Can Alcohol and Obesity be Considered Risk Factors for Diabetes Mellitus? (environmental study)

Ludmila Radkevich1* and Dariya Radkevich2

1Doctor of Biological Sciences, Center for Theoretical Problems of Physicochemical Pharmacology of the Russian Academy of Sciences, Russia
2Center for Theoretical Problems of Physicochemical Pharmacology of the Russian Academy of Sciences Russia

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*Corresponding author: Ludmila Radkevich, Doctor of Biological Sciences, Center for Theoretical Problems of Physicochemical Pharmacology of the Russian Academy of Sciences, Russia

Abstract

Rationale: The literature recognizes a causal relationship between alcohol consumption and the burden of noncommunicable chronic disease (NCD).

Objective: To investigate the relationship between the maximum and minimum consumption of alcoholic beverages (AB) and metabolic syndrome (MS), the burden of diabetes mellitus, pancreatic cancer, nephritis and alcoholism in 158 countries in 2004.

Methods: U-Mann-Whitney test (UMY) and multiple linear regression analysis (MRA) were used for data analysis; GBD databases 2004; FAO 1990-2005.

Results: Studies have shown that the maximum and minimum consumption of alcoholic beverages (AP) in the countries of the world differed 108 times and amounted to 343 grams per person per day, excluding gender and age (p≤0.001).

The 20 countries with the highest AB versus the 20 countries with the lowest AB were 14 times higher per capita income (p≤0.001); the burden of pancreatic cancer is 3.5 times higher in men and women (p≤0.001); the burden of alcoholism is 8 times higher for men, 18 times for women (p≤0.001); 2 times in men, the burden of diabetes mellitus is 3 times lower in women and the burden of nephritis is 7 times lower in men and women (p≤0.001). In countries with maximum AB, the predictors of metabolic syndrome - MS (% of men and women in a country with MS impairment) were 2 times higher (p≤0.001).

Conclusions: In countries with the highest AB consumption, the burden of alcoholism and pancreatic cancer is several times higher predictors of MS, but the burden of diabetes and nephritis is lower. Gender differences in the studied characteristics are noted. Further research is needed on the nature of the relationship between alcohol consumption and NCD to develop prevention methods.

Keywords: NCD; MS; Alcohol; Diabetes; Pancreatic cancer; Nephritis; Alcoholism; Quality of life

Abbreviations: AB: alcoholic beverages, AP: animal products, BMI: Body Mass Index, BP: blood pressure, CD: Communicable, maternal, perinatal diseases, Chol: blood cholesterol, diabetes mellitus, EEI: Ecological Efficiency Index, FAO: Food and Agriculture Organization of the United Nations, FS: fruits and sweeteners, Glu: blood glucose, HPI: Happiness Index, HD: Index of Human Development, IPC: per capita income, f: female, LPA: Low physical activity, m: male, NCD: Noncommunicable diseases, CV: cereals and vegetables, RE: Rating Educations, TDC: Total Daily Consumption, UV: Ultraviolet level

Introduction

Noncommunicable diseases (NCDs) are rapidly increasing. Risk factors for NCDs pose health problems in all countries [1-6]. In 2016, 71% of the 56.9 million deaths worldwide were caused by NCDs [4]. In countries with a high economic status, metabolic syndrome disorders are important, overweight, physical inactivity and unhealthy diet. These risk factors affect 35% of the population [2,4,7]. In countries with low economic status, the main risk factors for NCDs are tobacco smoking and alcohol [4-6]. Disorders of metabolic syndrome are the main risk factors for cardiovascular, respiratory and neuropsychiatric diseases, cancer and diabetes mellitus (CD1, CD2). The burden of these diseases accounts for 80% of NCDs [8,9]. Overweight and obesity cause chronic inflammation of the adipose tissue of low severity [10,11].
Inhibition of chemokines in the hypothalamus of mice converts obese-resistant mice into obese-prone mice [12]. Since the 1990s, the global burden of CD2 has quadrupled and is the ninth leading cause of death in the world [13]. A T2DM epidemic is developing in Asia. China and India are the epicenters of T2DM [13]. The course of T2DM is influenced by excessive alcohol consumption [14]. However, observational studies have shown that moderate alcohol consumption reduces the risk of T2DM [15,16]. Observational studies have found a J-shaped relationship between alcohol and the incidence of T2DM. The positive effect of low alcohol doses on the burden of T2DM is associated with improved glycemic control in T2DM [17]. The health benefits of moderate consumption of alcoholic beverages have been studied for several decades. The authors have antioxidant and anti-inflammatory effects of small doses of alcoholic beverages. However, there are no definitive recommendations [18]. There is an intensive search for diets for the prevention and treatment of T2DM. An increase in the proportion of protein in the diet (keto diet) is recommended for weight control and the treatment of T2DM [19]. Thus, MS, including obesity and alcohol abuse, are considered the main risk factors for T2DM and NCDs.

