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Nutritional Deficiencies and Their Behavioral Risk Factors in Alcohol Withdrawal Patients in Mongolia

Purevjargal Buddorj[1], Oyunsuren Davaasuren[2], Otgon Galsanjav[3], Erdenebayar Luvsandorj[4], Khishigsuren Zuunnast[2]

[1]Department of Mental Health, School of Medicine, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia; [2]Department of Mental Health, School of Medicine, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia; [3]Department of Physiology, School of Biomedicine, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia; [4]National Center for Mental Health, Ulaanbaatar, Mongolia

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Corresponding Author
Purevjargal Buddorj, MD, MSc
Department of Mental Health, School of Medicine, Mongolian National University of Medical Sciences, Ulaanbaatar 13270, Mongolia
Tel: +976-9907-7428
E-mail: jagai0522@yahoo.com

Objectives: This study aims to determine some nutritional and vitamin deficiencies, and to define some dietary factors affecting alcohol withdrawal patients. **Methods:** Data were collected from patients with alcohol withdrawal delirium admitted to 3 addiction care clinics in Ulaanbaatar. A total of 162 subjects were selected randomly with a ratio 1:1 to this case-control study. Nutrient intake was determined by questioning the patients regarding their food intake during the 24 hours prior to admission. **Results:** In patients with alcohol withdrawal delirium 13 nutrients from food were significantly lower. Two risk behaviors had weak and moderate effects leading to a statistically significant decrease in 11 nutrients. The risk of deficiency of fat and tryptophan intake was 17.54-22 times in drinking while hungry. Refusing food while drinking had a moderate effect in decreasing 9 nutrients by more than 57.8% in alcohol withdrawal patients. **Conclusion:** The level of 13 nutrients and vitamins from food were lower in patients with alcohol withdrawal delirium ($p<.001$). The dietary risk behaviors related to drinking were defined that lead to decreased fat, zinc, vitamin B12, tryptophan, and cysteine from their diet.

Keywords: Thiamine, Nutrition, Alcohol Consumption, Deficiency, Mongolia

Introduction

Alcohol addiction is a social problem and relatively common disease of western and eastern countries, and alcohol is consumed by more than half of the population in only three WHO regions – the Americas, Europe, and Western Pacific. In the African, Americas, Eastern Mediterranean and European regions, the percentage of drinkers have declined since 2000. However, it increased in the Western Pacific Region from 51.5% in 2000 to 53.8% today and has remained stable in the South East Asia Region[1]. About 3 million deaths every year result from harmful use of alcohol, this represents 5.3 % of all deaths worldwide. The harmful use of alcohol is a causal factor in more than 200 disease and injury conditions. Overall 5.1 % of the global

burden of disease and injury is related to alcohol, as measured in disability-adjusted life years (DALYs). Alcohol consumption causes death and disability relatively early in life. In the age group 20–39 years approximately 13.5 % of the total deaths are alcohol-related. In our country, 13.6% of the 10000 population, aged 15-65 met the criteria of being psychiatric and behavioral disorders due to alcohol use, 22% of men and 5% of women[1,2]. In the annual statistical report of the National Center for Mental Health, the incidence of alcohol withdrawal delirium is increasing every year. In 2012, 1233 inpatients with alcohol problems were admitted to the addiction clinic of the National Center for Mental Health, and of them, 95 inpatients (73 male, 22 female) were treated for alcohol withdrawal delirium syndrome. In 2016, 1254 people were treated for alcoholism, and 113 of them (93 male, 20 female) were diagnosed with alcohol withdrawal delirium[1-3].

The metabolic effects and nutritional value of ethanol differ with drinking patterns. Chronic alcohol abuse profoundly affects nutritional status. Ethanol can replace almost 60 percent of daily calorie intake of chronic adult drinkers in some cases leading to malnutrition. Excessive alcohol consumption may result in nutrient deficiencies reflecting variability in their clinical significance. Alcohol consumption changes the metabolism of most nutrients and the consequences of these distortions may play a significant role in the pathogenesis of liver disease. The dietary risk factors do not meet the structural and energy needs of the human body, but also influencing vulnerability to mental health, especially in emotional and cognitive activities. Micronutrients are a collection of many substances required for intermediary metabolism in varying amounts but usually in amounts less than 1g/d and sometimes only a few µg/d. Most individuals obtain these substances from their food, but where malnutrition exists or the diet is homogenous and imbalanced, deficiencies can occur[4-6].

