
Occl. pl. angle	9.08	3.40	11.42	3.64	2.82	*
Interincisal angle	130.71	6.61	124.09	7.63	3.90	*
1 to mand. Pl. angle	90.64	4.97	96.33	5.78	4.43	*
1 to occl. Angle	18.27	5.02	23.84	5.28	4.59	*
1 to AP pl. (mm)	5.55	1.67	8.92	1.88	8.06	*

\* significant at 0.05 level

**2. Northwestern analysis**

A Table 3 indicates the maximum, minimum, and mean values of the present subjects and the results of the comparison between the Mongolian females and the subjects of Riedel's study<sup>16</sup>.

The values for the S-N to mandibular plane angle and distance  $\perp$  to N-P were significantly greater, and the SNA angle and SNB angle were significantly smaller in the present subjects ( $p < 0.05$ ).

**Table 3. Comparison of Mongolian female standard and Riedel's study of Northwestern analysis.**

Northwestern measurement	present study				by Riedel's		T-value	p
	Max.	Min.	Mean.	S.D.	Mean.	S.D.		
Angle of convexity	6.32	-1.64	2.34	3.98	1.62	4.78	0.69	-
SNA	81.98	76.16	79.07	2.91	82.01	3.89	3.56	*
SNB	79.63	74.43	77.03	2.60	79.97	3.60	3.87	*
ANB	3.49	0.59	2.04	1.45	2.04	1.81	0.00	-
SN to mand. Pl. angle	38.72	30.86	34.79	3.93	31.71	5.19	2.78	*
$\perp$ to SN pl. angle	108.12	98.56	103.34	4.78	103.97	5.75	0.50	-
$\perp$ to mand. pl. angle	95.61	85.67	90.64	4.97	93.09	6.78	1.71	-
$\perp$ to Occl. pl. angle	66.71	76.75	71.73	5.02	69.37	6.43	1.71	-
Interincisal angle	137.32	124.10	130.71	6.61	130.98	9.24	0.14	-
$\perp$ to NP (mm)	11.14	6.08	8.61	2.53	5.51	3.15	4.55	*

\* significant at 0.05 level

As a result, the statistical value showed that the Mongolian subject had retruded the mandible and labially inclined maxillary and mandibular incisors, compared with those of a Caucasian subject. And the apical bases were small but the apical base relationship was balanced.

Since they did not measure the S-N to mandibular plane angle, the comparison was not made on this measurement. In the Mongolian females, the facial profile was straight with significantly smaller values ( $p < 0.05$ ) for the angle of convexity, SNA angle, SNB angle, ANB angle,  $\perp$  to S-N plane angle,  $\perp$  to mandibular plane angle,  $\perp$  to occlusal plane angle, and distance  $\perp$  to N-P plane and higher value for the interincisal angle ( $p < 0.05$ ).

Table 4 shows the comparison between the present subjects and the subjects used in the study of Iizuka and Ishikawa<sup>25</sup>.

**Table 4. Comparison of Mongolian and Japanese female standard (by Iizuka and Ishikawa) of Northwestern analysis.**

Northwestern measurement	present study		by Iizuka et al.		T-value	p
	Mean.	S.D.	Mean.	S.D.		
Angle of convexity	2.34	3.98	7.58	4.95	4.86	*
SNA	79.07	2.91	82.32	3.45	4.27	*
SNB	77.03	2.60	78.90	3.45	2.53	*
ANB	2.04	1.45	3.39	1.77	3.48	*
SN to mand. pl. angle	34.79	3.93	-	-	-	-
$\perp$ to SN pl. angle	103.34	4.78	104.54	5.55	0.12	-
$\perp$ to mand. pl. angle	90.64	4.97	96.33	5.78	4.43	*
$\perp$ to occl. pl. angle	71.73	5.02	66.16	5.28	4.59	*
Interincisal angle	130.71	6.61	124.09	7.63	3.90	*
$\perp$ to NP (mm)	8.61	2.53	11.74	2.73	5.04	*

\* significant at 0.05 level

**3. Steiner analysis**

Fifteen measurements were made on the Steiner analysis (Fig. 3).

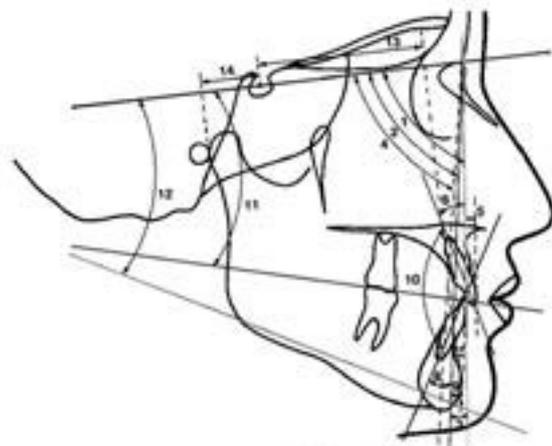


Fig. 3. The measurement of Steiner analysis

A Table 5 shows the maximum, minimum, and mean values of the present subjects. Comparisons were made between the mean values of the present study and ideal values of Steiner's study, because he did not perform the statistical analysis.

In the present subjects, the values for the SNA angle, SNB angle, SND angle, 1 to N-B angle and SL (distance) were smaller and 1 to N-A angle, 1 to N-A (distance), Go-Gn to S-N angle, and S-N to occlusal plane angle were greater than Steiner's ideal values. And ANB angle and interincisal angle were approximately the same.

From the view point of the Steiner analysis, the present subjects had retrognathic but balanced maxillae and mandibles with proclined incisors. However, the differences between the present subjects and Steiner's ideal were within the acceptable range in Steiner's orthodontic diagnosis.

**Table 5. Comparison of Mongolian female standard and Steiner's (Caucasian) and Uesato et al. (Japanese and Japanese American) study of Steiner analysis.**

Steiner measurement	present study				Steiner's ideal	Uesato et al ideal
	Max.	Min	Mean.	S.D.		
SNA	81.98	76.16	79.07	2.91	82	80
SNB	79.63	74.43	77.03	2.60	80	77
ANB	3.49	0.59	2.04	1.45	2	3
SND	77.32	71.98	74.65	2.67	76	75
1 to N-A (mm)	6.91	3.61	5.26	1.65	4	4
1 to N-A (Angle)	28.25	20.39	24.27	3.88	22	23
1 to N-B (mm)	7.66	3.72	5.69	1.97	4	5
1 to N-B (angle)	27.94	18.02	22.98	4.96	25	26
Po to N-B (mm)	3.52	0.58	2.05	1.47	not Established	2
Po & to N-B	11.80	-1.50	3.65	3.01	Varies	3
1 to 1 (Angle)	139.06	126.44	132.75	6.31	131	128
Occl. to S-N	21.80	9.50	17.68	3.25	14	18
Go-Gn to S-N	38.72	30.86	34.79	3.93	32	34
SL (mm)	50.23	37.69	43.69	6.27	51	47
SE (mm)	25.89	20.05	22.97	2.92	22	21

**Table 6. Mean values of Wylie analysis in Mongolian female adult (the present study) and comparison of values in the present study and Wylie's study (Caucasian) and normal Korean female adult (by Lee)**

Wylie's measurements	present study				by Lee		T-value	P	Wylie's original
	Max.	Min.	Mean.	S.D.	Mean.	S.D.			
Glenoid. to S	23.70	9.40	18.22	2.76	17.54	2.28	1.18	-	17
S to Ptm	24.30	12.10	18.88	3.34	19.65	2.53	1.15	-	17
Ptm to ANS	59.90	49.10	53.25	2.95	53.59	3.23	0.46	-	52
Ptm to 6	23.40	12.00	16.93	3.23	20.61	5.86	3.12	*	16
Mand.Length	125.50	100.90	112.38	5.76	108.46	4.86	3.21	*	101

\*significant at 0.05 level

Table 7 shows the comparison of the present subjects and the subjects used in the study of Uesato, et al. Uesato, et al. reported the ideal values for Steiner analysis, using 25 Japanese and Japanese American patients who were excellent facial profiles after orthodontic treatment at his office.

The mean values for each measurement of both groups were almost the same with the exception of SL distance. (SL of the present subjects was 3.31 mm larger than of Uesato's study).

**Table 7. Comparison of Mongolian and Japanese female standard (by Iizuka and Ishikawa) of Wylie's analysis.**

Wylie's measurements	present study		by Iizuka et al.		T-value	P	Wylie's original
	Mean.	S.D.	Mean.	S.D.			
Glenoid. to S	18.22	2.76	19.98	2.80	2.70	*	17
S to Ptm	18.88	3.34	17.90	3.49	1.22	-	17
Ptm to ANS	53.25	2.95	52.53	2.47	1.16	-	52
Ptm to 6	16.93	3.23	20.47	3.00	4.90	*	16
Mand. Length	112.38	5.76	109.87	4.33	2.18	*	101

\*significant at 0.05 level

#### 4. Wylie analysis

Fig. 4 shows the measurement items of the Wylie analysis. The measurement values for the present subjects and the comparison between the Mongolian subjects and the subjects used in the study of Wylie<sup>8</sup> were indicated in Table 6.

All measurement values of the Mongolian females except the ptm to 6 (distance) were larger than the Wylie study. Those differences might be due to the age difference of both subjects. (The present subjects: 20.16 years old, Wylie's subjects: 11.5 years old)

Wylie analysis consisted of the anteroposterior linear measurements of the craniofacial skeleton. Then, it can be said that the balance of the craniofacial skeleton of both groups resemble the data mentioned above.

Table 8 shows the comparison of measurement values between the Mongolian subjects and the Korean normal subjects used in Lee's study.

In the current subjects, the mandible grew well and relation of first molars was good, resulting in a significantly greater mandibular length ( $p < 0.05$ ) and smaller ptm to 6 (distance) ( $p < 0.05$ ).

**Table 8. Mean values of Tweed analysis in Mongolian female adult (the present study) and comparison of value in the present study, Tweed's study (Caucasian) and normal Korean female adult (by Lee)**

Tweed measurements	present study				by Lee		T-value	p	Tweed's original
	Max.	Min.	Mean.	S.D.	Mean.	S.D.			
FMA	34.00	16.00	26.71	4.47	27.00	5.87	0.21	-	25
FMIA	71.70	50.90	62.65	5.07	57.14	7.13	3.30	*	68
IMPA	101.90	81.80	90.64	4.98	96.78	7.05	3.83	*	87

\*significant at 0.05 level

Table 7 shows the comparison of measurement values between the present subjects and Japanese normal subjects used in the study of Iizuka and Ishikawa<sup>25</sup>

The values for the glenoid-sella (distance) and ptm-U6 (distance) were significantly smaller, and the mandibular length (distance) was greater in the present subjects ( $p < 0.05$ ).

The statistical analysis indicated that the present subjects had greater mandible and more stabilized maxillary molars

than Japanese normal subjects.

#### 5. Tweed analysis

Three measurement items of Tweed analysis were shown in Fig.5 and the result of the statistical analysis was indicated in Table 8.

The mean values of the Mongolian females were compared with the values reported by Tweed<sup>7</sup>, because Tweed did not perform the statistical analysis. In the present subjects, the values for the Frankfort mandibular plane angle and

incisor mandibular plane angle were greater and Frankfort mandibular incisor angle was smaller than the Tweed's values.

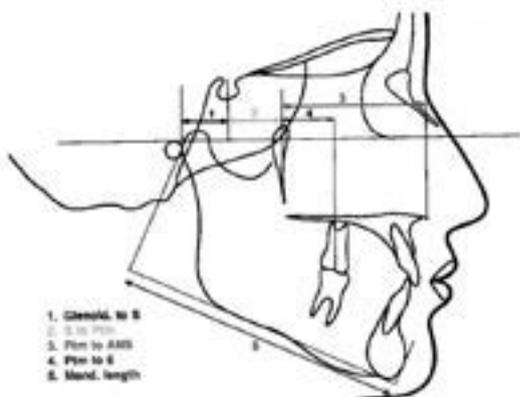


Fig. 4 The measurement of Wylie analysis

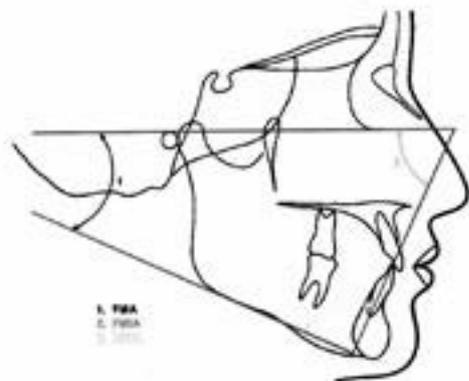


Fig. 5 The measurement of Tweed analysis

The values mentioned above indicated that the Mongolian subject were hyper divergent type with proclined mandibular incisors.

Table 8 shows the comparison of measurement values between the Mongolian normal and the Korean normal subjects used in the study of Lee.

In the present subjects, the mandibular incisor was upright with significantly smaller values for the incisor mandibular plane angle and greater Frankfort mandibular incisor angle ( $p < 0.05$ ).

In table 9 the comparison of measurement values between the Mongolian females and the Japanese normal subjects used in the study of Iizuka and Ishikawa<sup>25</sup> is shown.

The value for the Frankfort mandibular incisor angle was significantly greater and the value for the incisor mandibular plane angle was significantly smaller in the current subjects ( $p < 0.05$ ). The mandibular incisors of the Mongolian females were more upright than the Japanese normal subjects in the statistical analysis.

### 6. Dimensional linear analysis

Eighteen measurements were made on the dimensional linear analysis by Sakamoto, et al.<sup>27</sup>. A comparison of the measurement values between the present subjects and the subjects used in the study of Sakamoto, et al. <sup>27</sup> was conducted.

The present subjects exhibited significantly greater values for the N-Ans, S<sup>2</sup>-Ptm', Gn-Cd, and Pog<sup>2</sup>-Go, while values for the A<sup>2</sup>-ptm', Is-Is', Ii-Ii', Mo-Mi, and S-S' were significantly smaller.

As a result, the upper facial height and the size of the mandible of the Mongolian females were greater than the Japanese normal subjects.

**Table 9. Comparison of Mongolian and Japanese female standard (by Iizuka and Ishikawa) of Tweed analysis.**

Tweed measurements	present study		by Lee		T-value	p	Tweed's original
	Mean.	S.D.	Mean.	S.D.			
FMA	26.71	4.47	28.81	5.23	1.81	-	25
FMIA	62.6	5.07	54.63	6.47	5.73	*	68
IMPA	90.64	4.98	96.33	5.78	4.43	*	87

\*significant at 0.05 level

### CONCLUSIONS

1. Mongolian females incisors were more labially inclined and the mandible more retrognathic compared with the Caucasian subjects. Therefore Mongolian females have an hyper-divergent profile with noticeable proclined mandibular incisors.
2. The comparison between Mongolian female and Korean normal female adult shows that the present subjects' maxillae were retrognathic and the maxillary and mandibular incisors were lingually

- inclined. Consequently, facial profiles in Mongolian female were straighter, compared with normal Korean female adult subjects.
3. Mongolian female's mandible was prognathic and the maxillary and mandibular incisors were lingually inclined compared to the Japanese normal subjects. The upper facial height and the size of the mandible of the present subjects were greater than the Japanese normal subjects.

## REFERENCES

1. Tweed, C.H.: Clinical Orthodontics. Vol. 1, Saunt Louis, 1996.
2. Broadbent, B.H.: A New X-ray Technique and Its Application to Orthodontia. *Angle Orthod.*, 1: 45-66, 1931.
3. Brodie, A.G., Downs, W.b., Goldstein, A. and Ernest, m.: Cephalometric Appraisal of Orthodontic Results. *Angle orthod.*, 8: 216-265, 1938.
4. Brodie, A.G.: Late Growth Change in Human Face. *Angle Orthod.*, 23:146-157, 1953.
5. Tweed, C.H.: The Francfort Mandibular incisor (FMIA) in Orthodontic Diagnosis, Classification, Treatment Planning and Prognosis. *Angle Orthod.*, 24: 121-169, 1954.
6. Wylie, W.L.: The assessment of Anteroposterior Dysplasia. *Angle Orthod.*, 17: 97-109, 1947.
7. Lizuka, T.: A Study on the Developmental Facial Change of Japanese Children with Roentgencephalometry. *J. Stomatol. Soc. Jap.*, 25: 260-272, 1958. (Japanese)
8. Lizuka, T. and Ishikawa, F.: Normal Standards for Various Cephalometric Analysis in Japanese Adults. *J. Jap. Orthod.*, 16(1): 4-12, 1957 (Japanese)
9. Lizuka, T. and Ishikawa, F.: Point and Landmarks in Head Plates. *J. Jap. Orthod.*, 16(2): 66-75, 1957.
10. Sakamoto, T.: A Study on the Developmental Changes of Dentofacial Complex of Japanese with Special Reference to Sella Turcica. *J.Jap. Orthod.*, 18(1): 1-17, 1959. (Japanese)
11. Sakamoto, T., Miura, F. and Lizuka, T.: Linear Analysis on the Developmental Changes of Dentofacial Complex of Japanese by Means of Roentgenographic Cephalometry. *J. Stomatol, Soc. Jap.*, 30: 169-180, 1963. (Japanese)
12. Nakago, T.: Morphologic Studies of the Craniofacial Skeleton of Japanese Male Adults by a Postero-anterior Roentgenographic Cephalometry. *J. Jap. Orthod.*, 23(1): 63-74, 1964.(Japanese)
13. Yamauchi, K., Ito, K., Suematsu, A. and Ozeki, S.: Sex Difference of Japanese Adult Profile with Normal Occlusion on Cephalometric Roentgengrams. *J. Jap. Orthod.*, 26(2):155-160, 1967. (Japanese)
14. Ahn, H.K.: Normal Standard for Various Roentgenographic Cephalometric Analysis in Korea. *Korean Med. Digest.*, 3: 1433-1449, 1961. (Korean)
15. Yoo. Y.S.: The Roentgenocephalometric Standard of the Koreans According to the Higley's Analysis. *J. Korean Dent. Ass.*, 8:629-644, 1970. (Korean)
16. Jan, S.H.: The Position of the Incisors in Correlation to ANB Angle, Procumbency and Inclination in Korean Normal Occlusion. *J. Korean Academy of Orthod.*, 2: 7-14, 1971. (Korean)
17. Yang, N.S.: A Roentgenocephalometric Study on the Linear Analysis in Normal Occlusion for Korean. 4: 7-12, 1974. (Korean)
18. Lee, H.L.: A Roentgenocephalometric Study on the Children of Normal Occlusion in the Mixed Dentition. *J. Korean Academy of Orthod.*, 5: 11-19, 1975. (Korean)
19. Downs, W.B.: Analysis of Dentofacial Profile. *Angle Orthod.*, 26: 191-212, 1956.
20. Ricketts, R.M.: A Foundation for Cephalometric Communication. *Am. J. Orthod.*, 46: 330-357, 1960.
21. Burstone, C.J.: Integumental Contour and Extention Patterns. *Angle Orthod.*, 29: 93-104, 1959.
22. Burstone, C.J.: Lip Posture and Its Significance in Treatment Planning. *Am. J. Orthod.*, 53: 202-284, 1967.
23. Riedel, R.A.: Esthetics and Its Relation to Orthodontic Therapy. *Angle Orthod.*, 20: 168-178, 1950.
24. Riedel, R.A.: An Analysis of Dentofacial Relationship. *Am. J. Orthod.*, 43: 103-119, 1957.
25. Baum, A.T.: Orthodontic Treatment and the Maturing Face. *Angle Orthod.*, 36: 121-135, 1966.
26. Bloom, L.A.: Profile Changes in Orthodontic Treatment. *Am. J. Orthod.*, 47: 371-379, 1961.
27. Subtelny, J.D.: The Soft Tissue Profile, Grwoth and Treatment Changes. *Angle Orthod.*, 31: 105-122, 1961.
28. Subtelny, J.D.: A Longitudinal Study of Soft Tissue Facial Structures and Their Profile Characteristics. *Am. J. Orthod.*, 45: 481-507, 1959.
29. Yamauchi, K. and Matsumoto, M.: Studies on "Acceptable Face" of Japanese Female Adult, Part I Roentgenographic cephalometric analysis. *J.Jap. Orthod.*, 20(1): 7-12, 1961. (Japanese)
30. Ito, K. and Suematsu, H.: Cephalometrical Study on the Profile of Japanese Young Adult Females with Normal Occlusion. *J.Jap. Orthod.*, 26(1): 35-41, 1967. (Japanese)
31. Namura, S. and Suda, T.: A Study of Holdaway Ratio in Japanese. *J. Jap. Orthod.*, 33(1): 36-39, 1974. (Japanese)
32. Kinoshita, Z., Kawamoto, T., Hashimoto, N., Hamada, M., Yamawaki, H., Nakanishi, Y. Tatsuta, U., Okamoto, S., Fukawa, R., and Kumokawa, A.: A Study on the Application of Steiner's Analysis in Surgical Orthodontics. *J. Kinkitokai Orthod.*, 17: 22-25, 1982.

# Comparative Study of Conventional Surgery with Microsurgery For Lumbar Disc Herniation

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## ABSTRACT

The purpose of this study was to determine the efficacy of microsurgery compared with conventional surgery for lumbar disc hernia. This retrospective study included patients with intervertebral lumbar disc herniation in 2 institutions from 2004 to 2008. The first group of patients was treated by a conventional surgery method and the second group was treated by a new modified lumbar micro discectomy. Lumbar radical nerve root syndrome, compression of a nerve root, sensory function, loss of work capability, and pain were major categories for a patient's clinical assessment and pre and postoperative outcomes. Statistical analyses were done by using the SPSS-12 program. During the study period, 178 patients underwent lumbar discectomy and of those 103(57.9%) were men and 75(42.1%) were women. Post-operatively, the percentage of patients with severe back pain was reduced to 10.20% in standard discectomy versus 1.25% in microdiscectomy group. Normalization of tendon reflex was more prominent in the microdiscectomy group as compared with standard discectomy (98.75% versus 75.51% respectively). The neurological examination showed that recovery of sensory function was much higher in the group that received microsurgery. This study proves that our modified intervertebral lumbar micro discectomy surgery has more advantages than traditional lumbar discectomy surgery.

**Keywords:** spine, lumbar disc herniation, microsurgery

## INTRODUCTION

According to research, lumbar disk herniation is relatively prevalent in Mongolia due to unique climate and living conditions. Hence, this study aimed at developing management strategies of lumbar disc herniation to facilitate early diagnosis, precise establishment of type, form, and location and treatment options suitable for each of them and timing of the surgery leading to complete recovery.

Williams, R developed microsurgery for disk herniation in 1978. Since then, the minimally invasive method for disk herniation is widely used internationally. The method offers minimal tissue damage and less bleeding preventing from a number of complications. Microsurgery was introduced to Mongolia in 2007.

## MATERIALS AND METHODS

The current retrospective study was conducted among the inpatients of Traumatology Center and Achtan Elite Clinical Hospital who were diagnosed with intervertebral lumbar disc herniation. A database of these patients undergoing standard and microdiscectomy discectomy from 2004- 2008 was reviewed. The patients were from

different aimags (provinces) of Mongolia and Ulaanbaatar city.

Preoperative patients' complaints, clinical signs, and the results of investigations determining the severity of disease were similar in 2 groups.

Pre- and post- operative outcomes included pain and the work ability (VAS), tendon reflex (Antonov I. P and Poplyanski Ya. Yu). These outcomes were assessed at the time of discharge, 1 month, 6 month and 1 year.

We used a questionnaire containing 108 questions using the SPSS-12 version for statistical calculation.

## RESULTS

Between 2004-2008, 178 patients underwent lumbar discectomy in these two hospitals. There were 103(57.9%) men and 75(42.1%) women. 98 patients had the standard discectomy as it was the main operation for herniated lumbar disk in Mongolia prior to 2007. The introduction of microdiscectomy in Mongolia in 2007 has enabled 80 patients to receive this minimally invasive operation. Demographically, 98 patients who had the standard discectomy were aged from 15- 76 with a mean age of 35.7. 80 patients between 19-76 years of age were operated on by the modified new method for lumbar discectomy and their mean age was 38.1.

The main outcomes measured were back pain, work ability, tendon reflex, and sensory function. In terms of neurological clinical findings, compressed nerve symptoms were observed in 95 cases (53.375) followed

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by neurological deficit symptoms observed in 50 cases (28.09%). Preoperatively, 15.31% of the patients in the standard discectomy group and 8.75% in microdiscectomy group suffered from severe back pain (Table 1). Postoperatively severe pain is diminished in up to 10.20% of patients in the standard discectomy group

compared with up to 1.25% in the microdiscectomy group ( $p < 0.01$ ). 1 of 80 patients who underwent lumbar micro discectomy had vessel disease which caused postoperative bleeding. Also 2 patients had diabetes mellitus and tuberculosis before the operation and subsequently developed inflammation. We used "Student criteria" for statistical analyses.

**Table 1. Intensity of Pain**

Time	Intensity	Standard				Microdiscectomy				T
		N	n	%	m	N	n	%	m	
Pre-operative	1. Mild	98	30	30.61	4.66	80	18	22.50	4.67	1.23
	2. Moderate	98	53	54.08	5.03	80	55	68.75	5.18	2.03*
	3. Severe	98	15	15.31	3.64	80	7	8.75	3.16	1.36
At the time of Discharge	1. Mild	98	31	31.63	4.70	80	31	38.75	5.45	0.99
	2. Moderate	98	53	54.08	5.03	80	41	51.25	5.59	0.38
	3. Severe	98	14	14.29	3.53	80	8	10.00	3.35	0.88
1 month	1. Mild	98	37	37.76	4.90	80	32	40.00	5.48	0.31
	2. Moderate	98	48	48.98	5.05	80	41	51.25	5.59	0.30
	3. Severe	98	13	13.27	3.43	80	7	8.75	3.16	0.97
6 month	1. Mild	98	41	41.84	4.98	80	44	55.00	5.56	1.76
	2. Moderate	98	47	47.96	5.05	80	33	41.25	5.50	0.90
	3. Severe	98	10	10.20	3.06	80	3	3.75	2.12	1.73
1 year	1. Mild	98	53	54.08	5.03	80	68	85.00	3.99	4.81**
	2. Moderate	98	35	35.71	4.84	80	11	13.75	3.85	3.55**
	3. Severe	98	10	10.20	3.06	80	1	1.25	1.24	2.71**

Regarding the diminished reflex as a sign of compressed spinal nerve root, no significant difference was noted in the 2 groups preoperatively (Table 2). However, postoperative results at the 1 year follow up differ: normal tendon reflex observed in 98.75% of microdiscectomy patients in contrast with 75.51% of standard discectomy patients ( $p < 0.01$ ).

Sensory function assessed preoperatively showed identical results (Table 3). At 1 year postoperatively, the clinical findings demonstrated much more favorable results in sensory function recovery in the microdiscectomy group compared with standard discectomy group (95.00 versus 64.29 respectively) which was statistically significant or  $p < 0.01$ .

**Table 2. Tendon Reflex**

Time	Reflex response	Standard				Microdiscectomy				T
		N	n	%	m	N	n	%	m	
Pre-operative	1. Absent - 0	98	25	25.51	4.40	80	29	36.25	5.37	1.55
	2. Diminished - 1	98	68	69.39	4.66	80	45	56.25	5.55	1.81
	3. Normal - 2	98	0	0.00	0.00	80	6	7.50	2.94	
	4. Increased - 3	98	5	5.10	2.22	80	0	0.00	0.00	
At the time of discharge	1. Absent - 0	98	24	24.49	4.34	80	25	31.25	5.18	1.00
	2. Diminished - 1	98	59	60.20	4.94	80	48	60.00	5.48	0.03
	3. Normal - 2	98	12	12.24	3.31	80	7	8.75	3.16	0.76
	4. Increased - 3	98	3	3.06	1.74	80	0	0.00	0.00	

Function status of sensory	Standard				Microdissection				P	
	N	n	%	m	N	n	%	m		
Preoperative	1. Diminished	88	88	88.80	3.00	80	80	85.20	4.22	1.30
	2. Absent	88	10	10.10	3.00	80	8	10.00	3.32	0.04
	3. Increased	88	0	0.00	0.00	80	0	0.00	0.00	0.00
	4. Normal	88	0	0.00	0.00	80	0	0.00	0.00	0.00
At the time of discharge	1. Diminished	88	18	20.22	3.82	80	22	27.50	4.30	0.24
	2. Absent	88	0	0.00	0.00	80	3	3.75	5.15	1.21
	3. Increased	88	0	0.00	0.00	80	0	0.00	0.00	0.00
	4. Normal	88	8	9.09	1.12	80	15	18.75	23.00	1.41
1 month	1. Diminished	88	20	22.72	2.02	80	20	25.00	2.54	0.22**
	2. Absent	88	2	2.27	0.22	80	1	1.25	1.54	1.21
	3. Increased	88	0	0.00	0.00	80	0	0.00	0.00	0.00
	4. Normal	88	43	48.86	10.22	80	23	28.75	29.20	3.03**

Table 3. Sensory function

Because of using the magnifying microscope it decreases are less traumatic for nerve root than the traditional method. This study shows that microdissection surgical techniques

**DISCUSSION**

cured. patients and 83.72% of microdissection patients were in terms of curing rates, 72.21% of standard dissection

does not occur. related to the fact that the injury of the nerve root almost pain experienced after lumbar micro dissection is directly and protein denaturation of tissue. Another reason for less operation cause less tissue damage, and thermal influence being reduced to a lower level. Small incisions during the and regenerative destruction due to bipolar cauterization the tissue damage on the micro level and it reduces bleeding

1 year	1. Absent - 0	88	1	1.12	0.12	80	0	0.00	0.00	0.00
	2. Diminished - 1	88	23	26.13	2.82	80	1	1.25	1.54	0.88**
	3. Normal - 2	88	47	53.41	4.34	80	19	23.75	29.15	2.14**
	4. Increased - 3	88	0	0.00	0.00	80	0	0.00	0.00	0.00
6 month	1. Absent - 0	88	10	11.36	1.10	80	3	3.75	4.75	1.13
	2. Diminished - 1	88	11	12.50	1.10	80	2	2.50	3.15	1.10
	3. Normal - 2	88	17	19.32	1.74	80	15	18.75	23.32	1.15*
	4. Increased - 3	88	0	0.00	0.00	80	0	0.00	0.00	0.00
1 month	1. Absent - 0	88	0	0.00	0.00	80	1	1.25	1.54	1.22
	2. Diminished - 1	88	22	25.00	2.42	80	43	53.75	67.22	4.84**
	3. Normal - 2	88	00	0.00	0.00	80	30	37.50	47.22	3.42**
	4. Increased - 3	88	0	0.00	0.00	80	0	0.00	0.00	0.00

patients compared with standard discectomy patients: the study showed high curing rates in microdiscectomy microdiscectomy patients returned to their work. Overall, 23% percent of standard discectomy and 40% of in addition to the above clinical signs and examination. The term "cured" was based on the ability to return to work the microdiscectomy was superior to standard discectomy: including back pain, tendon reflex, and sensory function in terms of short and long term postoperative outcomes

**CONCLUSION**

pre-operative examination needs to be carried out carefully: Three complications during the study period show that the

ry other diagnostic methods:

since the start of the disease and disk hernia is confirmed remains at the same or at a worse level from 1-6 months fail to show favorable results and the neurologic deficit pharmacological therapy and 2-3 courses of physiotherapy. Lumbar disc herniation surgery is indicated if

herniated lumbar disc type, form and location.

(100%). These findings and MRI results will determine the radiographically, the Bann's signs were observed in all patients working age group or in those aged from 21-20. On a plain lumbar disc herniation is more common in the active

105:1305-1309.  
 American Journal of Roentgenology. 2000;  
 Foraminial Disk Herniation: Relative MRI Findings.  
 In Zook Lee et al. Extraforaminal With or Without  
 Focus \Volume 10 \ January, 2003\).  
 8. discal: uma junta do tempo juntas. \Neurologia-  
 historia da cirurgia da veterinária aplicadas a doenças  
 De Holanda Cristóvão José Alberto Landeiro A  
 Igor de Castro, Daniel Paes dos Santos, Daniel  
 medicajes 2005: b 11.  
 9. Hernie discare et discartroze veteriare Equine  
 \Neurologia: 28:28-30: discartroze 30-33 1991  
 with a conventional standard lumbar disc procedure.  
 Casbar microscopical discectomy and comparison  
 Casbar M' Campbell B' Barrie DD' et al. The  
 Health science: Publications 2000: e. B 12-18\  
 Surgical Treatment of Herniated Lumbar Disk \  
 Gonzalez Ts' Conchiguen D' Diagnosis and  
 method. Publications 2000: 180.  
 4. Буқлағ Г Зиятицай студияң оғ медицинағ иғ иғ  
 10:320-320 1997.  
 surgery in the obese patient. \Зиятицай Диска  
 Андрешак ТС' Ан НЗ' Халл 1' et al. Lumbar spine  
 1020.  
 3. microtic and lumbar spine. \Neurologia 42:028-032\  
 extraforaminal approach to parametric lesions of the  
 5. Larzon 21' Hoist BV' Hennly DC' et al. Гателл  
 14-23 1995.  
 to the minimally-operated lumbar spine. Cym Ombob:  
 and lumbar laminectomy: a standardised approach  
 Casroil 2E' Wiesel 2M. Neurological complications

**REFERENCES**

1 month	4. Normal	08	03	04'50	4'84	80	20	02'00	5'44	2'02**
	3. Increased	08	0	0'00	0'00	80	0	0'00	0'00	
	5. Absent	08	4	4'08	5'00	80	0	0'00	0'00	
	1. Diminished	08	31	31'03	4'20	80	4	2'00	5'44	2'03**
6 month	4. Normal	08	25	23'00	2'04	80	03	28'22	4'22	3'22**
	3. Increased	08	0	0'00	0'00	80	0	0'00	0'00	
	5. Absent	08	4	4'08	5'00	80	1	1'22	1'24	1'20
	1. Diminished	08	45	45'20	2'00	80	10	20'00	4'42	3'41**

# Alcohol consumption of adults in Mongolia

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## ABSTRACT

Health damages caused by the consumption of alcoholic beverages increase each year and become a leading cause of non-communicable diseases, accidents and injury, and population morbidity and mortality in Mongolia. Of Mongolian adults, 51.2% consume alcoholic beverages to excess, and the prevalence of alcoholism is 6.4 per 1000 in urban and 2.4 per 1000 in rural areas. In the last 5 years, 150,000 people were taken into custody due to the excessive use of alcohol. Over 1000 people die of alcohol-related diseases, injuries, and poisoning in one year. Therefore, there is a need for a detailed study on the influence of the consumption of alcoholic beverages on human health, and for a use of the study results in treatment, diagnosis, and prevention of alcohol-related diseases. The aim of this study was to determine the influence of alcohol consumption in Mongolians, its peculiarities and consequences. The study was carried out using a combination of questionnaire as in "STEPS survey", WHO, which studied risk factors of non-communicable diseases. One thousand, five hundred and thirty-three participants aged 15-64 years from Ulaanbaatar and 21 aimags of Mongolia were involved in the study. The prevalence of alcohol consumption did not depend on the location of participants, whereas the consumption of alcoholic beverages was higher in males than in females, and the percentage of alcohol consumers was highest in the 25-44 age group. The alcoholic flush was detected in 56.8% of participants, and this body reaction occurred after the consumption of smaller amounts of strong alcohol compared to beverages with a lower content of ethanol. Alcohol flush was detected after drinking strong alcohol in smaller amount than after the consumption of alcohol with the lower content of ethanol. The amount of alcoholic beverages that resulted in heavy intoxication was highest for airag and smallest for strong alcohol.