**Purpose of the work:** to investigate the influence of the maximum and minimum daily consumption of alcoholic beverages in the structure of nutrition in two groups of countries of the world (20 countries each) on MS, the burden of diabetes mellitus, pancreatic cancer, nephritis and alcoholism.

**Materials and Methods**

**Study design: statistical analysis of observations.**

For the work, a database of the burden of NCDs, diabetes mellitus, pancreatic cancer, nephritis and alcoholism (ICD-10 codes) was compiled for 158 countries. From this base, 2 groups of 20 countries in a group were selected.

Group 1: countries with the highest daily alcohol consumption (AB).

Group 2: countries with a minimum daily consumption of alcoholic beverages AB (List of countries 1).

Disease burden (DALY) data for men and women in 158 countries, standardized by sex and age per 100,000 population, were collected from the 2004 GBD database [20]. To characterize the "quality of life" (QOL) in countries, a number of indicators were used:

- per capita income (GDP) in 2000–2016 (US dollars per person per year) [21]
- the geographical position of countries in latitude and the level of ultraviolet radiation in the capital (UV) (J/m² 2004) [22]
- life expectancy for men and women (2008 and 2016) [23]
- access to quality medicine, clean water and clean air [24]
- standardized disease burden (DALY) data for men and women (2004) [20]
- standardized life expectancy for men and women (2008 and 2016) [23]
- access to quality medicine, clean water and clean air [24]

**In multiple comparisons, the Bonferroni correction was also used to assess the significance of the study results, taking into account two hypotheses (p≤0.025). Analysis of the dependence of the burden of NCD and MS on TDC products was performed using multiple linear regression analysis for «independent variables» (MRA). Standardized indicators of the burden of NCD morbidity: diabetes mellitus, pancreatic cancer, nephritis and alcoholism for 2004 [20] and predictors of MS [26] were used as the "independent variable" of the MRA. The daily blocks of TDC were used as "independent variables": AP (animal products), CV (cereals and vegetables), FS (fruits and sweeteners), and AB (alcoholic beverages) of 158 countries (2005) [27]. A step-by-step procedure for including «independent variables» was applied to obtain the best regression equations containing the minimum number of predictors statistically significantly associated with the «dependent variables». The quality of the regression model was assessed using multiple correlation coefficient (R1), determination coefficient (R2), F-distribution, t-tests for regression coefficients, and residual analysis. Residues
in all models had a normal distribution. Analysis of the values and signs of the coefficients of the $\beta^*$ and $\beta$ regression equations made it possible to estimate the contribution of consumption levels of various products to the values of the indicated types of NCD and MS predictors. Assessed how much the «dependent variable» will change when the «independent variable» is changed by a unit of measurement. All calculations were performed using the Statistica program (version 13). (Table 1).

Table 1: List of Countries 1 and 2 Groups.

| 1 Group of Countries | Country          | f Diabetes Mellitus | IPC 2000 | lat° | UV rad /m² 2004 | lon° | AB Amount |
|----------------------|------------------|---------------------|----------|------|----------------|------|-----------|
| 1                    | Luxembourg       | 154                 | 169      | 55 306 | 1 687 | 6 | 536     |
| 2                    | Ireland          | 150                 | 144      | 30 155 | 52  | 509       | 6 | 493     |
| 3                    | Czech Republic   | 210                 | 176      | 16 132 | 50  | 1 707     | 14 | 402     |
| 4                    | Austria          | 284                 | 239      | 29 301 | 47  | 1 888     | 16 | 397     |
| 5                    | Germany          | 213                 | 211      | 27 277 | 53  | 1 812     | 12 | 374     |
| 6                    | Belgium          | 168                 | 194      | 27 967 | 51  | 1 645     | 4  | 358     |
| 7                    | Denmark          | 238                 | 214      | 28 640 | 56  | 1 691     | 9  | 342     |
| 8                    | United Kingdom   | 163                 | 173      | 26 031 | 51  | 1 576     | -  | 338     |
| 9                    | Portugal         | 339                 | 309      | 18 872 | 39  | 2 585     | 30 | 333     |
| 10                   | Croatia          | 185                 | 157      | 10 747 | 45  | 1 976     | 16 | 326     |
| 11                   | Spain            | 254                 | 230      | 21 517 | 40  | 2 705     | 15 | 320     |
| 12                   | Australia        | 232                 | 171      | 26 406 | 34  | 3 206     | 15 | 305     |
| 13                   | Finland          | 192                 | 187      | 26 732 | 61  | 1 494     | 25 | 294     |
| 14                   | Estonia          | 313                 | 250      | 9 414  | 59  | 1 781     | 25 | 293     |
| 15                   | Netherlands      | 203                 | 188      | 31 573 | 52  | 1 662     | 4  | 291     |
| 16                   | Switzerland      | 182                 | 181      | 35 675 | 47  | 2 158     | 6  | 270     |
| 17                   | Lithuania        | 231                 | 207      | 8 451  | 54  | 1 801     | 26 | 269     |
| 18                   | United States of America | 374 | 375 | 36 450 | 39 | 2 736 | 83 | 269 |
| 19                   | Slovakia         | 261                 | 237      | 11 348 | 48  | 1 795     | 19 | 268     |
| 20                   | Slovenia         | 272                 | 199      | 18 036 | 46  | 2 256     | 14 | 263     |

