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# Lifestyle Habits of Croatian Diabetic Population: Observations from the Croatian Adult Health Survey

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## ABSTRACT

*The aim of this study was to assess the behavioural risk factors in Croatian diabetic population and to compare them with the lifestyle habits of individuals with no known history of diabetes. The study was a part of the Croatian Adult Health Survey (CAHS), a cross-sectional survey that provided comprehensive health assessment of the Croatian adult population. Risk factors were defined as an unhealthy nutritional regimen, excessive alcohol consumption, smoking and lack of physical activity. Physical inactivity was the most prevalent risk factor observed in a significant number of both diabetic and non-diabetic subjects (44.8% and 29.1%). It was also the only behavioural risk factor that was more prevalent in the diabetic individuals as compared to those without diabetes. Alcohol consumption did not vary significantly between the two groups (5.8% vs. 6.3%), while unhealthy dietary pattern and smoking were less frequent in respondents with diabetes (10.0% vs. 16.5% and 14.3% vs. 23.2%, respectively). Among diabetic patients, a significantly larger proportion of men than women reported smoking (19.2% vs. 10.0%), whereas no such sex-related differences were observed in other behavioural risk factors. Although the most prominent risk factor in diabetic patients was physical inactivity, a significant proportion of respondents with diabetes also reported the presence of other risk factors investigated in this survey. Since the majority of diabetic patients do not reach their treatment goals, there is a substantial need for curative and preventive interventions. Given the importance of physical activity in the treatment and prevention of diabetes and the high proportion of inactive diabetic patients, any future preventive programme in Croatia should address that risk as well.*

**Key words:** diabetes mellitus, physical activity, smoking, alcohol consumption, nutrition, Croatian Adult Health Survey

## Introduction

Diabetes has become a major public health problem globally<sup>1</sup>. Its prevalence is high in the most developed countries of the world, in entire Europe, and in Croatia as well<sup>2</sup>. It is well known that except for genetic and environmental factors, lifestyle habits and person-related factors play an important role in the development and progression of diabetes mellitus, especially that of type 2<sup>3</sup>. Physical activity and diet are critical factors in the primary prevention of diabetes in persons with normal and impaired glucose tolerance<sup>4</sup> and are also very important in the regulation of the disease and development of

its chronic complications. Unfortunately, it seems that overweight diabetic patients are less physically active than persons without diabetes, although the benefits on anthropological and metabolic parameters have been well established. Physical activity leads to an improvement in lipid levels and glucoregulation, a decrease in HbA1c, insulin resistance, blood pressure and body fat, especially visceral, and to an increase in muscular mass<sup>5,6</sup>. Furthermore, healthy diet considerably contributes to glucose and body weight control in diabetic patients. Even reducing the intake of dietary carbohydrates, especially of sim-

ple ones, consuming food with lower glycemic index and substituting saturated fats with unsaturated ones is beneficial<sup>7,8</sup>. Improvement in the above parameters reduces the risk of both micro- and macrovascular complications and that of cardiovascular and all-cause mortality<sup>9</sup>.

Smoking and alcohol consumption are other behavioural risk factors closely associated with diabetes. Smoking is an independent risk factor for the development of type 2 diabetes<sup>10</sup> accelerating the progression of atherosclerosis and nephropathy<sup>11,12,13</sup>. Excessive alcohol consumption has a similar negative effect on cardiovascular mortality, affecting rheologic properties of blood, blood pressure and insulin sensitivity<sup>14</sup>. Since alcohol inhibits gluconeogenesis and glycogenolysis, acute consumption of larger amounts with reduced food intake may precipitate hypoglycaemia in patients with diabetes<sup>15</sup>.

Considering the impact of various lifestyle-associated risk factors on atherosclerosis and other chronic complications of diabetes, this study aimed to establish the extent to which the most important behavioural risk factors (unhealthy diet, lack of physical activity, smoking, excessive alcohol consumption) are present in the diabetic population of Croatia.