**Key words:** Alcohol consumption, alcohol intoxication, alcohol flush, Mongolia

## INTRODUCTION

Consumption of alcoholic beverages has numerous negative consequences for society. Alcoholism leads to the increase of criminality and divorce rate, industrial and road accidents, and the decrease of production and working ability.<sup>1</sup>

Over 3.2% or 1.8 million of the total global mortality per year is caused by alcoholism.<sup>2</sup> Murray, Lopez et al. established that 773,600 people died in 1990 due to the consumption of alcoholic beverages, which amounts to 19.3 million years of life and 47.7 million years of working ability lost<sup>3</sup>. Eighty-two percent of the mortality, morbidity, and injuries care caused by alcoholism occur in developing countries.<sup>3</sup>

Health damages caused by the consumption of alcoholic beverages increase each year, and become the main cause of non-communicable diseases, accidents, and population morbidity and mortality in Mongolia.<sup>4</sup>Of Mongolian adults,

51.2% consume alcoholic beverages to excess, and the prevalence of alcoholism is 6.4 per 1000 in urban areas and 2.4 per 1000 in rural areas. The study on alcohol and alcohol dependence, which was conducted by Dr.L.Erdenebayr of the Center of the Mental Health and Narcology in 1997, indicated that over 51% of the population used alcohol more than recommended, 8% of those being women. UN survey 1998 identified that 12.7% of adults were classified as heavy drinkers. The Public Health Institute conducted a Knowledge Attitude Practice KAP survey in 2001 and indicated that 43.6% of respondents consumed 1-3 standart drink per week and 47.5% consumed more than 3 standart drink per week, with the frequency of alcohol use increasing in both high and low-income households. In the last 5 years, One hundred and fifty thousand people were taken into custody due to the excessive use of alcohol. Over 1000 people die of alcohol-related diseases, injuries, and poisoning in one year.<sup>5</sup>

However, there have been many changes in the Mongolia since the survey, and new and reliable data is needed to give a clearer picture of the problem. Therefore a survey was conducted on alcohol consumption with technical and financial support from the World Health Organization. The aim of this study was to determine the status of consumption of alcoholic beverages of adults in Mongolia.

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## MATERIALS AND METHODS

In order to achieve the goal, participants were randomly selected for a cross sectional study. Questionnaires were used for the evaluation of the alcohol consumption pattern. A total of 1533 participants that is about 95.8% of all the participants that were suppose to be participated in the study. The participants are of ages between 15-64 years from Ulaanbaatar city and the 21 aimags of Mongolia of which 759 participants from urban and 774 participants from rural areas are included in the study. Based on the new family list 95 households are selected randomly. From each selected household in urban and rural areas, only one person aged between 15-64 years was selected using Kish Method as the last step. The questionnaire was used to collect data on respondent's socio-economic status, and alcohol consumption.

Survey data collection in Ulaanbaatar and aimags was done by 7 teams with 5 researchers on each team. Survey teams consisted of a team leader, two interviewers, one person to obtain physical measurements, one laboratory technician, and two local assistants. Thus, teams often consisted of 7-8 people each. About 2-3 days prior to the interview process, an information leaflet on the survey goal and objectives, and consent forms were distributed to the members of randomly selected households. Survey participants were invited to selected Family General practitioners are in charge of collecting data in urban areas and soum/bagh hospitals in rural areas. Those participants unable to visit selected sites were reached at home for data collection purposes especially in remote rural areas.

**Monitoring of data collection.** Three monitoring teams comprised of two representatives from Ministry of Health MOH and Public Health Institute, PHI were the task of monitoring the survey data collection in accordance with the Monitoring Guidelines approved by State Secretary of the MOH. The teams monitored the survey data collection

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**Data entry and cleaning:** The survey respondent had a unique identifier comprised of cluster, family group, bagh, and individual ID numbers. The accuracy of coding was established within a week by elucidating any overlaps, omissions, and/or wrong coding. Next, the survey data was compiled into a single file, and the accuracy of recording respondents' age and sex, and other variables was established within a week using range and logical checking. Finally, data checking was also performed by using the analysis code provided by WHO HQ, which includes a code to check the data prior to every analysis performed.

## RESULTS

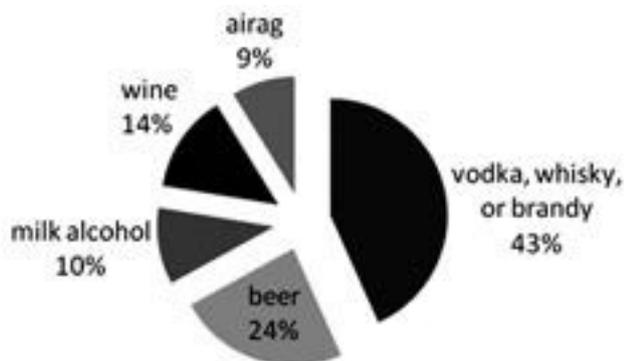
Over 70% of participants drank alcoholic beverages (70.9% in the urban area and 69.1% in the rural area, respectively) (Table 1). Eighty-one point four percent of males and 62.0% of females consumed alcoholic beverages. The highest prevalence of alcoholic beverage consumers were in the 25-44 age group (75.4%) and the lowest percentage in the age groups of 15-24 and 55-64 (56.6% and 57.4%, respectively). Of all participants, 41.1% consumed alcoholic beverages within the previous month (41.2% in the urban area and 41% in the rural area, respectively). Among the age groups, the indicator was lowest among participants aged 15-24 years (25.6%) and the highest in the age group of 25-34 and 35-44 years (45.2% and 47.4%, respectively). Fifty-six point one percent of men and 30.6% of women consumed alcohol in the month.

**Table 1. Consumption of alcoholic beverages (%)**

Classification		General consumption (n)	Consumption in previous month (n)
Sex	Male	81.4(515)	56.1(335)
	Female	62.0(558)	30.6(275)
Age group (year)	15-24	56.6(73)	25.6(33)
	25-34	75.4(321)	45.2(193)
	35-44	76.1(337)	47.4(209)
	45-54	67.7(228)	39.5(133)
	55-64	57.4(113)	31.0(61)
Setting	Urban	70.9(538)	41.2(312)
	Rural areas	69.1(534)	41.0(317)
	Total	70.0(1073)	41.1(630)

When the alcohol consumption was considered by types of alcoholic beverages, 43.3% of participants usually consumed vodka, whisky, or brandy, 23.7% beer, 13.6% consumed milk alcohol, 10.6% consumed wine, and 8.8% consumed airag (Figure 1).

**Figure 1. Consumption of alcoholic beverages (by type)**



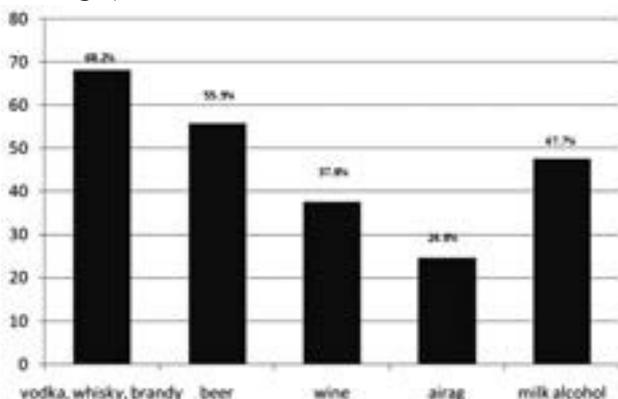
Alcohol flush was detected in 56.8% of participants after drinking strong alcohol (vodka, whisky, or brandy), in 38.8% after drinking beer, in 17.9% after drinking wine, in 32.1% after drinking milk vodka, and in 9.5% after drinking airag. Alcohol flush was detected in participants after drinking 89 ml of strong alcohol, 574 ml of beer, 755 ml of airag and 365 ml of milk vodka. The participants experienced light intoxication after drinking 148 ml of vodka, whisky, or brandy, 174 ml of wine, 1225 ml of airag, and 529 ml of milk vodka, and had heavy intoxication after drinking 448 ml of vodka, whisky or brandy, 174 ml of wine, 1225 ml of airag and 529 ml of milk vodka (Table 2). Alcohol flush was detected in the 15-24 age group after drinking a relatively small amount of strong alcohol (71.5 ml), and in men after drinking 111.6 ml of vodka, whisky, or brandy and in women after drinking 71.6 ml of strong alcohol. The sex related difference was statistically significant ( $p < 0.001$ ). This indicator was higher among urban participants than among rural participants (97.0 ml and 79.2 ml, respectively).

**Table 2. Influence of consumption of alcoholic beverages (by average amount of consumption, ml)**

Type of alcoholic beverages	Alcoholic flush	Light intoxication	Medium intoxication	Heavy intoxication
Vodka, whisky, brandy	89	148	251	448
Beer	574	1094	1714	2815
Wine	104	174	325	583
Airag	755	1225	2177	2905
Milk vodka	365	529	971	1822

Over 70% of participants experienced a hangover after drinking vodka, whisky, or brandy, 55.9% after drinking beer, 47.7% after drinking milk vodka, 37.8% after drinking wine and 24.8% of participants after drinking airag (Figure 2.). And in these study number are repeated since there are participants who drink more than one type of alcohol beverage to get drunk.

**Figure 2. Cases of hangover (by type of alcoholic beverages)**



Symptoms of a hangover after drinking vodka, whisky, or brandy were not detected in 31.8% of participants, and heavy hangover was detected in 17.9%, medium in 21.2%

and mild hangover in 29.2% of participants. Drinking beer did not result a hangover in 44.1% of participants, and resulted in heavy hangover in 14.4%, in medium 15.3% and in mild hang over in 26.2% of participants. Symptoms of hangover after drinking wine were not detected in 62.2% of participants, and heavy hangover was detected in 10.0%, medium in 9.6% and mild hangover in 18.3% of participants. After drinking airag a hangover was not detected in 75.2% of participants, and a heavy hangover was detected in 2.9%, medium in 9.1% and mild in 14.9%; after drinking milk vodka a hangover was not detected in 52.3% of participants, and a heavy hangover was detected in 16.4%, medium in 14.1% and mild hangover in 17.2% of participants.

Survey participants consume alcoholic beverages consecutively for 2.5 days on average. Males drank alcohol 2.8 days consecutively, and females 2.0 days. Participants of the age group 25-34 consume alcoholic beverages consecutively for 3.3 days, whereas younger participants (15-24 years of age) drank alcohol 1.5 days consecutively (Table 3).

Around 5 % of participants (7.9% of males and 1.7% of females) relieve hang overs with alcoholic beverages. The highest percentage of participants who relieve their hang over with alcohol is in the age group of 45-54 (7.7%) and the lowest is among participants 15-24 years of age (1.1%).

**Table 3. Problems related to consumption of alcoholic beverages**

Classification	Hangover relief with alcohol (%)	Alcoholism among close kindred (%)	Number of consecutive days of alcohol consumption (days)
15-24	1.1	25.9	1.5
25-34	3.0	2.5	3.3
35-44	4.4	26.3	2.6
45-54	7.7	26.6	2.0
55-64	4.3	19.3	2.1
Male	7.9	24.9	2.8
Female	1.7	26.3	2.0
Urban	4.3	24.6	2.2
Rural areas	4.6	26.9	2.8

Over 22 % of participants had a diagnosis of some type of liver disease and 24.5% had cardiovascular disease. The diseases tended to increase with age, and the cases of

diagnosed liver and cardiovascular diseases were higher among women than among men (Table 4).

**Table 4. Percentage of participants with liver and cardiovascular diseases (%)**

Classification	Had diagnosed a liver disease (%)	Had diagnosed a cardiovascular disease (%)
15-24	14.5	10.6
25-34	15.6	14.3
35-44	20.9	24.2
45-54	28.2	35.1
55-64	30.4	37.8
Male	19.9	17.0
Female	23.0	29.5
Urban	22.7	23.4
Rural areas	20.7	25.5
Total	21.8	24.5

Around 5% of participants with a diagnosed cardiovascular disease and 3.9% of participants who was not diagnosed for any of the diseases relieved hangover with alcohol (Table 5). The habit of hang over relieving with alcoholic

beverages was more prevalent among the participants with a diagnosed liver disease (6.8%) than among those who did not suffer from the disease (3.9%). The hangover was heavier after drinking strong alcohol or beer.

**Table 5. Status of hang over relieving with alcohol among participants with a diagnosed cardiovascular or liver disease**

Question	Answer	Hangover relieving with alcohol			
		No		Yes	
		Number	%	Number	%
Have you ever been diagnosed for any liver disease?	No	828	96.1	34	3.9
	Yes	261	94.9	14	5.1
	Total	1089	95.8	48	4.2
Have you ever been diagnosed for any cardiovascular disease?	No	870	96.1	35	3.9
	Yes	219	93.2	16	6.8
	Total	1089	95.5	51	4.5

## DISCUSSION

The results of this survey show that 70% of the survey participants were consumers of alcoholic beverages, and 41.1% consumed alcohol during the last month. The percentage of those who drank alcohol during the previous one month was 41.2% in urban areas and 41.0% in rural areas. This indicator was the lowest among the participants 15-24 years of age (25.6%) and the highest in the age groups of 25-34 and 35-44 (45.2% and 47.4%, respectively). One third of the population has abstained from alcohol their entire life. Current drinking or consumption of alcohol in the past 30 days was reported by 38.6% of all respondents or 49.8% of men and 27.2% of women. "Status of non-communicable disease risk factors" study conducted by Public Health Institute in 2009 shows 65.8% of the alcohol beverage consumption in the population in the last 30 days, of these 38.6% are vodka. About 47% of these consumers are ages between 25-44<sup>6</sup>. Therefore these "Status of non-communicable disease risk factors" study corresponds with our finding from this study.

Health report by World Health Organization in 2010 shows that geographical differences exist among the type of alcohol people consume – beer, wine, spirits or other alcoholic beverages. In this report spirits are the most consumed beverages in terms of litres of pure alcohol in Asian and eastern European countries Wine constitutes the largest proportion of alcohol consumed in some European countries and the South American wine growing countries of Argentina and Chile. The northern Europeans once preferred beer while southern Europeans drank more wine, are diminishing. Today, in Spain the most consumed alcoholic beverage in litres of pure alcohol is beer, while in Sweden, it is wine.

Other beverages than wine, beer and spirits are consumed mostly in sub-Saharan Africa, which has generally low alcohol use levels. In the rest of the world – including most of the Western Hemisphere, northern Europe, many African countries and Australia – the most consumed beverage in terms of litres of pure alcohol is beer.

Globally, more than 45% of total recorded alcohol is consumed in the form of spirits,

predominantly in the South-East Asia and Western Pacific (WPR) regions<sup>7</sup>.

Approximately 36% of total recorded alcohol is consumed in the form of beer.

Commonly, high overall consumption levels are found in countries such as the Russian Federation, which display both high beer and high spirits consumption.

The consumption of wine as a percentage of total recorded alcohol is globally quite low (8.6%), with significant levels of alcohol consumed in the form of wine in the European Region 26.4% and the Region of the Americas 12.0%. Beverages other than beer, spirits and wine such as fortified wines, rice wine or other fermented beverages made of sorghum, millet, maize have the highest share in total recorded consumption in the African Region 48.2% and in the Eastern Mediterranean Region 31.3%<sup>7</sup>.

Our study result shows that 43.3% of participants consumed vodka, whesky or brandy, 23.7% consume beer, 13.6% consume milk alcohol, 10.6% consume wine and 8.8% consume traditional fermented alcohol beverage. These types of alcohol consumption result come very close to results from other countries and regions that we compared.

## CONCLUSIONS

1. The prevalence of the alcohol consumption did not depend on the location of participants, but was higher in males than in females. The percentage of alcohol consumers was highest among the participants 25-44 years of age. The fact that the cases of light, medium, and heavy intoxication after drinking alcoholic beverages except wine were more frequent among men than among women shows that the excessive consumption of alcohol is prevalent among males.
2. Alcohol flush was detected in 56.8% of survey participants. Alcohol flush was detected after drinking strong alcohol in smaller amount than after the consumption of alcohol with the lower content of ethanol. The amount of alcoholic beverages that resulted in heavy intoxication was highest for airag and smallest for strong alcohol.

## REFERENCES

1. World Health Report, WHO, Geneva, 2002.
2. Edwards G. The Treatment of Drinking Problems. A Guide for the Helping Professions. London, 1982
3. Ludvig Arnold M. understanding the Alcoholic's Mind. New York: Oxford University Press, 1988
4. Erdenebayar.L - Clinical and epidimiological study on prevalence of alcohol abuse disease among the population, Ulaanbaatar 1989, Ninth scientific conference of psychological doctors, 61-62
5. Elena K, The center of Mental Health and Narcology, Mongolia, The report, research of the harm epidemiology, Mongolian usage of the alcohol, Ulaanbaatar, 2006.
6. Otgontuya D, Narantuya N, Mongolian STEPS survey on the Prevalence of Noncommunicable Disease and Injury risk factors-2009; 45-49
7. *The Global status report on alcohol and health*, WHO, Geneva, 2010

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## ABSTRACT

Health damages caused by the consumption of alcoholic beverages increase each year and become a leading cause of non-communicable diseases, accidents and injury, and population morbidity and mortality in Mongolia. Of Mongolian adults, 51.2% consume alcoholic beverages to excess, and the prevalence of alcoholism is 6.4 per 1000 in urban and 2.4 per 1000 in rural areas. In the last 5 years, 150,000 people were taken into custody due to the excessive use of alcohol. Over 1000 people die of alcohol-related diseases, injuries, and poisoning in one year. Therefore, there is a need for a detailed study on the influence of the consumption of alcoholic beverages on human health, and for a use of the study results in treatment, diagnosis, and prevention of alcohol-related diseases. The aim of this study was to determine the influence of alcohol consumption in Mongolians, its peculiarities and consequences. The study was carried out using a combination of questionnaire as in "STEPS survey", WHO, which studied risk factors of non-communicable diseases. One thousand, five hundred and thirty-three participants aged 15-64 years from Ulaanbaatar and 21 aimags of Mongolia were involved in the study. The prevalence of alcohol consumption did not depend on the location of participants, whereas the consumption of alcoholic beverages was higher in males than in females, and the percentage of alcohol consumers was highest in the 25-44 age group. The alcoholic flush was detected in 56.8% of participants, and this body reaction occurred after the consumption of smaller amounts of strong alcohol compared to beverages with a lower content of ethanol. Alcohol flush was detected after drinking strong alcohol in smaller amount than after the consumption of alcohol with the lower content of ethanol. The amount of alcoholic beverages that resulted in heavy intoxication was highest for airag and smallest for strong alcohol.

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## INTRODUCTION

Consumption of alcoholic beverages has numerous negative consequences for society. Alcoholism leads to the increase of criminality and divorce rate, industrial and road accidents, and the decrease of production and working ability.<sup>1</sup>

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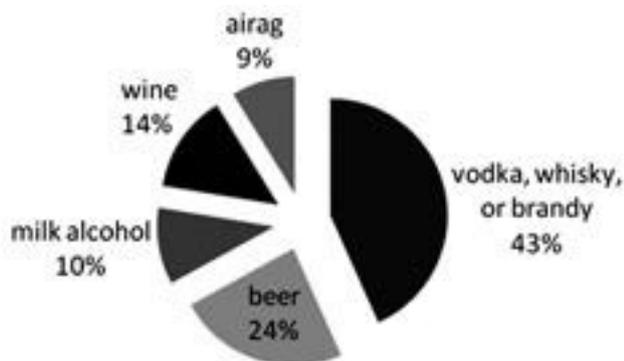
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**Figure 1. Consumption of alcoholic beverages (by type)**



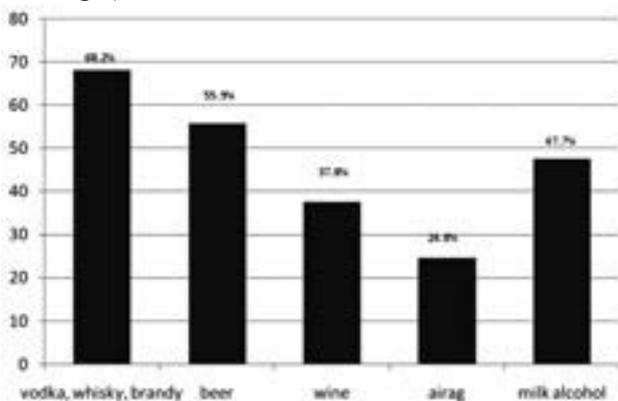
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**Table 2. Influence of consumption of alcoholic beverages (by average amount of consumption, ml)**

Type of alcoholic beverages	Alcoholic flush	Light intoxication	Medium intoxication	Heavy intoxication
Vodka, whisky, brandy	89	148	251	448
Beer	574	1094	1714	2815
Wine	104	174	325	583
Airag	755	1225	2177	2905
Milk vodka	365	529	971	1822

Over 70% of participants experienced a hangover after drinking vodka, whisky, or brandy, 55.9% after drinking beer, 47.7% after drinking milk vodka, 37.8% after drinking wine and 24.8% of participants after drinking airag (Figure 2.). And in these study number are repeated since there are participants who drink more than one type of alcohol beverage to get drunk.

**Figure 2. Cases of hangover (by type of alcoholic beverages)**



Symptoms of a hangover after drinking vodka, whisky, or brandy were not detected in 31.8% of participants, and heavy hangover was detected in 17.9%, medium in 21.2%

and mild hangover in 29.2% of participants. Drinking beer did not result a hangover in 44.1% of participants, and resulted in heavy hangover in 14.4%, in medium 15.3% and in mild hang over in 26.2% of participants. Symptoms of hangover after drinking wine were not detected in 62.2% of participants, and heavy hangover was detected in 10.0%, medium in 9.6% and mild hangover in 18.3% of participants. After drinking airag a hangover was not detected in 75.2% of participants, and a heavy hangover was detected in 2.9%, medium in 9.1% and mild in 14.9%; after drinking milk vodka a hangover was not detected in 52.3% of participants, and a heavy hangover was detected in 16.4%, medium in 14.1% and mild hangover in 17.2% of participants.

Survey participants consume alcoholic beverages consecutively for 2.5 days on average. Males drank alcohol 2.8 days consecutively, and females 2.0 days. Participants of the age group 25-34 consume alcoholic beverages consecutively for 3.3 days, whereas younger participants (15-24 years of age) drank alcohol 1.5 days consecutively (Table 3).

Around 5 % of participants (7.9% of males and 1.7% of females) relieve hang overs with alcoholic beverages. The highest percentage of participants who relieve their hang over with alcohol is in the age group of 45-54 (7.7%) and the lowest is among participants 15-24 years of age (1.1%).

**Table 3. Problems related to consumption of alcoholic beverages**

Classification	Hangover relief with alcohol (%)	Alcoholism among close kindred (%)	Number of consecutive days of alcohol consumption (days)
15-24	1.1	25.9	1.5
25-34	3.0	2.5	3.3
35-44	4.4	26.3	2.6
45-54	7.7	26.6	2.0
55-64	4.3	19.3	2.1
Male	7.9	24.9	2.8
Female	1.7	26.3	2.0
Urban	4.3	24.6	2.2
Rural areas	4.6	26.9	2.8

Over 22 % of participants had a diagnosis of some type of liver disease and 24.5% had cardiovascular disease. The diseases tended to increase with age, and the cases of

diagnosed liver and cardiovascular diseases were higher among women than among men (Table 4).

**Table 4. Percentage of participants with liver and cardiovascular diseases (%)**

Classification	Had diagnosed a liver disease (%)	Had diagnosed a cardiovascular disease (%)
15-24	14.5	10.6
25-34	15.6	14.3
35-44	20.9	24.2
45-54	28.2	35.1
55-64	30.4	37.8
Male	19.9	17.0
Female	23.0	29.5
Urban	22.7	23.4
Rural areas	20.7	25.5
Total	21.8	24.5

Around 5% of participants with a diagnosed cardiovascular disease and 3.9% of participants who was not diagnosed for any of the diseases relieved hangover with alcohol (Table 5). The habit of hang over relieving with alcoholic

beverages was more prevalent among the participants with a diagnosed liver disease (6.8%) than among those who did not suffer from the disease (3.9%). The hangover was heavier after drinking strong alcohol or beer.

**Table 5. Status of hang over relieving with alcohol among participants with a diagnosed cardiovascular or liver disease**

Question	Answer	Hangover relieving with alcohol			
		No		Yes	
		Number	%	Number	%
Have you ever been diagnosed for any liver disease?	No	828	96.1	34	3.9
	Yes	261	94.9	14	5.1
	Total	1089	95.8	48	4.2
Have you ever been diagnosed for any cardiovascular disease?	No	870	96.1	35	3.9
	Yes	219	93.2	16	6.8
	Total	1089	95.5	51	4.5

## DISCUSSION

The results of this survey show that 70% of the survey participants were consumers of alcoholic beverages, and 41.1% consumed alcohol during the last month. The percentage of those who drank alcohol during the previous one month was 41.2% in urban areas and 41.0% in rural areas. This indicator was the lowest among the participants 15-24 years of age (25.6%) and the highest in the age groups of 25-34 and 35-44 (45.2% and 47.4%, respectively). One third of the population has abstained from alcohol their entire life. Current drinking or consumption of alcohol in the past 30 days was reported by 38.6% of all respondents or 49.8% of men and 27.2% of women. "Status of non-communicable disease risk factors" study conducted by Public Health Institute in 2009 shows 65.8% of the alcohol beverage consumption in the population in the last 30 days, of these 38.6% are vodka. About 47% of these consumers are ages between 25-44<sup>6</sup>. Therefore these "Status of non-communicable disease risk factors" study corresponds with our finding from this study.

Health report by World Health Organization in 2010 shows that geographical differences exist among the type of alcohol people consume – beer, wine, spirits or other alcoholic beverages. In this report spirits are the most consumed beverages in terms of litres of pure alcohol in Asian and eastern European countries Wine constitutes the largest proportion of alcohol consumed in some European countries and the South American wine growing countries of Argentina and Chile. The northern Europeans once preferred beer while southern Europeans drank more wine, are diminishing. Today, in Spain the most consumed alcoholic beverage in litres of pure alcohol is beer, while in Sweden, it is wine.

Other beverages than wine, beer and spirits are consumed mostly in sub-Saharan Africa, which has generally low alcohol use levels. In the rest of the world – including most of the Western Hemisphere, northern Europe, many African countries and Australia – the most consumed beverage in terms of litres of pure alcohol is beer.

Globally, more than 45% of total recorded alcohol is consumed in the form of spirits,

predominantly in the South-East Asia and Western Pacific (WPR) regions<sup>7</sup>.

Approximately 36% of total recorded alcohol is consumed in the form of beer.

Commonly, high overall consumption levels are found in countries such as the Russian Federation, which display both high beer and high spirits consumption.

The consumption of wine as a percentage of total recorded alcohol is globally quite low (8.6%), with significant levels of alcohol consumed in the form of wine in the European Region 26.4% and the Region of the Americas 12.0%. Beverages other than beer, spirits and wine such as fortified wines, rice wine or other fermented beverages made of sorghum, millet, maize have the highest share in total recorded consumption in the African Region 48.2% and in the Eastern Mediterranean Region 31.3%<sup>7</sup>.

Our study result shows that 43.3% of participants consumed vodka, whesky or brandy, 23.7% consume beer, 13.6% consume milk alcohol, 10.6% consume wine and 8.8% consume traditional fermented alcohol beverage. These types of alcohol consumption result come very close to results from other countries and regions that we compared.

## CONCLUSIONS

1. The prevalence of the alcohol consumption did not depend on the location of participants, but was higher in males than in females. The percentage of alcohol consumers was highest among the participants 25-44 years of age. The fact that the cases of light, medium, and heavy intoxication after drinking alcoholic beverages except wine were more frequent among men than among women shows that the excessive consumption of alcohol is prevalent among males.
2. Alcohol flush was detected in 56.8% of survey participants. Alcohol flush was detected after drinking strong alcohol in smaller amount than after the consumption of alcohol with the lower content of ethanol. The amount of alcoholic beverages that resulted in heavy intoxication was highest for airag and smallest for strong alcohol.

## REFERENCES

1. World Health Report, WHO, Geneva, 2002.
2. Edwards G. The Treatment of Drinking Problems. A Guide for the Helping Professions. London, 1982
3. Ludvig Arnold M. understanding the Alcoholic's Mind. New York: Oxford University Press, 1988
4. Erdenebayar.L - Clinical and epidimiological study on prevalence of alcohol abuse disease among the population, Ulaanbaatar 1989, Ninth scientific conference of psychological doctors, 61-62
5. Elena K, The center of Mental Health and Narcology, Mongolia, The report, research of the harm epidemiology, Mongolian usage of the alcohol, Ulaanbaatar, 2006.
6. Otgontuya D, Narantuya N, Mongolian STEPS survey on the Prevalence of Noncommunicable Disease and Injury risk factors-2009; 45-49
7. *The Global status report on alcohol and health*, WHO, Geneva, 2010

# Placental changes during stillbirth

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## ABSTRACT

In 2010, the number of stillbirths in Mongolia in every 1000 births (live and stillbirths) was 7.3. A total of 100 mothers were chosen randomly. From the group of 100, 50 stillbirth mothers were chosen in a case group and 50 live birth mothers in a control group. Then the pathological examination findings were compared in the placenta of live birth and stillbirth mothers. When the placental changes were compared on the placenta stillbirth mothers with the placenta of live birth mothers of the period the blood circulation pathology deepened ( $p=0.006$ ), placenta malformation was 2.5 times higher in stillbirth ( $p=0.001$ ), and malformation of tissue was 2.3 times higher ( $p=0.001$ ). One problem that attracted attention in this study was the problem of placental failure. Chronic placental failure was revealed in 56% of placentas of stillbirth mothers ( $p=0.001$ ). Placental weight of live birth mothers was  $437.76\pm 122.12$  at 37-40 weeks of gestation, placental weight of stillbirth mothers was  $394\pm 90.01$ . Although the gestation period of stillbirth mothers was completed the placental weight remained low ( $p=0.001$ ).

**Key words:** Stillbirth, fetal death, placenta,

## INTRODUCTION

Approximately 3.2 million stillbirths occur annually in the world. However, less than five stillbirths in every 1000 births have been found in developed countries. 32.2 stillbirths occur in every 1000 live births in Sahara-Africa and approximately 31.9 (1.300.000 stillbirths) in South-Asia and Africa.<sup>1,2</sup> In relation to the population, the number of stillbirths is the highest in South-Asia.<sup>3</sup> The number of stillbirths in Mongolia in every 1000 births (live and stillbirths) was 9.6 in 2005, 9.2 in 2006, 7.6 in 2007, 7.5 in 2008, 7.0 in 2009 and 7.3 in 2010. This means that the number of stillbirths remains the same.<sup>4</sup> Some research relating to the unknown causes of stillbirths involve placental abruption, infections, fetal abnormalities, and other unknown causes.<sup>5</sup> According to Norwegian researcher Froen J.F and others, the causes of 25% of stillbirths are undetermined. The importance of studying maternal placenta and reducing undetermined causes of stillbirths were the basis of this study.

## MATERIALS AND METHODS

In the research, a total of 100 mothers were chosen randomly. From this group, 50 stillbirth mothers were chosen in a case group and 50 live birth mothers in a control group were chosen randomly. The cards were coded specially and provided a descriptive study. Then the pathological examination findings were compared in the placenta of live birth and stillbirth mothers and they were processed in the SPSS 14.0 program. We then calculated the mean, standard deviation, high and low significance

at a 95% confidence interval, and assessed the difference between the groups by a  $X^2$  test.

- Specimen were prepared from the placenta and fetus of live and stillbirth mothers as well as painted them with hematoxylin-eosin paint and examined them by a light microscope with 40 and 100 times magnification.
- As live birth mothers delivered, specimen were prepared from the placenta and general statement of placenta, color, width, thickness, diameter, cotyledon, belly button color, length, width, wind around, twisting, knotting, fetal color, odor, thickness, and etc. were noted. The placenta was then frozen. During the examination the placenta was let sit at room temperature for 24 hours.
- Placental morphometer index:
  1. Organometer analysis (The following were clarified: placenta form, diameter and thickness, placenta weight, fetal surface color, fibrin accumulation, cysts, vascular form, mother's surface color, completeness, and blood coagulum smear. Some changes were revealed in palpating villi.)
  2. Manometer indices were designed in detail
  3. Histometer analysis (The following changes were revealed: elements of villi-nutritional failure, inflammation, false and real infarction in intervilli tissue, focal of calcinosis, infarction, vascular embolism of villi, focal of inflammation transudation).

## RESULTS

In the research, 100 mothers were involved, from which 50 were live birth mothers and 50 mothers gave birth to stillborn fetuses. General indices of mothers involved in the research are shown in Table 1.

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**Table 1. General indices of mothers involved in the research**

Indices	normal birth	stillbirth	total	p value
<b>Age group</b>	<b>n=50</b>	<b>n=50</b>	<b>n=100</b>	
15-19 years	1(16.7%)	5(83.3%)	6(100.0%)	p=0.026
20-24 years	19(59.4%)	13(40.6%)	32(100.0%)	
25-29 years	11(47.8%)	12(52.2%)	23(100.0%)	
30-34 years	16(66.7%)	8(33.3%)	24(100.0%)	
35-39 years	2(15.4%)	11(84.6%)	13(100.0%)	
40-44 years	1(50.0%)	1(50.0%)	2(100.0%)	
Husband's smoking habit				p=0.001
Yes	5(17.9%)	23(82.1%)	38(100.0%)	
No	45(62.5%)	27(37.5%)	72(100.0%)	
Living condition				p=0.055
Ger	18(54.5%)	15(45.5%)	33(100.0%)	
House	12(35.3%)	22(64.7%)	34(100.0%)	
Apartment	20(60.6%)	13(39.4%)	33(100.0%)	

In all cases of the research, the placenta findings show placenta blood circulation disorders (spread infarction, vascular embolism, insult, blood filling, angiomas and placenta anemia) and stroke changes for live birth delivery are 14 (28.0%), and 18 (36.0%) for stillbirth delivery. This

number is higher than in live births and with a statistical significance. Table 1 shows that blood circulation disorders are higher in stillbirth delivery than in live birth delivery so they were considered statistically significant at  $p < 0.006$ .