2 group of countries

| 1                    | United Arab E    | 1 023               | 1 054    | 81 819 | 25  | 4 862     | 54 | 4       |
| 2                    | Nepal            | 347                 | 377      | 1 220  | 27  | 4 130     | 84 | 4       |
| 3                    | India            | 319                 | 291      | 1 978  | 28  | 4 514     | 77 | 4       |
| 4                    | Pakistan         | 398                 | 337      | 2 770  | 31  | 4 227     | 73 | 4       |
| 5                    | Guinea           | 416                 | 575      | 896   | 10  | 5 391     | 165| 4       |
| 6                    | Mali             | 505                 | 706      | 1 160  | 12  | 5 617     | 8  | 4       |
| 7                    | Tajikistan       | 260                 | 302      | 935   | 38  | 3 538     | 70 | 3       |
| 8                    | Myanmar          | 346                 | 336      | 1 036  | 17  | 4 565     | 95 | 3       |
| 9                    | Brunei           | 685                 | 716      | 65 035 | 5  | 5 148     | 115| 3       |
| 10                   | Solomon Islands  | 606                 | 531      | 1 371  | 9   | 4 071     | 160| 3       |
| 11                   | Chad             | 507                 | 679      | 787   | 14  | 5 669     | 14 | 3       |
| 12                   | Iran             | 264                 | 479      | 9 436  | 36  | 4 038     | 59 | 2       |
| 13                   | Syrian AR        | 401                 | 536      | 3 497  | 35  | 3 501     | 37 | 2       |
| 14                   | Kuwait           | 591                 | 711      | 55 421 | 29  | 4 214     | 48 | 2       |
| 15                   | Indonesia        | 533                 | 647      | 4 602  | 6   | 5 220     | 106| 2       |
Results

Quality of life in the 1st and 2nd group of countries

a) In group 1, compared to group 2, per capita income was 14 times and 9 times higher in 2000 and 2016, respectively (p≤0.001) (Table 2).

b) Group 1 of countries is located 30° north of Group 2 (p≤0.001).

c) Group 1 is located at 1 time zone, group 2 - at 4 time zone (64° east longitude) (p≤0.001).

d) In group 1, the level of ultraviolet radiation (J/m²) is 2.7 times lower than in group 2 (p≤0.001);

e) Group 1 has 6 times higher Prosperity rating (p≤0.001); the index of happiness is 1.5 times higher (p≤0.001); 1.7 times lower corruption (p≤0.001); 6.5 times higher amicability (p≤0.001); 1.6 times higher than the Human Development Index (p≤0.001); 3.4 times higher environmental efficiency (p≤0.001);

f) 1.4 times better than medicine (p≤0.001); 2.7 times cleaner water (p≤0.001); 12 times cleaner air (p≤0.001); life expectancy for men is 13 years higher and life expectancy for women is 14 years higher (p≤0.001) (Table 2).

g) In group 1 countries, the gender difference in life expectancy is 2 times higher than group 2 (p≤0.001).

Analysis of the burden of incidence of diabetes mellitus and concomitant NCD in groups 1 and 2 countries using the Mann-Whitney U test

a) In the 1st group of countries, the total DALY NCD in men is 1.4 times, in women it is 1.5 times lower than in the 2nd group (p≤0.001) (Table 2).

b) In the 1st group of countries, the burden of Diabetes mellitus in the 2nd group of countries is lower for men and 2.7 times for women (p≤0.001).

c) In group 1 countries, the burden of Pancreas cancer in group 2 countries is 3.4 times higher for men and 3.6 times for women (p≤0.001).

d) In 1 group of countries, the burden of Alcohol use disorders is 7.6 times higher for men and 18.3 times for women in 2 groups of countries (p≤0.001).

e) In the 1st group of countries, the burden of Nephritis and nephrosis in the 2nd group of countries is lower for men and

Analysis of MS predictors in the 1st and 2nd group of countries

a) In group 1 countries, the percentage of men and women with overweight was 3 and 2 times higher than group 2, respectively (BMI ≥ 25) (p≤0.001) and (p≤0.03*) with Bonferroni correction (Table 2).

b) In the 1st group of countries, the% of men and women was 6.3 times higher than the 2nd group, the percentage of women was 3.6 times, with obesity 6.3 and 3.6 times, respectively (BMI ≥ 50) (p≤0.001), (p≤0.022).

c) In the 1st group of countries, the % of men and women with hypercholesterolemia was 3.6 and 3.1 times higher, respectively (Col ≥ 6.2) (p≤0.001) and (p≤0.001).

d) In group 1 countries, the percentage of men and women with hyperglycemia was 1.4 and 1.1 times higher than group 2, respectively (Glu ≥ 7.0) (p ≤ 0.001), (p = 0.9).

e) In the 1st group of countries, the % of men and women with increased blood pressure by 1.3 times and 1.2 times, respectively, (BP ≥ 140/90) (p≤0.001) and (p≤0.001) was higher than group 2.

f) Indicators of hypodynamia did not differ between 1 and 2 group of countries (Table 2).