Many studies have been done on the relationship between the prevalence of mental disorders and food consumption in highly developed Western countries. Notably, many mental disorders such as depression, anxiety, distress are associated with inadequate dietary amounts of essential vitamins, nutrients, and omega-3 fatty acids[7] . Nutritional and electrolyte disturbances are common occurs among alcohol withdrawal patients. The quantity and duration of a given patient's alcohol consumption generally determine the clinical significance of these disturbances. Electrolyte abnormalities tend to be most severe in patients in whom protein-calorie malnutrition, vitamin deficiency. Alcohol also uses nutrients that it does not provide for its metabolism, impairs the metabolism of many others, and reduces liver stores of even more. For example, vitamins B1 and B3 are needed by the liver to metabolize alcohol, and these are often in short supply[8,9].

There are previous studies related to the clinical aspects of alcohol use disorders from Mongolia. For example, scholar Erdenebayar in 1997 defined the prevalence and clinical characteristics of alcoholism in Mongolia and determined the scientific basics of prevention from alcoholism[10]. Gantumur in 2012 detected the pathopsychological manifestations of alcoholic patients[11]. Furthermore, Narantuya in 2012 studied alcohol consumption and its characteristics among the Mongolian population, and Odongerel 2014 defined the clinical features of the alcohol-related psychosis[12,13]. However, these previous studies on the psychiatric and addiction of alcoholism did not focus on the deficiencies of dietary nutrients such as minerals, vitamins, essential amino acids, and other nutrients.

A study defining the nutritional deficiencies associated with alcohol withdrawal delirium and their risk factors is needed in Mongolia. In this paper, we aimed to identify the relationship between deficiency of nutrients and vitamins in dietary intake and some risk dietary behaviors leading to nutrients and vitamins deficiencies in patients with alcohol withdrawal delirium.

The objectives were to (1) determine levels of certain nutrients, minerals & vitamins in alcohol withdrawal patients and (2) define main risk behaviors leading to decreased levels of these nutrients, minerals, and vitamins in alcohol withdrawal patients.

Materials and Methods

Study design

A total of 162 people were selected on by randomized sampling with ratio 1:1 to this case-control study. The subjects were divided to case (alcohol withdrawal patients) and control groups.

Inclusion criteria: Case group included inpatients receiving treatment at National Mental Health Center's Addiction Unit, Narcology Center and at "Borjigonii otoch" clinic, diagnosed with Stage 2-3 Alcohol Withdrawal Syndrome by addiction psychiatrists. These subjects reported they not had consumed alcohol for past 2-3 days prior to a structured interview and they

were diagnosed with delirium.

Control group subjects did not have any alcohol addiction symptoms and were rated as being non-consumers or non-hazardous users according to Alcohol Use Disorders Identification Test (AUDIT).

Excluson criteria: The individuals who consumed alcohol the 2-3 days prior to a structured interview, who were having disulfiram induced psychosis, who were diagnosed with severe somatic, neurological and psychiatric diseases, who were having psychosis not related to alcohol withdrawal delirium, who received alcohol dependency or pharmacological treatment previously, or who refused to participate in the study were excluded from our study.

Method of evaluating Alcohol Withdrawal Delirium

All participants of case group were examined by addiction psychiatrist. After assessing their mental health statuses, we were assessed their stage of alcohol dependency by Short Alcohol Withdrawal Scale (SAWS)[14,15]. Alcohol dependency degree and stage of alcohol abused disorder were defined by Michigan Alcohol Screening Test (MAST)[16].

Methods of determining vitamin B1 and vitamin B12 levels in nutrition

Each participant was interviewed to complete a research questionnaire regarding their nutrient intake for the previous 24 hours, before admitted to clinic. Information regarding meal size, ingredients, variety, frequency of meals and eating habits were collected. The nutrients in meals and meal vitamin B1 and B12 concentration were determined using ''Food ingredient chart" in Ministry of Health and assessed by NUTRISURVEY program of the World Health Organization (WHO) in 2004[17,18].

