

# Nutrition and environmental risk factors of deaths of men in the Podlasie Region

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## Abstract

The aim of the study was to determine the risk factors in early deaths of men living in the north-eastern region of Poland.

The study involved a population of 1000 men employed in an industrial firm in the region. The observation was carried out in the years 1987-98. At the start, the age of the men ranged between 25 and 54 years (mean 35 years). Health problems of men included hypertension, ischaemic heart disease, as well as deaths and their causes. Environmental, economic and social conditions, nourishment and dietary habits with reference to health state were evaluated. The findings were elaborated using logistic analysis and the method of proportional Cox gambling.

During the 11-year observation period 40 men died, including 17 due to cardiovascular disorders. The overall risk factors were age, marital status (single) and increased alcohol consumption. Predictors of death due to cardiovascular diseases included age, abnormal arterial blood pressure and low intake of carbohydrates and vitamin C.

**Key words:** cardiovascular diseases, risk factors, social and economic conditions, nourishment and dietary habits, morbidity, mortality.

## Introduction

The most common causes of death in highly developed countries include cardiovascular diseases, cancer, injuries, acci-

dents and poisoning. The fact that cardiovascular diseases are common in the entire human population including Poland [1-3] draws particular attention. Such an unfavourable state of health is inseparably linked with an unhealthy lifestyle, especially insufficient physical activity, wrong dietary habits, smoking and an excessive consumption of alcohol [4-7].

Research on causes of death has been conducted for many years in highly developed countries resulting in preventive programs for specific populations [4,6-8]. In Poland the subject is only dealt with in a handful of research centers and the amount of data on the whole population of Poland is still noticeably small [9,10].

The aim of this study was to determine the risk factors of early deaths of men living in the north-eastern region of Poland.

## Material and methods

The study covered a population of 997 men aged 25-54 employed in an industrial company in the Podlasie Region.

The initial observation was carried out in the years 1987-98. After the initial observation the research was repeated for the first time in the years 1987-99; the research was repeated for the last time in the years 1996-98. Every man was examined after the period of 9 years.

Economic and social conditions, nourishment and dietary habits of the examined men were evaluated. Every person was subject to a thorough medical check up; additional laboratory testing and electrocardiographic monitoring were performed; furthermore specialists in particular areas were consulted. Arterial hypertension was recognised at the start of the medical examination process in accordance with the guidelines of FAO/WHO that were in force in 1987. Following these guidelines arterial hypertension was recognised when systolic pressure was  $\geq 160$  mmHg and diastolic pressure was  $\geq 95$  mmHg. Such values correspond to moderate arterial hypertension according to the currently valid classification.

The men's lifestyle was evaluated on the basis of the way

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**Table 1.** Change in the number of men suffering from arterial hypertension and ischaemic heart disease out of 630 men observed over the period of 9 years

		Ist examination	IIInd examination
Men suffering from arterial hypertension	n	93	187
	%	14.8	29.7
Men suffering from ischaemic heart disease	n	5	18
	%	0.8	2.9

I – men examined in the years 1987-89

II – men examined in the years 1996-98

of spending free time (active or passive), the A behaviour pattern, physical activity during the entire day in accordance with FAO/WHO/UNU [11].

The risk factors were classified according to the following criteria: the overall cholesterol  $\geq 200$  mg/dl, physical activity according to FAO/WHO/UNU  $< 1.43$ , smoking, glucose intolerance or diabetes, arterial hypertension,  $BMI \geq 25$ .

Dietary habits of the examined men were evaluated following an interview about their consumption in the last 24 hours. On the basis of the conducted interview the energetic value of the diet as well as the content of the basic nutrients were estimated. To do so a special computer program was written which underwent a standardization procedure in The Institute of Food and Nutrition. Moreover, the men's dietary habits were determined. The ability of the examined men to self-judge the nutrition was estimated on the basis of a comparison between the qualitative content of the 24 hour food intake according to the methodology by Szczygłowa [12] and the evaluation of their nutrition expressed by the examined men themselves.

The A behaviour pattern was evaluated on the basis of a questionnaire prepared by Wrześniewski [13].

Particulars in the death certificates were a source of data concerning deaths.

The findings were elaborated upon using the statistical computing package SAS applying the method of the Cox Proportional Hazards Model among others.

## Results

997 men were examined in the years: 1987, 1988, 1989 in three age groups: 25-34, 35-44, 45-54. The average age was 38,1 then.

After the period of 9 years 630 men were examined again because the remaining ones did not volunteer for the second round of examination; 40 of them had died in the meantime.

Tab. 1 shows the occurrence of arterial hypertension and ischaemic heart disease (ChNS) in the period of 9 years of observation.