Food structure in the 1st and 2nd group of countries

Alcohol consumption levels (g / person / day)

a) In the 1st group of countries in comparison with the 2nd group, the consumption of «Beverages, Alcoholic» was 23 times higher (p≤0.001) (Table 2).

b) In the 1st group of countries in comparison with the 2nd group, the consumption of «Wine» was 654 times higher (p≤0.001).

c) In the 1st group of countries in comparison with the 2nd group, the consumption of «Beer» was 137 times higher (p≤0.001).

d) In the 1st group of countries in comparison with the 2nd group, the% AB amount in the TDC structure was 50 times higher (p≤0.001) (Table 2).

e) In the 1st group of countries, in comparison with the 2nd group, the% AB amount in the TDC structure was 50 times higher (p≤0.001) (Table 2).
Table 2: d Mann-Whitney U Test, Quality of life, metabolic syndrome and the burden of NCDs in groups 1 and 2.

| Variable                                      | U   | Z   | p-value  | Median1 | Quartile1 | Median2 | Quartile2 |
|-----------------------------------------------|-----|-----|----------|---------|-----------|---------|-----------|
| The quality of life                           | 79,00 | 3.26 | 0.0011 | 26569 | 12644 | 1895 | 5921 |
| IPC 2000                                      | 73,00 | 3.27 | 0.0011 | 44718 | 18730 | 4730 | 9376 |
| IPC 2016                                      | 3.00 | 5.32 | 0.0000 | 50 | 7 | 20 | 16 |
| UV rad J/m 204                                 | - | -5.40 | 0.0000 | 1798 | 533 | 4714 | 1404 |
| lon°                                          | 70,00 | -3.50 | 0.0005 | 15 | 18 | 64 | 53 |
| Prosperity Rating                             | 7.00 | -5.21 | 0.0000 | 16 | 17 | 101 | 59 |
| HPI 2016                                      | 22,00 | 4.60 | 0.0000 | 6,889 | 1,271 | 4,524 | 1,276 |
| RK 2016                                       | 9.00 | -4.98 | 0.0000 | 17 | 28 | 131 | 51 |
| Rpful                                         | 5.00 | -4.85 | 0.0000 | 17 | 18 | 110 | 43 |
| IHD                                           | 16,50 | 4.95 | 0.0000 | 0.954 | 0.054 | 0.598 | 0.225 |
| EPI                                           | 11.00 | 5.02 | 0.0000 | 77 | 6 | 33 | 24 |
| ASM 1990                                      | 19,00 | 4.69 | 0.0000 | 100 | 1 | 69 | 30 |
| ACW 1990                                      | 17,50 | 4.63 | 0.0000 | 100 | 1 | 27 | 56 |
| Air 2004                                      | - | -5.25 | 0.0000 | 0 | 0 | 118 | 271 |
| male life expectancy                         | 38,00 | 4.37 | 0.0000 | 76 | 3 | 63 | 16 |
| female life expectancy                       | 2,00 | 5.34 | 0.0000 | 81 | 2 | 67 | 18 |
| gender                                       | - | - | - | - | - | - | - |
| m NCD                                         | 61,00 | -3.75 | 0.0002 | 9,841 | 1732 | 13593 | 2979 |
| f NCD                                         | 7.00 | -5.21 | 0.0000 | 8,743 | 1228 | 13418 | 3003 |
| m Diabetes mellitus                           | 24,00 | -4.75 | 0.0000 | 222 | 83 | 414 | 230 |
| f Diabetes mellitus                           | 8.00 | -5.18 | 0.0000 | 197 | 59 | 533 | 370 |
| m Pancreas cancer                              | - | 5.40 | 0.0000 | 74 | 25 | 22 | 18 |
| f Pancreas cancer                              | 21.00 | 4.83 | 0.0000 | 51 | 12 | 16 | 18 |
| m Alcohol use disorders                       | 9.00 | 5.15 | 0.0000 | 832 | 316 | 110 | 179 |
| f Alcohol use disorders                       | 4.00 | 5.29 | 0.0000 | 183 | 68 | 10 | 22 |
| m Nephritis and nephrosis                      | 21.00 | -4.83 | 0.0000 | 36 | 26 | 223 | 176 |
| f Nephritis and nephrosis                      | 20.00 | -4.86 | 0.0000 | 27 | 17 | 213 | 97 |
| Metabolic syndrome MS                         | - | - | - | - | - | - | - |
| m BMI ≥ 25 m/h2                                | 62,00 | 3.72 | 0.0002 | 64 | 7 | 21 | 40 |
| f BMI ≥ 25 m/h2                                | 115,00 | 2.09 | 0.0363* | 55 | 8 | 27 | 44 |
| m BMI ≥ 30 m/h2                                | 63,50 | 3.68 | 0.0002 | 25 | 5 | 4 | 15 |
| f BMI ≥ 30 m/h2                                | 115,00 | 2.29 | 0.0223 | 25 | 6 | 7 | 26 |
| m Chol ≥ 6.2 mmol / liter                      | 8.00 | 5.18 | 0.0000 | 18 | 7 | 5 | 4 |
| f Chol ≥ 6.2 mmol / liter                      | - | 5.40 | 0.0000 | 22 | 6 | 7 | 4 |
| m Glu ≥ 7.0 mmol / liter                       | 103,50 | 2.60 | 0.0094 | 11 | 2 | 8 | 3 |
| f Glu ≥ 7.0 mmol / liter                       | 199.00 | -0.01 | 0.9892 | 8 | 3 | 9 | 3 |
| m BP ≥140/90 mm Hg                             | 30,00 | 4.58 | 0.0000 | 47 | 6 | 36 | 6 |
| f BP ≥140/90 mm Hg                             | 49,00 | 4.07 | 0.0000 | 41 | 10 | 34 | 6 |

