

# Co-Occurrence of Risky Lifestyle Behavior with Overweight, Excess Abdominal Fat and High Blood Pressure – Case Oriented Approach

Silvije Vuletić, Josipa Kern, Ognjen Brborović and Tea Vukušić

»Andrija Štampar« School of Public Health, School of Medicine, University of Zagreb, Zagreb, Croatia

## ABSTRACT

*The objective was to estimate the proportion of cases developed interim risk factors (INTF: overweight, excess abdominal fat, high blood pressure) in relation with behavioral risk factors (BEHF: smoking, heavy alcohol intake, unhealthy diet, physical inactivity). NOBIR group was defined as cases with no BEHF and BIR as those with them. Both groups show higher proportions of INTF in older age. The increase by age varies of twofold (overweight: 13.2–29.2 for men, 18.1–42.6 for women) to six fold (high blood pressure: 4.6–26.5 for men, 6.6–40.8 for women) in proportions. Women show higher proportions of INTF than men in both groups, but BIR group shows higher proportions than NOBIR in all the age groups taking the both gender together. As a BEHF the physical inactivity has a markedly increase with age (from 4% to more than 25%). Smoking is the only BEHF decreasing in oldest for all the INTF.*

**Key words:** lifestyle, co-occurrence, overweight, high blood pressure, excess abdominal fat

## Introduction

The lifestyle behavioral risk factors such as smoking, heavy alcohol intake, unhealthy diet and physical inactivity are stated as the first step in developing interim risk factors such as overweight, excess abdominal fat and high blood pressure. Both groups of these risk factors are prerequisite for the outcome like coronary heart disease, stroke, diabetes and some other chronic degenerative diseases<sup>1,2</sup>.

It could be hypothesized that in Croatian adult health survey population (CAHS) exist different groups of cases, regarding the combination of lifestyle risk factors, smoking, heavy alcohol intake, unhealthy diet and physical inactivity with interim risk factors, overweight, excess abdominal fat and high blood pressure.

Two relations of behavioral risk factors with interim risk factors are of interest in the analysis of co-occurrence of variables. One of them is the group of cases with no behavioral risk factors but with developed interim risk factors (NOBIR). The other is group of cases with both behavioral risk factors and interim risk factors (BIR).

In epidemiology of cardiovascular risk factors (CVRF) the correlation of behavioral risk factors (BEHF) with interim risk factors (INTF) are mostly analyzed as variable oriented approach. This is a common strategy in epidemiology and public health research. The literature is abundant. Let us mention just a few of them, published on Croatian epidemiology of CVRF<sup>3-6</sup>.

The case-oriented approach applied in the paper starts with an idea that there are distinct and singular entities of BEHF and INTF that parallel each other sufficiently to allow comparing and contrasting them<sup>7</sup>.

The objective of the paper is to estimate the proportion of both groups of cases, NOBIR and BIR in the CAHS population according to gender and age. Both the groups represent the population burden of CVRF, and are the targeting cases for primary/secondary prevention.

## Materials and Methods

The data for the analysis NOBIR factors with BIR factors were taken from the 2003CAHS (lit).

*Definition of variables*

- We defined overweight as body mass index of 25 or higher, and excess abdominal fat as waist circumference equal 102 cm (for men), 88 cm (for women), or higher.
- The cutting point of high blood pressure was 140/90 mmHg.
- Smokers are: Current daily smokers and ex-smokers who used to smoke regularly at least five years and quit less than 10 years ago.
- Heavy alcohol intake was defined as having a binge of heavy drinking at least once a week, or drinking alco-

hol daily and having someone constantly advising them on the need to cut down on alcohol intake.

- Those who fulfilled at least three of the following criteria were counted as physical inactive: driving to work, working in white collar occupation, taking less than two 30-minute session of exercise weekly in their leisure time, or having someone constantly advising them on the need for more physical activity.
- Those who fulfilled at least three of the following criteria were classified as having an unhealthy diet: regularly eating food preparing with animal fat, regular consumption full-fat (at least 3.2%) milk and milk products, low consumption of fruits, eating smoked

**TABLE 1**  
CASES WITH INTERIM RISK FACTORS

	Bibehavioral risk factors			
	No		Yes	
	Estimated number of cases (n)	%	Estimated number of cases (n)	%
Age (years)				
			Excess abdominal fat	
18–34	70766	7.4	86353	9.0
Men		2.8		4.5
Women		4.6		4.5
35–64	401301	22.0	485392	26.6
Men		7.1		13.1
Women		14.9		13.5
65 and over	188784	27.0	290588	41.6
Men		7.2		13.1
Women		19.8		28.5
			Overweight	
18–34	126231	13.2	173472	18.1
Men		7.4		12.2
Women		5.8		6.0
35–64	538108	29.5	695163	38.1
Men		13.0		23.3
Women		16.5		14.9
65 and over	204166	29.2	298069	42.6
Men		10.2		17.1
Women		19.0		25.5
			High blood pressure	
18–34	43989	4.6	63307	6.6
Men		3.4		5.5
Women		1.2		1.1
35–64	310096	17.0	419177	23.0
Men		7.4		14.5
Women		9.6		8.5
65 and over	185288	26.5	285204	40.8
Men		9.1		16.4
Women		17.4		24.4

meat at least twice a week, and adding salt to food before tasting.