**Table 2. Placental changes during stillbirth and normal birth deliveries**

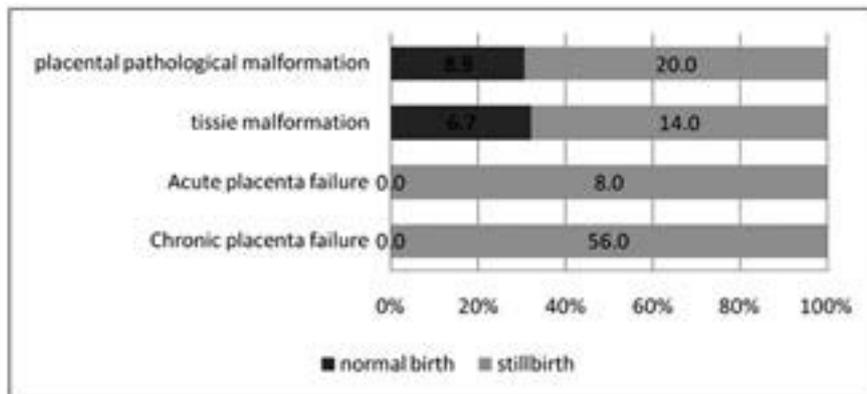
Placental changes	normal birth		stillbirth		total		p value
	n	%	n	%	n	%	
Placental infarction	12	24.0	32	64.0	44	88.0	p=0.001
Real	3	6.8	9	18.8	12	13.0	
False	9	20.5	16	33.3	25	27.2	
Combined	0	0.0	7	14.6	7	7.6	
Placental insufficiency	7	14.0	49	98.0	56	56.0	p=0.001
Chronic failure	0	0.0	28	56.0	28	29.5	
Acute failure	0	0.0	4	8.0	4	4.2	
Tissue malformation	3	6.7	7	14.0	10	10.5	
Placental pathological malformation	4	8.9	10	20.0	14	14.7	
Placental inflammation	7	14.0	29	58.0	36	36.0	p=0.001
Imflammation of villi	4	8.5	8	16.7	12	12.6	
Panplacentitis	0	0.0	12	25.0	12	12.6	
Amniotic imflammation	2	4.3	6	12.5	8	8.4	
Interdicidutitis	1	2.1	3	6.3	4	4.2	
Placental focal changes	37	74.0	40	80.0	77	77.0	p=0.001
Fibrinoid	8	16.0	16	32.0	24	24.0	
Hyalines	4	8.0	3	6.0	7	7.0	
Calcinosis	20	40.0	19	38.0	39	39.0	
Disseminated sclerosis	5	10.0	2	4.0	7	7.0	

By studying placental changes in detail it revealed that real infarction is 9 (18.8%), false infarction 16 (33.3%) and combined infarction is 7 (14.6%) in stillbirth. These changes are higher than the changes occurring in live birth delivery. There was no combined placental infarction during live birth but few real infarctions were found and the statistical significance is  $p=0.001$ . Placental failure is unified changes of acute and chronic clinical morphological signs of placental structure and function caused by any maternal disorders, and the expression of fetal response in the placenta through a multireaction.<sup>6, 7</sup> Therefore,

placental failure causes stillbirth, low weight birth, and asphyxia therefore this is the key problem of midwifery.

In figure 1, the placental pathological malformations are 10 (20.0%) in stillbirth, 4 (8.9%) in live birth and this is 2.5 times higher in stillbirth. Tissue malformation is 7 (14.0%) in stillbirth, 3 (6.7%) in live birth and this is also two times higher in stillbirth. However, acute and chronic placenta failure was not found in live birth which confirms the statistical significance that placenta failure leads to stillbirth.

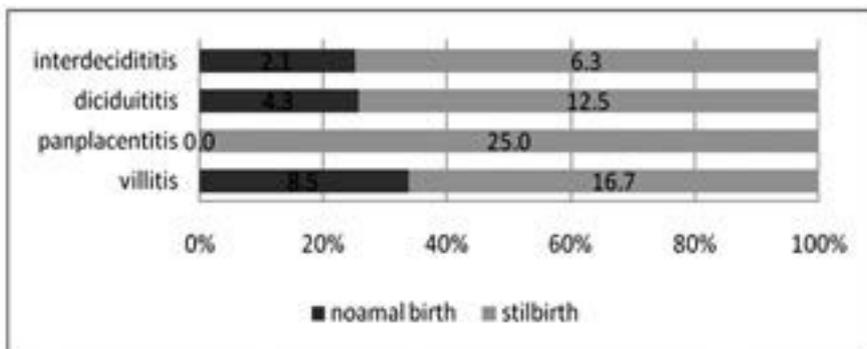
**Figure 1. Comparison of placental failure of still and live birth mothers**



In figure 2, the placental analysis of the research cases show that placental inflammation was specific and inflammation between folders of amniotic peel is 3 (6.3%), in live birth 1 (2.1%), amniotic inflammation 6 (12.5%) in stillbirth,

panplacentalitis 8 (16.7%) in stillbirth, 4 (8.5%) in live birth, panplacentalitis was not found in live birth, but it is 25.0% in stillbirth. Placental inflammation influences stillbirth and this is statistically significant ( $p=0.001$ ).

**Figure 2. Comparison of placental inflammation of live and stillbirth mothers**



**Table 3. Comparison of placental measurement of still birth and live birth mothers**

	Normal birth		Stillbirth				P value		
	n	m±SD	95% CI		n	m±Std.Dev		95% CI	
Placental weight			max	min			max	Min	
28-32 weeks	0	0	0.0	0.0	9	337.3±93.6	483.0	234.0	0.001
33-36 weeks	0	0	0.0	0.0	2	295.0±172.5	417.0	173.0	
37-40 weeks	38	437.8±122.1	691.0	250.0	33	394.9±90.0	570.0	232.0	
More than 41 weeks	12	424.6±71.8	563.0	325	6	473.2±80.9	560.0	353.0	

When the placenta weight was compared with the period of gestation for stillbirth mothers the placenta weight at 28-32 weeks of gestation is the least -234.0; at 33-36 weeks - 173.0; at 37-40 weeks -232.0; at more than 41 weeks - 353.0. When compared with the live birth mothers placenta weight is less, it affects stillbirth and it is statistically significant ( $p=0.001$ ).

### DISCUSSION

According to Savelieva.G.M. et al., it was determined that the maternal side of the placenta, and fetal side disease affect placenta failure and delay fetal development. In the current, chronic placenta failure was revealed in 56% , but Heazell A.E., Martindale E.A. found it in 2.6%.<sup>8</sup>

Nazaretian S.P. and Simsol L. (2002-2005) studied stillbirth cases and blood circulation failure occurred in 17 (21.84), 6 cases presented placenta separation, and hematoma at the back of the placenta, in 4 cases placental failure was revealed. In this research, 36.0% - hematoma, 6% - wide spread necrosis, in 45%- anemia occurred.<sup>9,10</sup>

In the research performed in Australia, 88 cases of placenta and fetus in 11 (14%) cases placenta inflammation was found, 8 cases had an inflammation of villi.<sup>9</sup> However, in Kh. Tsendsuren's research performed in Mongolia, placenta inflammation was 52.5%. It benefits this research but it was comparatively higher than foreign researchers' findings. In G.Bayasgalan's research the placenta weight is  $550\pm 14$  gr, in Kh. Tsendsuren's research in live birth  $52.6\pm 12.1$ , in stillbirth mother's  $400.0\pm 24.09$  average weight of placenta is not different in the period when the gestation period is complete.<sup>11,12</sup>

### CONCLUSIONS

When placental changes were compared on the placenta of stillbirth mothers with the placenta of live birth the period the blood circulation pathology deepened ( $p=0.006$ ), placenta malformation was 2.5 times higher in stillbirth ( $p=0.001$ ), malformation of tissue was 2.3 times higher ( $p=0.001$ ). Therefore, placental inflammation is 4 times higher in stillbirth and from this panplacentitis was not found in live birth but in stillbirth it was 25%. This shows that placental inflammation affects stillbirth ( $p=0.001$ ). Placental weight of live birth mothers was  $437.76\pm 122.12$  at 37-40 weeks of gestation, placental weight of stillbirth mothers was  $394\pm 90.01$ . Although, stillbirth mother's gestation period was completed the placental weight remained low ( $p=0.001$ ).

### REFERENCES

1. Lawn JE, Yakoob MY, Haws RA, Soomro T, Darmstadt GL, Bhutta ZA. 3.2 million stillbirths: epidemiology and overview of the evidence review. *BMC Pregnancy Childbirth*. 2009;9 Suppl 1:S2.
2. McClure EM, Saleem S, Pasha O, Goldenberg RL. Stillbirth in developing countries: a review of causes, risk factors and prevention strategies. *J Matern Fetal Neonatal Med*. 2009;22(3):183-190.
3. Goldenberg RL, Kirby R, Culhane JF. Stillbirth: a review. *J Matern Fetal Neonatal Med*. 2004;16(2):79-94.
4. Health indicators 2009, Department of health, Implementing agency of the government of Mongolia. Ulaanbaatar: Munkhiin Useg printing 2009. (in Mongolian)
5. Hogberg L, Cnattingius S. The influence of maternal smoking habits on the risk of subsequent stillbirth: is there a causal relation? *BJOG*. 2007;114(6):699-704.
6. Milovanov.A.P. Pathology system mate-placenta-fetus. Moscow: Medicine printing; 1999. (in Russian)
7. Altanzagas.Ts. To problems of diagnosing placental failure. Ulaanbaatar, Medical university; 2001. (in Mongolian)
8. Heazell AE, Martindale EA. Can post-mortem examination of the placenta help determine the cause of stillbirth? *J Obstet Gynaecol*. 2009;29(3):225-228.
9. Nazaretian SP, Simpson I. The importance of placental examination in all fetal biopsy and postmortem examinations. *Journal of Clinical Pathology*. 2007;60(7):846-848.
10. Nelson J, Kenny B, O'Hara D, Harper A, Broadhead D. Foamy changes of placental cells in probable beta glucuronidase deficiency associated with hydrops fetalis. *Journal of Clinical Pathology*. 1993;46(4):370-371.
11. Tsetsegsuren.Kh. Cause of stillbirth, factors of influence, morphological changes in placenta. Ulaanbaatar, HSUM; 2005. (in Mongolian)
12. Bayasgalan.G. Pregnant woman, clinical-morphological problems of preclampsia. Ulaanbaatar, HSUM; 2007. (in Mongolian).

# Cost-effectiveness analysis of the antihypertensive medicine

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## ABSTRACT

The World Health Report 2002 (5) identified a number of key risk factors and quantified the contribution of each to the global burden of cardiovascular disease. These risk factors are tobacco use, high cholesterol concentrations and high blood pressure levels. While the impact of these risks overlaps because of the multi causality of cardiovascular disease and joint effects of risk factors, the risk making the largest contribution was blood pressure<sup>2</sup>. Worldwide in 2000, about 7.1 million (13%) deaths were calculated to be attributable to blood pressure levels above an optimum systolic pressure of 115 mmHg<sup>2</sup>. Hypertension is the largest cause of death in both developed and developing countries. By 2020, the low and middle-income countries will also have coronary heart disease as the most frequent cause of death and largest disease burden. The research involved a total of 450 patients, individuals aged 20-69 years, identified through multi-stage probability sampling. The cost-effectiveness analysis included participants with hypertension under treatment with antihypertensive drugs. The costs of hypertension care is mainly dependent on the expenditure on blood pressure-lowering drugs. Treatment of hypertension with angiotensin-converting enzyme (ACE) inhibitors+ calcium channel blockers+ diuretics, ACE inhibitors+ beta blockers, ACE inhibitors+ diuretics, ACE inhibitors+ diuretics+ beta blockers, other combination therapy, or beta blockers was more cost-effective than treatment with ACE inhibitors+ diuretics+ beta blockers.

**Key words:** Cardiovascular disease, hypertension, pharmacoeconomy analysis, cost-effectiveness analysis, direct cost, direct cost

## INTRODUCTION

Cardiovascular disease (CVD)—which includes heart diseases and stroke—is the leading cause of death worldwide. It has long been a problem in high-income countries, CVD is now recognized as a global problem<sup>1</sup>. CVD causes 5 million premature deaths each year worldwide, 13% of global fatalities<sup>1</sup>. Hypertension is one the risk factors for coronary heart disease and cerebrovascular disease, such as stroke and a one of the influencing factors of the drug demand<sup>2</sup>. Hypertension usually occurs without any symptoms. If left untreated and uncontrolled, it can lead to damage of the heart and blood vessels, leading to stroke, heart attack, or renal failure<sup>3-4</sup>. Occasionally, when the blood pressure is extremely high, headache, dizziness or alterations in vision can be experienced. Older people are at a higher risk of developing hypertension and it has been prevailed among 40-59 as well as 60 years mostly<sup>5-7</sup>. By 2008, arterial hypertension has been placing 32.1% among the common cardiovascular disease in the Mongolia. Defining the economical indicators of the drugs that are essential for treating the arterial hypertension and not surveyed well marketing based cost-effectiveness analysis

on providing medicine has become the justification of this survey.

## MATERIALS AND METHODS

The research involved all 450 patients who applied for in State Central Clinical Hospital, Shastin's Central Clinical Hospital, Songino khairhan districts' hospital and Hovd. Uvurhangai, Orkhon, Dornogovi, Dornod aimag's hospital between July, 2006 and February, 2009. Consumption medicine of hypertensive therapy and analysis of laboratory were determined using research cards that included information from the history of Disease and patients, their education, income, smoking, previous morbidity, use of medicine, type of adverse effects, polypharmacy, and drug costs. The blood pressure was measured using aneroid sphygmomanometers.

The cost-effectiveness analysis included participants with hypertension under treatment with antihypertensive drugs. Participants who had a consultation during the interview were asked about direct healthcare costs, including the purchase of drugs or supplies, payment for visits to doctors, laboratory tests, health insurance costs, and expenses with meals and transportation to the healthcare facility. Indirect costs were investigated through absenteeism (workdays lost) due to disease, medical consultations, or performing tests. For data entering and analysis we used MS-Excel

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and SPSS-11.5. Descriptive statistics, such as mean ± SD, frequency, and percentages, were generated for all demographic variables, clinical indicators and BP values. We achieved an agreement from the Ethical Committee of Health Sciences University of Mongolia before the study.

**RESULTS**

Among the 450 participants interviewed, all patients had mean blood pressure 159.18/101.27 mmHg or were taking

antihypertensive drugs. These individuals had a mean age of 57.5 ± 10.3 years, predominantly female (57.6%).

Table 1 shows the direct and indirect costs for treating hypertension. Most of the direct costs associated with hypertension was due to expenditure on drugs, laboratory tests represented a greater cost for patients with hypertension Shastin's Central Clinical Hospital, State Central Clinical Hospital.

**Table 1. Mean costs to patients of the treatment of hypertension**

1	Hospital name	Drugs (thous.tug)	Direct cost (thous.tug)	Indirect cost (thous.tug)	Total cost (thous.tug)
1.	Shastin's Central Clinical Hospital	23.46	289.35	79.877	392.687
2.	State Central Clinical Hospital	21.39	249.84	91.006	362.236
3.	Songino khairhan districts' hospital	18.50	218.72	52.763	289.983
4.	Dornogovi aimag's hospital	12.60	214.60	38.763	265.963
5.	Hovd aimag's hospital	12.35	224.38	49.087	285.817
6.	Uvurhangai aimag's hospital	12.21	219.94	45.139	277.289
7.	Orkhon aimag's hospital	11.89	226.60	42.135	280.625
8.	Dornod aimag's hospital	10.34	220.73	48.768	279.838
	Mean	15.34	233.02	52.10	300.46

Analyzing this table, mean drug cost with hypertension patient 15.34 thousand/tug and spend total cost 392.687±45768.35 thousand/tug in Shastin's Central Clinical Hospital, 362.236±37722.61 thousand/tug in State Central Clinical Hospital, 289.983±20069.82 thousand/tug in Songino khairhan districts' hospital, 265.963±25542.18 thousand/tug in Dornogovi aimag's

hospital, 285.817±23962.33 thousand/tug in Hovd aimag's hospital, 277.289±28999.63 thousand/tug in Uvurhangai aimag's hospital, 280.625±30023.53 thousand/tug in Orkhon aimag's hospital, 279.838±24155.66 thousand/tug in Dornod aimag's hospital and nation's mean 300.46 thousand/tug, it's 77.55% is direct cost, 22.45% is indirect cost.

**Table 2. Cost-effectiveness ratio of combination therapy**

	Cost of combination therapy				
	Combination therapy 1 <sup>*</sup>	Combination therapy 2 <sup>**</sup>	Combination therapy 3 <sup>***</sup>	Combination therapy 4 <sup>****</sup>	Combination therapy 5 <sup>*****</sup>
Drugs	6.018	5.609	5.059	6.332	3.900
Direct cost	233.02	233.02	233.02	233.02	233.02
Indirect cost	52.10	52.10	52.10	52.10	52.10
Adverse of drug	3.181	3.303	3.49	3.558	3.051
Total	294.319	294.032	293.669	295.01	292.071
Outcome	12.21	9.87	12.65	14.48	8.09
Cost effectiveness Ratio	24.105	29.790	23.215	20.374	36.103

\* Combination therapy 1(angiotensin-converting enzyme (ACE) inhibitors+ calcium channel blockers+ diuretics)

\*\* Combination therapy 2(ACE inhibitors+ beta blockers)

\*\*\*Combination therapy 3(ACE inhibitors+ diuretics)

\*\*\*\*Combination therapy 4(ACE inhibitors+ diuretics+ beta blockers)

\*\*\*\*\*Combination therapy 5(other combination therapy)

Table 2 presents the cost-effectiveness relationship of the antihypertensive treatment with medicines. The cost of antihypertensive treatment was lower for ACE inhibitors+ diuretics+ beta blockers and other combination therapy. Patients without morbidities presented a less advantageous ratio for ACE inhibitors+ diuretics+ beta blockers (20.374) and ACE inhibitors+ diuretics (23.215).

## DISCUSSION

This study was able to describe the cost of the treatment and control of hypertension for patients taking blood pressure-lowering drugs. The selection of a hospital-based sample has the advantage of including a representative sample of the entire patient and allows the cost-effectiveness of treatment based on drugs actually in use to be assessed, thereby differing from indirect estimates based upon data from history of Disease, medical records, participants in randomized clinical trials. Each component of the cost was determined using direct information from the individuals under medical care for hypertension<sup>9-10</sup>. The lack of information on hospital costs is a limitation of this study, since hospital admission expenses were not covered and these represent the greatest cost<sup>11</sup>.

The use of a cost-effectiveness ratio requires the assumptions that the agent tolerability is comparable and that blood pressure lowering is a valid surrogate for cardiovascular risk reduction. In this context, the less advantageous cost-effectiveness ratios for ACE inhibitors and calcium channel blockers, detected in this and in other studies, indicates that they should not be recommended as the first-choice drugs for the treatment of hypertension, particularly among those without other chronic conditions<sup>12-13</sup>.

## CONCLUSION

Analyzing the cost-effectiveness ratio of the group medication of ACE inhibitors, using for patients to be admitted to hospital, combination therapy<sup>14</sup> is 20.374 thousands tugruks that it is been proving as an effective version of lowest-cost treatment.

## REFERENCES

1. The world health report 2002 – Reducing Risks, Promoting Healthy Life. Geneva, World Health Organization, 2002.
2. Murray C, et al. Reducing the risk of cardiovascular disease: effectiveness and costs of interventions to reduce systolic blood pressure and cholesterol - a global and regional analysis. *Lancet*, 2003. 361:717–725
3. Murray J, Lopez A. The global burden of disease: A comprehensive assessment of mortality and disability from disease, injuries and risk factors in 1990 and projected 2020, Cambridge, Harvard School of PH on behalf of WHO and World Bank 1996. 29-33
4. Howson CP, Control cardiovascular disease in developing countries: research, development, and institutional strengthening, National Academy Press, Washington, DC 1998. 44-51
5. Tan-Torre Edeje T., Baltussen R., Adam T., Hutubessy R., Acharya A., Evans D B., Murray C J L., WHO guide to cost-effectiveness analysis. 2003. 18-27
6. Hilleman DE, Mohiuddin SM, Lucas BD, et al. Cost-minimization analysis of initial antihypertensive therapy in patients with mild-to-moderate essential diastolic hypertension. *Western Journal of Medicine*. 1996. 164(4): 303-309
7. Drummond F., Sculper J., Torrance W., O'Brien., Stoddart L., *Methods for the Economics Evaluation of Health Care Programmes*. New York: Oxford University press. 2005. 7-48
8. Fonarow G.C., Walden J.A., Livingston N., et al. Cost effectiveness of specialty care for patients with advanced heart failure. *Heart failure*. 1996. Vol.3.
9. Oster G, Epstein A, Cost-effectiveness of antihyperlipidemic therapy in the prevention of coronary heart disease: *Journal of the American Medical Association*, 218, 2381-7
10. Cost-effectiveness of hypertension treatment: A population-based study. *Sao Paulo Medical Journal*. 2002. 120(4), 3-13

# The Diagnosis and Surgical Treatment of Herniated Lumbar Disk

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## ABSTRACT

Studies show that lumbar disc herniation (LDH) usually affects people aged 17-76 years. In some developed countries, the incidence of LDH is 37 per 100,000 compared with 57 or more per 100,000 in Mongolia (the present study population). The objective of this study was to formulate means of early diagnosis and develop effective management strategies of the lumbar disc hernia. This study revealed that L4-L5 and L5-S1 is a common location for the hernia. In terms of gender and age differences, the young males are at a increased risk, perhaps due to occupational differences. In other words, the majority of the patients with hernia are in workplaces, which require an extensive physical strength (such as carpenter and sportsman). Correct X- ray techniques and precise determination of the level that is affected are crucial for early diagnosis. If positive outcome with medical and rehabilitation management is not satisfactory, the surgical treatment is indicated as soon as possible.

**Keywords:** hernia, disk, lumbar, microsurgery

## INTRODUCTION

In Mongolia no studies have been conducted in this area, and according to observation the prevalence of this condition has been increasing over the last years.

It is well documented that herniated lumbar disk is prevalent in many other countries, and mostly affects subjects in their active employment age. For instance, a study conducted in France in 2002 showed that the average age of patients with a herniated lumbar disk was 45. In France, according to P. Grillier, Ph. Mahtieu, and M. Wyber the incidence of herniated lumbar disk is 37 in 100,000. In Mongolia, herniated lumbar disk hernia occurs in 53 per 100,000 people.

Therefore, it's essential to improve the diagnosis, treatment of herniated lumbar disc hernia, and develop the evidence-based standard of management and rehabilitation methods.

## MATERIALS AND METHODS

We studied 62 patients who have been treated at the Department of Neuro- and Spinal Surgery, Trauma and Orthopedic Hospital from 2002 to 2005. The diagnosis is made on the basis of neurological examination, radiographic characteristics, myelography after the injection of contrast into the spinal cord, computed tomography, and MRI.

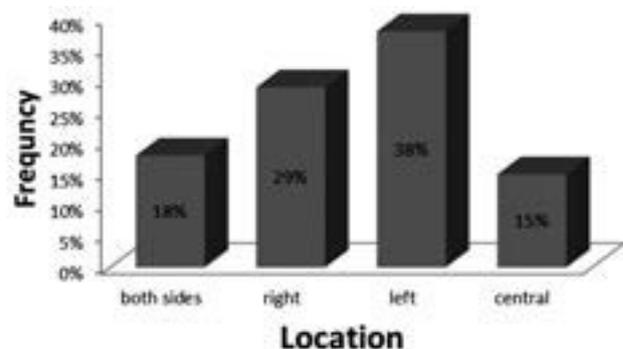
Of the 62 patients, there were 41 males (66%) and 21 females (34%), ages ranging from 21- 45. The current study showed that herniated lumbar disk mostly affects

individuals aged 21- 35 years. Compared to other countries, it is evident that more young people and especially males are affected in Mongolia. A plain X- ray was taken in all patients in 2 positions, using the Shimadzu apparatus from Korea. 23 patients had myelogram in 4 directions with the injection of Lopamiron-300, Omnipack- 200, 300 at the level of L3- L4. 8 patients underwent a MRI with 2-3 mm layering using CT pro-speed plus apparatus made by "CE" company.

## RESULTS

11(18%) of study patients had a nerve root bilaterally compressed of which 18(29%) on the right, 24(38%) on the left, and 9(15%) demonstrated central compression and irritation (Figure.1).

**Figure. 1 Compression of nerve roots**



In terms of the spine level, 2(3%) cases at the level of L1- L2, 3(5%) level L2- L3, 7(11%) level L3- L4, 31(50%) level L4- L5, 19(31%) at the level of L5- S1, clearly exhibiting that a common level of lumbar disk is L4- L5 and L5- S1 (Figure. 2).

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Figure. 2 Spine levels

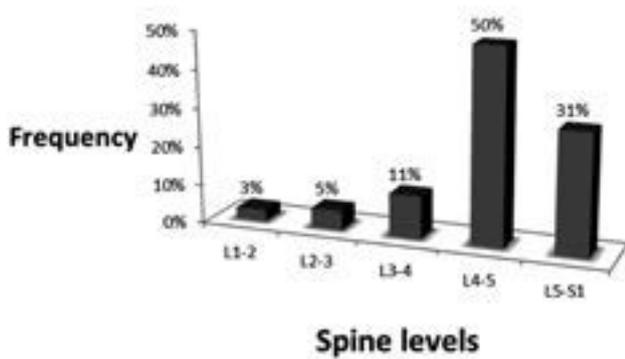


Figure. 5 Type and approach of the surgery

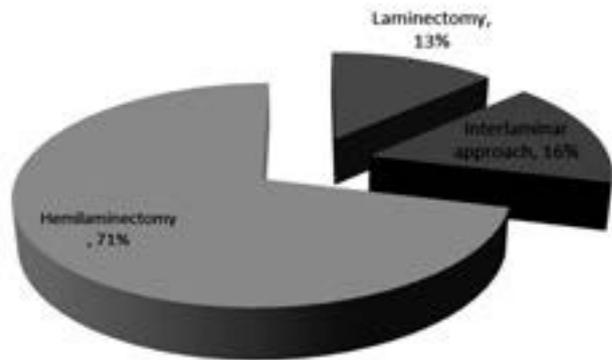
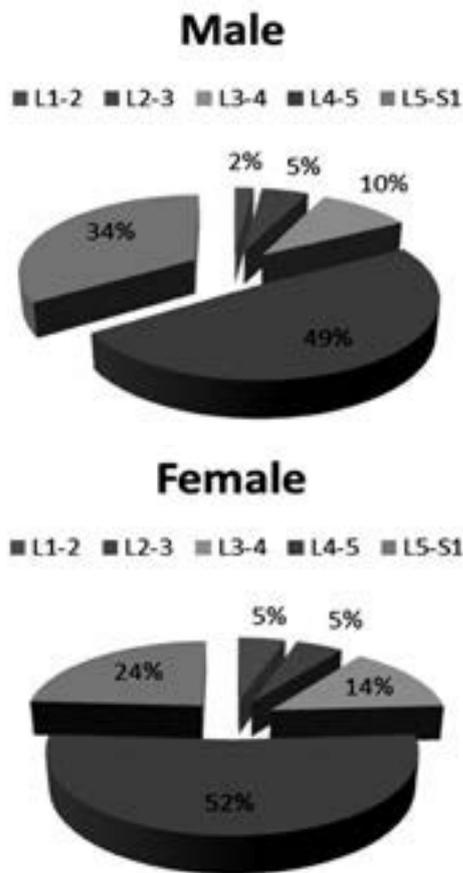
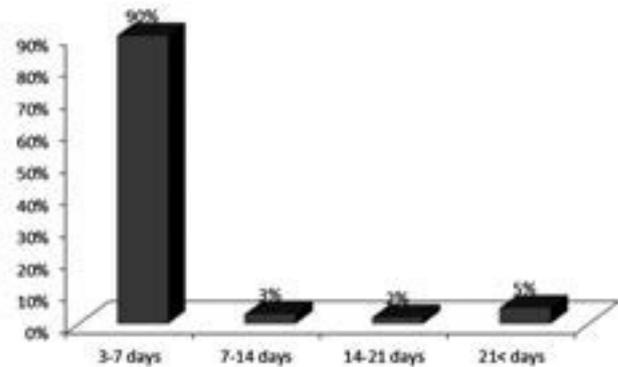


Figure. 3 and 4. Spinal levels affected depending on the gender.



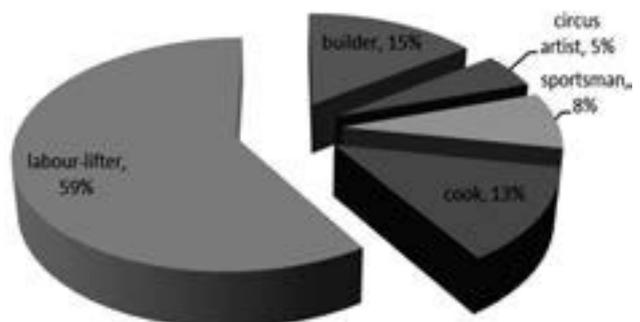
The disk was ruptured and compressed the nerve root in 23(37%) patients, and a mass resembling a tumor compressing the nerve root was observed in 39(62, 9%). After 3-7 days of the operation, pain disappeared in 90% of the patients, after 7-17 days in 3%, after more than 14 days in 2%. After 21 days following the surgery, the patient's motor and sensory deficiency was completely dissolved. A follow up of patients as after 3 years has shown that no patient has repeated the surgery.

Figure. 6 Pain relieve and recovery of sensory



The greater part of the patients who had surgery were individuals who do heavy physical activity/carrier, chief, construction worker, sportsmen, circus artists/ showing that this condition is closely related with occupation.

Figure. 7 Occupation



The neurological examinations have been confirmed by the myelogram, computed tomogram, and MRI.

It is worth to note that that medications, physical therapy, and rehabilitation were not satisfactory means of management, and even in some cases resulted in more pain, and aggravation of motor- and sensory deficiency.

Of 62 patients who underwent surgical treatment, almost half of the patients had hemilaminectomy 44(71%) and the percentage of interlaminectomy (16%) and laminectomy (13%) were similar.

### DISCUSSION

Internationally, the prevalence of herniated lumbar disk is 37 in 100,000, whereas 53 in 100,000 in Mongolia. The reason of this affecting more males could be related to their life style and occupational differences. In terms of age, the majority of patients were young adults.

The study demonstrated that surgery should be recommended as early as possible in cases that showed no efficacy of rehabilitative and physical therapy.

### CONCLUSION

1. Prevalence of herniated lumbar disk is higher in Mongolia compared to international estimation.
2. Herniated lumbar disk is more common at the level of L4- L5, L5- S1.
3. If medical, physical therapy, or rehabilitation management is not effective, surgery is recommended soon as possible. The surgical method of treating herniated lumbar dick significantly eradicates the motor and sensory deficiencies, and restores functional ability.

### REFERENCES:

1. Khalil. J. Chedid and Mokvel K. Chedid MD. The "tract" of history in the treatment of lumbar degenerativ disc disease. *Neurosurgery Focus*. 2003; 16: 1-3.
2. Igor de Castro, Daniel Paes dos Santos, Daniel De Holanda Christoph, Jose Alberto Landeiro. A historio da cirurgia da vertebral aplicada à doenca discal: uma linha do tempo ilustrada. *Neurosurgery Focus*. 2003;16.
3. Postachini F. Lumbar disc herniation. In: Postacchini, Rauschnig. W . *Pathomorphology*; 1999. p. 97- 171.
4. Benzel EC. Spine Surgery Techniques, complication avoidance, and management.. In: Ehni B, Benzel EC, Biscup RS. Volume one. 2<sup>nd</sup> ed. Elsevier Churchill Livingstone; 2005.p.602-603.
5. Budjav L. Statistical studying of medicine and its method; 2000. p.180.
6. Ganzorigt.Ts, Gonchigsuren. D. Diagnosis and Surgical Treatment of Herniated Lumbar Disk. *Health science*. 2006; 6:17-18.
7. Rengachary SS, Wilkins RH, editors: *Neurosurgical Operative Atlas*, volume 8. In: Lanzino G, Shaffrey CI, Jane JA. Surgical treatment of lateral lumbar herniated discs. Park Ridge, IL, American Association of Neurological Surgeons; 2000. p. 243-251.
8. Hall H. Surgery: indications and options. *Neurol Clin*. 1999; 17:113-130.
9. Robe P, Martin D, Lenelle J, et al: Posterior epidural migration of sequestered lumbar disc fragments: report of two cases. *J Neurosurg*. 1999; 90:264-266.

# Ambient particulate matter mass and trace elemental concentrations in Ulaanbaatar

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## ABSTRACT

Airborne particulate trace metals have important health implications. As a consequence, their concentrations are increasingly monitored in many urban locations worldwide. In Mongolia, air particle monitoring was started 2 years ago, but research on the health effects of air pollution in Mongolia has been very limited. Also, the effects of exposure to specific components of ambient fine particulate matter (PM<sub>2.5</sub>, including metals, have not been fully characterized in Mongolia. The objective of this study was to determine PM mass concentrations and elemental composition in PM<sub>10</sub> and PM<sub>2.5</sub> (airborne particulate matter smaller than 10 µm and 2.5 µm, respectively) during winter time. PM<sub>10/2.5</sub> samples were collected by a Harvard Impactor at the urban site of Ulaanbaatar, the capital city of Mongolia, and analyzed for 36 elements by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Ambient air samples were collected from 22 January to 23 March, 2010. While Ag was the least abundant trace metal with a mean concentration of 0.95 ng m<sup>-3</sup>, Fe showed the maximum mean concentration of 5701.53 ng/m<sup>3</sup>. The daily concentration variations of 36 elements in ambient air were in the range from 0.03 ng/m<sup>3</sup> to 884 ng/m<sup>3</sup>. PM air concentrations exceed WHO Air Quality Guidelines.

## INTRODUCTION

Air pollution is a major health threat to children and a risk factor for both acute and chronic respiratory and cardiovascular disease. Outdoor air pollution is largely and increasingly a consequence of the combustion of fossil fuels for transport, power generation and other human activities. Combustion processes produce a complex mixture of pollutants that comprises both primary emissions, such as diesel soot particles and lead, and the products of atmospheric transformation, such as ozone and sulfate particles formed from the burning of sulfur-containing fuel. Clean air is considered to be a basic requirement of human health and well-being. However, air pollution continues to pose a significant threat to health worldwide. According to a WHO assessment of the burden of disease due to air pollution, more than 2 million premature deaths each year can be attributed to the effects of urban outdoor air pollution and indoor air pollution (caused by the burning of solid fuels). More than half of this disease burden is borne by the populations of developing countries<sup>1</sup>.

Ulaanbaatar, the capital city of Mongolia has experienced dramatic population growth in recent years and this growth has led to major increases in the city's air pollution emissions. Major sources include three coal-fired power plants, wood and coal burning for home heating and cooking, and vehicles, some of which still use leaded gasoline. Strong temperature inversions and the surrounding topography lead to high concentrations during

winter, but to date measurements have been very limited<sup>2</sup>.

Air pollution and health related studies conducted in Mongolia findings suggest that traditional ger areas in Ulaanbaatar are responsible for emitting approximately 70 percent of the city's air pollution<sup>3</sup>. There is a need to conduct PM and health related studies. The goal of this study was to determine elemental composition and concentration of PM<sub>10</sub> and PM<sub>2.5</sub> samples collected during the winter in Ulaanbaatar.

## MATERIALS AND METHODS

This study was conducted in the city of Ulaanbaatar, the most polluted city in the country. The study period was winter time (22 February to 23 March, 2010), when air pollution is worst. and every 24 hour simultaneous sampling was carried out during sampling period. The air sampling site in Ulaanbaatar was the State Government Air Monitoring Agency fixed site #1 and the samplers were placed on the roof of the site, at height of approximately 3m off the ground. We used filter-based Harvard Impactor for PM<sub>10</sub> and PM<sub>2.5</sub> samples. During sampling fixed station were operated by Government Air Monitoring Agency, the site operator changed filters, calibrated pumps for 21 days. The 24-h PM (10/2.5) samples were collected on Teflon filters. Filter based PM<sub>10</sub>/PM<sub>2.5</sub> samples were weighed before and after sampling and analysed to determine PM elemental composition and concentration. Elemental analysis was conducted by ICPMS (Inductively Coupled Mass Spectrometry) by the Alberta Research Council. Altogether, 36 elements were quantified: Elemental mass concentration and air concentrations of each 36 elements

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of ambient particulate matter were determined in PM10 and PM2.5 samples (Table 1).