IPC: Per Capita Income; Lon: Longitude; Lat: Latitude; UV: Ultraviolet; HPI: Happiness Index; RK: Corruption Rating; Rpful: Peacefulness Rating; HDI: Human Development Index; EPI: Environmental Performance Index; MC: Metabolic Syndrome; BMI - m/h2: Body Mass Index; m: Male, f: Female; The quality of life; Medicine level; Pure water; Fresh air; Life expectancy; Daily burden; Blood cholesterol - mmol / liter; Blood glucose mmol / liter; Arterial blood pressure - mm Hg; Bonferroni correction p ≤0.025*

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Daily consumption levels of TDC products (grams / person / day)

a) In group 1 countries, the total TDC was 2.4 times higher than group 2 (p≤0.001) (Table 1).

b) In the 1st group of countries the consumption of «products of animal origin» - AP () (p≤0.001) was 3.3 times higher than in the 2nd group.

c) In the 1st group of countries the consumption of "red meat" was 5.3 times higher than in the 2nd group (p≤0.001).

d) In group 1 countries consumption was 1.3 times higher than group 2 "Grains and vegetables" - CV (p≤0.010).

e) In group 1 countries consumption was 1.3 times lower than group 2 «Legumes» (p≤0.010).

f) In group 1 countries consumption was 3.9 times higher than group 2 «Fruit and sweeteners» - FS (p≤0.001).

g) In group 1 countries consumption was 132 times higher than group 2 «Alcoholic drinks» - AB (p≤0.001) (Table 1).

Macronutrients

Common macronutrients in country groups 1 and 2

a) In the 1st group of countries, the level of total Energy (kcal / person / day) was 1.4 times higher than in the 2nd group (p≤0.001) (Table 1).

b) In the 1st group of countries, the Diversification of Total Energy was 2 times higher than in the 2nd group (p≤0.001).

c) In the 1st group of countries, the% of total carbohydrates in the total Energy was 1.3 times lower than the 2nd group (p≤0.001).

d) In the 1st group of countries the% of total Proteins in the total Energy was 1.1 times higher than the 2nd group (p≤0.004).

e) In the 1st group of countries, the% of total Fats in the total Energy was 1.6 times higher than in the 2nd group (p≤0.001) (Table 1).

Macronutrients of «animal products» - AP in groups 1 and 2

a) In the 1st group of countries it was 3.1 times higher than the 2nd group% of Energy of "products of animal origin" - AP in the total Energy (p≤0.001) (Table 1).

b) In the 1st group of countries it was 2.3 times higher than the 2nd group% of the Protein Energy of "animal products" - AP in the total Protein Energy (p≤0.001).

c) In the 1st group of countries it was 2.1 times higher than the 2nd group% of Fat Energy of "animal products" - AP in the total Fat Energy (p≤0.001).

Relationship between NCD Burden and MS Predictors on TDC Product Consumption in Country Groups 1 and 2

Linear Multiple Regression Analysis (MRA)

a) MRA was carried out for the influence of the «independent variables»: «AP - animal products», «CV - grains and vegetables», «FS - fruits and sweeteners» and «AB - alcoholic beverages» on the «dependent variables»: «NCD», «Diabetes mellitus », «Nephritis », «Pancreas cancer », «Alcohol use disorders» and predictors of MS:»BMI> 25 «, »BMI> 30 «, »Gluc> 7.0 », »Total Energy », »Animal Energy (Table 2).