Questions such as "Do you drink while you are hungry?", "Do you end up not eating while drinking?" were asked from alcohol dependent participants in order to determine some risk factors leading to vitamin B deficiencies. Questions regarding their diet were asked when they answered "Yes".

Statistical analysis

Data were initially analyzed determining their descriptive statistics (mean, and standard deviation) and then Pearson correlation and multiple logistic regression analysis. The t and p-values were calculated with independent sample t-test. A log transformation was used for non-parametric variables, and correlation was considered significant at the $p<.01$ and $p<.05$ levels (2-tailed). All reference categories were "No" except for the employment variable which used "Yes" as the reference. The independent behavioral risk factors leading to deficiencies of main nutrients (protein, fat and carbohydrates), certain B vitamins (B1 and B12), 3 essential amino acids (tryptophan, cysteine, and tyrosine), and minerals (zinc, selenium, copper, and iron) were given binary outcomes answered by either "Yes" or "No". Multiple logistic regression analysis was used to examine the relationship between risk behaviors in alcohol withdrawal patients (stage III alcohol abuse disorder, drinking while hungry, refusing food while drinking, employment status, and marital status.) and dietary deficiencies (decreased intake of the major nutrients, B vitamins, and minerals in meals). The statistical analyses were done using SPSS 21.0.

Ethical statements

All subjects gave written informed consent. The research proposal was reviewed and approved by the Academic Committee of the Mongolian National University of Medical Sciences on 01.05.2018. Ethical approval was obtained from Biomedical Ethics Committee of the Mongolian National University of Medical Sciences on January 26, 2018 (№ 2108/3-01). Data were collected only after the administrative approvals were obtained.

Results

A total of 162 subjects, between 18 and 65 years of age, were selected for our case-control study. The case group consisted of 81 subjects between 27 and 65 years of age with stage II-III alcohol withdrawal syndrome by addiction psychiatrists. Selected socio-demographic characteristics, employment status and stage of alcohol abuse disorder of all participants are summarized in Table 1.

The average the majority of the subjects were male (77.8%, n=126) were male and the gender distribution was identical in both the case and control groups. The average age of case group participants was 42.43 ± 8.28 years. Their average age when they first consumed alcohol was 22.10 ± 6.37 years and the average age they began overusing of alcohol was 32.31 ± 8.98 years. The average age at which they were diagnosed with

Table 1. Some socio-demographic characteristics by case and control (N=162)

Demographic characteristics	Alcohol withdrawal delirium patients N (%)	Non-alcoholic Patients N (%)	Total N (%)	p-value
Age				
≤29	4 (4.9)	26 (16.0)	30 (18.5)	<.0001
30-39	27 (33.3)	22 (27.2)	49 (30.2)	
40-49	31 (38.3)	24 (29.6)	55 (34)	
≥50	19 (23.4)	9 (11.1)	28 (34.5)	
Gender				
Male	63 (77.8)	63 (77.8)	126 (77.8)	.932
Female	18 (22.2)	18 (22.2)	36 (22.2)	
Educational status				
Secondary	49 (60.4)	28 (34.5)	76 (46.9)	<.0001
Specialized secondary	7 (8.6)	11 (13.6)	18 (11.1)	
Higher	26 (32.1)	42 (51.9)	68 (41.9)	
Employment status				
Governmental, NGO	10 (12.4)	63 (77.7)	73 (45.0)	<.0001
Private	40 (49.3)	10 (12.3)	50 (30.9)	
Unemployed	31 (38.2)	8 (9.9)	39 (24.1)	
Marital status				
Married	35 (43.2)	56 (69.1)	91 (56.2)	<.0001
Single	46 (56.8)	25 (30.9)	71(43.8)	
Stages of alcohol abuse disorder				
Stage II	32 (39.5)	0 (0)	32 (39.5)	<.0001
Stage III	49 (60.5)	0 (0)	49 (30.3)	
Total	81 (100)	81 (100)	162 (100)	

p-value was calculated with Chi-Square Test ; NGO-Non Governmental Organization; Stage of alcohol abuse disorder by Michigan alcohol screening test (MAST)[16].

alcohol abuse disorder was estimated to be 38.14 ± 8.56 years.