RESULTS

Ambient air Particulate Matter mass and concentration. Filter-based PM sampling result shows Particulate Matter mass of PM10 and PM2.5 are statistically different ( $p < 0.01$ ) by size of particulate matter (Table 1).

Table 1. p mass and concentration, by size of particulate matter.

Particle size		PM* mass mg/filter	PM* conc mg/m <sup>3</sup>
PM10	mean	708.17	49.46
	min	504.33	33.09
	max	943.33	74.55
	st.div	171.39	15.08
PM2.5	mean	492.26	34.25
	min	254.67	20.81
	max	788.67	54.74
	st.div	145.17	10.09

\*  $p < 0.00$        $p < 0.01$

Result show that PM mass and concentration are decreased by week during 22 February to 23 March, 2010 (Table 2).

Table 2. PM mass and concentration, from 22 February to 23 March, 2010 by 3 weeks

Week	Statistics	PM mass	PM conc.
22Feb-01March	mean	629.14	46.12
	min	254.67	20.81
	max	943.33	74.75
	st.div	216.97	16.74
02-12 March	mean	541.26	37.34
	min	314	22.7
	max	862.67	55.96
	st.div	189.4	11.84
15-23 March	mean	429.29	31.79
	min	354	23.05
	max	602	41.47
	st.div	93.58	7.05

$p < 0.005$        $p < 0.005$

Concentration of elements in Particulate Matter.

PM elemental analysis shows that Ag, Be and Hg were the least abundant trace metals with a mean concentration of  $0.95 \text{ ng m}^{-3}$ ,  $0.8 \text{ ng m}^{-3}$ ,  $0.41 \text{ ng m}^{-3}$ , respectively. The highest elemental concentrations were for Fe, Al, K and Na, with mean concentrations of  $5432.57.1 \text{ ng m}^{-3}$ ,  $8503.9 \text{ ng m}^{-3}$ ,  $2684.8 \text{ ng m}^{-3}$  and  $2285.1 \text{ ng m}^{-3}$  respectively. Elements were divided by their concentration levels in  $\text{PM}_{10}/\text{PM}_{2.5}$  into three groups: Major metals (Al, Fe, K, Na and Ti  $\geq 10^2 \text{ ng m}^{-3}$ ), sub-major elements (As, Br, Ba, Cr, Cu, Mn, P, Pb, Sr, and Zn  $\sim 10^1 \text{ ng/m}^{-3}$ - $10^2 \text{ ng/m}^{-3}$ ) and minor elements (Ag, Be, Bi, Ca, Cd, Cl, Hg, Li, Mg, Mo, Ni, S, Sb, Se, Si, Th, Tl, U and V  $< 10^1 \text{ ng m}^{-3}$ ). All major elements and some of the submajor elements in PM10 and PM2.5 concentrations are statistically different. (Table 3, 4).

Table 3. Major elements in  $\text{PM}_{10}/\text{PM}_{2.5}$  air concentration

		*Al <sub>air</sub>	*Fe <sub>air</sub>	*K <sub>air</sub>	*Na <sub>air</sub>	*Ti <sub>air</sub>
PM10	Mean	1576.66	953.52	406.44	372.84	63.68
	Min	680.06	453.04	189.88	165.06	29.46
	Max	2497.95	1466.77	647.39	527.17	102.76
PM2.5	Mean	346.72	237.02	131.43	102.98	14.83
	Min	144.57	127.69	74.57	57.95	7.37
	Max	781.83	482.69	222.37	191.52	31.99

\*  $p < 0.005$

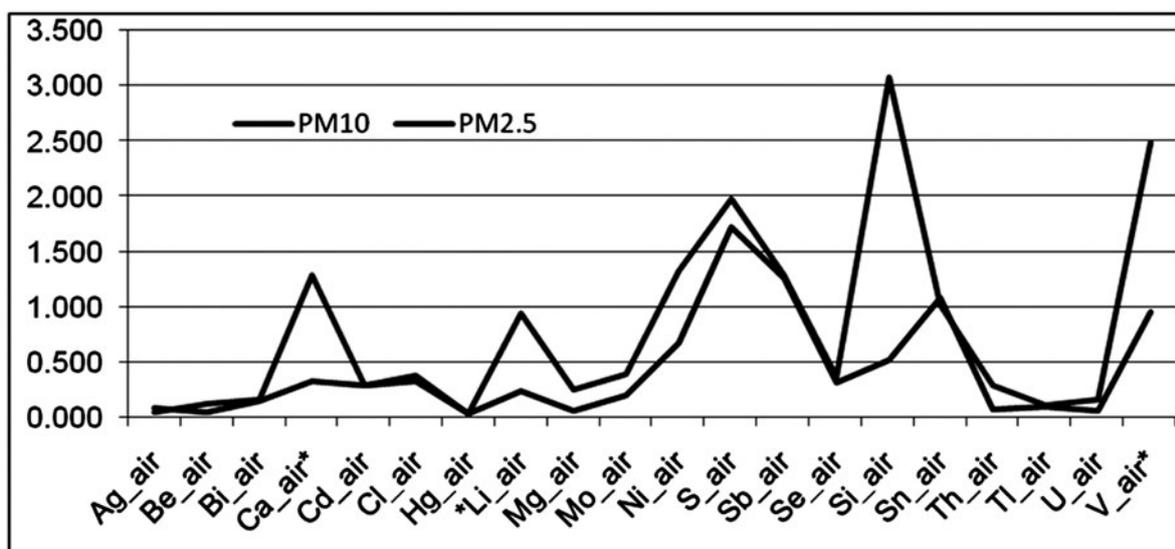
Table 4. Submajor elements in  $\text{PM}_{10}/\text{PM}_{2.5}$  air concentrations

		As	Br	Ba*	Cr	Cu
PM10	mean	5.34	9.79	28.32	4.13	5.46
	min	2.65	6.07	14.53	1.26	2.71
	max	9.80	18.22	57.17	5.22	8.21
PM2.5	mean	4.18	7.19	7.67	3.55	2.84
	min	2.16	4.48	3.92	1.91	1.23
	max	6.77	13.22	19.26	6.16	5.85
Mn*	P*	Pb	Sr*	Zn		
25.38	32.13	12.88	18.35	33.07		
11.78	19.54	7.34	10.08	26.93		
38.30	41.93	19.45	36.64	43.34		
8.14	9.99	11.48	4.67	28.83		
4.50	5.70	5.15	2.35	15.28		
14.40	16.55	19.22	11.01	51.28		

\*  $p < 0.005$

Most minor elements air concentration in PM10 and PM2.5 show that they are not statistically different by size of the particle except Ca, Li, Si and V (Figure 1).

Figure 1. Minor elements in PM<sub>10</sub>/PM<sub>2.5</sub> air concentrations



Toxic metals mass and air concentrations are not statistically different except nickel (Table 5).

Table 5. Toxic metals concentrations in PM<sub>10</sub> and PM<sub>2.5</sub>

	Mass		Air conc	
	PM10	PM2.5	PM10	PM2.5
As	75.806	60.014	5.336	4.180
Cd	4.274	4.135	.295	.286
Cr	59.367	50.844	4.126	3.552
Ni*	18.831	9.624	1.320	.676
Pb	186.685	166.552	12.883	11.484
Zn	477.567	413.317	33.068	28.832

\* p < 0.005

Elemental mass and air concentration in PM<sub>10</sub>/PM<sub>2.5</sub> were decreased by weeks (p<0.01) for most elements except Cd, Cu, Mn, Mo, and S during study time, from 22 February to 23 March, 2010, PM mass is increased for elements such as Cd, Cu, Pb and Se in third week comparing with 1st week (Table 5).

DISCUSSION

Mean daily 24h concentrations for PM10 is not exceeded and for PM2.5 mean concentration is exceeded 1.4 times, maximum concentration 2.2 times higher than the WHO Air Quality Guideline, 2005 value. This result shows that the weather was windy during the study period (from 22 February to 23 March, 2010) and air temperature was not very cold, compared with cold winter time December-January. PM10/2.5 mean concentrations are lower than cold winter time concentration, comparing with Government Air Monitoring fixed site data (147.8mg/m3) from December to January (Table 6)<sup>2</sup>.

Table 6. Ambient air MP concentration, comparing with WHO Air Quality Guideline

Particle size		PM conc. mg/m3	WHOAQ guideline
PM10	mean	49.46	50 mg/m3 (24 h)
	min	33.09	
	max	74.55	
	st.div	15.08	
PM2.5	mean	34.25	25 mg/m3 (24h)
	min	20.81	
	max	54.74	
	st.div	10.09	

PM mass and concentration were decreased by 3 weeks, result show this could be attributed by weather parameters such as wind speed, air temperature and no temperature inversion, which are frequent during winter in Ulaanbaatar.

Elemental analysis demonstrated that some elemental mass and concentrations are not decreased week by week (p>0.005), some toxic elements, including lead, were increased in the last week compared to the first week of sampling. This increase in lead concentration is potentially related to increased car traffic due to the Mongolian Lunar New year. We tried to compare elemental analysis findings with previously conducted study, but we didn't find locally published papers in Mongolia. Thus we compared with research findings which conducted in other countries and cities.

Elemental air concentration findings were compared with Shankhai, one of the world's most polluted city. For some elements, 7 out of 36 elements in PM2.5, such as As, Ba,

Be, Co, Cr, Fe and Ti concentrations 2.6, 1.5, 4, 1.2, 1.4, 1.03 and 1.4 times higher than concentrations in PM<sub>2.5</sub> of Jiading, the less polluted area of Shanghai. Elemental analysis findings compared with Shanghai, some of the toxic elements such as As and Cd in PM<sub>2.5</sub> of Ulaanbaatar, Mongolia are higher, and lower for Pb concentration than in Shanghai air PM<sub>2.5</sub><sup>4</sup>.

As a result, As concentration were highest concentration among all 36 elements, it may be related to burning of coal in gers for heating and cooking and 3 power plants. Coal burning is one of the big sources of urban air pollution in many developing countries, especially in Mongolia. Other studies found that As concentrations were higher in the neighborhood of the coal-fired, utility power plants<sup>5</sup>. PM mass and air concentrations are highest for Al, Fe, which are soil/dust related metals<sup>6</sup>.

The high soil-related concentrations in Ulaanbaatar are due to dust from uncovered soil, which is another important source of air pollution of Ulaanbaatar. There is a need for further detailed research to determine seasonal variation of elemental concentrations.

#### CONCLUSION

Mass concentrations and elemental compositions of PM<sub>10</sub> and PM<sub>2.5</sub> samples from Ulaanbaatar, Mongolia were analyzed. The daily concentration of 36 elements were in the range from 0.03 ng/m<sup>3</sup> to 884 ng/m<sup>3</sup>. Mean air PM concentrations exceed WHO AQ Guidelines. Elemental mass and air concentrations are different by particle size (PM<sub>10</sub> and PM<sub>2.5</sub>) and time period. Toxic metals such as Cd, Cr, Ni, Pb and Zn mass and concentrations are lower than big cities, like in Beijing, Shanghai and Seoul. Arsenic (As) concentration is higher than some Asian cities such as Shanghai and Seoul. Further, there is needed research on Particulate Matter-health related studies and elemental analysis to determine temporal and seasonal variations.

#### ACKNOWLEDGEMENTS

Authors are grateful to National Air Monitoring Agency for their invaluable cooperation in all the field sampling, and equipment calibration. Air pollution monitoring was provided by the Ulaanbaatar City Environmental Monitoring Agency and Mongolian National Air Monitoring Agency. We thank Dr. Ryan Allen, Faculty of Health Sciences, Simon Fraser University for assistance with study design and data collection. Funding for this work was provided by BC Environmental & Occupational Health Research Network and Health Canada.

#### REFERENCES

1. World Health Organization Geneva, Air pollution 2011, [homepage on the internet], available from: <http://www.who.int.airpollution/health>
2. Ryan A, Enkhjargal G, Barkhasragcha B, Oyuntogos L, et al., Characterization of Wintertime Air Pollution concentration and Variability in Ulaanbaatar, Mongolia. *Epidemiology*. 2011; 1: 116
3. Saijaa N, Oyunbileg J, Enkhtuya P. Air Pollution and Health Ulaanbaatar city of Mongolia, *Epidemiology*. 2011; 1: 114-115
4. Chen J, Tan M, Li Y, Zheng J, et al., Characteristics of trace elements and lead isotope ratios in PM (2.5) from four sites in Shanghai, *J Hazard Mater*. 2008; 156: 36-43.
5. Freitas MC, Farinha MM, Ventura MG, et al., Gravimetric and chemical features of airborne PM<sub>10</sub> and PM<sub>2.5</sub> in mainland Portugal. *Environ Monit Assess* 2005; 109:81-95.
6. Roy M. Harrison and Jianxin Yin, et al., Chemical speciation of PM<sub>2.5</sub> particles at urban background and rural sites in the UK atmosphere, *J Environ Monit.*, 2010, 12,1404-1414
7. Vassilakos Ch, Saraga D, Maggos T, et al., Temporal variation of PM<sub>2.5</sub> in the ambient air of suburban site in Athens, Greece *J. Science of the Total Environment*, 2005, 349: 223-231
8. Schneidmesser E, Stone EA, Quraishi TA, et al., Toxic metals in the atmosphere in Lahore, Pakistan, *J. Science of the Total Environment* 2010; 1640-1648
9. Marcazzan GM, Valli G, Vecchi R et al., Factors influencing mass concentration and chemical composition of fine aerosols during a PM high pollution episode, *J. Science of the Total Environment* 2002; 298, 65-79
10. Park EJ, Kim DS, Park K et al., Monitoring of ambient particles and heavy metals in a residential area of Seoul, Korea. *Environ Monit Assess*. 2008; 137: 441-9.
11. Perrino C, Catrambone M, Pietrodangelo A et al., Influence of atmospheric stability on mass concentration and chemical composition of atmospheric particles: A Case study in Rome, Italy *Environ Int*. 2008; 34: 621-628

# Study of the prevalence of overweight and obesity among schoolchildren and risk factors for these diseases

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## ABSTRACT

Over 22 million children are overweight or obese in the world. The approximate estimation is saying that 75 percent of these overweight and obese children live in the low and middle income countries and this number has a tendency to increase. Overweight and obesity are duly considered as risk factors for non communicable diseases and they can lead to many health complications. Most of the overweight and obese adults have a tendency to gain weight in their childhood. Particularly, 86% of children, gaining weight in adolescence, will have overweight problems when they become adults. Research on overweight and obesity among children is lacking in Mongolia. A school based cross-sectional survey was conducted and 1504 schoolchildren from 20 secondary schools of Ulaanbaatar were involved in this survey by their age groups (primary, middle and high school), sex ratio is considered the same in each group. Study result showed that 7.2% of the total surveyed children were overweight and obese. Overweight and obesity was statistically significant ( $p=0.001$ ) among middle school children comparing to the other age groups. Socio-economic status, health education, physical activity and participation in sports and recreational activities of the schoolchildren influenced being overweight and obese.

**Key words:** schoolchildren, overweight and obesity, prevalence, risk factors

## INTRODUCTION

Overweight and obesity has become a serious problem of public health not only in developed countries but also in developing ones<sup>1</sup>. Studies, conducted in Mongolia, demonstrated that the prevalence of overweight and obesity among the total population increased from 17.3 to 27 percent between 1993 and 2002, and moreover, the rate among adults, who live in downtown of Ulaanbaatar city, was 47.7 percent<sup>2</sup>.

The results of the Nationwide study, conducted in Mongolia in 2005, showed that the prevalence of overweight and obesity of the 15-64 years of age population was 21.8% and 9.8% respectively, but a 2009 study revealed that those numbers increased and reached 27.3% and 12.5% respectively<sup>3,4</sup>. Although some studies on the prevalence of noncommunicable diseases and overweight children have been done, they are prevailing in adults, and therefore, the possibility of getting basic information related to those health problems among children is lacking.

Thus, the goal of this study was to determine the prevalence of overweight and obesity among schoolchildren and the risk factors, causing these health problems and to develop recommendations.

## MATERIALS AND METHODS

This study was done by using school based cross-sectional method. 1504 children, between the ages of 6 to 18, from 20 private and public schools of 5 districts of the

Ulaanbaatar were involved in this survey. The children were divided by their age groups (primary, middle and high schools), sex ratio is considered the same in each group. The participants' dietary habits, physical activity, alcohol and tobacco consumption and general knowledge on prevention of noncommunicable diseases were determined by a questionnaire, and moreover their anthropometry measurements (height, weight, BIM) were noted.

The approval of the Ethical Committee of the Health Sciences University of Mongolia was received on the 16<sup>th</sup> of June 2009. The study procedure was explained to schoolchildren and their parents and written informed consent was obtained. SPSS version 12.0 was used for data analysis to determine average, confidence, frequency and relationship between independent and dependent variables. Correlation coefficients with confidences over 95% were selected.

## RESULTS

General characteristics of participants: thirty four percent of the total participants were selected from private schools, whereas the remaining were from public schools. The socio-economic status of the schoolchildren showed that the average family had  $4.6 \pm 1.39$  members. The number of the family of 4 was the highest and occupied 38.8% of the total family. By the accommodation study result, 57.3% of the participants live in apartments with a central heating system, 26.5% live in fenced houses, 9.4% live in gers (Mongolian dwelling) and 5.3% of live in private houses. According to educational background of parents, 39% of the mothers and 31% of fathers of the schoolchildren have higher education. The average number

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of children in a family was  $2.38 \pm 1.1$ . The number of the family with 2 children was the highest, occupying 43.8% of the total family. 37% of participants were the oldest child in the family, whereas 31.9% were the youngest ones. Comparison of the household income per person per month between private and public schools was statistically significant ( $p=0.003$ ), showing that indicator was higher

in private schools by 0.5 times more than in public ones. Overweight or obese schoolchildren occupied 7.2% of the total participants and, male participants prevailed. Therefore, the prevalence of overweight and obesity were different in the age groups, and the highest prevalence was observed in the middle schoolchildren (Table 1).

**Table1. Population indicators of overweight and obese schoolchildren**

Indicators	Total		Male		Female		P
	n	%	n	%	n	%	
Ownership of school							0.001
Private	46	42.2	29	26.6	17	15.6	
Public	63	57.8	38	34.9	25	22.9	
Age							0.001
Elementary	32	29.4	19	17.4	13	11.9	
Middle	52	47.7	32	29.3	20	18.4	
High	25	22.9	15	13.7	10	9.3	
Household condition							0.001
Apartment with central heating	70	64.2	48	44	22	20.1	
Fenced house	28	25.7	18	16.5	10	9.2	
Ger	2	1.9	1	0.9	1	0.9	
Private house	9	8.2	5	4.6	4	3.6	
Which child in the family							0.03
The oldest	41	37.6	26	23.8	15	13.7	
Middle	13	11.9	8	7.3	5	4.6	
the youngest	35	32.1	21	19.3	14	12.8	
Only child	20	18.3	12	11.1	8.1	7.3	

There was a probability that the schoolchildren with good socio-economic status had a higher tendency to become overweight and obese. The probability of becoming overweight and obese was 3 times higher among children, living in apartments with central heating than among the children, living in gers, and it was 1.5 times higher among children, going to private schools than the children in public schools, this resulted in the statistically significant differences.

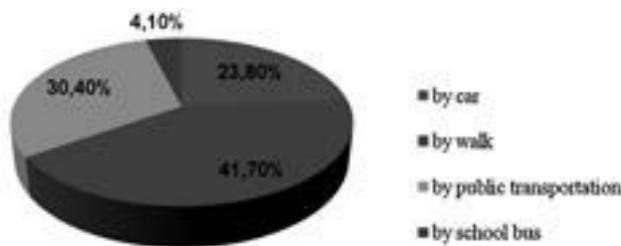
Fruit consumption of the participants was insufficient and consuming only  $1.7 \pm 1.3$  serving size per day is 3 times less than WHO recommendation. But no difference was observed in the frequency and serving size ( $1.8 \pm 1.1$  for normal,  $1.7 \pm 1.4$  for overweight) of fruit consumption per day between overweight and normal weight schoolchildren. The study result of the consumption of green leafy vegetables with high antioxidant effect, such as romaine, lettuce, spinach and celery, showed that 53.7% of the participants hadn't consumed them last month, some had never heard such names before.

The study result of weekly consumption of fat showed that nearly all participants regularly consume mutton and beef

with high saturated fat content, which promotes the risk of noncommunicable diseases (cancer, arterial hypertension and heart diseases), whereas consumption of white meat, such as chicken and fish with high unsaturated fatty acid content, which is good for health, was  $1.62 \pm 1.35$  and  $1.12 \pm 1.43$  per day respectively.

Study results of eat-out indicators showed that family with overweight or obese children eat-out more regularly than the family with normal weight children. A major percent of the normal weight children only eat-out during holidays, whereas most of the overweight children eat-out 1-2 times a week or sometimes a month. On one hand, the number of times eating-out indicate good household income level; however, on the other hand it also represents an unhealthy diet.

Physical activity of the schoolchildren: Study of the schoolchildren's transportation to and from school revealed that every other child and 1 child in every 3 children often goes to school by walking and by public transportation, respectively in public schools, whereas, 1 child in every 3 children of private schools travels by car Figure1.



**Figure1. Transportation for going to and back from schools of schoolchildren**

Physical education (physical exercise) class is being taught 2 times a week in 77.1% of the surveyed schools, whereas only 1 time a week in other of the schools. There were schools, that didn't have a gym and some that rent other's gym to teach this class.

Study results of schoolchildren's enrollment in the after-school activities showed that only 28.8% of the children participated, some kind of after-school activities; however foreign languages and theoretical classes in dominated in those activities. The reasons for not enrolling in the after-

school activities were determined in this study; and the results showed that 42.5% of the children don't have spare time, 35.1% don't enroll because of tuition, and 18.2% said the location of those places are far from their home. Although the children in private schools enrolled in the after-school activities 2 times more than children in public schools, producing a statistical significant difference, the activities for theoretical classes, such as foreign languages and musical education were higher than physical ones.

After class school children do sedentary work which has low energy consumption. They watch TV for 3.53±1.24 hours and work on the computer 2.83±1.07 hours a day. Average working hours on a computer was higher among middle school children, which resulted in a statistical significant difference (P≤0.003). Overweight and obese children spend 1.5 more hours for sedentary work than normal weight children. By the genetic factor indicators, 14.5% of the overweight and obese children have an overweight or obese person in their generation. If we compare it to the percentage of normal weight children (34%), who gave the same answer, there was a relatively high result of statistic analysis (p=0.001) Table2.

**Table2. Relationship between overweight and genetic factor**

Indicators	Yes		No		Don't know		P
	n	%	n	%	n	%	
Normal weight	474	33.9	900	64.51	21	1.5	
Overweight and obese	49	44.9	58	53.3	2	1.8	0.001
Total	523	34.8	958	63.7	23	1.5	

**Tobacco and alcohol consumption:**

Tobacco consumption results showed that 92.2% of the children don't smoke, 6.1% smoke, and 1.7% have quit smoking. The earliest and the latest age of beginning to smoke was 9 and 16 respectively, whereas the average age of starting to smoke was 13.2±2.5. The schoolchildren smoke 3.5±1.5 cigarettes a day. The percentage of the participants, who have one or more smokers in their family, was 46.8%.

Nearly 11% of the participants have used alcohol in some way and 6.2% of them still use it. There was no significant difference in tobacco and alcohol consumption between normal and overweight children.

**General knowledge of noncommunicable disease:**

The evaluation of schoolchildren knowledge of risk factors for and prevention from nocommunicable disease showed that 45.7% of the participants received "F" grade, 15% "B", and 39.3% "C" grade. Percentage of participants, who have not taken a school health program, was 38.2. Joining the school health program was 57% in private schools, whereas that indicator was 84% in public ones. General

knowledge of health education of the schoolchildren, who took the class, was higher than those who didn't take it, resulted in a significant difference (P<0.001). There was direct and strong correlation between children's general knowledge of health and the length of their involvement in the school health program, and the duration of this class.

**DISCUSSION**

Overweight and obesity is dramatically increasing all over the world. Prevalence of overweight and obesity is 31.5% in USA, 20% in Western Europe, 23.9% in Kingdom of Saudi Arabia, and 6.7% in China. The study result showed that this prevalence is 7.2% in Mongolia<sup>5-8</sup>. Socio-economic factors have a strong influence in overweight and obesity. The study of the researchers Lluch A, Herbeth B, Mjean L, Siest G, revealed that a probability of becoming overweight or obese was higher among children with a high income parents than among children with low household income<sup>9</sup>. In addition, children with low household income also had a tendency to become overweight or obese if they have a unhealthy diet. The study, conducted by researchers B.Enkhtungalag and L.Narantuya, showed that the prevalence of overweight and obesity among the

family with higher level income than the lowest income level of living standard was 43.1%, whereas that indicator was 10.9% among the family with lower income level than that standard<sup>10</sup>. The certain percentage (46.4%) of the overweight or obese participants, attend private schools, and the average household income per family member was 0.5 times higher than the participants in public schools, which represents that socio-economic status has a great influence in overweight and obesity. Insufficient consumption of fruits and vegetables among schoolchildren was the same as the result of the previous nationwide NCD step surveys. Children and adolescents are increasingly engaging in sedentary behavior, spending less time on outdoor activities and more time for watching TV and playing video games. Research work, conducted by of Brazilian researchers dos Santos Cde J, Silva JS, and da Conceio SI, revealed that 58.4% of schoolchildren travel to school by walking and spend 2.66 hours a day for sedentary work, such as for watching TV and playing computer games<sup>11</sup>. The Third National Health and Nutrition Examination Survey in the USA indicated that 20% of US children, aged 8-16, participated in 2 or fewer bouts of vigorous activities per week, and more than 26% and 67 % watched TV at least 4 and 2 hours per day, respectively.

This study results revealed that schoolchildren watch TV for 3.53±1.24 hours and work on the computer for 2.83±1.07 hours a day, which was relatively close to the above mentioned surveys' results. The results of the genetic factor surveys, completed by other researchers, showed that a probability of becoming overweight or obese for children, whose parents are both overweight, was 80% and for children, which one overweight parent, was 40% and for children, whose parents are not overweight, was 10%<sup>12</sup>. This study revealed almost the same results, showing 45% of the overweight and obese children had an overweight or obese person in their generation. "Report of the evaluation of nutrition" by the Ministry of Health and Public health Institute showed that 41.4% of adolescents didn't have knowledge of healthy diet<sup>13</sup>, which was close to our study result, revealing 45.7% of the participants received "F" grade or insufficient evaluation on risk factors for and knowledge of prevention from noncommunicable diseases knowledge.

### CONCLUSION

The prevalence of noncommunicable diseases has increased in recent years in Mongolia. Overweight, is one of the risk factors of NCD, and was observed not only in adults but also among adolescents and children. But surveys in this field are rare and only limited information is available. Thus, future studies on obesity and overweight children have to be conducted to determine the real situation and problems.

On one hand, the percentage of youth in Mongolia is high; on the other hand, our study results showed that health education of schoolchildren was insufficient, so

that school health program must to be improved in order to provide children with adequate and systematic health education, including a healthy diet, physical activity, and bad behavioral habits, from early age.

### REFERENCES

1. Rodgers A, Vaughan P. World health report 2002: Reducing risks, Promoting healthy life. Geneva, Switzerland: World Health Organization; 2002.
2. Public Health Institute of Mongolia, Nutrition centre of Kagava, Japan. Nutrition and health. Ulaanbaatar 2002.
3. WHO, Ministry of Health Mongolia, Public Health Institute of Mongolia. Mongolian STEP survey on prevalence of noncommunicable disease risk factors 2006. Ulaanbaatar 2008.
4. WHO, Ministry of Health Mongolia, Millennium Challenge Account Mongolia, Public Health Institute of Mongolia. Mongolian STEP survey on prevalence of noncommunicable disease risk factors and injury risk factors-2009. Ulaanbaatar 2010.
5. Hedley A, Ogden C, Johnson C, Curtin L, Flegal K. Prevalence of overweight and obesity among US children, adolescents, and adults 1999-2002. *JAMA*. 2004;291:2847-2850.
6. Sjoberg A, Moraes L, Yngve A. Overweight and obesity in representative sample of schoolchildren-exploring the urban and rural gradient in Sweden. *Int J Obes*. 2011;12:305-314.
7. Amin TT, Al-Sultan AL, Ali A. Overweight and obesity and their relation to dietary habits and socio-demographic characteristics among primary schoolchildren in Al-Hansa, Kingdom of Saudi Arabia. *Eur J Nutr* 2008;47:310-318.
8. Li Y, F. Zhai F, Yang X. Determinants of childhood overweight and obesity in China. *Br J Nutr*. 2007;69:210-215.
9. Jianhua Z, Jonathan P, Mingyao Li, Kai W. The role of obesity-associated loci identified in genome wide association studies in the determination of pediatric BMI. *Int J Obes*. 2001;17: 2254-2257
10. Enkhtungalag B, Narantuya L. Study of the relationship between BMI and household diet. Public Health Institute of Mongolia-Abstract book;2003.
11. dos Santos Cde J, Silva JS, da Conceio SI. Physical activity and sedentary lifestyle among children from private and public schools in Northern Brazil. *J Sports Med*. 2010;44:996-1004.
12. Lluch A, Herbeth B, Mjean L, Siest G. Dietary intakes, eating style and overweight in the Stanislas Family Study. *Int J Obes Relat Metab Disord*. 2003;24:1493-1499.
13. Ministry of Health Mongolia, Public Health Institute of Mongolia. Summary report of the assessment of current nutritional status among the school children. Ulaanbaatar 2006.

# Ultrasound diagnosis of Thyroid Cancer

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## ABSTRACT

To evaluate the outcomes of ultrasound (US) diagnosis and differential diagnosis of thyroid cancer and its recurrences. In this study, 225 consecutive patients (from 9 to 70 years old, mean age: 50; 16 males and 131 females) with non palpable and palpable (mean size: 8-54 mm) thyroid gland disease were examined. All patients were studied by US, color-Doppler US, and US guided fine needle aspiration biopsy (FNAB). During the US panoramic study, US pattern of thyroid cancer: echogenicity (hyper-, iso- or hypoechoic lesion), echo structure (solid, mixed or cystic), margins (well defined, irregular or blurred), and presence of hyperechoic spots (coarse calcifications or microcalcification) were identified. Color-Doppler US examination identified three types of vascularity: type 0-2 (hyper-, hypo- or avascularity). In 147 of 225 patients, (65.3%) detected thyroid cancer, in 30 patients (13.3%) recurrence of thyroid cancer, in 24 patients simple adenoma, in 24 patients Autoimmune Thyroiditis (AIT). By the cytological evaluation, in all 147 patients with thyroid cancer papillary cancer was in 89 (61%) cases, follicular cancer in 44 (30%), medullary cancer in 5 (3.4%) and anaplastic in 9 (6.1%) of all cases. The main US and CD US signs of thyroid cancers were: without capsularity margin-131 (90.3%), non homogeneous echo structure-126 (86.9%), hypoechoic-121 (83.45%), irregular margin-119 (82.1%), non smooth margin-104 (71.7%), abnormal shape-99 (68.3%), with cystic component-53 (36.55%), micro calcification-36 (24.8%), cervical lymph nodules one side of the metastasis-15 (10.2%), hypervascular-65%, hypovascular-27.5%, avascular-7.5%. This study shows that US diagnosis is a significant and cost-effective method in diagnosis of thyroid focal lesions. US guided FNAB of thyroid nodules had high sensitivity (91%).

**Keywords:** thyroid, cancer, nodular disease, ultrasonography, malignancy

## INTRODUCTION

According to the WHO study the prevalence of thyroid gland disease is estimated 8-18 % of (1.5 million people) all population.<sup>1</sup> Among endocrine diseases, the prevalence of thyroid disease is second place after diabetes mellitus.<sup>1,2</sup> Thyroid cancer represents about 1.47 % of cases of cancer and the detection rate among endocrine cancers is increasing.<sup>3,4</sup>

From 2005 – 2008, a total of 140 patients were diagnosed with thyroid cancers at the National Cancer Center of Mongolia.<sup>3</sup> High-frequency ultrasonography has emerged as an important screening and diagnostic imaging modality for the evaluation of nodular thyroid disease.<sup>5,6,7</sup> Epidemiologic studies have estimated that women are affected more frequently than men and the mean age of prevalence is between 40-55 years.<sup>8</sup>

In Mongolia, the number of indices of thyroid cancer is increasing and early detection and differential diagnosis is therefore essential.

From 2005-2008, 225 consecutive patients (9-79 years old) with thyroid disease were examined at the State

Central Hospital and National Cancer Center of Mongolia. All patients were examined by US, color – Doppler US and US guided fine needle aspiration biopsy (FNAB). The outcomes of the US study were compared with cytological and histological findings retrospectively. US examinations were performed by Hitachi, Aloka, Medison US apparatus and 5-7,5 MHz linear and convex transducers were used.

In 147 of 225 patients, (65.6%) thyroid cancer was detected, in 30 patients (13.3%) thyroid cancer recurrences were diagnosed, in 24 patients were simple adenomas, in 24 patients autoimmune thyroiditis were detected (AIT). All patients under went surgery treatment and in 186 patients FNAB was performed before the surgery. By cytological findings, of these 147 patients with thyroid cancer, 89 cases (61 %) were papillary cancer, follicular cancer was present in 44 cases (30 %), medullary cancer in 5 cases (3.4 %) and anaplastic carcinoma was detected in 9 cases (6.1 %).

131 female and 16 male patients with a mean age of 50 years old (between 41-55) had thyroid cancer. In 43.4 % of cases, single nodule cancer was present, and was commonly detected in the right lobe (36.5 %).

Ultrasound features of malignant nodules were compared and analyzed with other thyroid diseases. (Table 1)

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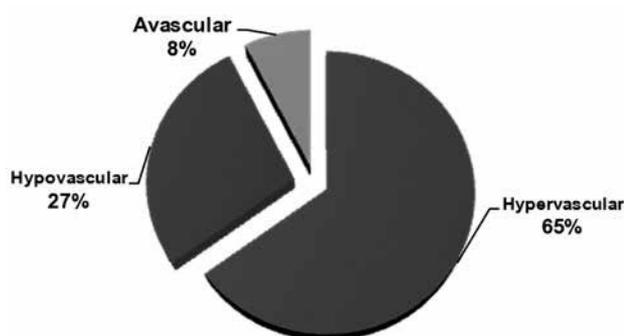
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**Table 1. Ultrasound features of thyroid cancer versus adenomas and AIT**

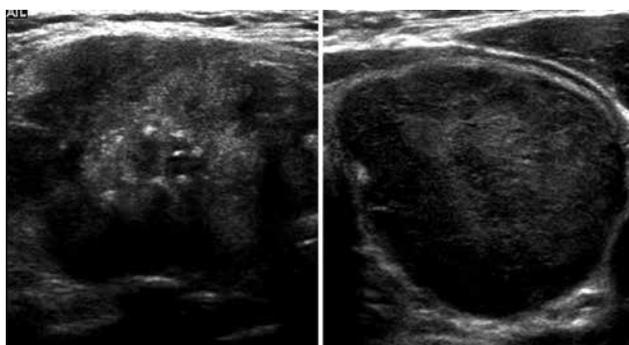
US signs	Adenomas (n=24)		AIT (n=24)		Thyroid cancer (n=147)	
	n	%	n	%	n	%
1. Shape:						
- round	10	41.7	15	62.5	20	15.1
- oval	12	50.0	5	20.8	26	17.6
- abnormal	2	8.3	4	16.7	101	67.3
2. Margin:						
- well defined	20	83.3	21	87.5	26	17.7
- poorly defined	4	16.7	3	12.5	121	82.3
3. Margin:						
- smooth	22	91.7	19	79.2	43	28.3
- non smooth	2	8.3	5	20.8	104	71.7
4. Echogenicity:						
- hypoechoic	4	16.7	10	41.6	121	82.3
- hyperechoic	9	37.5	7	29.2	9	6.1
- isoechoic	11	45.8	7	29.2	17	11.6
5. Echo structure:						
- homogenous	11	45.8	11	45.8	19	13.0
- heterogeneous	13	54.2	13	54.2	128	87.0
6. Calcification:						
- yes	2	8.3	3	12.5	38	25.9
- no	22	91.7	21	87.5	109	75.1
7. Cystic changing:						
- yes	4	16.7	5	20.8	53	36.1
- no	20	83.3	19	79.2	94	63.9
8. Capsular margin:						
- yes	20	83.3	7	29.2	14	9.6
- no	4	16.7	17	70.8	133	90.4
9. Increase of posterior enhancement:						
- yes	19	79.2	3	12.5	42	28.6
- no	5	20.8	21	87.5	105	71.4
10. Decrease of posterior enhancement						
- yes	-	-	7	29.2	10	6.9
- no	24	100	17	70.8	137	93.1
11. Metastasis:						
- same side lymph node	-	-	-	-	15	10.2
- both side lymph node	-	-	-	-	2	1.4

Table 1 demonstrates thyroid cancer signs on gray scale mode US: without capsularity margin 90.4%; hypoechoic echogenicity 82.3%, poorly defined irregular margin 82.3%, non smooth margin 71.7%, abnormal shape 67.3%, calcification 25.9%, with cystic component 36.1%, lymph node metastasis 10.2%.