b) It was found that the highest correlation (R1) and determination (R2) coefficients were under the influence of: «AP» on «Animal Energy» - (0.9244; 0.854); «AP» for «Total Energy kk / p / d» - (0.906; 0.822); «AP» for «m BMI> 25 » - (0.813; 0.661); «AP» for «m BMI> 30 » - (0.777; 0.603); «CV» for «f NCD» - (0.754; 0.569). This indicates that that more than 60% of the variability of these "dependent variables" can be determined by "animal products - AP" (p≤0.001).

c) An increase in «AB» (alcoholic beverages) by 10 grams is accompanied by a decrease in «f NCD» by 0.5%; M Diabetes mellitus 1.9%; F Diabetes mellitus by 1.5%; M Nephritis by 1.9%; F Nephritis by 1.9%; but an increase in «m Pancreas cancer» by 4.6%; F Pancreas cancer by 3%; «M Alcohol use disorders» by 3%; «F Alcohol use disorders» by 3% (p≤0, 001) (Table 2).

d) An increase of 10 grams in the «independent variable» «FS» (fruit, sweeteners) caused a decrease in the burden of «m NCD» by 1.3%, «f NCD» by 0.8%, as well as an increase in «m BMI> 25 » and « f BMI> 25 » by 2.0% and «m BMI> 30 » by 2.8% and «f BMI> 30 » by 3.4% (p≤0.001); "Total Energy kk / p / d" by 0.9% (p≤0.001) (Table 2).

e) An increase of 10 grams in the «independent variable» «CV» (grains, vegetables) was accompanied by a decrease in the burden of «m NCD» by 0.1% and a decrease in the burden of «m Diabetes mellitus» by 0.5%, and «f Diabetes mellitus» by 0 , 4% (p≤0,001), a decrease in the burden of «m Nephritis» by 0.5% and «f Nephritis» by 0.6% (p≤0.001), but an increase in «m Pancreas cancer» by 2, 0% and "total Energy kk / p / d" by 0.8% (Table 3).

f) An increase of 10 grams in the «independent variable» «AP» (animal products) resulted in an increase in the «dependent variables» «Animal Energy» by 2%; «Total Energy kk / p / d» by 0.2%; predictors of MS «BMI> 25 » and «BMI> 30 » by 0.7%, as well as a decrease in the burden of «m Nephritis» by 1.0% «and» f Nephritis » by 0.6%; but an increase in «f Alcohol use disorders» by 1.0% (p≤0,001) (Table 4 & Figures 1-4).
**Table 3:** Test Mann-Whitney U, Daily food consumption levels; alcohol and macronutrients in groups 1 and 2.

| Dietary Pattern DP | U   | Z    | p-value | Median1 | Quartile1 | Median2 | Quartile2 |
|--------------------|-----|------|---------|---------|-----------|---------|-----------|
| "Alcoholic Beverages" - AB gram / person / day | -   | 5.40 | 0.0000  | 16.4    | 12.50     | 0.7     | 1.00      |
| Beverages, Alcoholic | -   | 5.40 | 0.0000  | 65.4    | 60.00     | 0.1     | 0.00      |
| Wine | -   | 5.40 | 0.0000  | 259.8   | 61.00     | 1.9     | 1.50      |
| Beer | -   | 5.40 | 0.0000  | 341.6   | 85.50     | 2.6     | 2.00      |
| AB amount | -   | 5.40 | 0.0000  | 15.1    | 3.31      | 0.3     | 0.28      |
| AB % TDC | -   | 5.40 | 0.0000  | 16.4    | 12.50     | 0.7     | 1.00      |
| Daily consumption levels TDC | -   | 5.40 | 0.0000  | 15.1    | 3.31      | 0.3     | 0.28      |
| TDC: amount gram / person / day | 2.00 | 5.34 | 0.0000  | 2245    | 235       | 946     | 713       |
| "animal products" - AP | 12.00 | 5.07 | 0.0000  | 810     | 182       | 245     | 337       |
| "grains, vegetables" - CV | 105.00 | 2.56 | 0.0106  | 821     | 115       | 614     | 398       |
| "fruits, sweeteners" - FS | 18.00 | 4.91 | 0.0000  | 268     | 80        | 68      | 139       |
| "alcoholic Beverages" - AB | -   | 5.40 | 0.0000  | 323     | 86        | 3       | 2         |
| TDC % | | | | | | | |
| AP % TDC | 118.00 | 2.20 | 0.0275  | 36      | 6         | 25      | 16        |
| CV % TDC | 26.00 | -4.69 | 0.0000  | 37      | 4         | 62      | 16        |
| FS % TDC | 92.00 | 2.91 | 0.0036  | 12      | 2         | 8       | 7         |
| AB % TDC | -   | 5.40 | 0.0000  | 14      | 3         | 0.25    | 0.3       |
| Common macronutrients | | | | | | | |
| Total Energy kcal / person / day | 19.50 | 4.87 | 0.0000  | 3395    | 430       | 2435    | 760       |
| Carboh % TE | 8.00 | -5.18 | 0.0000  | 52      | 6         | 69      | 8         |
| Proteins % TE | 93.50 | 2.87 | 0.0041  | 12      | 2         | 11      | 1         |
| Fats % TE | 6.50 | 5.22 | 0.0000  | 36      | 6         | 22      | 8         |
| Animal macronutrients | | | | | | | |
| Animal Energy % TE | 2.50 | 5.33 | 0.0000  | 31      | 6         | 10      | 10        |
| Animal Proteins % TP | 3.50 | 5.30 | 0.0000  | 61      | 6         | 26      | 22        |
| Animal Fat % TFat | 16.00 | 4.96 | 0.0000  | 58      | 7         | 27      | 18        |
| Diversification | | | | | | | |
| DE%05 | 0.50 | 5.38 | 0.0000  | 70      | 8         | 39      | 19        |