## Patients and Methods

This study was a part of the Croatian Health Survey (CAHS), a cross-sectional survey of adults aimed at providing a comprehensive community health assessment of Croats, including their access to and use of health care services, health status, and determinants of health such as nutrition, physical activity, smoking and alcohol consumption. A large field study designed to provide nearly complete coverage (98%) of the Croatian adult population was performed in 2003, with a total of 9,070 respondents aged 18 and over. The complete design of the CAHS is described elsewhere<sup>16</sup>. Diabetes was assessed based on patients' self-reported medical history.

The most important behavioural risk factors as assessed in our study were defined as follows:

### (i) Unhealthy diet

Subjects who reported at least two of the following risks were considered as having an unhealthy diet: consumption of animal fat, milk and dairy products with more than 1.5% of fat, eating sweets every day, not eating fruit every day, always adding salt to food.

### (ii) Physical inactivity

Subjects who reported at least two of the following risk factors were considered as physically inactive: working at home, travelling to work by public transport, or working within a 15-min walking or cycling distance, easy or very easy job (sedentary or walking), physical activity less than 30 min a day during leisure time, advice received from a health care professional within the past year to increase physical activity.

### (iii) Smoking

Subjects who reported never smoking, smoking only occasionally, or every day for up to 5 years more than 10 years before the survey were not considered to be at risk, whereas those who reported regular smoking for at least 5 years in the previous 10-yr-period were considered to be at risk.

### (iv) Alcohol consumption

Subjects who reported drinking six or more glasses or bottles of alcohol on a single occasion, once a week or more often, or drinking every day and receiving advice from a family member or health care professional to drink less were considered to be at risk.

## Statistics

Analysis was performed using SAS version 9.0 and bootvar procedure (version 3.1) in order to estimate variances using the bootstrap method. Descriptive analysis included calculations of means, 95% confidence intervals (CI) of means and frequencies as well as calculation of coefficient of variations of all estimates. Statistical significance was set at  $p < 0.05$ .

## Results

Diabetic patients were older than non-diabetic subjects (mean age 61.0 vs. 46.3 yrs). The sex distribution was similar in both populations (54.0% of diabetic women and 46.0% of men, and 52.8% of non-diabetic women and 47.2% of men), as was the level of urbanization (urban/suburban/village settlement: 44.1%/19.9%/34.9% in diabetics vs. 43.3%/19.8%/36.4% in non-diabetics). In comparison with the subjects without a history of diabetes, diabetic patients were heavier (mean weight 81.9 vs. 76.5 kg), shorter (mean height 168.3 vs. 170.7 cm), more obese (mean body mass index 28.9 vs. 26.2 kg/m<sup>2</sup>), and with larger waist circumference (mean circumference 101.2 vs. 91.6 cm). They also more frequently lived with a partner (72.2% vs. 67.2%), had a lower employment rate (20.0% vs. 40.9%), lower level of education (unfinished primary school/primary school/high school/college or university: 22.3%/27.7%/39.2%/10.8% vs. 10.9%/21.0%/54.8%/13.3%) and worse economic status (worse than average/average/better: 44.5%/47.6%/7.9% vs. 36.8%/50.8%/12.4%) than the subjects without a history of diabetes. They had healthier nutritional habits than the individuals without diabetes (90.0% vs. 83.5%), but were more often physically inactive (44.8% vs. 29.1%). Smoking and excessive alcohol consumption were less frequent in diabetic subjects compared to the nondiabetic ones (14.3% vs. 23.2% and 5.79% vs. 6.27%, respectively) (Table 1).

Diabetic population revealed no sex-related differences in physical activity, while women were shown to be less frequently exposed to the remaining three risks. The most common risk factor in both men and women was the lack of physical activity (43.3% of men, 46.0% of women), followed by smoking (19.2% of men, 10.0% of