In 80 % of cases with evidence of these 3 or more signs the malignancy can be approved. By color-Doppler US examination 3 type of vascularization were identified. (Figure 1)

**Figure 1** Vascularization of Thyroid cancer

Correlation between tumor size and vascularization: tumors less than 0.8 cm diameter were avascular 98 %, tumors with 0.8-3.0 cm diameter were hypovascular 92 %, tumors over 3.0 cm size were hypervascular 99 %.

**Picture 1** US depiction of malignant thyroid nodules

**a-** papillary carcinoma **b-** follicular carcinoma

Recurrences of thyroid cancer were usually detected at the right lobe (59.1%), with dimensions of 1-3 cm (77.2%), by single nodule type (72.7%). On ultrasonography: 21 (95.5%) were without capsular margin, 21 (95.5%) with non smooth margin, 19 (86.4%) had hypoechoic echogenicity, 19 (86.4%) had heterogeneous echo structure, 19 (86, 4 %) had poorly defined margins and 13 (59.1%) were with irregular shapes.

### DISCUSSION

In this investigation, the prevalence of thyroid gland disease was higher in female patients (89.1%) which is consistent with the study of Russian researcher Dvorchenko VV et al (85%).<sup>1</sup> The Sex ratio (8.2:1 more in female patients) in the current study was similar to the results of Americans (6.7:1) and Russians (5.5:1) but was significantly different from Italians (2-4:1).<sup>1,7,8</sup> The Mean age in this study (41-55) was the same as the study of Russian researcher Dvorchenko VV et al. (41-50) and with the study of Korean researcher Kim Kyung (47.7).<sup>1,8</sup> By the investigation of morphology of thyroid cancer a high differentiated carcinoma was in 90.4% in the current study which was equal with the results of Korean (80-95%), American (90-95%) and Russian (88-93%) investigators.<sup>1,8,9</sup>

Ultrasound major depiction signs of thyroid gland diseases in this study were acapsularity margins, hypoechoic echogenicity, poorly defined irregular margins, non smooth margins, abnormal shape, with cystic component, non homogeneous structure when in the study of Kim Kyung hypoechoic echogenicity, poorly defined irregular margins, non smooth margins and hypervascularity signs were the same but lymph node metastasis and calcifications were significantly higher.<sup>8</sup> In the study of Munkhbaatar D et al., US depiction signs such as acapsularity margins, hypoechoic echogenicity, poorly defined irregular margins and non homogeneous structure were the same with results of this investigation.<sup>2</sup>

### CONCLUSIONS

We have defined main US signs indicating malignancy of thyroid nodules. If 3 or more of these signs occurs, with involvement of lymphatic nodules, thyroid cancer diagnosis have sensibility 85.3 %, specificity 75.3 % and accuracy 74.2 %. Tumor vascularization is important in making differentiation and the monitoring of thyroid cancer.

### REFERENCES

1. Dvornichenko VV, Thyroid cancer. M.Medicine, Moscow. Russia.1999; 65-87
2. Enkhbayar D, Munkhbaatar D, Gonchigsuren D, US diagnosis of thyroid gland disease. Ulaanbaatar, Mongolia, 2005; 16-48.
3. National Cancer Center of Mongolia. Division of information, science and statistical analysis. Statistical reports. Ulaanbaatar, Mongolia. 2005-2008.
4. Tsib AF, Parshin VC, et al., US diagnosis of thyroid gland disease. M. Medicine, Moscow. Russia. p. 330
5. Khurana KK, Richards Vi. et al. The role of ultrasonography-guided fine-needle aspiration biopsy in the management of non palpable and palpable thyroid nodules. Thyroid, 8 (6), 511-512
6. Lin JD, Huang BY. et al. Thyroid ultrasonography with fine-needle aspiration cytology for the diagnosis of thyroid cancer. J Clin. Ultrasound. 1997; 25 (3) 111-112
7. Court-Payen M, Nygaard B et al. Color Doppler Ultrasound in the initial assessment of palpable thyroid nodules. 9<sup>th</sup> Congress of WFUMB. 2000; Florence. Italy. Springer 180.
8. Eun- Kyung Kim. Sonographic Diagnosis of Thyroid Mass with Pathologic Correlation. 8th Congress AFSUMB. Thailand. Bangkok. 2007; 86.
9. James Norman. Thyroid cancer. [Online]. 1997-2008. Available from: [http://www.endocrineweb.com/thyroid cancer](http://www.endocrineweb.com/thyroid%20cancer).

# Average values of alcohol metabolizing enzymes in serum of Adults in Mongolia

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## ABSTRACT

Over consumption of alcohol and its negative effects on human life and social life has become one of the main concerns in Mongolia. According to the results of the study on consumption of alcohol and alcoholic beverages, "Causes and prevalence of risk factors of Non-communicable diseases and injuries", some 65.8% of the Mongolian population has a bad habit of drinking alcoholic beverages. Mongolian men (4.3%) and women (1.8%) aged 15-65 consume alcohol in dangerous amount, and of these 10% of men and 2.8% of women use alcohol which leads to long-term negative effects. Studies of genetic polymorphic isozymes of ADH and ALDH enzymes in Mongolians revealed that deficient ALDH2\*2 phenotype occurred frequently. Some research has been done to study genetic polymorphic isozymes of Alcohol Dehydrogenase (ADH) and Aldehyde Dehydrogenase (ALDH) enzymes but there are no studies on the level of these enzymes in the blood of Mongolians. Therefore, this study was conducted to determine the average level of ADH and ALDH activity, enzymes that break down alcohol in human blood, in the blood of Mongolians and develop evidence-based policy documents. The study was carried out using a combination of questionnaire and biochemical methods as in "STEPS survey", WHO, which studied risk factors of Non-communicable diseases. The study covered 1610 people aged 24-64 from 21 aimags and Ulaanbaatar city. Levels of ADH and ALDH activity were determined from the serum of the morning blood sample by Enzyme-linked immune-sorbent assay (ELISA). Data was entered and statistical analysis was performed on "SPSS 11.0 for Windows". The results of the study revealed that the level of ADH enzyme in blood serum of Mongolians was  $18.5 \pm 12.8$  ng/ml, which was relatively lower than in the blood serum of other nationalities.

**Keywords:** Alcohol Dehydrogenase, Aldehyde Dehydrogenase, consumption of alcohol

## INTRODUCTION

Some researchers concluded that determining of levels of ADH activity is one of the diagnostic tests for people addicted to alcohol and furthermore, is relevant for monitoring outcomes of treatment<sup>1</sup>. The researchers concluded that Enzyme-linked immune-sorbent assay method is more sensitive than the widely spread photometry method in determining the level of ADH and ALDH enzymes in biological fluids, tissues, homolysate, and blood serum<sup>2</sup>.

Some researchers determined the blood serum level of ADH activity using in the human serum by blazer substrate<sup>3</sup>. Sackler et al. concluded that women neutralize alcohol dependent upon the phase of the menstrual cycle<sup>4</sup>. Over consumption of alcohol and its negative effects on human life and social life have become one of the main concerns in Mongolia.

Mongolian men (4.3%) and women (1.8%) aged 15-65 consume alcohol in dangerous amount, and of these 10% of men and 2.8% of women use alcohol which leads to long-term negative effects<sup>5</sup>.

Studies of genetic polymorphic isozymes of ADH and ALDH enzymes in Mongolians revealed that deficient ALDH2\*2 phenotype occurred frequently. This was especially observed in chronic alcoholics, their deficiency of ALDH2\*2 phenotype is reduced of twice the amount and this proved to be one of genetic factors to limit alcohol consumption<sup>6</sup>.

Although there are studies to determine ADH and ALDH genetic polymorphic isozymes in Mongolians, currently there are no studies to determine their level in the blood. Therefore, this study aimed to determine the level of ADH and ALDH enzymes, and there is a need to conduct research for it and develop evidence-based policy documents.

## MATERIALS AND METHODS

The study was carried out using biochemical methods as in "STEPS survey", WHO, which studied the risk factors of Non-communicable diseases. Levels of ADH and ALDH activity were determined from the serum of the morning blood sample by Enzyme-linked immune-sorbent assay (ELISA).

The study covered 240 people aged 24-64 from 21 aimags and Ulaanbaatar city. Data was entered and statistical analysis was performed on "SPSS 11.0 for Windows".

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**RESULTS**

The average level of ADH was 17.6ng/ml (95%CI 17.5-17.7) for people aged 24-54 who participated in the study. There was a slight difference in average levels between

sexes with 18.5ng/ml (95%CI 18.4-18.6) for males and 16.2ng/ml (95%CI 16.1-16.3) for females, but this was not statistically significant (p=0.523), (Table 1).

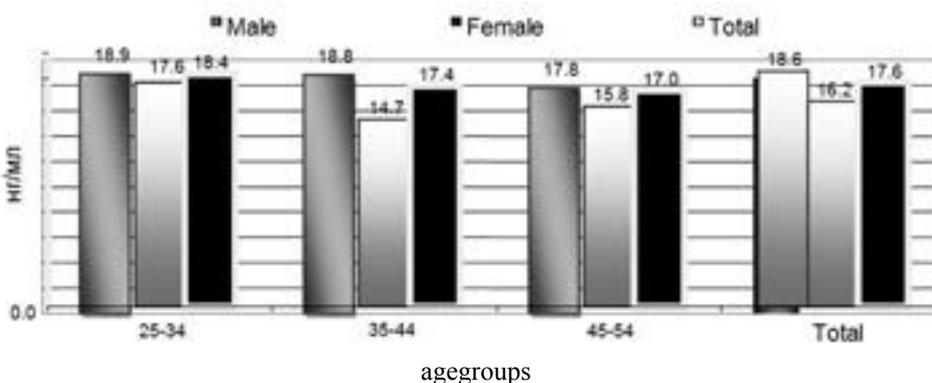
**Table 1. Average level of ADH in blood by age and sex, ng/ml**

Age group	Male			Female			Total		
	N	Average	95% CI	N	Average	95% CI	N	Average	95% CI
25-34	38	18.9	18.7-19.0	38	17.6	17.4-17.8	76	18.4	18.2-18.5
35-44	46	18.8	18.6-19.0	43	14.7	14.5-14.9	89	17.4	17.2-17.5
45-54	36	17.8	17.7-17.9	39	15.8	15.6-16.0	75	17.0	16.9-17.1
Total	120	18.5	18.4-18.6	120	16.2	16.1-16.3	240	17.6	17.5-17.7

There were no differences in average level of ADH in the age groups but 45-54 year olds' level of ADH in blood was relatively lower for both sexes compared to other age groups. For example, for 25-34 years old people the

average level of ADH in blood was 18.9ng/ml and 17.6ng/ml for males and females respectively whereas for 45 – 54 years old it was 17.8ng/ml and 15.8ng/ml for males and females respectively (Figure 1).

**Figure 1. Average level of ADH in blood by age groups and sex, ng/ml**



There was a slight difference of average level of ADH regarding the place of living. Average level of ADH of people aged 25-34 living an urban area was 13 ng/ml

(95%CI 12.9-13.0) whereas people living in rural area was 20.6 ng/ml (95%CI 19.7-19.9) (Table 2).

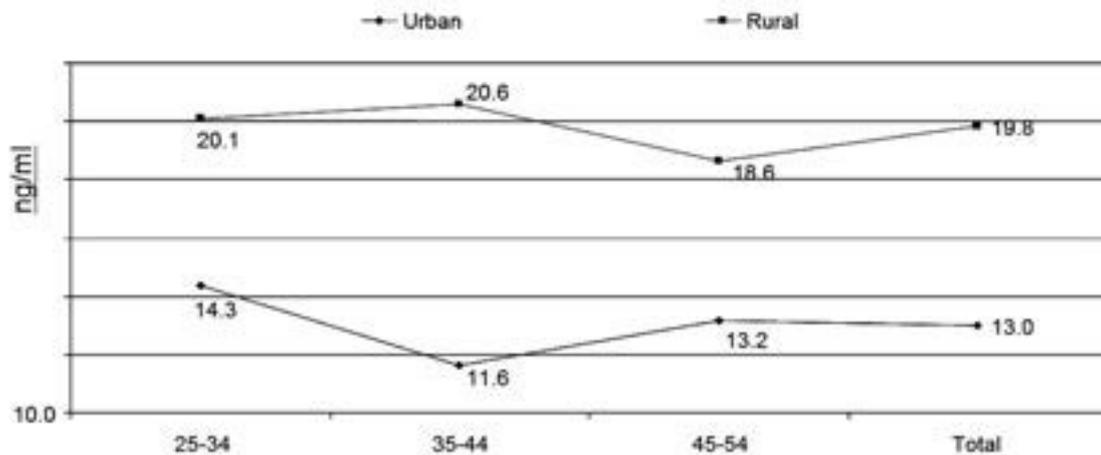
**Table 2. Average level of ADH in blood by place of living, ng/ml**

Place of living Age group	Male			Female			Total			
	N	Average	95% CI	N	Average	95% CI	N	Average	95% CI	
Urban area	25-34	10	14.3	14.2-14.5	11	14.4	14.3-14.4	21	14.3	14.2-14.4
	35-44	15	12.6	12.5-12.7	12	10.0	9.9-10.1	27	11.6	11.5-11.7
	45-54	10	15.5	15.4-15.6	10	9.1	9.1-9.2	20	13.2	13.1-13.2
	Total	35	14.0	13.9-14.0	33	11.6	11.5-11.6	68	13.0	12.9-13.0
Rural area	25-34	28	20.6	20.4-20.7	27	19.4	19.1-19.6	55	20.1	19.9-20.2
	35-44	31	22.2	22.0-22.4	31	17.6	17.4-17.9	62	20.6	20.4-20.8
	45-54	26	18.9	18.7-19.0	29	18.3	18.1-18.5	55	18.6	18.5-18.8
	Total	85	20.6	20.5-20.6	87	18.5	18.4-18.7	172	19.8	19.7-19.9

Table 2 shows that there was a significant difference between the average levels of ADH of people aged 25-54 living in urban and rural areas (p=0.768). Average level of ADH of people aged 25-54 and living in urban area were

14 ng/ml (95%CI 13.9-14.0) for males and 11.6 ng/ml (95%CI 11.5-11.6) for females while people living in rural area were 20.6 ng/ml (95%CI 20.5-20.6) for males and 18.5 ng/ml (95%CI 18.4-18.7) for females (Figure 2).

Figure 2. Average level of ALDH in blood by place of living, ng/ml



There was a statistically significant difference between the average level of ALDH of people aged 25-54 living in urban and rural areas (p=0.001).

The outcomes of the study was to determine the level of Alcohol Dehydrogenase and the average level of ALDH

in the blood of people aged 25-54 was 15.9 ng/ml (95%CI 15.7-16.0). There was slight difference between sexes as follows: average level of ALDH in males was 16.5 ng/ml (95%CI 16.4-16.6) and 14.9 ng/ml (95%CI 14.7-15.0) in females (Table 3).

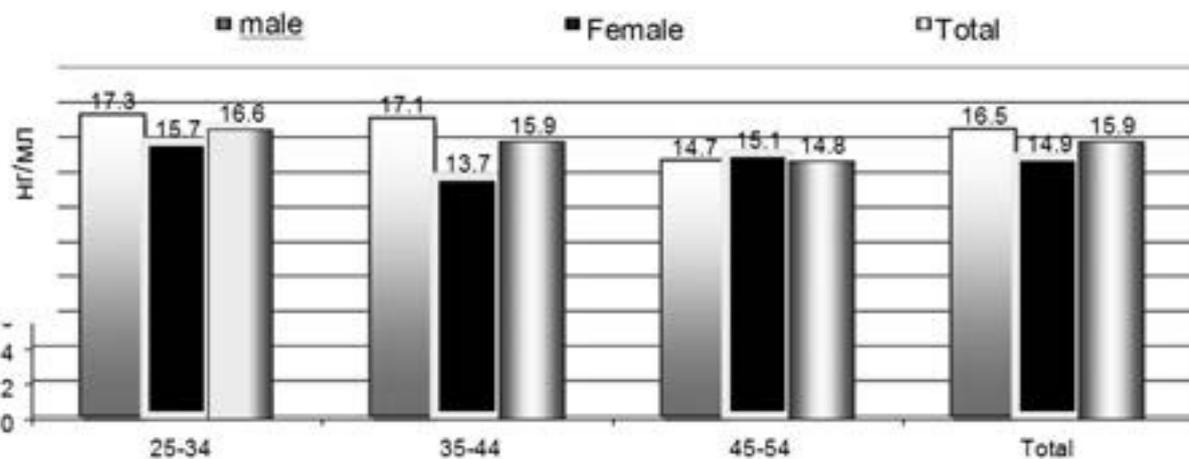
Table 3. Average level of ALDH in blood by sex and age, ng/ml

Age group	Male			Female			Total		
	N	Average	95% CI	N	Average	95% CI	N	Average	95% CI
25-34	38	17.3	17.1-17.5	38	15.7	15.4-15.9	76	16.6	16.4-16.7
35-44	46	17.1	16.9-17.3	43	13.7	13.5-13.9	89	15.9	15.7-16.0
45-54	36	14.7	14.5-14.9	39	15.1	14.8-15.3	75	14.8	14.7-15.0
Total	120	16.5	16.4-16.6	120	14.9	14.7-15.0	240	15.9	15.7-16.0

There was a slightly lower level of ALDH in the blood of people aged 45-54 compared to other age groups. The average level of ALDH in the blood of males and females aged 25-34 was 17.3 ng/ml and 15.7 ng/ml respectively

whereas the average level of ALDH of males and females was 14.7 ng/ml and 15.1 ng/ml respectively. This is shown in Table 4 and Figure 3.

Figure 3. Average level of ALDH in blood by age groups and sex, ng/ml



Comparison average level of ALDH of people by place of living revealed little difference. The average level of people aged 24-54 and living in urban area was 8.1 ng/ml

(95%CI 8.0-8.1) whereas average level of people in rural area of the same age group was 19.6 ng/ml (95%CI 19.5-19.7) (Table 4).

**Table 4. Average level of ALDH in blood by place of living, ng/ml**

Place of living Age groups	Male			Female			Total			
	N	Average	95% CI	N	Average	95% CI	N	Average	95% CI	
Urban	25-34	10	10.2	10.0-10.5	11	7.9	7.8-8.0	21	9.1	9.0-9.3
	35-44	15	6.3	6.2-6.4	12	8.1	8.0-8.3	27	7.0	6.9-7.1
	45-54	10	9.3	9.1-9.5	10	6.2	6.1-6.3	20	8.2	8.1-8.3
	Total	35	8.4	8.3-8.5	33	7.6	7.5-7.6	68	8.1	8.0-8.1
Rural	25-34	28	19.9	19.7-20.1	27	19.7	19.4-20.0	55	19.8	19.7-20.0
	35-44	31	23.0	22.8-23.3	31	17.1	16.8-17.4	62	21.0	20.8-21.1
	45-54	26	17.2	17.0-17.4	29	18.4	18.1-18.7	55	17.7	17.5-17.9
	Total	85	20.2	20.1-20.3	87	18.5	18.4-18.7	172	19.6	19.5-19.7

The level of ALDH of people aged 25-54 and living in urban areas was relatively lower than of people living in rural areas. The average level of ALDH of people aged 25-54 and living in urban areas was 8.4 ng/ml (95%CI 8.3-

8.5) for males and 7.6ng/ml (95%CI 7.5-7.6) for females whereas people living in rural areas was 20.2 ng/ml (95%CI 20.1-20.3) for males and 18.5 ng/ml (95%CI 18.4-18.7) for females (Figure 4).

**Figure 4. Average level of ALDH in blood by place of living, ng/ml**

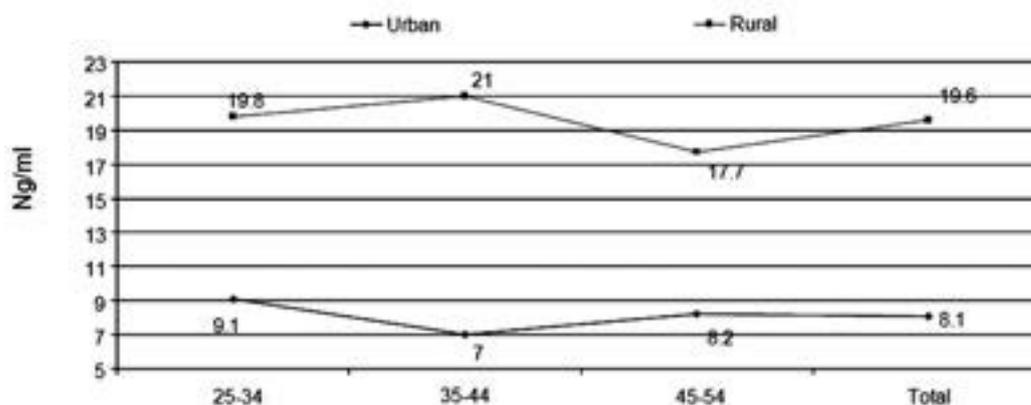


Figure 4 shows that the average level of ALDH of people aged 25-54 living in urban and rural areas differ. The average level of ALDH of people aged 25-54 and living in urban areas was twice as low (8.1 ng/ml (95% CI 8.0-8.1) compared to the average level of ALDH living in rural areas (19.6 ng/ml (95% CI 19.5-19.7)).

**DISCUSSION**

It was mentioned in the introduction part that no study on the serum levels of ADH and ALDH of Mongolians has been conducted to date. Therefore, we compared the results of our study with the data foreign researchers published in scientific journals. For this purpose, we chose the studies that used the same laboratory method of determination of serum levels of ADH and ALDH (ELISA).

Swiss researchers Raulph Buchler and Jean Pierre von Watburg determined the level of ADH activity in blood of relatively healthy people by ELISA. According to the

results of their study, the level of ADH of relatively healthy people (n=9) was 59±16 ng/ml whereas level of ADH of people suffering from a liver disorder (n=26) was 20 times higher (1310ng/ml)<sup>5</sup>. Studies of genetic polymorphic isozymes of ADH and ALDH enzymes in Mongolians revealed that deficient ALDH2\*2 phenotype occurred frequently. This was observed in chronic alcoholics, their deficiency of ALDH2\*2 phenotype is twice as low and this proved to be a genetic factor to limit alcohol consumption<sup>8</sup>. The study results show that the average level of ADH was 18.5±12.8 ng/ml, and minimal and maximal values were 0.14 – 92.04 ng/ml.

It is not possible to compare the results of this study with other studies' results due to differences in methods used to determine the level of ADH and ALDH activity. Most international research was conducted using a method of determining enzymes alcohol breaking down activity.

### CONCLUSIONS

1. The average level of ALDH of people who participated in the study was 15.9 ng/ml (95%CI 15.7-16.0); 16.5 ng/ml (95%CI 16.4-16.6) for males and 14.9 ng/ml (95%CI 14.7-15.0) for females.
2. The average level of ADH in the blood of people aged 25 – 54 was 17.6 ng/ml (95%CI 17.5-17.7); 18.5 ng/ml (95%CI 18.4-18.6) for males and 16.2 ng/ml (95%CI 16.1-16.3) for females.
3. The average level of ALDH of people aged 25-54 and living in urban and rural areas differ. The average level of ALDH of people aged 25-54 and living in urban area was twice as low (8.1 ng/ml (95% CI 8.0-8.1) compared to average level of ALDH living in rural areas (19.6 ng/ml (95% CI 19.5-19.7)).

### REFERENCES

1. Matej Kravos, Ivan Malesek and Susana Levanic, Serum alcohol dehydrogenase levels in patients with mental disorders, J Clini Chim Acta 2005; 361:86 – 94.
2. Rolf Buhler, PhD and Jean – Pierre von Wartburg, MD., Quantification of alcohol dehydrogenase in human tissue and serum by an Enzyme Linked Immunosorbent Assay, J Alcohol 1982; 6:506-511,.
3. Ali Reza Waladkhani, Peter Kunz, Werner Zimmermann and Michael Roland Clemens, Changes in human serum alcohol dehydrogenase activity during retinoic treatment of cancer patients, Sut J Alcohol Alcohol 1997; 32:739-743.
4. Sutker P. B., Goist K. C., Allain A. N., and Bugg F. Acute alcohol intoxication: sex comparison on farmacokinetics and mood measures, Alcoholism, 1998; 11: 507 – 512.
5. Elena K, The center of Mental Health and Narcology, The report, research of the harm epidemiology, Mongolian usage of the alcohol, Ulaanbaatar, 2006.
6. Ayush D, The research result of the Mongolian ethyl spirit exchange of Alcohol Dehydrogenase ferment immunity polymorphous formation. Medical Research results 1997; 309-310.

# Prevalence of depression risk factors among elderly

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## ABSTRACT

In Mongolia, number of surveys has been completed on prevalence of mental diseases, but there is a lack of surveys on determining depression of the elderly, so this became a background for the research. In this cross-sectional study, one cluster from each of the five regions of Mongolia was randomly chosen and total 1207 elderly aged 60 years and over for men and 55 years and over for women were recruited in the study. The research was conducted by using the internationally recognized Geriatric Depression Test<sup>6</sup> with 30 items, which reveals depression, ADL<sup>7</sup> and IADL<sup>8</sup> tests. There were 392 males and 815 females in the survey. Some 16.5% (199) of patients were found to have depression and among patients with depression there were 27.6% (55) males and 72.3% (144) females, which had statistical significant difference of  $p=0.001$ . Depression was found in 165 patients in 1000 elderly. The mean age of elderly with depression was 67.9, 67.1±10 and 70.2±7.2 in males and females respectively. Some 25.5% of patients were in Gobi and 40.1% in Khangai region, which were considered to be higher compared to other regions. There was found significant correlation of depression with region ( $P<0.0001$ ). In conclusion, the prevalence of depression among Mongolian elderly is found to be 165 per 1000. Depression of the elderly is dependent from gender, educational background, income, marital status and family members whom they live with.

**Key words:** Elderly, depression, diseases, Activities of Daily Living

## INTRODUCTION

In the world, the first attempt to determine the prevalence of mental disorders was made by French psychiatrists Pinel and Escirole. Mongolian psychiatrist Sh.Dorjadamba began to study on this issue and published a paper "The prevalence of mental diseases among population of Khorshoolol subdistrict of Ulaanbaatar city" in 1965.

There is number of surveys for depression worldwide. Depression is not only a disease which manifests in relation to many physical illnesses, but it strongly affects the quality of life of elderly. According to USA survey result, depression is accurately correlated with stroke, which is the complication of high blood pressure and cerebro-vascular diseases<sup>1</sup>.

Depression is one of the actual diseases among psychological disorders, which affect elderly and it occurs in 1% of elderly above 65 years<sup>2</sup>, 60 % of inpatients in geriatric departments<sup>3</sup> and 30% of inpatients in emergency

department<sup>4</sup>. The researchers found that the Activities of Daily Living (ADL) of elderly decreases in severe types of depression and in some cases they become dependent on others.

In the current changing period of morbidity of population due to social and economic transition, the research team aimed at determining the prevalence of depression and interaction of other diseases among elderly, correlation of demographic indicators, and decrease of ADL followed by depression.

Although, in Mongolia, a number of surveys have been completed determining the prevalence of mental diseases, but we lack a surveys and information on mental diseases among the elderly, in particular on determining depression, so it became the background of the research. To determine the correlation between the prevalence of depression and some factors, which affect it. In order to fulfill our goal we made the following objectives:

1. To determine prevalence and composition of depression among Mongolian elderly
2. To find out some social, demographic and health factors of elderly with depression

## MATERIALS AND METHODS

According to 2007 data population of Mongolia was 2635 thousand people and 4.4% of them were elderly. There

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were 1207 elderly recruited in to the study. Gender ratio, proportion of urban and rural elderly among all population by accounting. Mongolia is divided into 21 provinces and Ulaanbaatar city. The provinces divided into five economic and geographic regions.

In this cross-sectional study, one cluster from each of the five regions of Mongolia was randomly chosen and total 1207 elderly aged 60 years and over for men and 55 years and over for women were recruited in the study. The research was carried out in Ulaanbaatar city, which represented urban area, Ulgii of Bayan-Ulgii and Dalanzadgad of Umnugobi represented the provinces, Kherlen soum of Dornod, Ikh-Uul soum of Khubsgul, and Bulgan soum of Umnugobi represented the soum. The research team was trained in advance, and doctors and social workers worked as researchers.

The research was conducted by using the internationally recognized GDS<sup>5</sup> (Geriatric Depression Scale) with 30 items, which reveals depression, ADL<sup>6</sup>, and IADL<sup>7</sup> tests. The internationally accepted tests were translated into Mongolian, and were approved by Academic Board of the School of Medicine, Health Sciences University of Mongolia.

According to scores of Geriatric Depression Test, scores from 0 to 9 refer to normal, scores between 10 and 19 to mild and scores 20-30 to severe type of depression.

For ADL, people who had score 6 assessed as normal, scores from 3 to 5 as partially dependent on others and scores up to 2 as fully dependent.

In terms of IADL evaluation, score 8 considers as normal, scores between 4 and 7 as IADL impaired moderately, finally scores up to 3 as IADL impaired severely.

Interviews were taken by face-to-face design at home. Although 7% elderly involved in the survey were illiterate, they did not cause any difficulties in the survey.

## **RESULTS**

The survey involved 1207 elderly, 32.5% (392) males and 67.5% (815) females. Some 63% (975) of them referred to the age group of 60-75. Their mean age was 68.1±8.1 (68.9±6.5 in males and 65.7±8.5 in females).

In the survey, 16.5% (199) of elderly were found to have depression. Among patients with depression there were 27.6% (55) males and 72.3% (144) females, which had statistical significant difference of  $p=0.001$ . The male:female ratio 1:2, and depression in terms of prevalence is estimated to be 14% in males and 21.3% in females. Depression was found in 165 in 1000 elderly. The mean age of depressed elderly was 67.9, 67.1±10 and 70.2±7.2 in females and males respectively.

By classification, there are mild and severe types of depression.

Among the involved 1207 elderly, 16.5% (199) had depression and with no difference in age group, however there was statistically significant difference in gender in registered cases .

The family status was found to have statistically significant difference in males and females elderly. In the study 50.5% lived with a spouse, 68.6% of them males and 41.7% females. However, there were 3.7 times more widowed women than men. Depression among elderly is differed in the city and countryside with statistical significant difference. It was determined that 7.4% of elderly in the city and 22.3% of elderly in the countryside found to have depression ( $p<0.0001$ ).

The results showed that depression is higher in the age group of 55-59 and over 80 compared to other age groups. In particular, depression is detected in one fifth of elderly aged over 80. However, 11.8-12.1% of elderly had depression in age groups 60-64 and 75-79, which is considered to be the lowest. Though there was statistical difference between age groups ( $p<0.0001$ ) there is no significant difference in the city, but differs in the countryside.

Some 65.7% of depressed elderly who live in a city referred to be a widow and 28.6% lived with a spouse while 30.5% and 38.4% elderly with depression in the countryside were widow and lived with spouse respectively. Therefore, depression among elderly is correlated to their family status ( $p<0.0001$ ).

**Table 1. Depression of elderly by age group and marriage**

Indicator	Male		Female		P value	City		Countryside		P value
	Total Quantity (%)	Of which with depression Quantity (%)	Total Quantity (%)	Of which with depression Quantity (%)		Total Quantity (%)	Of which with depression Quantity (%)	Total Quantity (%)	Of which with depression Quantity (%)	
Age group					0.001					0.0001
55-59	-	-	241 (100)	44(18.3)		91(100)	8(8.8)	150(100)	36 (24)	
60-64	114 (100)	13 (11.4)	166 (100)	20(12)		126 (100)	6(4.8)	154(100)	27(17.5)	
65-69	113 (100)	17 (15)	161 (100)	27 (16.8)		107 (100)	10 (9.3)	167(100)	34(20.3)	
70-74	87 (100)	9 (10.3)	120 (100)	27(22.5)		81(100)	5 (6.2)	126 (100)	31(24.6)	
75-79	48 (100)	9 (18.8)	68 (100)	6 (8.8)		32 (100)	2(6.3)	84 (100)	13(15.5)	
80-84	20 (100)	4 (20)	35(100)	8 (22.9)		25(100)	3 (12)	30(100)	9 (30)	
>85	10 (100)	3 (30)	24 (100)	12(50)		11 (100)	1 (9)	23(100)	14 (60.8)	
Marital status					0.002					0.0001
Not married	22 (100)	5 (22.7)	59 (100)	9 (15.3)		11(100)	2 (18.2)	70(100)	12(17.1)	
Widowed	93 (100)	20(21.5)	349 (100)	53 (15.2)		231(100.)	23 (10)	211(100)	50(23.7)	
Divorced	8 (100)	2 (25)	67 (100)	37 (55.2)		-	-	74 (100)	39(52.7)	
Married	269 (100)	28(10.4)	340 (100)	45 (13.2)		230 (100)	10 (4.3)	379 (100)	63(16.6)	
Total	392 (100)	55 (14)	815	144 (17.6)		473 (100)	35 (7.4)	734 100)	164 22.3)	

**Table 2. Depression status of elderly by region and marital status**

	No depression	With mild depression	With severe depression	P value
<b>The depression status</b>	<b>66.4 (801)</b>	<b>28.3 (341)</b>	<b>5.4 (65)</b>	
In regions				<0.0001
Western	73.1 (128)	24.6 (43)	2.3 (4)	
Eastern	75.4 (138)	24.6 (45)	0	
Central	77.2 (365)	19.9 (94)	3 (14)	
Mountainous	33.3 (64)	50 (96)	16.7 (32)	
Gobi	57.6 (106)	34.2 (63)	8.2 (15)	
Marital status				0.0001
Married	72.1 (439)	24.1 (147)	3.8 (23)	
Widowed	65.4 (289)	30.3 (134)	4.3 (19)	
Single	69.1 (56)	18.5 (15)	12.3 (10)	
Divorced	22.7 (17)	60 (45)	17.3 (13)	

The proportion of elderly, who have a risk to be affected by depression was 13.1% (158). However, 14% (169) of them were affected by mild depression and 2.5% (30) of them experienced severe depression.