| DV | INV | R1 | R2 | b* | b | T | F | p   | DV1 | DV2 | Effect % |
|----|-----|----|----|----|---|---|---|-----|-----|-----|----------|
| m NCD | FS | 0.615 | 0.378 | -0.615 | -17.025 | -9.74 | F(1,156)=94.8 | 0.0000 | 13071 | 12901 | 98.7     |
| f NCD | CV | 0.754 | 0.569 | -0.206 | -1.631 | -3.38 | F(3,154)=67.8 | 0.0009 | 11840 | 11823 | 99.9     |
| AB   | FS | -0.306 | 5.406 | -0.402 | 0.0001 | 11840 | 11775 | 99.5 |     |     |

**Table 4:** Multiple linear regression analysis (MRA) Independent variables: TDC: AP, CV, FS, AB, quantity, disease, DALYs-dependent variables and metabolic syndrome predictors, Energy, AP Energy%.
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|                          | CV     | 0.457 | 0.209 | -0.271 | -0.165 | -3.65 | F(2,155)=20.49 | 0.0004 | 396 | 394 | 99.5 |
|--------------------------|--------|-------|-------|--------|--------|-------|----------------|--------|-----|-----|------|
| m Diabetes mellitus      | AB     | -0.300| -0.491| -4.04  |        |       |                | 0.0001 | 396 | 391 | 98.7 |
| f Diabetes mellitus      | CV     | 0.560 | 0.314 | -0.330 | -0.252 | -4.76 | F(2,155)=35.4 | 0.0000 | 469 | 467 | 99.6 |
| m Nephritis and nephrosis| AB     | -0.370| -0.759| -5.34  |        |       |                | 0.0000 | 469 | 462 | 98.5 |
| CV                       |        |       |       |        |        |       |                |        |     |     |      |
| f Nephritis and nephrosis| AB     | -0.291| -0.375| -3.50  |        |       |                | 0.0006 | 208 | 204 | 98.1 |
| m Pancreas cancer        | CV     | 0.709 | 0.502 | -0.328 | -0.185 | -3.55 | F(3,154)=51.8 | 0.0005 | 208 | 206 | 99.0 |
| f Pancreas cancer        | CV     | -0.225| -0.077| -3.65  |        |       |                | 0.0004 | 160 | 159 | 99.4 |
| m Alcohol use disorders  | AB     | 0.441 | 0.194 | 1.789  | 6.14   |       | F(1,156)=37.6 | 0.0000 | 570 | 588 | 103.0 |
| f Alcohol use disorders  | AB     | 0.655 | 0.429 | 0.337  | 0.121  | 3.85  | F(2,155)=58.2 | 0.0002 | 94  | 95  | 101.0 |
| m BMI>25                 | FS     | 0.813 | 0.661 | 0.384  | 0.031  | 5.18  | F(2,155)=151.0| 0.0000 | 42.5| 42.8| 100.7 |
| f BMI>25                 | FS     | 0.604 | 0.364 | 0.604  | 0.110  | 9.43  | F(1,155)=88.8 | 0.0000 | 46  | 47  | 102.0 |
| m BMI>30                 | FS     | 0.777 | 0.603 | 0.367  | 0.014  | 4.57  | F(2,155)=117.8| 0.0000 | 13.8| 13.9| 100.7 |
| f BMI>30                 | FS     | 0.547 | 0.299 | 0.547  | 0.067  | 8.15  | F(1,156)=66.4 | 0.0000 | 20.5| 21.2| 103.4 |
| m glu > 7.0              | FS     | 0.554 | 0.307 | 0.554  | 0.005  | 8.32  | F(1,156)=69.2 | 0.0000 | 9.3 | 9.4 | 101.0 |
| f glu > 7.0              | FS     | 0.342 | 0.117 | -0.338 | -0.008 | -2.80 | F(4,153)=5.08 | 0.0057 | 9.3 | 6.7 | 72.0 |
| total Energy kk/p/d      | CV     | 0.906 | 0.822 | 0.271  | 0.543  | 4.89  | F(3,154)=236.3| 0.0000 | 271 | 272 | 102.0 |
| animal Energy %          | FS     | 0.466 | 2.453 | 8.51   |        |       |                | 0.0000 | 271 | 274 | 100.9 |

NCD: Non-Communicable Diseases; TDC: Total Daily Food Intake (g/p/d); AP: Animal Products (g/p/d); DALY: Disability-Adjusted Life Year; CV: Grains, Vegetables (g/p/d); FS: Fruits, Sweeteners (g/p/d); AB: Alcoholic Drinks (g/p/d); DV1: Dependent Variable 1; DV2: Dependent Variable 2
Bonferroni amendment
R1: коэффициент корреляции; R2: коэффициент детерминации; b*: стандартизированный коэффициент; b: коэффициент регрессии
Figure 1: Levels of consumption of alcoholic beverages in the 1st and 2nd group of countries.