The age distribution of the alcohol withdrawal patients differed from the control patients with alcohol withdrawal patients being older than the control group (p<.0001). The gender composition of each group was 77.8% (n=63) male. The distribution of education levels achieved by the alcohol withdrawal patients differed from the control patients (p<.0001) with withdrawal patients being less educated (32% (n=26) completing a higher level of education compared to 51.9% (n=42) of the control group). Their distribution of employment and marital status were also significantly different (p<.0001) with the number of alcohol withdrawal patients who were unemployed being over three times greater that of the control group (38.2 vs. 9.9%) and they were nearly twice as likely to be single (56.8% vs. 30.9%). Most of the alcohol withdrawal patients were in stage III of the alcohol abuse disorder (60.5%, n=49). Table 2 shows the results of the nutrient consumption of all the participants.

As shown in Table 2, the levels of 13 nutrients in meals were significantly lower in patients with alcohol withdrawal delirium. Other than selenium which was low in both groups, they consumed significantly less nutrients compared to control group (p<.0001). With the exception of selenium, the amount consumed by the withdrawal patients was less than half compared to the control group.

Results of correlation analysis examing the relationship between risk behaviors in alcohol withdrawal patients (stage III alcohol abuse disorder, drinking while hungry, refusing food while drinking, employment status, and marital status.) and dietary deficiencies (decreased intake of the major nutrients, B

Table 2. Dietary nutrient consumption in meals for case and control groups (N=162).

Nutrients	Average daily consumption in Mongolia	Case (N=81)		Control (N=81)		t	p-value*	95% CI
		Mean	SD	Mean	SD			
Protein (gr)	90	34.6	24.6	88.4	41.5	11.5	<.0001	[0.4;0.6]
Fat (gr)	67	23.3	20.9	63.7	39.7	9.9	<.0001	[0.5;0.7]
Carbohydrate (gr)	360	121.1	102.6	300.5	137.3	10.4	<.0001	[0.4;0.5]
Calorie (kcal)	2400	850.3	677.2	2136.0	900.8	11.7	<.0001	[0.4;0.5]
Zinc (mg)	10	3.1	3.4	8.9	8.0	8.6	<.0001	[0.4;0.7]
Selenium (mcg)	47	3.2	4.9	5.2	13.3	0.2	.836	[0.2;0.2]
Copper (mg)	2.7	.01	.02	0.1	.5	3.0	.003	[0.1;0.5]
Iron (mg)	11.4	4.0	2.86	10.7	9.1	11.0	<.0001	[0.4;0.5]
Vitamin B1 (mg)	1.2	.34	.28	1.01	1.5	9.0	<.0001	[0.3;0.5]
Vitamin B12 (mg)	2.4	2.7	2.40	9.72	8.6	9.6	<.0001	[0.8;0.7]
Tryptophan (gr/day)	.3	0.3	0.3	0.9	0.4	10.5	<.0001	[0.4;0.5]
Cysteine (gr/day)	1.3	0.5	0.4	1.16	0.5	10.1	<.0001	[0.3;0.5]
Tyrosine (gr/day)	2.2	0.1	0.7	2.6	1.3	11.5	<.0001	[0.4;0.5]

*p-value was obtained from independent t-test. Log transformation was performed to make data normally distributed. Case group included 81 alcohol withdrawal patients; Control group is included 81 non-alcoholic individuals; CI Confidence Interval; Potential nutrients and vitamin B1 & B12 concentration in meal were determined using ''Food Ingredient Chart"[17,18].

vitamins, and minerals in meals) are summarized in Table 3.