There were 25.5% of elderly with depression in the Gobi region and 40.1% in Khangai region, which was considered to be higher compared to other regions. The depression picture and its prevalence significantly correlated with the region ( $P < 0.0001$ ).

Depression among elderly was determined to be lower for the elderly who live with their spouse, while it was the highest or 55.2% in the divorced women and higher for the unmarried and divorced men.

Depression among all elderly is dependent on their educational background ( $p < 0.0001$ ). Along with the decline of educational background the depression rate increased, 31.3% of non-educated elderly males and 42.6% of elderly females were found to have depression, which was estimated to be higher compared to other levels of education. However, depression among elderly who lived

in the city and countryside is differed statistically in terms of educational level. There was not any difference for the elderly who lived in the city with no education or primary education, but 60.8% of non-educated elderly who live in the countryside suffered from depression.

The depression among elderly who live with their spouse or children is estimated to be lower (10.6-14.5%), while 34.8% of elderly who live with their relatives and 33.3% of elderly who live with their partner, which considered to be higher.

In terms of income, 50.3% of depressed elderly had income of up to 100000 tugrug per month, 41.2% 100000-150000 and 8.5% 150000 and above. In depressed elderly male 41.8% of them had income of up to 100000 tugrug per month, 50.9% 100000-150000 tugrug and 7.3% above 150000 tugrug. Moreover, 53.8% of depressed elderly female had income of up to 100000 tugrug per month, 37.5% 100000-150000 tugrug and 9% above 150000 tugrug.

**Table 3. Some demographic indicators of depressed elderly (by gender, city and countryside)**

Gender	Male		Female		P value	City		Countryside		P value
	Quantity	Percent	Quantity	Percent		Quantity	Percent	Quantity	Percent	
Education					0.1					0.08
Primary	23	18	64	21.1		10	10.1	77	23.2	
Incomplete secondary	8	9.6	18	10.8		5	3.9	21	17.4	
Complete secondary	3	6.3	22	16.9		9	9.9	16	18.4	
Specialized secondary	5	13.2	10	11.5		5	8.6	10	14.5	
Diploma education	7	10.6	4	6		2	2.6	9	16.1	
No education	9	31.3	26	42.6		4	10.3	31	60.8	
Family members					0.064					0.0001
With spouse	12	6	17	8.5		1	0.5	28	14	
With spouse and children	16	4.1	27	6.8		9	2.3	34	5.6	
No spouse, with other family members	15	3.1	79	16.4		21	4.4	73	15.1	
With relatives	3	13	5	21.7		0	0	8	34.8	
With partner	1	33.3	0	0		1	33.3	0	0	
Single	8	7.7	16	15.4		3	2.9	21	20.2	
Income					0.5					0.04
<100000	23	16.5	77	15.6		22	8.7	78	20.5	
100001-150000	28	16.6	54	22.5		8	6.3	74	26.2	
150001-200000	3	5.7	10	22.2		3	6.8	10	18.5	
200001-250000	-		1	9.1				1	11.1	
250001-300000	1	12.5	1	12.5		1	10	1	16.7	
>300000			1	5.9		1	4.2			
Total	392 (100)	55 (14)	815	144 (17.6)		473 (100)	35 (7.4)	734 (100)	164 (22.3)	

Income of elderly with depression differs compared to the city and countryside (P=0.04). However, 1 in 4-5 elderly who live in the countryside and have income up to 150000 tugrug are found to have depression, in a city 1 in 10 respectively.

The co-morbidities among the 1207 elderly in the survey were diseases of cardiovascular system. In terms of gender, men were affected more by cardiovascular diseases while women by diseases of urogenital system. The correlation of co-morbidities and depression of involved elderly is as shown below:

**Table 4. The correlation of depression and other prevailing diseases which affect elderly**

Diseases	OR	95.0% CI		P value
		Lower	Upper	
Arrhythmia	0.442	0.292	0.668	0.000
Stroke	0.410	0.209	0.804	0.009
Chronic bronchitis	0.399	0.172	0.925	0.032
Chronic inflammation of kidney	0.787	0.536	1.155	0.221
Osteoarthritis	0.663	0.445	0.986	0.042
Anxiety	0.091	0.062	0.134	0.000
Atherosclerosis	0.945	0.126	7.090	0.956
Asthma	0.309	0.190	0.504	0.001
Polyarthritis	0.846	0.557	1.284	0.432

It was revealed that elderly who are affected by arrhythmia, anxiety and asthma were prone to have depression and results were statistically significant (p<0.0001). Depression and some co-morbidities were directly correlated.

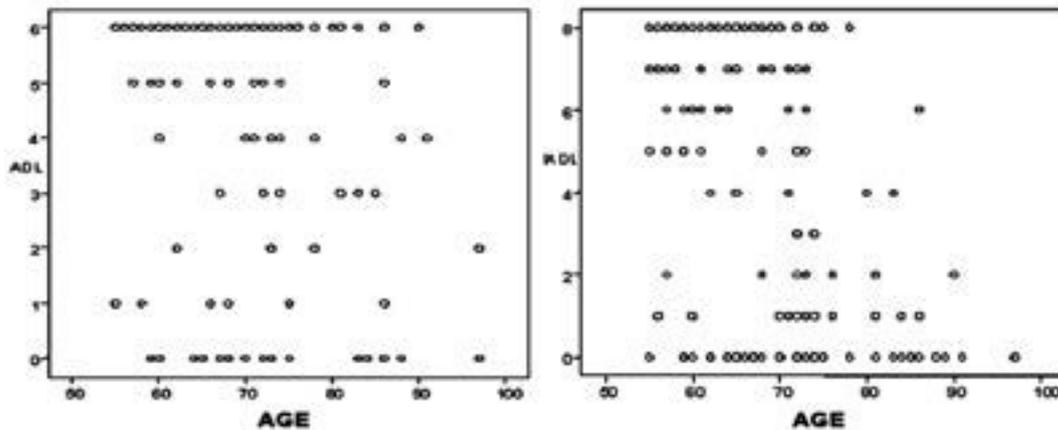
In this research, 40.7% of elderly had anxiety and 13.1% had a risk for anxiety, and 29.2% had low level of anxiety. However, 5.6% of elderly who had a severe level of anxiety had severe depression. Elderly depression and anxiety had a direct correlation (r=0.5).

**Table 5. Survey involved depressed elderly (ADL and IADL points)**

Activities of Daily Living (6)			P value
No depression	With depression		
Points	5.3±1.4	4.5±2.2	<0.0001
Instrumental Activities of Daily Living (8)			P value
No depression	With depression		
	6±2.8	4.8±3.3	<0.0001

When the loss of ADL and IADL was compared regarding age of elderly with depressed, it was found that the loss of IADL was predominant with ageing.

**Figure 1. Decrease of Activities of Daily Living and Instrumental Activities of Daily Living for depressed elderly (by age)**



ADL (Activities of Daily Living) of elderly was determined by assessing abilities of bathing, dressing, toileting, transferring, continence and eating, and then compared groups of with and without depression.

Bathing, dressing, toileting, transferring, continence and eating abilities had statistically significant difference between with and without depression groups. ADL of elderly was significantly decreased due to depression ( $p < 0.0001$ ).

**Table 6. Depression, Activities of Daily Living and Instrumental Activities of Daily Living (n-1207)**

ADL and IADL	Total		No depression		With depression		ANOVA
	n	%	n	%	n	%	
<b>Activities of daily living (ADL)</b>							
Bathing							P<0.0001
Able	981	81.28	849	84.2	132	66.3	$\chi^2=241$
Unable	226	18.72	159	15.8	67	33.7	F=12.3
Dressing							P<0.0001
Able	1061	87.9	915	90.8	146	73.4	$\chi^2=241$
Unable	146	12.1	93	9.2	53	26.6	F=12.3
Toileting							P<0.0001
Able	1102	91.3	939	93.15	163	81.9	$\chi^2=200.9$
Unable	105	8.7	69	6.85	36	18.1	F=39.5
Transferring							P<0.0001
Able	1056	87.49	905	89.782	151	75.9	$\chi^2=230.8$
Unable	151	12.51	103	10.218	48	24.1	F=37.7
Continence							P<0.0001
Able	1117	92.5	945	93.8	172	86.4	$\chi^2=154.7$
Unable	90	7.5	63	6.3	27	13.6	F=16.6
Eating							P<0.0001
Able	1015	84.1	871	86.4	144	72.4	$\chi^2=267.3$
Unable	192	15.9	137	13.6	55	27.6	F=35.6

**Table 6. Instrumental Activities of daily living (IADL)**

Using the telephone								P<0.0001
Able	803	66.5	707	70.1	96	48.2	$\chi^2=599.5$	
Unable	404	33.5	301	29.9	103	51.8	F=58.4	
Shopping								P<0.0001
Able	895	74.2	778	77.2	117	58.8	$\chi^2=481.8$	
Unable	312	25.8	230	22.8	82	41.2	F=48.7	
Meal preparation								P<0.0001
Able	925	76.6	794	78.77	131	65.8	$\chi^2=462$	
Unable	282	23.4	131	65.83	68	34.2	F=33.4	
Doing housework								P<0.0001
Able	818	67.8	706	70.04	112	56.3	$\chi^2=527.6$	
Unable	389	32.2	302	29.96	87	43.7	F=34.9	
Doing laundry								P<0.0001
Able	818	67.8	706	70.04	112	56.3	$\chi^2=260.4$	
Unable	389	32.2	302	29.96	87	43.7	F=14.5	
Outside walking								P<0.0001
Able	945	78.3	815	80.9	130	65.3	$\chi^2=421.2$	
Unable	262	21.7	130	65.3	69	34.7	F=43.8	
Taking medication								P<0.0001
Able	916	75.9	810	80.4	106	53.3	$\chi^2=324.1$	
Unable	291	24.1	198	19.6	93	46.7	F=65.4	
Handling personal finance								P<0.0001
Able	930	77.1	805	79.86	125	62.8	$\chi^2=431.1$	
Unable	277	22.9	203	20.14	74	37.2	F=51.8	

Among elderly in the survey, the mean of ADL was 87.4%, of which, the following abilities such as: continence (92.5%), toileting (91.3%), and dressing (87.9%) were better while the bathing ability was impaired mostly in 18.2%.

The loss of IADL (Instrumental Activities of Daily Living) was found to be 29.9%, of which 24.1% was for elderly who had no depression while 53% for depressed elderly. IADL, in particular, using the telephone, shopping, meal preparation, doing housework, doing laundry, transferring, taking the medication, and handling personal finance activities were found in 13.7-61.8% less in depressed elderly compared to non-depressed and the above mentioned abilities had decreased for depressed elderly with statistically significant difference ( $p<0.0001$ ). Among IADL in depressed elderly, mostly decreased

transferring, meal preparation and taking medication respectively. Although housework and laundry abilities were decreased, it was decreased in less percentage than other abilities.

## DISCUSSION

The survey results were compared to research outcomes of Poland because the social structure of this country was more close to ours and Saudi Arabia's percentage of elderly in population were similar to our country, while Mexico's social structure was completely different.

Saudi Arabia researchers Al-Shammari, S.A. and A. Al-Subaie (1999) carried out a survey involving 7970 elderly by using the Geriatric Depression Scale and proved that it was an easy and effective tool<sup>8</sup>. This study also used this method in the research and it revealed similar results

Chan, M.F. and W. Zeng in Makao (2004) discovered that 11.9% of survey involved 1042 women aged 60-98 years old, were estimated to have depression. Their outcome that high blood pressure is correlated to depression of elderly women ( $p=0.001$ ) is corresponding to the research results<sup>9</sup>. Poland researchers Bien, B., Z.B. Wojszel, and J. Wilmanska (2000) carried out research in Vialistok among elderly 70 years and over and determined that 69.2% of elderly women with chronic diseases had loss of ADL and the depression among them was higher than men<sup>10</sup>. It was similar to our result that depressed elderly women with chronic diseases were identified more than elderly men. In the research of Arias-Merino, E.D., et al., in Mexico 451 elderly were involved aged between 60-104 and found that depressed elderly may have cognitive impairment with statistically significant difference, which was similar to the current study's results<sup>11</sup>.

According to research by Heslin, J.M and others from Ireland (2001), common diseases among elderly were found to be depression and anxiety, the treatment outcome was directly correlated to ADL impairment<sup>12</sup>. The Poland researchers Viyin V and Vojiszal (2000) discovered through cross sectional study covered 117 elderly above 70 years old in Vialistok city that 69.2% of them were found to have ADL impairment<sup>13</sup>. Due to the current research depression and ADL decrease were correlated, which corresponds to Heslin's study and ADL impairment was 69.2% according to Viyin, which was higher compared to the research. According to current research the ADL impairment was found in 29.9% of total elderly, while IADL impairment was revealed in 53% of elderly with depression.

In the result of research done by Al-Shammari S.A. and A. Al-Subaie (1999), Saudi Arabia, the mean age and standard deviation of survey involved 7970 elderly was  $68.8 \pm 7.7$  (for male  $69.1 \pm 7.7$  and for female  $67.7 \pm 7.5$ ), which coincided to the middle age of the survey involved elderly<sup>14</sup>. Depression was presented in 39% (3110) of all elderly, of which 8.4% had severe depression, whereas, depression was presented in 16.5% of this study's elderly. Among Saidi Arabic elderly, depression was dependent on primary education ( $p=0.001$ ), unemployment ( $p=0.001$ ); divorce, widow ( $p=0.001$ ) and old-old age women ( $p=0.001$ ); in Mongolia it was also identified more for elderly who had primary education, no education, and same time for women, divorced and widow women, so that we can conclude that the results were same.

According to this research, the depression was differed in terms of total elderly ( $p<0.0001$ ), however, there was not any difference in terms of age group in the city, but a difference in the countryside, which might be related to less detection of depression in the city.

The prevalence of depression, among Mongolian elderly was found 165 in 1000, which took second place among prevalence of mental and behavioral disorders. The depression is revealed more in cardiovascular patients, which took the highest prevalence. Subsequently, in further it has been determined from the research that it is essential to pay attention on diagnosing, screening and treating the depression.

### CONCLUSIONS

1. The prevalence of depression among Mongolian is found to be 165 per 1000.
2. The prevalence of depression was identified in more percentage for the elderly who diagnosed to have cardiovascular and urogenital diseases.
3. Gender, educational background, marital status and income affects the depression of the elderly.

### REFERENCES

1. Kales HC, Maixher DF, Mellow AM, Cerebrovascular disease and late-life depression. *Am J Geriatr Psychiatry*, 2005;13:88-98.
2. Heithoff K., Does the ECA underestimate the prevalence of late life depression? *J Am Geriatric Soc*, 1995; 43:2-6.
3. Spar, J., Ford CV., Liston EH., Hospital treatment of elderly neuropsychiatric patients, II; statistical profile of the first 122 patients in a new teaching ward. *J. Am Geriatric Soc*, 1980; 28: 539-543.
4. Gurland GJ., Cros PS., Epidemiology of psychopathology in old age. *Psychiatry Clinic North Am*, 1982; 5: 11-26.
5. Brink T.L., Yesavage J.A., Screening tests for geriatric depression. *Clinical Gerontologist* 1982;1:37-44.
6. James E. Spar., Asenath la Rue., Activities of daily living scale. *Geriatric psychiatry*. 1997; 284
7. James E. Spar., Asenath la Rue., Instrumental activities of daily living scale. *Geriatric psychiatry*. 1997; 285.
8. Al-Shammari, S.A. and A. Al-Subaie, Prevalence and correlates of depression among Saudi elderly. *Int J Geriatr Psychiatry*, 1999; 14: 739-47.
9. Chan, M.F. and W. Zeng, Investigating factors associated with depression of older women in Macau. *J Clin Nurs* 2009; 18: 2969-77.
10. Bien, B., Z.B. Wojszel, and J. Wilmanska, Care of the frail elderly in population studies. *Pol Merkur Lekarski*, 2000; 9: 775-8.
11. Arias-Merino, E.D., et al., Correlates of cognitive impairment in elderly residents of long term care institutions in the metropolitan area of Guadalajara, Mexico. *J Nutr Health Aging*, 2003.7: 97-101.

12. Heslin, J.M., et al., Health status and service utilisation of older people in different European countries. *Scand J Prim Health Care*, 2001;19:218-22.
13. Bien, B., Z.B. Wojszel, and J. Wilmanska, Care of the frail elderly in population studies. *Pol Merkur Lekarski*, 2000; 9 (53): 775-8.
14. Al-Shammari, S.A. and A. Al-Subaie, Prevalence and correlates of depression among Saudi elderly. *Int J Geriatr Psychiatry*, 1999; 14(9) : 739-47.

# An outbreak of shigellosis in a day care center, Ulaanbaatar, Mongolia, 2010

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## ABSTRACT

On January 29, a report on diarrhea outbreak was received from Mongolian-Russian Joint School No. 3. We conducted investigation to identify the source of outbreak and to make recommendations to prevent further outbreaks. We defined a case as two and more loose stools or one and more bloody or mucus stool within 24 hours in a person from Mongolian-Russian Joint school No 3 on January 28-31, 2010. We sent specimens of stool and vomiting for laboratory testing. We searched for cases using by telephoning or visiting the infectious disease hospital, face to face interview with the pupils, teachers, food handlers and employees. We conducted a retrospective cohort study to identify the source of infection. We identified 151 cases among 204 pupils of day care center (Attack rate=74%) between January 28-31, 2010. The attack rate was highest among pupils preparation grades (25%), followed by 1-3<sup>rd</sup> grade (18%). The shape of epidemic curve indicated a point source outbreak. 18% of 156 specimens tested were positive for *Shigella flexneri* 2a. Bivariate analyses identified pirojki (RR=1.9 (1.4-2.7)) and carrot salad (RR=1.4 (1.2-1.7)) as the food items associated with illness. Further stratification analyses identified only piroshky (RR=2.8 (1.1-7.3)) was the food associated with outbreaks. An outbreak caused by *Shigella Flexneri* 2a with high attack rate about 74%. Piroshky may have been the source of food-borne shigellosis outbreak. However, the method of contamination of the piroshky is not clearly understood.

**Key words:** *Shigella flexneri* 2a, outbreak, day care center

## INTRODUCTION

Shigellosis is an acute bacterial disease involving the distal small intestine and colon caused by one of four shigella species. *Shigella* serotypes are transmitted by direct or indirect fecal-oral contact, and outbreaks occur in crowded conditions and where personal hygiene is poor, such as in prisons, institutions for children, day care centers and mental hospitals(1). Reported cases of shigellosis represent only a small proportion of cases, even in developed areas. Infection may occur after the ingestion of contaminated food or water as well as from person-to-person (1). Shigellosis is a notifiable disease in Mongolia. Annually approximately 2000 cases notified to the Government Agency Health Department. In 2009, a total of 3099 cases (11.7 cases per 10.000 populations) were reported, most occurred in young children aged 0-4 years and most the cases were caused by *Shigella Flexneri* (2). In 2004, 2006 years occurred two large outbreaks of shigellosis in dormitory of Umnogovi province (3) and Darkhan province (4). This is third large outbreak of shigellosis which occurred during last 7 years. Event notification

At 13:30 pm, January 29, 2010, an employee of the Mongolian-Russian joint school No. 3, reported to the Surveillance Department of National Centre for

Communication Diseases (NCCD) that some pupils were suffering from diarrhea, high fever, abdominal cramp and other symptoms such as vomiting, nausea, headache, malaise and chills in his school.

The secondary school is located in Sukhbaatar district of Ulaanbaatar city. A total of 1826 pupils attend to the school and 218 of them staying at day care center which located near of the school in the morning or afternoon. School cafeteria provides lunch for children of the day care center. On January 29, we initiated an investigation with the objectives of assessing the magnitude of the outbreak, identifying the agent and the source of infection, initiating control and preventive measures and identifying gaps in disease surveillance activity.

## MATERIALS AND METHODS

The outbreak investigation and response team consisted in epidemiologists of NCCD, 4 FETP trainees, clinicians and a microbiologist.

### Descriptive epidemiology

We collected information on demographics, clinical symptoms, disease onset and grades of pupils with acute gastroenterocolitis to generate hypotheses about potential exposures that would be common to all cases. Based on preliminary information, we defined a case of the disease as two and more loose stools or one and more bloody or mucus stool within 24 hours in a person from Mongolian-Russian Joint school No 3 January 28-31. We searched

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cases through interview of patients and their parents and teachers aggressively. Data was entered in excel and analyzed using Epi-info software. We described illnesses by onset of disease, age, sex and clinical symptoms, and calculated grade-specific attack rates and drew an epidemic curve.

**Analytical epidemiology**

Review of the descriptive epidemiology findings led us to generate the following hypotheses. Pupils who ate contaminated foods in the day care center caused the outbreaks. To test the hypothesis, we conducted a retrospective cohort study. The day care center was selected for the cohort study because most of cases were clustered around it. We defined a case of two and more loose stools or one and more bloody or mucus stool within 24 hours in a person from day care center of Mongolian-Russian Joint school No 3 January 28-31.

We collected information on symptoms, date and time of symptom onset and food consumption by standardized questionnaire. For each exposure, we calculated the relative risk (RR) of becoming a case using the chi-square test.

**Laboratory analyses**

**Human stool and vomiting samples**

We collected stool and vomiting samples from pupils and employees with acute gastroenterocolitis and sent them for culture and isolation at the NCCD laboratory. Those were tested using Gram staining, culturing, identification by

VITEK.

**Food items and environmental swabs**

At school cafeteria meal items are routinely sampled and samples are kept for 72 hours. The State and Ulaanbaatar city Inspection Agencies tested the food samples which were prepared between January 27-29, water (tap and bottled) and raw materials, swabs from cup, spoon, dish dryer, cutting boards, utensils and freezer's handle for sanitary microbiology testing.

**Human subject protection**

Since this work was conducted in the context of an emergency response to an outbreak, it was exempt from ethical committee approval.

**RESULTS**

**Descriptive epidemiology**

We identified a total of 165 cases that met the case definition among the 2004 persons of Mongolian-Russian Joint School No3 (Overall attack rate: 8.2 %). There were 0 deaths. The attack rate was highest among pupils of the preparation grade (25%), followed by 1-3<sup>rd</sup> grade (18%)

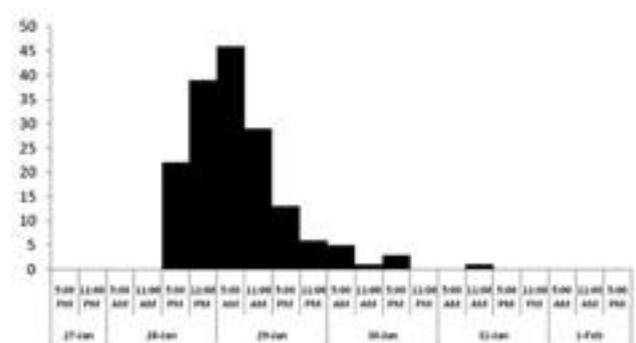
(Table2). 151 cases of 165 were clustered around the day care center. Median age was 8 years (range: 5-11 years); 124 (60.8 %) were female. Predominant symptoms were diarrhea (100 %), fever >38° C (92%), headache (87%), abdominal cramps (84%), headache (68 %), lose appetite (56%), nausea (54%) and vomiting (53%) (Table1).

**Table1: Frequency of selected signs and symptoms of Shigellosis among pupils of Mongolian-Russian joint school No.3 during outbreak, Ulaanbaatar, Mongolia, January 28-30, 2010.**

Symptoms	Percentage
Diarrhea	100
Loose diarrhea	91
Bloody diarrhea	9
Fever	
>38C	92
>39C	34
Abdominal cramp	84
Headache	68
Lose appetite	56
Nausea	54
Vomiting	53

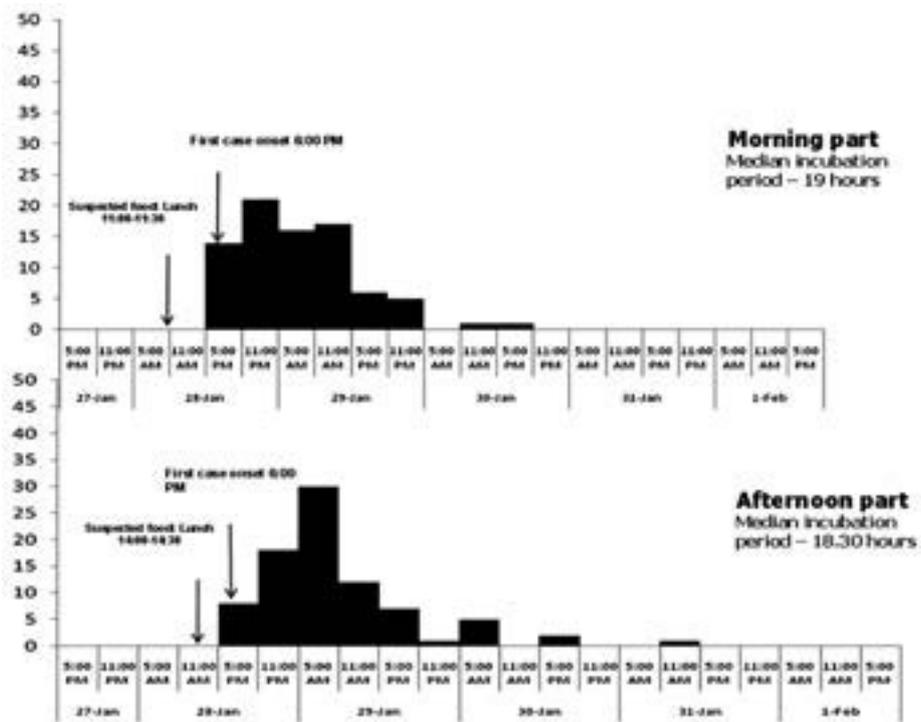
The menu included piroshky, carrot salad, seabacktorn, tomato cucumber and bantan. First Cases occurred at the 18:00 pm, January 28, peaked at 5 am January 29 and decreased at 05 am January 30, 2010 (Figure 1).

**Figure1. Cases of shigellosis outbreak, by time of onset symptoms, Mongolian-Russian joint school No.3, Ulaanbaatar, Mongolia, January 28-30, 2010 (n=165)**



The shape of epidemic curve indicated a point source outbreak. The median incubation period was 19 hours in the morning and afternoon part (range: 4-56 hours) (Figure 2).

**Figure2. Cases of shigellosis outbreak in a day care center, by date of onset, morning and afternoon part, Mongolian-Russian joint school No.3, Ulaanbaatar, Mongolia, January 28-30, 2010.**



**Table 2: Attack rate of Shigellosis in Mongolian-Russian joint school No.3, Ulaanbaatar, Mongolia, January 28-30, 2010**

Group	Population	Cases	AR (%)
Students	1854	164	8.8
Preparation grade 1-15	204	50	25
Grade 1-3	589	108	18
Grade 6, 8, 11	371	6	1.6
Other Grade	690	0	0
Teachers	120	1	0.8
Food handler and other employee	30	0	0
Total	2004	165	8.2

**Table 2a: Attack rate of Shigellosis in Mongolian-Russian joint school No. 3, Ulaanbaatar, Mongolia, January 28-30, 2010**

Group	Population	Cases	AR (%)
Preparation grade 1-15	204	50	25
Day care center	78	50 (100%)	64
Grade 1-3	589	108	18
Day care center	126	101 (94%)	80
Total	793	158	20
Day care center	204	151 (96%)	74

Analytical epidemiology  
Of 214 persons, 204 (95%) pupils were included for further cohort analysis. We compared exposed group with unexposed through the calculation of attack rates, relative

risks their 95% confidence intervals for each eaten meal. Bivariate analyses identified the pirojki (RR=1.9 (1.4-2.7)) and carrot salad (RR=1.4 (1.2.- 1.7)) as the food items associated with illness (Table3).

**Table 3: Food items eaten by pupils who ate the day care center during implicated meals, Mongolian-Russian joint school No.3, Ulaanbaatar, Mongolia, January 28-30, 2010 (n=204)**

	Exposed		Unexposed		Attack Rate%		RR	95%CI	P value
	Case	All	Case	All	Exp.	Unexp.			
Pirojki	132	160	19	44	83	43	1.9	<u>1.4-2.7</u>	0.0001*.
Carrot salad	104	124	47	80	84	59	1.4	<u>1.2-1.7</u>	0.0001*.
Tomato cucumber	77	101	74	103	76	72	1.1	0.90-1.2	0.5
Seabckthorn juice	94	112	57	79	75	72	1.0	0.87-1.2	0.7
Bantan	83	58	68	92	74	74	1.0	0.85-1.2	0.8

We conducted further analysis by dividing the cohort into those who ate in the morning session and afternoon session and we found that in the morning session only the piroshky (RR=2.0 (1.1-3.6)) (Table 4) was statistically significant and in the afternoon session both the piroshky (RR=1.9

(1.2-2.8)) and carrot salad (RR=1.6 (1.2-2.2)) were the food items associated with illness (Table 5). Further stratification analyses identified only the piroshky (RR =2.8 (1.1-7.3)) was the food associated with illness (Table 6).

**Table 4: Food items eaten by pupils who ate at the day care center, in the morning session during implicated meals, Mongolian-Russian joint school No.3, Ulaanbaatar, Mongolia, January 28-30, 2010.**

	Exposed		Unexposed		Attack Rate%		RR	95%CI	P value
	Case	All	Case	All	Exp.	Unexp.			
Pirojki	66	78	6	14	85	43	2.0	<u>1.1-3.6</u>	0.001*
Carrot salad	48	57	24	35	84	69	1.2	0.96-1.6	0.1
Tomato cucumber	36	47	36	45	77	80	0.96	0.77-1.2	0.8
Seabuckthorn juice	42	57	30	35	74	86	0.86	0.70-1.1	0.2
Bantan	42	54	30	38	78	79	0.99	0.79-1.2	0.9

**Table 5. Food items eaten by pupils who ate at the day care center, in the afternoon session during implicated meals, Mongolian-Russian joint school No.3, Ulaanbaatar, Mongolia, January 28-30, 2010.**

	Exposed		Unexposed		Attack Rate%		RR	95%CI	P value
	Case	All	Case	All	Exp.	Unexp.			
Pirojki	66	82	13	30	81	43	1.9	1.2-2.8	0.001*
Carrot salad	56	67	23	45	84	51	1.6	1.2-2.2	0.001*
Tomato cucumber	41	54	38	58	76	66	1.2	0.91-1.5	0.3
Seabuckthorn juice	52	68	27	44	77	61	1.2	0.95-1.6	0.1
Bantan	47	58	38	54	71	70	1.0	0.79-1.3	0.2

**Table6. Stratification by food items eaten by pupils who ate at the day care center, in the morning session during implicated meals, Mongolian-Russian joint school No.3, Ulaanbaatar, Mongolia, January 28-30, 2010 (n=92).**

Pirojki	Carrot salad	Cases	Total	AR%	RR	95%CI	P value
+	+	45	53	85	2.8	1.1-7.3	0.001
+	-	21	25	84	2.8	1.1-7.3	0.006
-	+	3	4	75	2.5	0.83-7.5	0.3
-	-	3	10	30	ref	ref	

**Laboratory results**

Of the 156 specimens from case-patients tested for microbiological identification at the bacteriological laboratory of NCCD (18 %) was positive for Shigella flexneri 2a. Coliforms was confirmed in 12 food samples such as piroshky, bantan, carrot salad and raw meat which one of ingredients of piroshky. E. Coli and Enter bacterium were confirmed in 7 samples from cup, spoon, dish dryer, cutting boards, utensils and freezer’s handle.

**DISCUSSION**

Most of cases occurred within 3 days between 28 and 31 January, strongly indicating a point source of infection. The median incubation period was 19 hours in the morning and afternoon session (range: 4-56 hours). Based on median incubation period we suspected the 28<sup>th</sup> January lunch was source of existing outbreak.

Bivariable analyses identified the piroshky and carrot salad as the food items associated with illness; But in the morning session only the piroshky; in the afternoon session both piroshky and carrot salad associated with illness. Thus, it is possible cross contamination. The method of contamination of the piroshky is not clearly understood.

Shigella was not detected in samples of food specimens. However, E. coli and Enter bacterium were confirmed in 7 samples from cup, spoon, dish dryer, cutting boards, utensils, freezer’s handle and Coli forms was confirmed in 12 food samples indicating that the food items were contaminated by fecal material.

Shigella produces the thermo stable endotoxin with its typical main clinical symptom gastroenterocolitis (5) which was dominated among pupils during outbreak. Thus, it is possible not detect Shigella in food samples.

Row meat, one of ingredients of piroshky stuffing perhaps was contaminated in 48-72 hours before it went on sell and along with noticed meat processing technology default possibly caused this food born outbreak.

Conducted outbreak investigation had some limitations. We interviewed with only one food handler who was responsible for the day care center lunch. And combined interview conducted among 5-11 years old pupils and study result will be reflect probability, lead to recall bias. We cannot assess dose-response relationships because of some interviewed pupils did not clearly remember food items and amount of eaten meals and beverage.

**Table 7. Stratification by food items eaten by pupils who ate at the day care center, in the afternoon session during implicated meals, Mongolian-Russian joint school No.3, Ulaanbaatar, Mongolia, January 28-30, 2010 (n=112).**

Pirojki	Carrot salad	Cases	Total	AR%	RR	95%CI	P value
+	+	52	58	90	2.1	1.3-3.5	0.001
+	-	14	24	58	1.4	0.75-2.5	0.5
-	+	4	9	44	1.4	0.43-2.5	0.1
-	-	9	21	43	ref	ref	

### CONCLUSIONS

Our investigation indicated that consumption of shigella flexneri 2a-contaminated piroshky caused the outbreak. Strict personal hygiene and proper disinfection of environmental surfaces remain crucial to prevent shigella transmission.

We recommended that to discard the implicated foods and to conduct cleaning and disinfection of school cafeteria for school authorities. The longer term recommendations were 1) to require all food handlers to submit a specimen before allowing them to return to work 2) to educate food handlers on proper food handling procedures including hand washing and appropriate hot-holding and cold-holding temperature. Through the experience of this investigation suggested that review and revise the Food borne Infectious Diseases Investigation Form approved by Health Ministers' order No185.

### Acknowledgements

The team acknowledges individuals who assisted in this study. We thank to G. Surenkhand (Deputy Director, NCCD), other members of the Infectious diseases surveillance and control department, P. Enkhtuya (WHO, MFETP coordinator) and E. Temuulen (WHO, MFETP

assistant). The study team also greatly appreciates the advice of Dr. Luo Dapeng (WHO, Medical officer) and Shi Guoqing (China FETP, supervisor). In addition we sincerely thank to Dr. D. Davaalkham (Head, Department of Epidemiology and Biostatistics, Health Sciences University of Mongolia) for important contribution to this paper.

### REFERENCES

1. David L. Heymann. Control of Communicable diseases Manual 19<sup>th</sup> edition. 2008.
2. The National bulletin on morbidity and mortality. Government agency, Health department, 2009.
3. An outbreak of shigellosis in a dormitory, Umnogovi province. Mongolian Journal of Infectious Diseases Research 2004; 1:31-32 (in Mongolian).
4. Altantsetseg T, Altanchimeg S, Tsend N, Tsetseglen D, Urantsetseg N. An outbreak of typhoid fever, shigellosis and salmonellosis in Khongor soum, Darkhan-Uul province. Mongolian Journal of Infectious Diseases Research 2006; 3:46-48 (in Mongolian).
5. Beaglehole R, Bonita R. Basic Epidemiology, 2<sup>nd</sup> Edition, 2006.