Figure 2: Characteristics of the quality of life in the 1st and 2nd group of countries.
Discussion

As a result of the research, it was found that in the 1st group of countries the total consumption of alcoholic beverages (AB) was 132 times higher than in the 2nd group of countries. In the 1st group of countries, the consumption of strong alcohol was 23 times higher, the consumption of wine was 654 times and the consumption of beer was 137 times higher. In the 1st group of countries, the share of hard alcohol was 4.8% versus 27% in the 2nd group (p≤0.001). In the 1st group of countries, the share of wine was 19% versus 1.9% in the 2nd group (p≤0.001). The
The recreational use of psychoactive substances has been known since ancient times. Preferences and prohibitions depend on cultural traditions. Health issues from psychoactive use substances remain the subject of scientific discussions [18,30]. It is known that alcohol is a source of energy (7.1 g/kcal). The energy content of 1 gram of alcohol is 29 kf (7.1 kcal). Alcohol consumption can lead to excess weight [30-34]. Predictors of MS and alcohol consumption in Group 1 of countries were higher than Group 2 (p≤0.001). But the burden of diabetes mellitus (CD1 + CD2) and nephritis in men and women in Group 1 countries was significantly lower than Group 2 (p≤0.001). Our results contradict the literature data [35-40]. Group 1 had a higher burden of pancreatic cancer and alcoholism than Group 2. This correlates with high rates of rice factors in group 1 countries and literature data [37-39].

An increase in the independent variable AB by 10 grams (MPA) was accompanied by a decrease in the NCD dependent variables by 0.5%; and diabetes mellitus, as well as nephritis by 2% (p≤0.001). However, an increase in the independent variable AB by 10 grams was accompanied by an increase in the burden of the dependent variables for pancreatic cancer and alcoholism by 5% and 3%, respectively (p≤0.001). Our results, using two statistical methods, indicate that the effects of risk factors on NCD disease can be positive and negative. According to a number of authors, insulin resistance in T2DM occurs in the muscles of thin people predisposed to diabetes [41]. According to the authors, this insulin resistance is responsible for the excessive accumulation of fat associated with T2DM. This early muscle insulin resistance is the etiology of hyperlipidemia and excess fat accumulation, typical for type 2 diabetes [41]. Diabetes is a general term for a group of metabolic disorders. They affect the ability of the human body to use glucose for energy. This serious problem threatens the quality of human life [42]. The etiology of diabetes is still a mystery. To our knowledge, the burden of diabetes depends solely on the latitude and level of ultraviolet radiation [43]. At the same time, the burden of cardiovascular disease is related to economic status and does not depend on latitude [44]. Hormone-dependent cancers and MS are dose dependent on the income of countries [45,46].

The fight against obesity has led to the development of effective pharmacological and surgical methods. Bariatric surgery (BS), or weight-loss surgery. Research shows HD causes significant weight loss, reduced food addiction, diabetes recovery, and a 23% reduction in mortality from 40%. BS revealed an unexpected phenomenon called by the authors «reward deficit transfer» [47]. Some patients after BS showed a craving for psychoactive substances, including alcohol [47,48]. Preclinical and clinical studies have shown a decrease in dopamine receptors in the brain. Etiotropic agents have been tested to correct these transfers [47-51].

Conclusion

Studies have shown that the maximum and minimum daily consumption of alcoholic beverages (AB) in the diet in 158 countries of the world in 2004 differed 108 times and amounted to 342 and 2.6 grams per person without regard to gender and age (p ≤ 0.001). In group 1 (20 countries) with high AB compared to group 2 (20 countries) with low AB, GDP was 14 times higher (p≤0.001). In group 1, the burden of pancreatic cancer was 3.5 times higher (p≤0.001) and 12 times the burden of alcoholism was higher (p≤0.001).

However, in group 1 countries, the burden of diabetes mellitus was 2.5 times lower and the burden of nephritis was 7 times lower (p≤0.001). In countries with maximum AB, predictors of metabolic syndrome - MS (% of men and women in the country with MS disorder) were 2 times higher (p≤0.001). In addition, Group 1 countries were 3 times higher predictors of MS. Gender differences in the studied characteristics are noted.

Conflict of interest

The authors have no conflicts of interest

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