*Qualitative comparative analysis*

In qualitative comparative analysis approach (QCA) any case is conceived holistically as configuration of conditions, not a collection of scores on variables. The simplest type of analysis involves dichotomous variables – antecedents (smoking, alcohol intake, unhealthy diet, physical inactivity) and consequents variables (overweight, excess body fat, high blood pressure). Once BEHF are selected, cases conforming to each combination of BEHF are examined to see if they agree on the INTF as outcome variables. QCA was performed by SAS Program (SAS Institute Inc., Cary, NC, USA).

**Results**

In the QCA analysis the results are presented as proportions of combination of BEHF and INTF variables in the CAHS population. Comparison of NOBIR and BIR cases are presented in Table 1.

Both NOBIR and BIR groups of cases show higher proportions of INTF in older age groups. The increase by age varies of twofold (overweight) to six fold (high blood pressure) in proportions. Women show higher proportions of INTF than men in both NOBIR and BIR groups, but BIR group shows higher proportions than NOBIR in all the age groups taking the both gender together.

The cases with solitary BEHF and developed INTF are presented in Figures 1–3. All the BEHF show at least slightly increases in ages 35 to 64. The physical inactivity as a BEHF has a markedly increase in oldest age group, 65 and over. Smoking is the only BEHF decreasing in the oldest age group for all the INTF.

The estimation of proportion of combinations of two, three or four BEHF are less than 0.5% in the CAHS population.

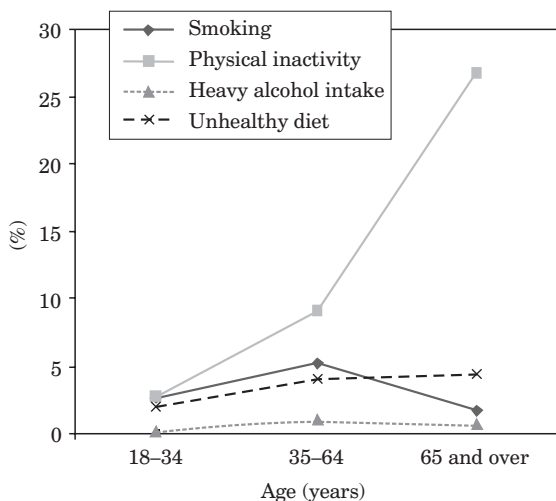


Fig. 1. Percentage of cases with solitary behavioral risk factors and excess abdominal fat.

**Discussion and Conclusion**

Two groups of cases were identified in the CAHS population. NOBIR and BIR group of cases. The BIR group is in accordance with empirical evidence that BEHF and INTF go together. For the NOBIR group of cases might be supposed that they are generally genetically predisposed, but exogenous conditions have not yet added their contribution to development of overweight, excess abdominal fat and high blood pressure. Any other interpretation is limited, because CAHS is cross-sectional study.

It is true that INTF may occur even though BEHF are not fulfilled. BEHF are probabilistic element to what is supposed to occur in development of INTF.

Anyhow and with precaution the causality between BEHF and INTF could be interpreted because BEHF and INTF are not identical, BEHF are at least contin-

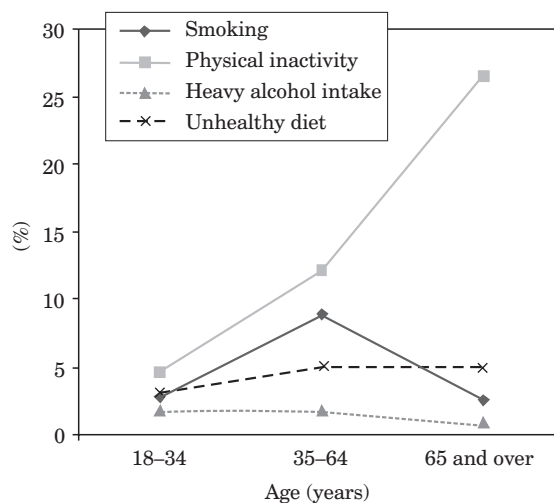


Fig. 2. Percentage of cases with solitary behavioral risk factors and overweight.