# Soft tissue Cephalometric analysis of Aesthetic Mongolian female

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## ABSTRACT

The purpose of this study was to provide data on the normative values of some clinically important soft tissue dimensions for Mongolian adult females with aesthetically pleased facial profiles. Lateral Cephalograms were taken with the subjects in a natural head position with the teeth in occlusion and the lips at rest. The means and standard deviations were determined and presented. In addition, comparisons with the previous studies were performed. The results of the present study were as follows: The upper and lower lips were posteriorly located in relation to the Ricketts' E line (Upper lip to E line: -2.08, Lower lip to E line: -0.04). Both lips were more posteriorly located than those in the results of previous studies on Korean females selected by normal occlusion, but more anteriorly located than in the results of studies selected on an aesthetic basis. The nasolabial angle for Mongolian females was 101.03 degrees with a standard deviation of 8.47 degrees.

**Key words:** Soft tissue, Aesthetic facial profile, Mongolian adult female.

## INTRODUCTION

Attaining an aesthetic soft tissue profile has been one of the primary motives of the patients seeking orthodontic treatment.<sup>1-5</sup> With advanced various surgical techniques, the scope of orthodontic treatment available to the orthodontist today has widened vastly and radical facial change has become more attainable.<sup>6</sup> Moreover, orthodontic treatment has been recently more aesthetically oriented. Many researchers have noted the importance of soft tissue integument in the determination of facial aesthetics, as it behaves differently from those of the underlying skeleton.<sup>1,2,3,6,7</sup> Therefore, the establishment of the aesthetic of the aesthetic outline is increasingly more important to a proper diagnoses and treatment planning.<sup>8-3</sup>

However, the definition of balanced facial profile is controversial and dependent on various factors such as age, race, and sex.<sup>14-20</sup> As Hellman has stated that studies examining only the Class I face as the norm or goal for treatment can be misleading, because what is normal does not necessarily equate as beauty.<sup>7</sup> White soft tissues of idealized individuals have been studied extensively among Caucasians such studies have not been well documented in Asian populations.<sup>17-20</sup> In addition, studies with samples selected by the aesthetic beautiful and balanced faces rather than by normal occlusions have been rare and the latter study samples may not represent the changed perception of the contemporarily beautiful profile.<sup>21-26</sup> Therefore, there is a need for a cephalometric analysis which assesses the soft tissue outline of the aesthetic face perceived by their contemporaries regardless of their occlusion.

The purpose of this study therefore was the following:

1. To provide data on the normative values of clinically important soft tissue dimensions for Mongolian adult females by using a standardized radiographic technique.
2. To compare the determined values with corresponding data obtained from samples of Mongolian females selected on the basis of normal occlusion.

## MATERIALS AND METHODS

Thirty two Mongolian females who have a pleasing face (most of the them were models) were first selected on the basis of their pleasing faces, balanced profile, and competent lips. These subjects were chosen as a representative of the public preference and to eliminate personal preference on the part of the orthodontists. No distinction was made between orthodontically treated and untreated subjects, because this study was a soft tissue analysis of aesthetically pleasing facial profiles. Subjects who satisfied these criteria even if they had malocclusions were included in this study. However, none of the subjects suffered from severe malocclusion.

By means of frontal, lateral extraoral photographs, and a silhouette image produced from a lateral cephalogram, subjects were finally selected who were judged by the authors to have well balanced faces. The mean age for the sample was 18 years with a range between 19.4 and 27.5 years.

All the cephalograms were taken with the subjects in a natural head position with the teeth in centric occlusion and the lips at rest. The radiographs were taken with the Asahi CX-90SP (Asahi, Japan) cephalostat at 72 to 74 Kvp, 20mA/sec at the Health Science University Dental School and 'Ortho-Dent' Research Center. No cephalograms with observable facial strain or facial expressions were used.

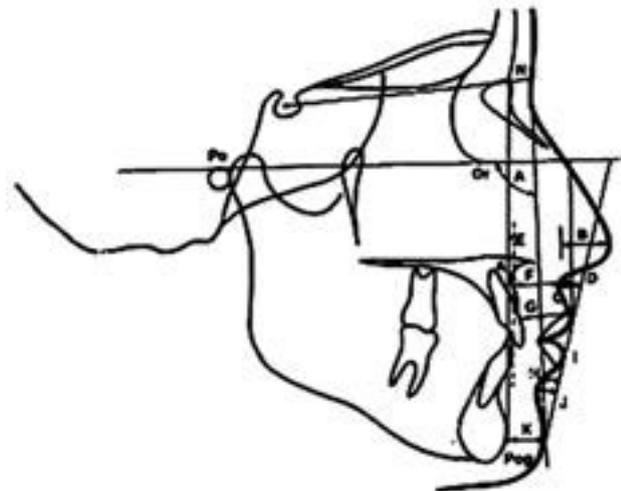
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Prior to taking the cephalogram, the patients head positions were carefully adjusted until they assumed a natural head position with both arms hanging freely beside the trunk. They were asked to stand and look into the reflection of their own eyes in a round mirror located at the same level as the pupils of their eyes. The mirror was attached to the wall 130 mm in front of the original transmeatal axis of the cephalostat in a plane parallel to this axis. A true vertical stainless steel plumb line was attached to the base plate of the cassette holder, and its exposure produced a true extracranial vertical reference line on each radiograph. The distance between the film and the midline of the cephalostat was 150 mm, accounting for about 1.1% image magnification. For all subjects, 8x10 inch films were used.

The set of standardized landmarks was then traced onto all head films by the author as shown in Fig. 1. Bilateral structures were traced by bisecting right and left images. The points were digitized by means of a graphic tablet (Wacom Co. Ltd. USA) with an IBM compatible computer. By using a program developed for this purpose, the x-y coordinates of these points were used to generate a list of measurements.

**Fig1. Landmarks for soft tissue analysis**



**1) Landmarks and Reference Planes**

The definitions of the soft tissue landmarks are adopted from Carconas and Bartroff<sup>16,17</sup> and some of them were modified by other investigators<sup>17-20</sup>. The hard tissue landmarks were identified according to the definition of Jacobson et. Abbreviations and descriptions of the cephalometric landmarks, reference planes and measurements are given in the following (Fig 1).

1. N' (soft tissue nasion): The point of greatest concavity in the midline between the forehead and the nose. It was determined by projecting a sella nasion plane onto the skin.
2. Nt (nose tip): Determined by drawing a nasal inclination line that runs from N' and tangent to the

- nasal contour. The lowest point where this nasal inclination line intersect the nasal contour is taken to be the tip of the nose.
3. Pr (pronasale): The most prominent or anterior point of the nose.
4. Sn (subnasale): The point at which the nasal septum (columella) merges with the upper lip in the midsagittal plane, the deepest point on the curve where the outline of the nose joins the lip.
5. Cm (columella point): The point where the tangent line from subnasale to the nasal base contour intersects.
6. UL (labrale superius): The most anterior point of the upper lip.
7. LL (labrale inferius): The most anterior point on the mandibular lip.
8. A' (soft tissue A point): Superior labial sulcus. The point of greatest concavity in the midline of the upper lip between the subnasale and labrale superius.
9. B' (soft tissue B point): Inferior labial sulcus. The point of the greatest concavity in the midline of the lower lip between labrale inferius and chin.
10. UIE (upper incisor edge): The incisal edge of the maxillary central incisor.
11. LIE (lower incisor edge): The incisal edge of the mandibular central incisor.
12. U1A (upper incisor apex): The apex of the upper central incisor.
13. L1A (lower incisor apex): The apex of the lower central incisor.
14. UIF: The most anterior point on the labial surface of the upper central incisor.
15. LIF: The most anterior point on the labial surface of the lower central incisor.
16. TH: The true horizontal plane.
17. TV: The true vertical plane (plumb line).
18. SnV: The true vertical reference line through subnasale.
19. S line: The line extending from the soft tissue pogonion to the midpoint of the S-shaped curve between subnasale and nasal tip (Cm).
20. H line: The line tangent to the chin (Pg') and upper lip.

**2) Measurements**

The following cephalometric measurements were made in this study and shown in Fig1. Soft tissue facial angle.

1. Angle of soft tissue facial convexity excluding the nose: N' -Sn-Pg' (°)
2. Angle of total facial convexity: N' -Nt to Pr-Pg' (°)
3. Angle of skeletal convexity: N-A-Pg' (°)
4. Facial contour angle: G-Sn-Pg' (°)
5. Soft tissue facial plane angle: N' -Pg' to Frankfort

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| <p>horizontal plane (<math>^{\circ}</math>)</p> <p>6. Z angle: Pg' –more protruding lip to Frankfort horizontal plane (<math>^{\circ}</math>)</p> <p>7. H angle: NB to UL-Pg' (<math>^{\circ}</math>)</p> <p>8. Nasofacial angle: G-Pg' to N'-Nt (<math>^{\circ}</math>)<br/>Nasal form</p> <p>9. Nasal depth: N'-Pr (projected on the true horizontal) (mm)</p> <p>10. Columella length: Sn-Pr (projected on the true horizontal) (mm)</p> <p>11. Nasal profile angle: Sn-N'-Nt (<math>^{\circ}</math>)</p> <p>12. Nasolabial angle: Cm-Sn-UL (<math>^{\circ}</math>)</p> <p>13. Inclination of nasal base: Sn-Cm to TH (<math>^{\circ}</math>)<br/>Lip and chin area</p> <p>14. UL to E line: The distance from the upper lip to E line (mm)</p> <p>15. LL to E line: The distance from the lower lip to E line (mm)</p> <p>16. UL to S line: The distance from the upper lip to S line (mm)</p> <p>17. LL to S line: The distance from the lower lip to S line (mm)</p> <p>18. UL to Sn-Pg': The distance from the upper lip to Sn-Pg' line (mm)</p> <p>19. LL to Sn-Pg': The distance from the lower lip to Sn-Pg' line (mm)</p> <p>20. Upper thickness: UL to UIF (mm)</p> <p>21. Lower lip thickness: LL to LIF (mm)</p> <p>22. Chin thickness: Pg-Pg' (mm)</p> <p>23. Menton –Menton': Me-Me' (mm)</p> <p>24. Incision-stomion distance: St-UIE (projected on the true vertical) (mm)</p> <p>25. U1 to FH: U1 to Frankfort horizontal plane (<math>^{\circ}</math>)</p> <p>26. Upper lip inclination to FH: Sn-UL to the Frankfort horizontal plane (<math>^{\circ}</math>)</p> <p>27. Upper lip inclination to TH: Sn-UL to the true horizontal plane (<math>^{\circ}</math>)</p> | <p>28. Upper lip prominence to SnV: Horizontal distance of UL from SnV (mm)</p> <p>29. Lower lip prominence to SnV: horizontal distance of LL from SnV (mm)</p> <p>30. Chin prominence to SnV: horizontal distance of Pg' from SnV (mm)</p> <p>31. Sagittal chin to lip distance: horizontal distance of Pg' from more protrusive lip (mm)</p> <p>32. Nasal tip to H line: the distance from Pr to H line (mm)</p> <p>33. Upper sulcus depth to H line: the distance from A' to H line (mm)</p> <p>34. Lower sulcus depth to H line: the distance from B' to H line (mm)</p> <p>35. Lower lip to H line: the distance from LL to H line (mm)</p> |
|---|--|

**Statistical Analysis**

The means, standard deviations, and ranges of the variables were determined for the total sample. The significance (z values) of any difference in the means of the variables were indicated to a 5% level of confidence ( $z < 1.96$ ).

Error determination. A combined determination of both cephalometric landmark location and measurement error was calculated. Ten randomly selected sets of cephalograms were retraced and redigitized after the first set of recordings was obtained. Dahlberg's formula was used to determine the error standard deviations for the variables in each data set. The linear measurement error was less than 0.46 mm (upper lip thickness), and angular measurement error was less than 0.91 degrees (nasolabial angle).

**RESULTS**

The soft tissue analyses were performed on Mongolian adult females and the mean values and standard deviations were calculated and presented in Table 1 through 3.

**Table 1. Summary of means and standard deviations.–Facial profile measurements**

Measurements	Abbreviation	Mean	SD
1. Angle of soft tissue facial convexity excluding the nose	N'-Sn-Pg'	16.68	4.09
2. Angle of total facial convexity	N'-Nt to Pr-Pg'	133.98	2.45
3. Angle of skeletal convexity	N-A-Pg	7.78	3.44
4. Facial contour angle	G-Sn-Pg	12.7	3.04
5. Soft tissue facial plane angle	N'-Pg' to FH	91.61	1.03
6. Z angle	Pg' to more protruding lip to FH	73.03	3.45
7. H angle	NB to UL-Pg'	11.97	2.8
8. Nasofacial angle	G-Pg' to N'-Nt	34.33	1.56

**Table 2. Nasal form**

Measurements	Abbreviation	Mean	SD
9. Nasal depth	N'-Pr	25.12	2.71
10. Columella length	Sn-Pr	14.67	1.33
11. Nasal profile angle	Sn-N'-Nt	18.61	2.48
12. Nasolabial angle	Cm-Sn-UL	101.03	8.47
13. Inclination of Nasal base	Sn-Cm to TH	22.58	6.46

**Table 3. Lip and chin area**

14. UL to E line	Distance from UL to E line	-2.08	1.02
15. LL to E line	Distance from LL to E line	-0.36	1.1
16. UL to S line	Distance from UL to S line	0.94	1
17. LL to S line	Distance from LL to S line	1.44	1.04
18. UL to Sn-Pg'	Distance from UL to Sn-Pg' line	22.58	6.46
19. LL to Sn-Pg'	Distance from LL to Sn-Pg' line	4.14	0.94
20. Upper lip thickness	UL to UIF	12.61	1.44
21. Lower lip thickness	LL to LIF	13.81	1.13
22. Chin thickness	Pg-Pg'	13.17	1.8
23 Menton –Menton	Me-Me	7.33	1.54
24. Incision-stomion distance	St-U1E	2.78	1.17
25. U1 to FH	U1 to FH	112.22	3.93
26. Upper lip inclination to FH	Sn-UL to FH	102.78	4.92
27. Upper lip inclination	Sn-UL to TH	101.92	5.1
28. Upper lip prominence to SnV	Distance of UL from SnV	3.5	1.5
29. lower lip prominence to SnV	Distance of LL from SnV	0.028	2.03
30. Chin prominence to SnV	Distance of Pg' from SnV	-7.06	2.38
31. Sagittal chin to lip distance	Distance of Pg' from more protrusive lip	10.33	1.89
32. Nasal tip to H line	Distance from Pr to H line	3.56	1.68
33. Upper sulcus depth to H line	Distance from A' to H line	-7.58	1.45
34. lower sulcus depth to H line	Distance from B' to H line	-4.47	1.14
35. lower lip to H line	Distance from LL to H line	0.86	1.15

### CONCLUSIONS

1. The upper and lower lips were posteriorly located in relation to the Ricketts'E line (Upper lip to E line: -2.08, Lower lip to E line: -0.04).
2. Both lips were more posteriorly located than those in the results of previous studies on Korean females selected by normal occlusion, but more anteriorly located than in the results of studies selected on an aesthetic basis.
3. The nasolabial angle for this sample was 101.03 degrees with a standard deviation of 8.47 degrees.

### REFERENCES

1. Basis NM. The aesthetic analysis of the face. *Eur J Orthod* 1991; 13:343-50
2. Burstone CJ. Integumental contour and extension patterns. *Angle Orthod* 1959; 29: 93-104.
3. Peck H, Peck S. A concept of facial esthetics, *Angle Orthod* 1970; 40: 284-317.
4. Holdaway RA. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning. Part I. *Am J Orthod* 1983; 84: 1-28
5. Holdaway RA. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning. Part II. *Am J Orthod* 1984; 85: 279-93
6. Czarnecki ST, Currier GF, Perceptions of a balanced facial profile. *Am J Orthod Dentofac Orthop* 1993; 104: 180-7
7. Hellman CH. A philosophy of orthodontic treatment. *Am J Orthod* 1945; 31:74
8. Sutter RE, Turkey PK, Soft tissue evaluation of contemporary Caucasian and African female facial profiles. *Angle Orthod* 1998; 68: 487-96.
9. Amette GW, Jelic JS, Kim J, et. Al Soft tissue cephalometric analysis: Diagnoses and treatment planning of dentofacial deformity. *Am J Orthod Dentofac Orthop* 1999; 116: 239-53.
10. Brons R. Facial harmony: Standards for orthognathic surgery and orthodontics. Quintessence Co.,Ltd. 1993.
11. Farkas LG, Katic MJ, Hreczko TA, et. Al Anthropometric proportions in the upper lip-lower lip-chin area of the lower face in young white adults. *Am J. Orthod* 1984; 86: 52-60.
12. Legan HL, Burstone CJ. Soft tissue cephalometric analysis for orthodontic surgery. *J Oral Surg* 1978; 38: 744-51.
13. McNamara JA Jr, Brust EW, Riolo ML. Soft tissue evaluation of individuals with an ideal occlusion and a wellbalanced face. In: McNamara JA Jr., ed. *Esthetics and the treatment of facial form.*

- Monograph 28, Craniofacial Growth Series. Ann Arbor: Center for Human Growth and Development, The University of Michigan, 1993.
14. Powell N, Humphreys B. Proportions of the aesthetic face. New York. Thieme-Sratton Inc. New York. Thieme-Sratton Inc. New York 1984.
15. Scheideman GB, Bell WH, Legan HL, Finn RA, Reisch JS. Cephalomeric analysis of dentofacial normals. *Am J Orthod* 1980; 78: 404-20.
16. Carconas SJ, Bartroff JD. Prediction of normal soft tissue facial changes. *Angle Orthod* 1975; 45: 12-25.
17. Ki-Su Lee, Kyu-Rim Chung. Cephalometric analysis on the skeletofacial pattern of the Korean adult with normal occlusion. *Kor j Orthod* 1987; 17: 199-214.
18. Seung-Hak Baek, Won-Sik Yang: A soft tissue analysis on facial esthetics of Korean young adults. *Kor J Orthod* 1991; 21: 131-70.
19. Je-Kyung Woo, Oh-Won Kwon, Jae-Hyun Sung. A cephalometric analysis on esthetic facial soft tissue of Korean young adult female. *Kor J Orthod* 1997; 27: 245-58.
20. Joon-Row, Young-Kyu Rhu. A cephalometric analysis on facial esthetics of Korean young adult female. *Kor J Orthod* 1988; 18: 127-39.
21. Dahlberg AG. Statistical methods for medical and biological students. New York: interscience Publica-tions, 1940.
22. Auger TA, Turley PK. changes in the esthetic soft tissue profile as presented by the mass media during the 1900s: A photographic analysis. *J Dent Res Special Isseu, Abstract of Papers.* 1996; 75: 336-2549.
23. De Smit A, Dermout L. Soft tissue profile preference. *Am J Orthod* 1984; 86: 67-73.
24. Pogrel MA. What are normal esthetic values? *J Oral Maxillofac Surg* 1991; 49: 963-9.
25. Thomas RG. An evaluation of the soft tissue facial profile in the North American black woman. *Am J Orthod* 1979; 76: 84-94.
26. II-Su Baek, Young-Kyu Rhu. A cephalometric study on the adolescent with normal occlusion. *Kor J Orthod* 1982; 12: 177-91.
27. Won-Yu Lee, Byung-Wha Sohn. A cephalometric study on the norm of Korean adult with normal occlusion. *Kor J Orthod* 1984; 14: 135-49.
28. Merrifield LL. The profile lines as an aid in critically evaluation facial esthetics. *Am J Orthod* 1966; 52: 804-822.

# Inhibitory effect of *S. alopecuroides* on in vitro growth, adherence and acid production of mutans streptococci

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## ABSTRACT

Dried, ground roots of *Sophora alopecuroides*, one of the most popular herbal remedies of Mongolia, were extracted with distilled water and methanol. Four fractions were obtained from methanol extract, and labeled as ME<sub>1</sub>, ME<sub>2</sub>, ME<sub>3</sub> and ME<sub>4</sub>. The extracts of ME<sub>1</sub>, ME<sub>3</sub>, and ME<sub>4</sub> of *S. alopecuroides* inhibited the growth of either *Streptococcus mutans* or *Streptococcus sobrinus*, while ME<sub>2</sub> and WE possessed no inhibition activity. The extract of ME<sub>4</sub> inhibited the acid production of both strains at low concentrations, followed by the ME<sub>3</sub> and ME<sub>1</sub>, and finally, the WE and ME<sub>2</sub>. ME<sub>4</sub> of *S. alopecuroides* was the strongest inhibitor of the sucrose-dependent adherence of growing cells of *S. mutans* and *S. sobrinus*, followed by the ME<sub>3</sub> and ME<sub>1</sub>, and then, by the WE and ME<sub>2</sub>. At 10mg/ml, ME<sub>2</sub> completely inhibited the adherence of *S. sobrinus*, while that of *S. mutans* was inhibited by 82%. The WE of *S. alopecuroides* completely inhibited the adherence of *S. mutans* at 10mg/ml, while it inhibited the adherence of *S. sobrinus* by 83% at the same concentration.

**Keywords:** *Sophora alopecuroides*; mutans streptococci; cell growth; adherence; acid production

## INTRODUCTION

Mutans streptococci, in particular *Streptococcus mutans* and *Streptococcus sobrinus*, are generally considered to be the principal microbial pathogen of dental caries. A number of phenotypic traits such as the synthesis of extracellular polysaccharides from sucrose, lactic acid production by metabolism of dietary carbohydrates, and acid tolerance are fundamental to their virulence<sup>6</sup>. Both *S. mutans* and *S. sobrinus* can produce extracellular glucosyltransferases (GTF), which allow the synthesis of α-(1, 3)-rich, water-insoluble glucan from sucrose<sup>7</sup>, and hence the bacterial colonization and ecological emergence on the teeth and plaque formation. The establishment of these microorganisms on the tooth surface results in an accumulation of lactic acid in situ during bacterial growth and fermentation of various dietary sugars and thus, the demineralization of the enamel.

Strategies to prevent caries including preventing plaque formation, inhibiting the growth of cariogenic bacteria, and inhibiting the expression of virulence factors<sup>8,9</sup>. Extensive screenings have been made for effective anticariogenic agents from natural sources. For example, glycyrrhizin isolated from the roots of licorice have been reported to significantly inhibit the plaque formation of *S. mutans*<sup>10</sup>. Propolis, a resinous bee product, has been shown to

inhibit the growth of oral microorganisms and the activity of GTFs<sup>11</sup>. Bakuchiol isolated from the seeds and leaves of *Psoralea corylifolia* Linn exhibited an inhibiting effect on the cell growth of oral microorganisms and virulence properties of *S. mutans*<sup>11</sup>. Gallotannins from *Melaphis chinensis* inhibited the growth, water-insoluble glucan synthesis, and aggregation of mutans streptococci<sup>12</sup>.

*Sophora alopecuroides* (L.), a plant native to the Gobi desert and nearby areas, is one of the most popular herbal remedies in Mongolia. Its root extracts are used in traditional medicine, of which when taken internally, cure respiratory tract conditions, colds, fever, skin problems, including skin infections, sores, rashes, itching and cuts, and promote wound healing. They are also used topically for treating skin problems and as a gargle to treat tonsillitis, gingivitis, and toothaches.

The objective of this study was to investigate the effect of *S. alopecuroides* on the growth, in vitro adherence, and acid production of *S. mutans* and *S. sobrinus*.

## MATERIALS AND METHODS

### Plant material

Roots of *Sophora alopecuroides* were collected from its natural habitat, from Bayanlyg region of Bayanhongor province of Mongolia, in September of 2001. The roots were washed with water to remove soil and dried in shade. The plant material was authenticated and deposited at the Institute of Traditional Mongolian Medicine.

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#### Water extract (WE) preparation

Fifty grams of ground, dried radices of *S. alopecuroides* were suspended in 500 ml of distilled water at 90°C until one third of its original volume never mind evaporated. It was then centrifuged for 20min at 25°C, and the supernatant was filtered through a 0.45µm cellulose filter (Toyo Roshi Co. Ltd., Tokyo, Japan). The filtrate was evaporated at 80°C using a rotary evaporator (EYELA, NE-1, Tokyo Rikakikai Co. Ltd.). The extract was then freeze-dried. Solutions of the resulting lyophilizate were prepared in distilled water at the concentrations of 100mg/ml, 50mg/ml and 10mg/ml and stored at -20°C.

#### Methanol extract (ME) preparation

One kg of ground, dried radices of *S. alopecuroides* was extracted with 10 l of 80% methanol, and magnetically stirred for 1 week. It was then filtered through a cellulose filter, and evaporated at 40°C using a rotary vacuum evaporator to give an oily residue. This extract was washed with warm distilled water and decanted. The remaining water-insoluble phase was taken up in 200ml of 100% methanol, and was labeled as ME<sub>4</sub>. Solutions of ME<sub>4</sub> were prepared at the concentrations of 100ml/ml, 50ml/ml and 10ml/ml in distilled water and stored at -20°C.

The water-soluble phase was evaporated at 80°C to give an oily residue which could not be frozen. The condensate was then washed and taken up in cold distilled water. This water-soluble fraction consisted of two phases, a liquid phase and sediment. After filtration through a cellulose filter, the supernatant was evaporated and freeze dried. It was labeled as ME<sub>1</sub>. The sediment was dried, and the resulting powder was labeled as ME<sub>2</sub>. Solutions of both ME<sub>1</sub> and ME<sub>2</sub> were prepared in distilled water at 100mg/ml, 50mg/ml and 10mg/ml, respectively, and stored at -20°C.

The remaining water-insoluble phase was redissolved in 100% methanol and labeled as ME<sub>3</sub>. Solutions of the resulting extract were prepared at the concentrations of 100ml/ml, 50ml/ml and 10ml/ml in distilled water and stored at -20°C until use.

#### Microorganisms and growth conditions

The organisms used in this study were *Streptococcus mutans* ATCC 25175 and *Streptococcus sobrinus* ATCC 33478. Both cultures were grown in brain heart infusion broth (BHI, Difco Laboratories, Detroit, MI, USA) supplemented with 0.2% sodium thioglycolate to late log phase and used in the following assays.

#### Antibacterial assay

The disk diffusion method was employed for investigating

the growth inhibition effect of the crude extracts of *S. alopecuroides* against the test microorganisms. Aliquots of 100ml cell suspensions of 8h cultures were streaked onto BHI agar. Then, paper disks (d=6mm) soaked with the test extracts were placed onto the inoculated plates. The plates were incubated anaerobically for 48h at 37°C. 0.2% chlorhexidine gluconate was served as the positive control, while distilled water and 100% methanol served as the negative controls.

#### Acid production assay

The fermentability of glucose by mutans streptococci in the presence of the crude *S. alopecuroides* extracts was examined. The inoculum size was adjusted to 10<sup>5</sup> to 10<sup>6</sup> CFU/ml. Aliquots of 200 ml cell suspensions were inoculated into tubes with phenol red broth (Difco Laboratories, Detroit, MI, USA) containing 1% glucose and test extracts at various concentrations (from 10mg/ml to 1.2mg/ml (two fold dilution) for the WE and ME<sub>1</sub> and ME<sub>2</sub>, and from 10ml/ml to 0.004ml/ml for the ME<sub>3</sub> and ME<sub>4</sub>), and incubated for 18h at 37°C. At the end of incubation, the pH of the medium was measured with a pH-meter (Orion, model 920A).

#### Adherence assay

BHI broth containing 1% sucrose and various amounts of the crude extracts of *S. alopecuroides* (from 10 mg/ml to 1.2mg/ml for the ME<sub>1</sub> and ME<sub>2</sub> and water extracts, while it was from 10ml/ml to 0.004ml/ml for the ME<sub>3</sub> and ME<sub>4</sub>) were inoculated with aliquots of 200ml bacterial cell suspensions at 10<sup>5</sup> to 10<sup>6</sup> CFU/ml. Then, the tubes were inclined at a 30 degree-angle and incubated for 18 hours at 37°C. After the incubation period, the contents of the tubes were decanted and the tubes were gently washed 3 times with sterilized saline. The decanted broth and washes were pooled, centrifuged, and suspended in sterile saline. The bacteria that adhered to the glass were removed by 0.5M sodium hydroxide, centrifuged and re-suspended in saline. The quantities of adhered and non-adhered bacteria were determined spectrophotometrically, as described by Segal (1985).

## RESULTS

Table 1 shows the growth inhibition of test bacterial strains in the presence of crude extracts of *S. alopecuroides* at various concentrations. The crude extracts of ME<sub>4</sub>, ME<sub>3</sub> and ME<sub>2</sub> of *S. alopecuroides* exhibited strong growth inhibition effect against either *S. mutans* or *S. sobrinus*, while the ME<sub>1</sub> and WE possessed no inhibition activity. Distilled water and 100% methanol, which served as the negative controls, showed no visible inhibition zones, whereas 0.2% chlorhexidine used as the positive control showed the greatest zone of inhibition.

**Table 1. Antibacterial effect of the crude extracts of *S. alopecuroides* against mutans streptococci**

Preparations tested	Inhibition zone (mm, Mean +SD)	
	<i>S.mutans</i> ATCC 25175	<i>S.sobrinus</i> ATCC 33478
Fraction-1 extract		
10mg/ml	7.33±0.51	9±0.63
50mg/ml	10.42±1.28	9.67±0.82
100mg/ml	10.75±0.27	10.5±0.55
Fraction-2 extract		
100mg/ml	0	0
Fraction-3 ME		
50ml/ml	8.83±0.75	7±0
100ml/ml	10.75±0.98	9.67±0.52
Fraction-4 ME		
50ml/ml	8.5±0.55	9.5±0.84
100ml/ml	11.67±0.52	9.17±0.41
WE of SA at 100mg/ml	0	0
0.2% chlorhexidine gluconate	22±0.89	20.16±0.98
Distilled water	0	0
100% methanol	0	0

Table 2 shows the acid production from glucose by *S. mutans* and *S. sobrinus* in the presence of the crude extracts of *S. alopecuroides*. The extract of ME<sub>4</sub> strongly inhibited the acid production of both strains at low concentrations, followed by ME<sub>3</sub> and ME<sub>2</sub>, and finally, by the WE and ME<sub>1</sub>.

There were statistically significant differences ( $p < 0.001$ , ANOVA followed by Bonferroni test) between the final pH values of the test bacterial strains in the presence and absence of the test SA extracts.

**Table 2. Effect of the crude extracts of *S. alopecuroides* in the acid production of mutans streptococci**

Preparations tested	18h pH (Mean±SD)	
	<i>S.mutans</i> ATCC 25175	<i>S.sobrinus</i> ATCC 33478
WE of <i>S. alopecuroides</i>		
10mg/ml	6.25±0.15	5.96±0.33
Fraction-1 extract of <i>S. alopecuroides</i>		
19mg/ml	7.0±0.007	7.03±0.01
9.8mg/ml	7.0±0.007	7.01±0.007
4.9mg/ml	6.89±0.01	5.91±0.01
4.9mg/ml	0	0
Fraction-2 extract of <i>S. alopecuroides</i>		
10mg/ml	6.02±0.39	5.54±0.12
Fraction-3 ME of <i>S. alopecuroides</i>		
0.312ml/ml	6.92±0.007	6.91±0.01
0.156ml/ml	6.88±0.02	6.08±0.31
0.078ml/ml	6.3±0.67	3.85±0.02
Fraction-4 ME of <i>S. alopecuroides</i>		
0.039ml/ml	7.01±0.007	6.9±0.01
0.019ml/ml	7.0±0.007	6.88±0.01
0.009ml/ml	6.15±0.007	6.84±0.02
Control (no extract)	4.22±0.07	3.84±0.08

The ME<sub>4</sub> of SA was the strongest in inhibiting the sucrose-dependent adherence of growing cells of *S. mutans* and *S. sobrinus* (Figure 1d), followed by the ME<sub>3</sub> (Figure 1c) and ME<sub>2</sub> (Figure 1a), and lastly, by the WE (Figure 1e) and ME<sub>1</sub> (Figure 1d).

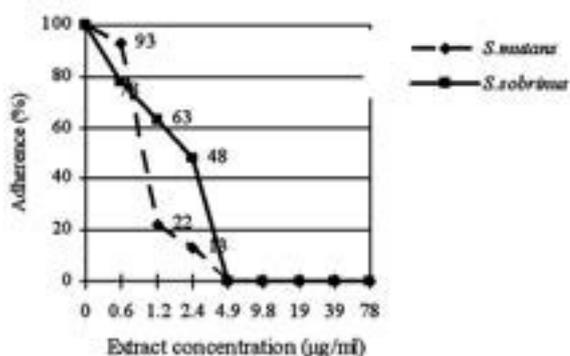


Fig. 1a. Adherence of mutans streptococci in the presence of Fraction-1 extract of SA

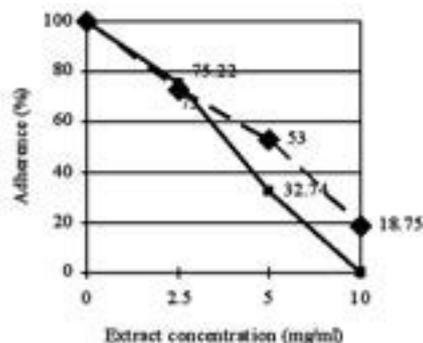


Fig. 1b. Adherence of mutans streptococci in the presence of Fraction-2 extract of SA

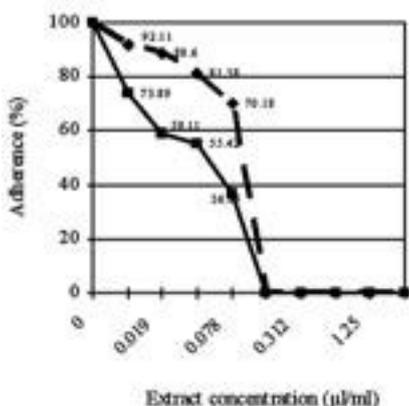


Fig. 1c. Adherence of mutans streptococci in the presence of Fraction-3 ME of SA

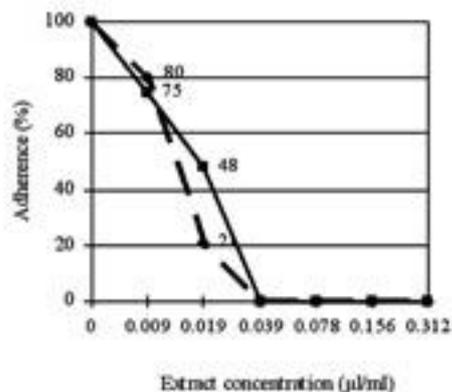


Fig. 1d. Adherence of mutans streptococci in the presence of Fraction-4 ME of SA

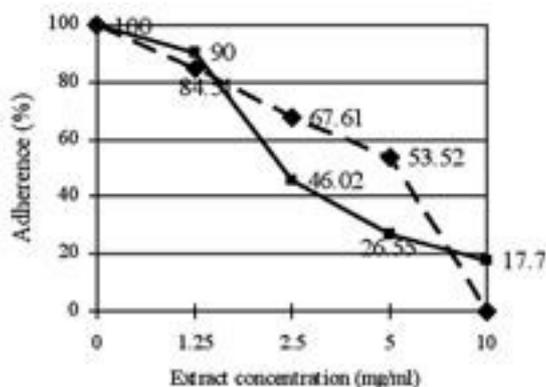


Fig. 1e. Adherence of mutans streptococci in the presence of SAWE

In the presence of the ME<sub>1</sub> at 10mg/ml, the adherence of *S. sobrinus* was completely inhibited, while that of *S. mutans* was inhibited by 82%. The WE of SA completely inhibited the adherence of *S. mutans* at 10mg/ml, while it inhibited the adherence of *S. sobrinus* by 83% at the same concentration.