**TABLE 1**  
CHARACTERISTICS OF RESPONDENTS WITH AND WITHOUT A HISTORY OF DIABETES MELLITUS

	Respondents with history of known diabetes	Respondents without history of diabetes
Age (years)	61.0 ± 13.0*	46.3 ± 17.2*
Sex		
Male	46.0%	47.2%
Female	54.0%	52.8%
Weight (kg)	76.5 ± 15.3*	81.9 ± 14.8*
Height (cm)	170.7 ± 9.8*	168.3 ± 9.5*
Body mass index (kg/m <sup>2</sup> )	26.2 ± 4.7*	28.9 ± 4.8*
Waist circumference (cm)	91.6 ± 14.6*	101.2 ± 14.2*
Unhealthy diet	10.0%	16.5%
Physical inactivity	44.8%	29.1%
Smoking	14.3%	23.2%
Heavy alcohol consumption	5.8%**	6.3%**
Marital status		
Married or living in a partnership	72.2%	67.2%
Single, separated, divorced or widowed	27.8%	32.8%
Employed	20.0%	40.9%
Education		
Unfinished primary school	22.3%	10.9%
Primary school	27.7%	21.0%
High school or similar	39.2%	54.8%
College or University	10.8%	13.3%
Economic status (self-evaluation)		
Worse than average	44.5%	36.8%
Average	47.6%	50.8%
Better than average	7.9%**	12.4%
Level of urbanization		
Urban settlement	44.1%	43.3%
Suburban settlement	19.9%	19.8%
Village settlement	34.9%	36.4%

\* Mean ± standard deviation

\*\* High sampling variability

women), unhealthy diet (13.2% of men, 7.3% of women) and heavy alcohol consumption (10.5% of men, 1.7% of women). A statistically significant difference between the sexes was observed only for smoking ( $p < 0.05$ ), while other observed differences were not significant (Figure 1).

Coefficients of variation for almost all performed estimates were acceptable ( $< 16.5\%$ ). Estimates of marginal variability (16.6%–33.3%) are accompanied by a warning about the high sampling variability, while those with unacceptable variability ( $> 33.3\%$ ) are not presented.

## Discussion

A large majority of persons with diabetes were shown to have healthy nutritional habits but since diabetic diet is more comprehensive than the nutrition-related habits investigated in this study, data does not reflect the pro-

portion of diabetics adhering to an adequate diabetic diet. Our findings suggest better nutritional habits in both persons with and without diabetes than previously published<sup>17</sup>. Diabetic patients also showed better nutritional habits than the subjects without diabetes despite the observed socio-economic obstacles (lower general education, less frequently employed, and lower economic status), which was likely due to the level of diabetes education and care in Croatia.

The major risk factor in the largest proportion of diabetic patients was lack of physical activity, which showed no sex-related differences, its prevalence corresponding to that from previously published data<sup>18</sup>. They were also more often inactive than the subjects without diabetes, which could be explained by their older age in our study. Since physical activity is such an important tool in the management of diabetes mellitus<sup>5,6</sup>, the present status is unsatisfactory and presents a great risk for inadequate

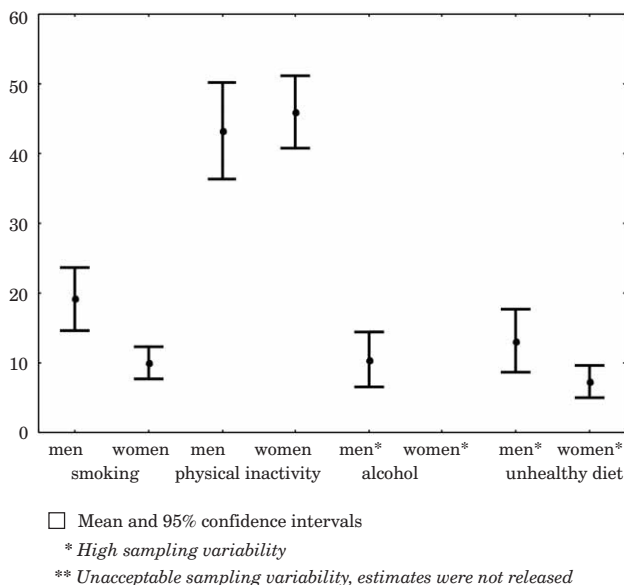


Figure 1. Proportion of diabetic patients with behavioural risk factors

diabetes management and consequent development of complications.