As shown in Table 3, there were correlations between drinking while hungry and stage III alcohol abuse disorder (r=.27**) and refusing food while drinking and stage III alcohol abuse disorder (r=.34*). The correlations were weak and moderate relating to a decrease in vitamin B1 associated with drinking while hungry (r=.25**), refusing food while drinking (r=.34**), and stage III alcohol abuse disorder (r=.32**). Similar associations were observed between these behavioral factors and vitamin B12, protein, fat, and decrease of essential amino acids cysteine, and tyrosine except for tryptophan which had the highest correlation between it and the drinking while hungry (r=.64**). However, socio-demographic characteristics, such as unemployment and divorce in alcoholic patients were most strongly correlated with decreased fat consumption (r=.29**, r=-.27**) and decreased cysteine consumption in the unemployed (r=.21**). However, the correlation analysis for risk factors leading to deficiencies of the major nutrients, minerals and certain B vitamins in meals of subjects in both groups, did not find any correlations for the control group. Therefore, only the results of correlation the alcohol withdrawal patients group are shown in Table 3.

Using the factors identified in the correlation analysis (stage III alcohol abuse disorder, refusing food while drinking, alcohol drinking while hungry, employment status, and marital status), we determined their effect on the decreased consumption of main nutrients and B vitamins in meals using multiple logistic regression (Table 4).

As seen in Table 4, decreased consumption of major nutirients and B vitamins in meals was most significantly associated with stage III alcohol abuse disorder with over a 3-fold risk of these occurring in patients with stage III alcohol abuse disorder (OR 3.85; 95% CI 1.42;10.42, p=.008 and OR 3.07; 1.32;7.16, p=.009, respectively). This was followed by an over 12 fold risk of decreased consumption of major dietary nutrients in patients who drank while hungry (OR 12.58; 95% CI 1.42;111.24, p=.02). Unemployment was associated with an over three-fold risk of decreased consumption of major dietary nutrients (OR 3.45; 95% CI 1.16;10.02, p=.02) while refusing food while drinking was associated with over three times the risk

Table 3. Results of correlation analysis for risk factors leading to deficiencies of main nutrients, minerals and certain B vitamins in meal of alcohol withdrawal patients (N=81).

	Drinking while hungry	Refusing food while drinking	Stage III alcohol abuse disorder	Increase vitamin B1	Decrease vitamin B1	Increase vitamin B12	Decrease vitamin B12	Increase protein	Decrease protein	Increase fat	Decrease fat	Increase zinc	Decrease zinc	Increase tryptophan	Decrease tryptophan	Decrease cysteine	Decrease tyrosine	Unemployment	Single
Drinking while hungry	1																		
Refusing food while drinking	.53**	1																	
Stage III alcohol abuse disorder	.27**	.34**	1																
Increase vitamin B1	-.08	-.12	-.13	1															
Decrease vitamin B1	.25**	.34**	.32**	-.20**	1														
Increase vitamin B12	-.40**	-.34**	-.34**	.08	.18**	1													
Decrease vitamin B12	.48**	.38**	.28**	-.08	-.59**	-.29**	1												
Increase protein	-.27**	-.31**	-.28**	.31**	-.56**	-.39*	.39*	1											
Decrease protein	.38**	.31**	.26**	-.20**	-.46**	.35**	.36**	-.50**	1										
Increase fat	-.24**	-.26**	-.29**	.19	-.46**	-.57**	-.16	-.71**	-.45**	1									
Decrease fat	.33**	.26**	.34**	-.17**	.49**	-.41**	.26**	-.54**	.49**	-.49**	1								
Increase zinc	-.10	-.12**	-.09	.45**	-.33**	.02	.01	.19	-.19	.22	-.05	1							
Decrease zinc	31**	-.36**	.36**	-.16**	.44**	-.02	.13	-.25*	.38**	-.30**	.10	-.44**	1						
Increase tryptophan	-21**	.36**	-.25**	.27**	-.54**	.33**	-.24	.83**	-.61	.41**	-.30**	.55**	-.36**	1					
Decrease tryptophan	.64**	.36**	.28**	.01	.32**	-.41**	.53**	-.22	.35**	-.23**	.23*	.09	.32**	-.24	1				
Decrease cysteine	.38**	.36**	.30**	-.21**	.65**	-.54**	.32**	-.64**	.76**	-.45**	.56**	-.26**	.33**	-.59**	.35**	1			
Decrease tyrosine	.37**	.28**	.31**	-.20**	.62**	-.51**	.38**	-.63**	.79**	-.48*	.59**	-.28**	.36**	-.58**	.37**	.76**	1		
Unemployment	.18*	.27**	.21**	-.03	-.19**	-.14	.17*	-.23**	.16*	-.15	.29**	-.11	.19*	-.26	.14	.21**	.09	1	
Single	-23**	-.31**	-.32**	.10	.18**	.15	-.04	.18**	-.17	·21**	-.27**	.13	-.25**	-.14	.10	.07	.19*	.01	1

**Correlation is significant at the p<.01 level (2-tailed).

*Correlation is significant at the p<.05 level (2-tailed).