## DISCUSSION

Herbal remedies have been present since the ancient times. Today, herbal medicine is still the primary source of healthcare for 80% of the world's population. Moreover, active substances isolated from medicinal plants have been serving as prototypes for the development of new

therapeutic agents<sup>12, 13</sup>. Thus, in the field of dentistry extensive screenings for biologically active substances from herbal sources with anti-caries effects has been carried out. Catechins in green tea, one of the most popular Japanese drinks, have been found to have an inhibitory effect on the cell growth and adhesion of *S. mutans*<sup>14, 15, 16</sup>. The aqueous extract of *Azadirachta indica* (Neem) has been reported to inhibit plaque formation by mutans streptococci<sup>17, 18</sup>. The *Azadirachta indica* Neem bark acetonc extract has exhibited a growth inhibition effect on *S. sobrinus*<sup>19</sup>, and the Neem bark aqueous extract has shown an inhibitory effect on the adhesion and acid production of *S. sobrinus* in vitro<sup>20</sup>. Flavanones of *Sophora exigua* have been reported to have a growth inhibitory effect against cariogenic bacteria<sup>21</sup>.

In this study, *S. alopecuroides* inhibited the cell growth of either *S. mutans* or *S. sobrinus*, and also their important virulence properties such as adherence and acid production at very low concentrations. The methanol extract of Fraction-4 was the strongest against test bacterial strains, followed by Fraction-3 and finally, by Fraction-1. Fraction-2 and the WE of *S. alopecuroides* had weak antibacterial activities. Though, the extract of ME<sub>1</sub> and WE of *S. alopecuroides* did not inhibit the cell growth of the test bacterial strains, they inhibited their adherence and acid production. Based on these results, we have proposed that the insufficient extraction of the active compounds of *S. alopecuroides* using water caused the weak inhibition of the growth against these bacteria. On the contrary, the sufficient extraction of the active substances from this plant using an organic solvent, methanol, resulted in visible growth inhibition against the test microorganisms. However, the extract of Fraction-2, the water-soluble phase, was the weakest among the methanol extracts. It was postulated that the effective components of *S. alopecuroides* are water-insoluble and contained in the water-insoluble phase, namely in the methanol-soluble phase.

This study has shown that *S. alopecuroides* can inhibit the growth and virulence properties of cariogenic bacteria. Thus, *S. alopecuroides* would be useful for the suppression of oral pathogens and dental plaque control, and has the potential for use in the prevention and treatment of dental caries.

#### REFERENCES

1. Bratthal D and Kohler B. Streptococcus mutans serotypes: Some aspects of their identification, distribution, antigenic shifts, and relationship to caries. *J Dent Res.* 1976; 55 (Spec Iss): C15-C21.
2. Hamada S and Slade HD. Biology, immunology, and cariogenicity of Streptococcus mutans. *Microbiol Rev.* 1980; 44 (2): 331-384.
3. Van Houte J. Bacterial specificity in the etiology of dental caries. *Int Dent J.* 1980; 30 (4): 305-326.
4. Hamada S, Koga T and Ooshima T. Virulence factors of Streptococcus mutans and dental caries prevention. *J Dent Res.* 1984; 83 (3): 407-411.
5. Tanzer JM. On changing the cariogenic chemistry of coronal plaque. *J Dent Res.* 1989; 68 (Spec Iss): 1576-1587.
6. Tanzer JM. Microbiology of dental caries. In: Contemporary Oral Microbiology and Immunology (Edited by J. Slots and M. A. Taubman), St. Louis, MO: Mosby-Year Book. 1992; pp. 377-424.
7. Hamada S, Horikoshi T, Minami T, Okahashi N and Koga T. Purification and Characterization of cell-associated glucosyltransferase synthesizing water-insoluble glucan from serotype c Streptococcus mutans. *J Gen Microbiol.* 1989; 135: 335-344.
8. Scheie AA. Modes of action of currently known chemical anti-plaque agents other than chlorhexidine. *J Dent Res.* 1989; 68 (Spec Iss): 1609-1616.
9. Marsh PD. Microbiological aspects of the chemical control of plaque and gingivitis. *J Dent.* 1992; 71 (7): 1431-1438.
10. Segal R, Pisanty S, Wormser R, Azaz E and Sela, MN. Anticariogenic activity of licorice and glycyrrhizine I: Inhibition of in vitro plaque formation by Streptococcus mutans. *J Pharm science.* 1985; 74 (1): 79-81.
11. Katsura H, Tsukiyama R, Suzuki A and Kobayashi M. In vitro antimicrobial activities of bakuchiol against oral microorganisms. *Antimicrob Agents and Chemotherapy.* 2001; 45 (11): 3009-3013.
12. Farnsworth NR. Ethnopharmacology and drug development. In: Prance, G. T. (Ed.), *Ethnobotany and the Search for New Drugs.* 1994; Wiley, Chichester (Ciba Foundation Symposium 185): 42-59.
13. Cowan MM. Plant products as antimicrobial agents. *Clin Microbiol Rev.* 1999; 12 (4): 564-582.
14. Rosen S, Elvin-Lewis M, Beck FM and Beck EX. Anticariogenic effects of tea in rats. *J Dent Res.* 1984; 63 (5): 658-660.
15. Sakanaka S, Kim M, Taniguchi M and Yamamoto T. Antibacterial substances in Japanese green tea extract against Streptococcus mutans, a cariogenic bacterium. *Agricult and Biol Chem.* 1989; 53 (9): 2307-2311.
16. Hamilton-Miller JMT. Anti-cariogenic properties of tea (*Camellia sinensis*). *J Med Microbiol.* 2001; 50: 299-302.
17. Wolinsky LE, Mania S, Nachnani S and Ling S. The inhibiting effect of aqueous *Azadirachta indica* (Neem) extract upon bacterial properties influencing in vitro plaque formation. *J Dent Res.*

- 1996; 75 (2): 816-822.
18. Wolinsky LE, Sote EO. Isolation of natural plaque-inhibiting substances from "Nigerian chewing sticks". *Caries Res.* 1984; 18: 216-225.
  19. Bhuiyan MM, Nishimura M and Shimono T. Antibacterial effects of the crude *Azadirachta indica* Neem bark extract on *Streptococcus sobrinus*. *Ped Dent* 1997; 7 (1): 61-64.
  20. Bhuiyan MM, Nishimura M and Shimono T. Effect of *Azadirachta indica* Neem bark extract on the acid production and adherence of *Streptococcus sobrinus*. *Ped Dent* 1998; 17 (2): 261-268.
  21. Tsuchiya H, Sato M, Iimuna M, Yokoyama J, Ohyama M, Tanaka T, Takase I and Namikawa I. Inhibition of the growth of cariogenic bacterial in vitro by plant flavanones. *Experientia.* 1994; 50: 846-849

# Immunological and histopathological criteria for differential diagnosis of immunobullous skin diseases

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## ABSTRACT

Immunobullous Skin Diseases are the group of pathologies with different clinical forms and different etiological and pathogenetic mechanisms and characterized by pathogenic autoantibodies directed at target antigens of desmosomes or of the basement-membrane of the skin. The objective of the study was to establish immunological and histopathological criteria of differential diagnosis of different forms of immunobullous diseases in Mongolian patients. 16 patients (11 females and 5 males) aged 6-72 year, with vesicular-bullous lesions were enrolled in this hospital based descriptive study. All patients were tested for serum anti-desmoglein 1, and 3 autoantibodies, and skin biopsates from all patients were investigated using histopathological, and direct and indirect immunofluorescent techniques. On the basis of results of the study 5 cases of pemphigus, 9 cases of bullous pemphigoid and 2 cases of linear IgA disease have been diagnosed. The results of these observations established that (1) intraepidermal blisters in histopathological investigation, positive anti-Dsg1 and anti-Dsg3 circulating autoantibodies, positive Tzanck test in cytological investigation, and IgG deposits in intracellular space of keratinocytes by direct immunofluorescent assay are specific criteria for the diagnosis of pemphigus; (2) subepidermal blisters in histopathological investigation, linear IgG deposits in the basement membrane zone by direct immunofluorescent assay and serum bullous pemphigoid IgG autoantibodies bind to the epidermal side of 1M NaCl-split skin by indirect immunofluorescent assay are specific criteria for the diagnosis of bullous pemphigoid; and (3) subepidermal blisters in histopathological investigation and linear IgA deposits in the basement membrane zone by direct immunofluorescent assay are specific criteria for diagnosis of linear IgA dermatitis.

**Key words:** Immunobullous skin diseases, pemphigus, pemphigoid, linear IgA disease, immunofluorescence

## INTRODUCTION

Immunobullous Skin Diseases (IBSDs) are the group of pathologies with different clinical forms and different etiological and pathogenetic mechanisms of development. IBSDs, although uncommon, have a dramatic impact on the patient and their family and have severe economic consequences for the family and health services.<sup>1</sup>

<sup>2</sup> Appearance of vesicles and blisters with exudates inside as a primary lesion on the surface of the skin and mucosa is the most common clinical sign of the IBSDs.<sup>2</sup>

<sup>3</sup> The immunobullous diseases are characterized by pathogenic autoantibodies directed at target antigens whose function is either cell-cell adhesion within the epidermis or adhesion of stratified squamous epithelium to the dermis or mesenchyme. These target antigens are components of desmosomes or of the functional unit of the basement-membrane zone (BMZ) known as the adhesion complex.<sup>3</sup> According to the localization of target antigens IBSDs are classified into two groups. The first group or intraepidermal immunobullous diseases include clinical variants of pemphigus (pemphigus vulgaris, pemphigus foliaceus and pemphigus vegetans), induced pemphigus,

intercellular IgA dermatosis, subcorneal pustular dermatosis, and paraneoplastic pemphigus. The second group or subepidermal immunobullous diseases include bullous pemphigoid, mucous membrane pemphigoid, pemphigoid gestations, linear IgA disease, epidermolysis bullosa acquisita, and dermatitis herpetiformis.<sup>3</sup> The most important techniques for the investigation of patients with immunobullous disease are histopathology, and direct and indirect immunofluorescence.<sup>4</sup>

According to statistical bulletin of National Dermatology Center, 23 cases with suspected IBSDs were registered in 2001, but in 2006 this rate increased to 47.<sup>5</sup> However, all of these cases were not confirmed and differentiated using appropriate laboratory techniques.

There are no publications highlighting immunobullous skin diseases in Mongolian patients. The objective of the study was to establish immunological and histopathological criteria of differential diagnosis of different forms of immunobullous diseases in Mongolian patients.

## MATERIALS AND METHODS

The hospital based descriptive study design was used. 16 patients (11 females and 5 males) aged 6-72 year, with current vesicular-bullous lesions or legend of same lesions in the skin and rarely in mucosa for not more than 2 weeks, and who were observed in the National Dermatology Center from February 2010 to April 2011. A bullous pathology of viral (negative anti-HSV1/2 by ELISA) and

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allergic (titer of serum IgE <25IU/mL by ELISA) origin were previously excluded in these patients. All patients were tested for the presence of anti-desmoglein 1 and 3 autoantibodies (anti-Dsg1 and anti-Dsg3 ELISA test kit, MBL, USA). The contents of skin blisters were taken and tested for the presence or absence of acantolytic cells (Tzanck test). A punch biopsy of the skin lesions was performed in all patients and the biopsy materials were processed for histopathological investigation according to standard protocol (MNS 5602-1:2006)<sup>6</sup> using a tissue processor, paraffin embedding system, autostainer (Tissue Tek, Japan), and for direct immunofluorescent (DIF) investigations<sup>7</sup> using cryostat (Leica, CM151US, Germany). The preparations for direct and indirect immunofluorescence (IIF) were magnified under the immunofluorescent microscope (Olympus BX51) and images were transferred onto a personnel computer using output software accessories (Discus, Discus Software Company, USA).

The Methods of this study were reviewed in the meeting of the Ethical Committee in Ministry of Health, Mongolia and concluded that the statement in the methods complied with the requirements of experiments on human subjects and were issued a resolution No. 03 dated 04 February 2010.

## RESULTS

ELISA testing for anti-desmoglein 1 and 3 has shown an elevated titer of these circulating autoantibodies in serum of 5 patients out of 16 with suspected IBSDs. 4 of these 5 patients have demonstrated only anti-Dsg3, while 1 patient has anti-Dsg1 antibodies. A histopathological investigation of the skin biopsy materials of these 5 patients has demonstrated intraepidermal blisters (Figure 1). The cytological study of contents of blisters in these patients has found acantolytic cells (positive Tzanck test) (Figure 2). DIF of skin biopsy materials has demonstrated deposits of IgG antibodies (anti-human IgG FITC conjugated mouse secondary antibody, Dako, USA) in intracellular spaces of keratinocytes (Figure 3) in patients who had intraepidermal blisters and a positive anti-DSG response.

In the remaining 11 patients subepidermal blisters were found in histopathological preparation (Figure 4) and negative Tzanck test by cytological investigation of the blister contents. DIF in 9 of these patients were found linear IgG deposits (Figure 5) in BMZ of the skin and in 2 of them linear IgA deposits (anti-human IgA FITC conjugated mouse secondary antibody, Dako, USA) (Figure 6) in BMZ. IIF on normal skin splits with serum of 9 patients who had linear IgG deposits in BMZ by DIF demonstrated a serum bullous pemphigoid IgG autoantibodies bind to the epidermal side of 1M NaCl-split skin (Figure 7).

## DISCUSSION

The demonstration of intraepidermal blisters by histopathological study may indicate intraepidermal immunobullous diseases in 5 patients. On the basis of positive anti-desmoglein 1 and 3 circulating autoantibodies by ELISA, positive Tzanck test by cytology and intracellular IgG deposits by DIF it was confirmed that

these patients have IBSDs of the pemphigus group.<sup>3, 4</sup> 4 patients with positive anti-Dsg3 were diagnosed with pemphigus vulgaris, and in a patient with positive anti-Dsg1 antibodies were diagnosed pemphigus foliaceus.<sup>3</sup>

9 patients with subepidermal blisters have shown linear IgG deposits in BMZ by DIF. Similar histopathological and DIF patterns may be found in patients with bullous pemphigoid and in patients with epidermolysis acquisita bullosa.<sup>1, 3, 4</sup> But IIF demonstrated serum bullous pemphigoid IgG autoantibodies bind to the epidermal side of 1M NaCl-split skin in all 9 patients and subsequently a diagnosis of bullous pemphigoid were confirmed in these patients. In 2 patients with linear IgA deposits in BMZ by DIF were diagnosed a linear IgA disease.

The results of these observations established that (1) intraepidermal blisters in histopathological investigation, positive anti-Dsg1 and 3 circulating autoantibodies, positive Tzanck test in cytological investigation, and IgG deposits in intracellular space of keratinocytes in DIF are specific criteria for a diagnosis of pemphigus; (2) subepidermal blisters in histopathological investigation, linear IgG deposits in BMZ by DIF and serum bullous pemphigoid IgG autoantibodies bind to the epidermal side of 1M NaCl-split skin by IIF are specific criteria for a diagnosis of bullous pemphigoid; and (3) subepidermal blisters in histopathological investigation, linear IgA deposits in BMZ by DIF are specific criteria for a diagnosis of linear IgA disease.

## REFERENCES:

1. Hertl M: Humoral and cellular autoimmunity in autoimmune bullous skin disorders. *Int Arch Allergy Immunol* 2000;91:100-102.
2. Blistering and pustular diseases; in Shimizu H (ed): Shimizu's textbook of dermatology. Hokkaido, Hokkaido University Press/Nakayama, 2007, pp 202.
3. Wojnarowska F, Venning VA, Burge SM: Immunobullous diseases; in Burns T BS, Cox N, Griffiths C, (ed): Rook's textbook of dermatology seventh edition. Oxford, Blackwell publishing, Inc, 2004, pp 2031-2090.
4. Kirtschig G, Wojnarowska F: Autoimmune blistering diseases: An update of diagnostic methods and investigations. *Clin Exp Dermatol* 1994;19:97-112.
5. Report of morbidity and mortality of skin diseases. National Dermatology Center. Ulaanbaatar, 2001, 2005.
6. Department of Standardization and Metrology: Technical Instruction for Histopathological Investigation of the Human Skin: National Standard of Mongolia MNS 5602-1:2006. Ulaanbaatar, 2006
7. Protocols for immunofluorescent investigation of the skin: Autoimmune bullous diseases: An immunofluorescence patterns. Singapore, Mayo clinic press, 2007, pp 45-54.

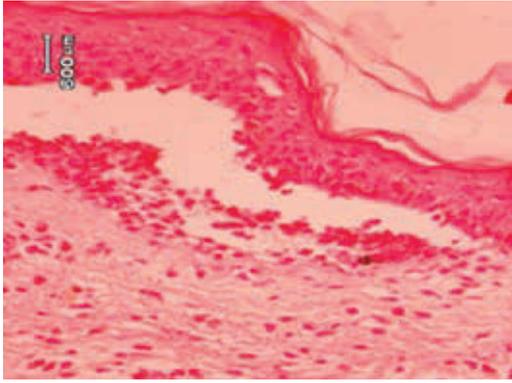


Figure 1. An intraepidermal blister in a patient with pemphigus. Hematoxylin and Eosin x100

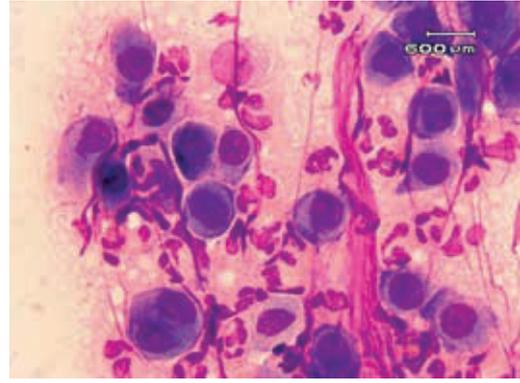


Figure 2. Tzanck cell in contents of blisters in patient with pemphigus. Giemsa stain x1000

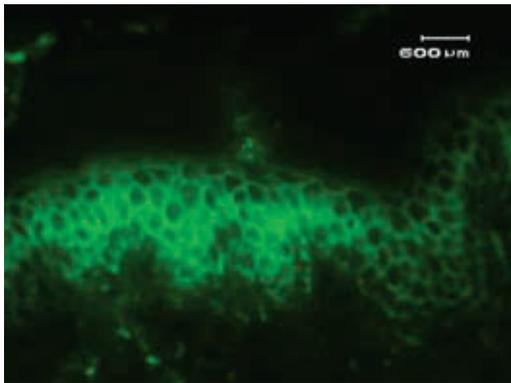


Figure 3. IgG deposits in intracellular space of keratinocytes in a patient with pemphigus. Direct immunofluorescence x400

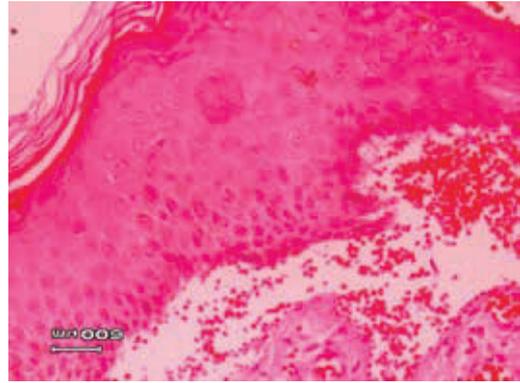


Figure 4. Subepidermal blisters in a patient with bullous pemphigoid. Hematoxylin and Eosin x400

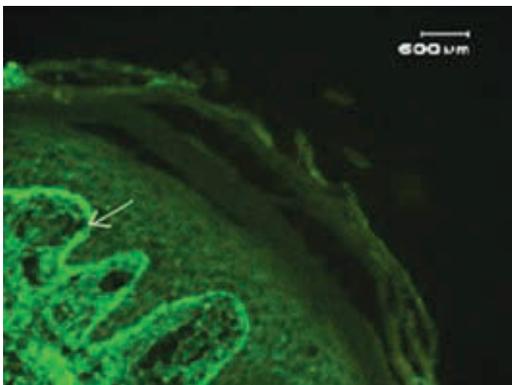


Figure 5. Linear IgG deposits in BMZ in a patient with bullous pemphigoid. Direct immunofluorescence x400

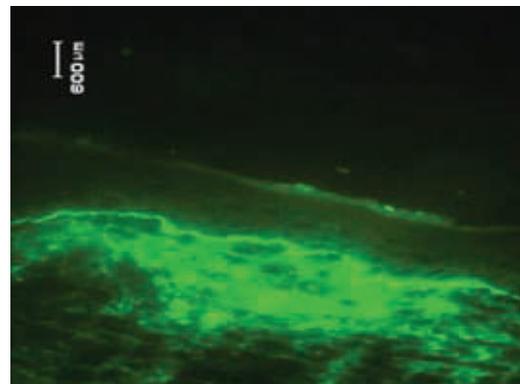


Figure 6. Linear IgA deposits in BMZ in patient with Linear IgA dermatosis. Direct immunofluorescence x100

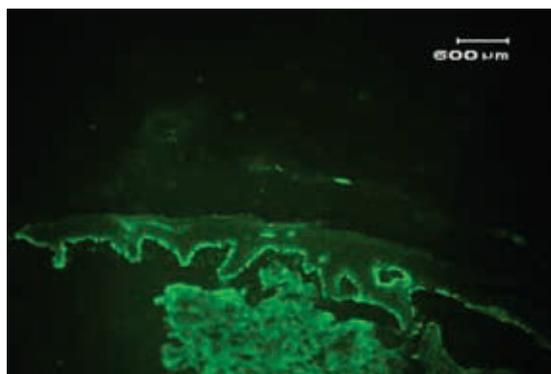


Figure 7. Serum bullous pemphigoid IgG autoantibodies bind to the epidermal side of 1M NaCl-split skin in a patient with bullous pemphigoid. Indirect immunofluorescence x200

# Determining the Microalbuminuria in patients with type 2 diabetes mellitus

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## ABSTRACT

International Diabetes Federation estimates that 246 million people around the world have diabetes. For Type 2 DM, revealing of microalbuminuria expresses not only nephropathy but also the risk of cardio-vascular complications. Therefore, it becomes the indication to provide a cardiac examination. The aim of this study is to determine microalbumin in the urine with Type 2 DM. This study was conducted using hospital-based cross-sectional method. The subjects were selected from follow-up patients with Type 2 DM in endocrinology wards of the district health centers of 5 districts. General urine analysis and revealing of microalbumin was performed in fasting blood. The general analysis in the urine was determined by total protein excretion. Microalbuminuria analysis was conducted in 182 patients with no proteinuria. Microalbumin detection analysis in urine was repeated 3 times. Microalbuminuria analysis was conducted in 182 patients without proteinuria and the results of 23.1% (42) patients were positive, but 76.9% (140) were negative. Micro albumin amount in patients with positive results was ranged 20.2-187.0 mg/L. The analysis was repeated in 42 patients with microalbuminuria and 29 patients have positive results, but 13 have negative results. The micro albumin amount of urine in patients with positive results was 21.5-194 mg/L. The results of microalbuminuria were positive in males 57.6% and in females 42.4%. The mean age of patients with microalbuminuria was 62.6. Mean period of having DM in patients with no microalbuminuria was 6.1 years, but in patients with microalbuminuria 8.7 years. Microalbuminuria is occurred 1.8 times higher in patients-smokers than in patients who don't smoke. In conclusion, microalbuminuria was revealed in 18.1% of patients on whom no protein detected in general urine analysis and amount of microalbumin of urine ranged between 20.2-187.0 mg/L.

**Key words:** diabetic nephropathy, microalbuminuria, early diagnosis, type 2 diabetes

## INTRODUCTION

International Diabetes Federation estimates that 246 million people around the world have diabetes. This is 5.9 % of total world population and it is expected to rise to 380 million by 2025. There is a hypothesis that 7.1% of all adults in the world will develop diabetes.<sup>1</sup> Diabetes Mellitus(DM) is doubled for each 10 and 15 years as well as the mortality rate increases by 2-3 times and 3.2 million people die from the disease worldwide. In 1999, the prevalence of DM was 3.1%, but in 2006, it was 8.2 or was increased by 5.1%. Besides, latent form of DM or the percentage of number of people with sugar changes in fasting blood was 9.2% in 1999, but it was grown to 12.5% by 2006.<sup>2</sup>

It is noted that during diagnosis of Type 2 DM 17-25% of microalbuminuria is revealed.<sup>3</sup> Longitudinal study also revealed that during Type1 DM the level of micro albuminuria is increased by 15-30%.<sup>4</sup> Albuminuria is

increased after discovering initial microalbuminuria and it is increased and reaches 5-7 nonclassical proteinuria and it is transferred to clinical phase of nephropathy.<sup>5</sup> For Type 2 DM, revealing of microalbuminuria expresses not only nephropathy but also the risk of cardio-vascular complications.<sup>6</sup> Therefore, it has become an indication to provide a cardiac examination. The aim of this study is to determine microalbumine in the urine among patients with Type 2 DM.

## MATERIALS AND METHODS

This study was conducted in hospital-based method. The subjects were selected from follow-up patients with Type 2 DM in endocrinology wards of the united hospitals of Bayanzurkh, Bayangol, Chingeltei, Songino Khairhan, and Khan-Uul districts in Ulaanbaatar.

### Laboratory analysis

General urine analysis and investigation of microalbumin was performed in fasting blood. The general analysis in the urine was determined by total protein excretion. In patients' urine with no protein were further examination for microalbuminuria 2-3 times. Descriptive and inferential statistical analyses were conducted by SPSS 17.0 program.

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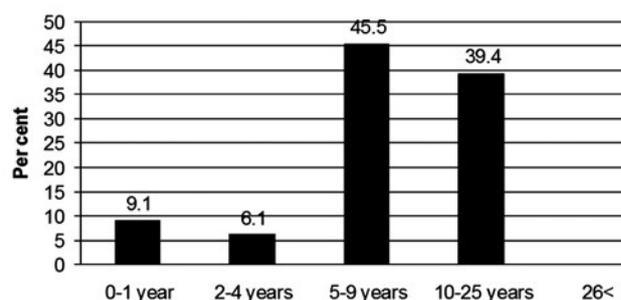
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**RESULTS**

Microalbuminuria analysis was conducted in 182 patients with no proteinuria. From them males were – 56.0% (102), females – 44% (80). Microalbumin detection analysis in urine was repeated 3 times. Microalbuminuria analysis was conducted in 182 patients with no proteinuria and the results of 23.1% (42) patients were positive , but 76.9% (140) were negative. Micro albumin amount in patients with positive results was 20.2-187.0 mg/L. The analysis was repeated in 42 patients with microalbuminuria and 29 patients have positive results, but 13 have negative results. The micro albumin amount of urine in patients with positive results was 21.5-194 mg/L, ii was 1.7-12.9 mg/L in patients with no results. The results of microalbuminuria were positive in males – 19 (57.6%), in females – 14 (42.4%). The mean age of patients with microalbuminuria was – 62.6, but the mean age of patients with no microalbuminuria was 59.3.

Mean period of having DM in patients with no microalbuminuria was 6.1 years, but in patients with microalbuminuria – 8.7 years.

**Figure 1. Correlation between the duration of DM and microalbuminuria level**



Microalbuminuria was the highest in diabetic patients who suffered for 5-9 years (45.5%). It was revealed that 33.3% (11) of patients with microalbuminuria , 21.4% (32) of patients with no microalbuminuria have smoking habit. Microalbuminuria is occurred 1.8 times higher in patients who smoke than in patients who don't smoke (OR=1.8). According to sex, microalbuminuria was observed in 18.6% (19) among males and in 17.5% (14) among females (P=0.86). The body mass index of both groups with and without microalbuminuria and with no microalbuminuria was the same with overweight.

**Table1. Amount of microalbuminuria excretion**

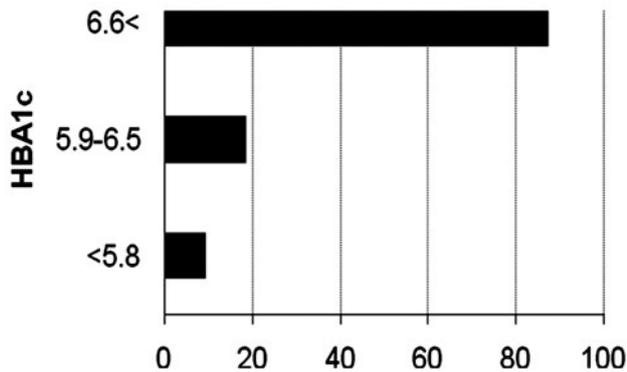
Frequency	No. of patients	Level of microalbuminuria, mg/L
I	42	20.2-187.0
II	29	21.5-194.0
III	13	20.9-31.6

**Table 2. Comparison of indices on incidents of microalbuminuria and normoalbuminuria**

Variables	Normoalbuminuria	Microalbuminuria	P value
Number of patients	149 (81.9%)	33 (18.1%)	
Age	59.3±10.0	62.6±11.3	0.03
Sex	83/66	19/14	0.84
Body mass index	29.1±4.3	29.0±4.9	0.75
Family history of DM	22.8	21.2	0.84
Duration of DM (years)	6.1±4.6	8.7±5.4	0.006
Family history of hypertension	41.6	21.2	0.13
Hypertension	64.4	72.7	0.36
SBP mm.Hg)	134.3±17.9	141.4±18.7	0.03
DBP (mm.Hg)	84.7±10.2	87.1±9.6	0.30
HbA1c (%)	8.0±2.1	8.8±1.9	0.01
Total cholesterol mmol/L	5.0±1.2	5.0±1.4	0.27
Triglyceride mmol/L	2.2±2.5	2.8±2.7	0.59
Retinopathy (%)	4.1	9.1	0.21
Smoking (%)	21.5	33.3	0.15
Acohol consumption (%)	26.8	21.2	0.50

There was 9% of microalbuminuria in patients who first diagnosed with DM. Microalbumin was revealed in the urine among 54.5% (15) of patients aged above 65 years old ( $P < 0.003$ ). Microalbuminuria was detected in 20.1% (23) of 114 patients diagnosed with DM after 50 years old. 69.9% of all patients with microalbuminuria were diagnosed with DM at above 50 year old age.

**Figure 2. Association between microalbuminuria and the level of HbA1c**



### DISCUSSION

This study determined the microalbumin level in the urine. The prevalence of microalbuminuria was 18.1% as we diagnosed during preclinical period of nephropathy. Research work enrolled 8178 Type 2 diabetic patients in Spain showed that microalbuminuria prevalence was 17.7% which was similar to our research.<sup>8</sup> In 2004, researchers from Sweden showed that 15.5% of 31037 Type 2 DM subjects had microalbuminuria.<sup>9</sup> This results was lower compared to our study. According to the study (2009) on complication of DM in Shanghai, China microalbuminuria was 22.8% in 930 Type 2 diabetic patients.<sup>10</sup> In 2001, a research was conducted in South Korea where microalbuminuria was observed in 21.8% among Type 2 diabetic patients. Other study results showed that prevalence of microalbuminuria was 25% in Amsterdam (2000). Asian perspective study was conducted in 2008, enrolled 8 Asian countries involving 8561 people revealed a prevalence of 44% of microalbuminuria.<sup>11,12,13</sup> These findings are higher compared to our research. According to N.Erdenekhuu's study which was done in 2002, DM microalbuminuria in both Types 1, 2 DM was 33%.<sup>14</sup>

By the study involving 6513 Type 2 diabetic people in Sweden microalbuminuria started to be revealed in patients who affected by DM more than 5 years, but microalbuminuria is revealed due to the poor diagnosing Type 2 DM for a long time. In 2006, by the research based in Bahrain state hospital microalbuminuria occurred in 712 Type 2 diabetic patients aged over 65,<sup>15</sup> showing similar findings with our research results.

### CONCLUSION

Microalbuminuria was revealed in 18.1% of Type 2 DM patients without proteinuria and level of microalbumin of urine was ranged between 20.2-187.0 mg/L.

### REFERENCES

1. World health organization.2005; Reports diabetes world health organization. Geneva.
2. Suvd J. Prediabetes diagnosis and intervention lifestyle. Mongolian Diabetes International Conference. 2010.
3. Dedov II, Shestakova MB. Diabetic nephropathy. 2000; 46-98.
4. Brenner Rectors. Diabetic Nephropathy. The Kidney: 2008; 1265-1289
5. John Feehally, Jurgen Floege, Richard Johnson. Prevention and Treatment of Diabetic Nephropathy. *Compreh Clin Nephrol.* 2007; 353-363
6. David Windus, Katherine E, Henderson Thomas M, De Fer; *Nephrology Subspeciality Consult* 2008; 193-199.
7. Davison Alex M, Cameron J Stewart, Grunfeld Jean-Pierre, Ponticelli Claudio, Ritz Eberhard, Winearis Christopher G, Ypersele Charies Van. *Oxford Textbook of clinical Nephrology.* 2005, 658-670.
8. Campos-Pastor MM, Escobar-Jimenez F, Mezduita P, Herrera-Pombo JL, Hawkins-Garranza F.Luna JD, Azriel S, Serraclaro A, Rigopoulos M. Factors associated with microalbuminuria in type 1 diabetes mellitus. *Diabet Res Clin Practice.*2000;48:43-4.
9. Cederholm J, Eliasson B, Nilsson PM, Weiss L, Gudbjornsdottir S. Microalbuminuria and risk factors in type 1 and 2 diabetic patients. *Diabet Res Clin Practice.* 2005;67:258-266.
10. Weiping J, Xin G, Can P, Xuhong H, Yuqian B, Wei L, Wenxia W, Yuhua Z, Huilin G, Kunsan X. Prevalence and risk factors of albuminuria and chronic kidney disease in Chinese population with type 2 diabetes and impaired glucose regulation. *Nephrol Dial Transplant.* 2009;24:3724-3731.
11. Kim YI, Kim C-H., Choi C S., Chung Y E., Lee M S., Lee S I., Park J Y., Hong S K., Lee K.-U. Microalbuminuria is associated with insulin resistance.Syndrome independent of hypertension and type 2 diabetes in Korean Population. *Diabetes Res Clinical Practice.*2001;52;145-152.
12. Loek T J Pijls., Hendrik de Vries., Didi M. W. Kriegsman., Ab J.M.Donker. Jacquis ThM van Eijk. Determinants of albuminuria in people with Type 2 Diabetes mellitus. *Diabetes research and clinical practice.*2011;52:132-143.
13. Pan C Y., Ho L T., Soegondo S., Prodjosudjadi W., Suwanwalaikorn s., Lim S C., Chan T M., Chou K W; Thoenes M., Choi D S. Prevalence of albuminuria

- and cardiovascular risk profile in a referred cohort of patients with type 2 diabetes: Asian perspective. *Diabetes Technol Ther*:2008;10(5):397-403.
14. Erdenekhuu N., Determinants of microalbuminuria and HbA1c in diabetic patients. Thesis for master of medical science. 2002.
15. Salman R A., Basri H A., Sayyad A S., Hearnshaw HM., Prevalence and risk factors of albuminuria in Type 2 diabetes in Bahrain. *J Endocrinol Invest*. 2009; 32(9):746-751.