A smaller proportion of diabetic subjects were smokers, which is in contrast to some of the previous reports on a similar percentage of smokers in diabetic and non-diabetic subjects<sup>19</sup>. The overall rate of smokers among diabetic patients was lower than was previously published<sup>20</sup> but almost identical to data from the CroDiab, the Croatian National Diabetes Registry<sup>21</sup>. As expected, women reported lower prevalence of smoking exposure.

A lower percentage of excessive alcohol consumption was observed in the diabetic population as compared to

that without diabetes. Although alcohol consumption according to CroDiab data was higher than that obtained in this study<sup>21</sup>, the difference might be explained by different inclusion criteria. Data on extensive alcohol consumption and a lower smoking exposure risk in women revealed in our study are comparable with the previously published reports<sup>22</sup>.

A possible limitation of this study might be that medical conditions were self-reported. However, data were collected by trained interviewers, which could provide a certainty that medical conditions were recognized and classified properly.

According to CroDiab<sup>21</sup>, only 21.6 % of diabetic patients in Croatia have good glycaemic control (HbA1c < 6,5%), more than 87% of them are obese or overweight, and the majority do not reach target values for other chronic complication risk factors (lipids, blood pressure, etc.). Such a situation points to a substantial need for curative and preventive interventions. Given the importance of physical activity in the treatment of diabetes<sup>23</sup> on the one hand, and its observed lack in diabetic patients on the other hand, too many patients can still be considered to be physically inactive, and any future preventive programmes in Croatia should address this risk factor as well. Nevertheless, there is still a need to continue with the prevention of other investigated risks factors, as they all have an impact on the treatment goals, progression and mortality of diabetes.

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## **ŽIVOTNE NAVIKE OSOBA SA ŠEĆERNOM BOLEŠĆU U REPUBLICI HRVATSKOJ: ZAPAŽANJA IZ HRVATSKE ZDRAVSTVENE ANKETE**

### **S A Ž E T A K**

Cilj ovog istraživanja bio je utvrditi životne navike osoba sa šećernom bolešću u Republici Hrvatskoj i usporediti ih s životnim navikama ispitanika bez utvrđene šećerne bolesti. Istraživanje je bilo dio Hrvatske zdravstvene ankete (HZA), presječnog istraživanja zdravstvenog stanja odrasle hrvatske populacije. Rizični čimbenici bili su definirani kao prisutnost rizičnih ponašanja povezanih s nezdravim načinom prehrane, prekomjernim uživanjem alkohola, pušenjem i nedostatkom tjelesne aktivnosti. Najčešći rizični čimbenik, nedostatak tjelesne aktivnosti, zapažen je u značajnom broju ispitanika sa i bez šećerne bolesti (44,8% i 29,1%). To je ujedno bilo i jedino rizično ponašanje koje je kod dijabetičkih bolesnika bilo češće nego kod osoba bez utvrđene šećerne bolesti. Uživanje alkohola nije se značajno razlikovalo između skupina bolesnika sa ili bez šećerne bolesti (5,8% i 6,3%), dok su nezdravi način prehrane i pušenje zapaženi u manjem udjelu dijabetičara (10,0% i 16,5% odnosno 14,3% i 23,2%). Kod dijabetičkih bolesnika je značajno veći udio muškaraca nego žena naveo pušenje kao rizični čimbenik (19,2% i 10,0%), dok kod ostalih ispitivanih rizičnih čimbenika nije bilo značajnih razlika prema spolu. Najistaknutiji čimbenik rizika u osoba sa šećernom bolešću bila je tjelesna neaktivnost, no značajan broj ispitanika bio je izložen i ostalim rizičnim čimbenicima ispitivanim u ovoj anketi. Budući da većina osoba sa šećernom bolesti ne postiže ciljne vrijednosti u liječenju, neophodno je provođenje kurativnih i preventivnih intervencija. S obzirom na značaj tjelesne aktivnosti u liječenju i prevenciji šećerne bolesti i visokom udjelu neaktivnih dijabetičkih bolesnika, buduće preventivne akcije trebale bi obuhvatiti i ovaj rizik.