Table 4. Results of multiple logistic regression analysis for 5 risk factors leading to deficiencies of main nutrients and certain B vitamins in meal of alcohol withdrawal patients.

Factors leading to deficiencies	Decreased consumption of main nutrients in meals[a]			Decreased consumption of B vitamins in meals[b]		
	cOR	CI, 95%	p-value	cOR	95% CI	p-value
*Stage III alcohol abuse disorder						
No	1		.008	1		.009
Yes	3.85	[1.42; 10.42]		3.07	[1.32; 7.16]	
Refusing food while drinking						
No	1		.85	1		.02
Yes	1.10	[0.38; 3.14]		3.12	[1.19; 8.18]	
Alcohol drinking while hungry						
No	1		.02	1		.46
Yes	12.58	[1.42; 111.24]		1.58	[0.45; 5.04]	
Employment						
Yes	1		.02	1		.02
No	3.45	[1.16; 10.02]		1.69	[0.69; 4.13]	
Single						
No	1		.58	1		.69
Yes	1.24	[0.56; 2.76]		0.86	[0.40; 1.81]	

1 - Reference value, cOR – Crude Odd ratio, *The main independent variable is stage of alcohol abused disorder; dependent variable is binary outcome
a. Major nutrients included protein, fat and carbohydrate in meal of alcohol withdrawal patients. b. B vitamins included B1 and B12 vitamin in meals of alcohol withdrawal patients.

of decreased B vitamins consumption (OR 3.12, 95% CI 1.19; 8.18, p=.02).

Discussion

The study examined the levels of certain nutrients, minerals & vitamins and defined the main risk behaviors leading to decrease of certain dietary compounds of alcohol withdrawal patients. Regression results showed that the stage of alcohol abuse disorder, alcohol drinking while hungry and employment status significantly influenced the deficiencies of main dietary main compounds.

Dietary habits are a major aspect of people's lifestyles that influence health, morbidity and mortality for a range of conditions. A number of studies have focused on patterns of food consumption and their relation to mental wellbeing. Diet has an effect on mood and varying cognitive functions. Electrolyte disorders can occur in patients with chronic alcohol use disorder, irrespective of their social circumstances and these disorders are not confined to patients with malnutrition or intercurrent illness. But rather they can be encountered in well-nourished patients with alcohol abuse[19-21].

Serotonin is involved in various emotional and behavioral activities, and tryptophan in food is important for the production of serotonin (5-hydoxytryptamine) as it is a precursor amino acid of serotonin.

High carbohydrate intake tends to increase brain uptake of tryptophan activating serotonin synthesis and due to this, serotonin can affect depression, aggression, impulsivity, sleep and appetite. But there is a theory that high protien food can increase alertness. In other words, the content of protein and carbohydrate in the food are important for brain serotonin activity, the variation of protein and carbohydrate in the diet effects human behavior[4,19].

Our results shown that 13 nutrients from food were significantly lower in patients with alcohol withdrawal delirium. Particularly, the decrease of nutrients' levels other than the selenium from food were highly statistically significant.

Furthermore, two risk behaviors related to alcohol drinking (drinking, while hungry and refusing from food while drinking) were weak and moderate effected with statistically significant to decrease 8 nutrients particularly, vitamin B12 (r=.48**, r=.38**), and decrease of tryptophan (r=.64**, r=.36**), which is an essential aminoacid with significant role for serotonin synthesis; cysteine (r=.38**, r=.36**) which is protector of liver and brain from harmful substances, such as alcohol and tobacco and tyrosine (r=.37**, r=.28**) which is the precursor of neuromediators dophamine, and noradrenalin.

Our results indicate that there is a clear correlation with the lack of serotonin, which is the neurobiochemical basis of symptoms, associated with the loss of ability to monitor the behavior of alcohol withdrawal delirium patients and their impulsivity[22,23].