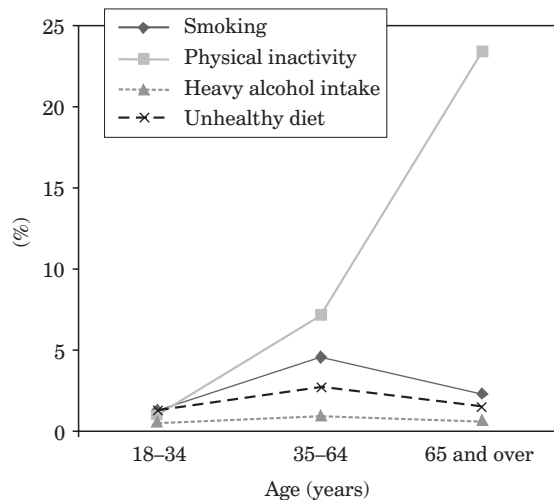


Fig. 3. Percentage of cases with solitary behavioral risk factors and high blood pressure.

gently necessary for development of INTF, and BEHF does not succeed the INTF<sup>8</sup>.

The follow-up of this group of cases in CAHS population, which is just now in the course, possibly will make clear the problem of causality.

Both groups of cases pose a real public health problem for intervention because of high frequency in population. Targets an intervention on pockets of high prevalence in communities is public health research needs, and should be done. Our health care system is lacking of coordination and balance of downstream health improvement

work focused on lifestyles with more upstream work, particularly through the community planning process. In the European countries, particularly in Scotland is part of the national public health programs<sup>9</sup>.

### Acknowledgements

The study is supported by the Ministry of Science, Education and Sport of the Republic of Croatia (Regionalism of cardiovascular behavioural risk factors – model of intervention; No: 108-1080135-0264).

### REFERENCES

1. KÖNIG D, BÖNNER G, BERG A, Herz, 32 (2007) 553. — 2. SCHUIT AJ, VAN LOON AJM, TIJHUIS M, OCKE MC, Prev Med, 35 (2002) 219. — 3. BÉCUE-BERTAUT M, KERN J, HERNÁNDEZ-MALDONADO ML, JURESA V, VULETIĆ S, Public Health, 122 (2008) 140. — 4. KERN J, STRNAD M, CORIC T, VULETIĆ S, BMJ, 331 (2005) 208. — 5. TUREK S, RUDAN I, SMOLEJ-NARANČIĆ N, SZIROVICZA L, ČUBRILLO-TUREK M, ŽERJAVIĆ-HRABAK V, RAK-KAIĆ A, VRHOVSKI-HEBRANG D, PREBEG Z, LJUBIČIĆ M, JANIČIJEVIĆ B, RUDAN P,

Coll Antropol, 25 (2001) 77. — 6. VULETIĆ S, POLAŠEK O, KERN J, STRNAD M, BAKLAIĆ Ž, Coll Antrop, 33 Suppl 1 (2009) 3. — 7. RAGIN CC, Introduction to qualitative comparative analysis. In: SARANTAKOS S (Ed) Data Analysis, Vol 2. (SAGE Publications, Los Angeles, 2007). — 8. HEISE DR, Journal of Mathematical Sociology, 14 (1989) 139. — 9. LOWTHER M, MORDUE A, Primary Prevention of cardiovascular Disease in Scotland, 2006, accessed on May 16th, 2008, available from URL: <http://www.vhscotland.org.uk/library/misc/NHS-CVD%20Full%20Doc.pdf>

S. Vuletić

»Andrija Štampar« School of Public Health, School of Medicine, University of Zagreb, Rockefellerova 4, 10000 Zagreb, Croatia  
e-mail: svuletic@snz.hr

### ZAJEDNIČKA POJAVNOST RIZIČNOG PONAŠANJA I PREKOMJERNE TJELESNE TEŽINE, ABDOMINALNE DEBLJINE I VISOKOG KRVNOG TLAKA – STUDIJA SLUČAJEVA

### SAŽETAK

Cilj je procijeniti proporciju slučajeva koji su razvili interim faktore rizika (INTF: prekomjerna tjelesna težina, abdominalna debljina, visoki krvni tlak) u odnosu prema ponašajnim faktorima rizika (BEHF: pušenje, prekomjerno pijenje alkohola, nezdrava prehrana, fizička neaktivnost). U grupu NOBIR uključeni su slučajevi bez BEHF, a u BIR oni s BEHF. Obje grupe pokazale su višu proporciju INTF u starijoj dobi. Porast po dobi varira od dvostrukog (prekomjerna težina: 13,2–29,2 muški, 18,1–42,6 ženski) do šestrestrukog (visoki krvni tlak: 4,6–26,5 muški, 6,6–40,8 ženski). Žene imaju veću proporciju INTF-a nego muškarci u obim grupama, ali BIR pokazuje više vrijednosti nego NOBIR u svim dobnim grupama promatrajući oba spola zajedno. Fizička neaktivnost kao jedan od BEHF pokazuje zamjetni porast s dobi (od 4% do više od 25%). Pušenje je jedini BEHF koji se smanjuje u najstarijoj dobnj grupi za sve INTF.