From the results of many studies, it has been determined that saturated and unsaturated fatty acids mainly polyunsaturated fatty acids intake may affect mood and behavior by fairly direct effects on neural function. A deficiency of n-3 long-chain polyunsaturated fatty acid is an important factor underlying increased vulnerability to depression and hostile, and aggressive behavior[23].

Also, some scholars suggest that to be lower rates of depression in North America and many European countries over the last 100 years is concomitant with an increasingly high consumption of vegetable oils, high contained n-3 long-chain polyunsaturated fatty acid (sunflower and maize oils) and low intake of fish oils. Also, studies related to metabolism of polyunsaturated fatty acid shown that dietary fats can play a critical role in both initiation and treatment of alcohol-induced organ injuries, such as intestinal, liver and brain cell[5,8,24-26].

Heavy alcohol consumption not only influences the dietary pattern of alcohol abusers but also the reduces the absorption of proteins, fats, vitamins, and minerals from food in the gastrointestinal tract leading to the development of deficiency of these nutrients due to the deprivation of their metabolism[7,9,27,28].

In addition, to the reduced intake of food nutrients, the diminished eating of alcohol abusers leads to deficiencies of food nutrients, that are important for mental health because alcohol impairs digestion and absorption of many nutrients, such as most B vitamins (B1, B6, B12), choline, folic acid and some minerals, such as iron, selenium, zinc. Deficiencies of any these nutrients can cause mental health problems such as depression, fatigue, inadequate attention, and altered sleep[19,29].

When calculating some nutrients, minerals, vitamins B1 and B12 from food of patients with alcohol withdrawal delirium, we identified that the mean and standard deviation of these variables in case group was markedly lower with statistically significant than the control group. The anorectic effect of alcohol in hunger and satiety centers of the hypothalamus leads alcoholic abusers to refuse food. Furthermore, alcoholic patients have poor nutrition in their diet and attempt to meet their caloric needs from ethanol decomposition leading to alcoholic drinkers being hungry many days while heavily drinking[30].

Therefore we determined the relationship of drinking while hungry or refusing food while drinking in alcoholic withdrawal patients. First, the drinking while hungry significantly decreased the main nutrients such as protein, fat, and carbohydrate more than other dietary compounds. Second, refusing food while drinking significantly decreased B vitamins consumed during meals by alcohol withdrawal patients.

These outcomes are similar to results of the above mentioned international studies, which defined to decrease dieting and dietary nutrient, calorie & vitamin caused by alcohol dependence. Several studies related to alcohol addiction problems have been done during last four decades and all those studies aimed to detect epidemiology, prevalence of alcohol consumption and alcohol use disorder, and clinical features of alcohol use disorders. Furthermore, previous studies of psychiatric and addiction have not focused on deficiencies of dietary nutrients such as minerals, vitamins, essential amino acids, and other potential nutrients. To our knowledge, our study is the first focused on defining certain nutrients and vitamins in dietary intake of alcohol withdrawal delirium in Mongolia. The present study shows that determining nutritional issues in alcohol abuse disorder is a very area for further research in the clinical addiction field. Therefore we believe is that the nutritional therapy can very important in treatment for alcoholic patients and it is possible to prevent from many alcohol-induced mental, behavioral and somatic problems by providing adequate nutrients and vitamin in needed. Furthermore, we need a study of nutritional needs for monitoring and treating alcoholic patients.

There are a few limitations in this study. This study was difficult because one researcher (Purevjargal B) provided private funding for the research and it was expensive. We were not able to involve more subjects due to funding problems. Second, it

was difficult for the participants of this study to recall their daily meal ingredients, because most of the participants had memory problems related to chronic alcohol consumption. Third, subjects of control group were admitted with psychoses, and it was difficult to collect data from these participants.

We will further investigate changes in memory and cognitive functions during alcohol dependency disorder.

Conclusions

The levels of 13 nutrients in meals were significantly lower in patients with alcohol withdrawal delirium ($p<.0001$). Five risk behaviors related to alcohol withdrawal delirium were defined, and these risk behaviors lead to decreased intake of nutrients and B vitamins more than dietary minerals.

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