During 9 years of observation of 630 men the number of people suffering from arterial hypertension increased from 93 persons (14,8%) in the 1st examination to 187 persons (29,7%). The incidence of arterial hypertension in the examined group of men in the period of 9 years of observation was equal to 19.4/1000/a year.

**Table 2.** The numbers of risk factors of ischaemic heart disease occurring at the same time among 630 men in the 9 year observation period

The number of occurring risk factors		Ist examination n=630	IIInd examination n=630	Level of significance $p < 0.05$
0 factors	n	31	27	
	%	4.9	4.3	
1 factor	n	123	98	
	%	19.5	15.6	
2 factors	n	219	188	
	%	34.8	29.8	
3 factors	n	198	195	
	%	31.4	31.0	
4 factors	n	53	107	I-II
	%	8.4	17.0	
5 factors	n	5	12	
	%	0.8	1.9	
6 factors	n	1	3	
	%	0.2	0.5	

I – men examined in the years 1987-89

II – men examined in the years 1996-98

**Table 3.** The number and causes of men's deaths in the 9 year observation period among 997 men selected for the 1st examination (years 1987-1989)

Causes of men's deaths	Deaths	
	n	% of the population
Cardiovascular diseases	17	1.7
Cancers	8	0.8
Injuries, accidents and poisoning	8	0.8
Suicides	4	0.4
Diseases of the digestive system	3	0.3
Total	40	4.0

Relatively few men suffered from ischaemic heart disease in the period of 9 years. In the 1st examination only 5 men (0,8%) out of 630 taken into analysis were found to suffer from ischaemic heart disease; after 9 years 18 persons (2,9%) had ChNS. The incidence of ChNS was equal to 23.1/10000/a year.

Tab. 2 shows the numbers of risk factors of ischaemic heart disease occurring at the same time among 630 men in the 9 year observation period.

None of the 6 risk factors of ischaemic heart disease taken into consideration occurred only in the case of 4.9% persons in the 1st examination and 4.3% persons in the 2nd examination. One of the risk factors occurred in the case of 19.5% persons in the 1st examination and 15.6% persons in the 2nd examination ( $p > 0.05$ ). The percentage of men affected by 4 or more risk factors of ischaemic heart disease rose by 10% in the period of 9 years; 4 of the risk factors were present in the case of 8.4% of men in the 1st examination and in the case of 17.0% of men in the 2nd examination ( $p < 0.05$ ).

The causes of men's deaths in the period of 9 years are presented in Tab. 3. 40 men out of 997 who participated in the 1st examination in the years 1987-89 died over the period of 9

**Table 4.** Nutrition and environmental risk factors of deaths of men in the 9 year observation period. The risk of death was estimated applying the method of the Cox Proportional Hazards Model

Dependent variable	The total of deaths n=40			Deaths due to cardiovascular diseases n=17	Deaths due to myocardial infarction n=5
	a.J.	a.J/W	a.Wcz.	a.J.	a.J.
<b>Independent variables</b>					
Age ( $\Delta=1$ year)	1.09	–	1.10	1.13	1.27
Physical activity according to FAO/WHO ( $\Delta=1$ point)					
Smoking (no/yes)					
Marital status (married/single)		2.46	2.39		
Income per person ( $\Delta=1$ 000 PLN)	1.07			1.09	
Education (elementary, secondary/higher)					
Way of spending free time (active/passive)					
Behavioural patterns A ( $\Delta=1$ point)					
Arterial hypertension (no/yes)				2.97	6.35
Diabetes (no/yes)					
BMI ( $\Delta=1$ kg/m <sup>2</sup> )					
Ability to self-judge nutrition (does not possess/possesses)					
Salting dishes (no/yes)					
Total energy ( $\Delta=1$ kcal)					
Total protein ( $\Delta=1$ g)					
Total fat ( $\Delta=1$ g)					
Vegetable fat ( $\Delta=1$ g)					
Total carbohydrates ( $\Delta=1$ g)	0.997			0.995	
Alcohol ( $\Delta=1$ g)	1.008	1.01	1.01		
Vitamin A ( $\Delta=1$ $\mu$ g)					
Vitamin B <sub>1</sub> ( $\Delta=1$ mg)					
Vitamin B <sub>2</sub> ( $\Delta=1$ mg)					
Vitamin C ( $\Delta=1$ mg)				0.977	

a.J. – one-factor analysis

a.J./W. – one-factor analysis with standardization of age

a.Wcz. – multi-factor analysis

years making it 4%. Deaths due to cardiovascular diseases constituted 42.5% (17 people) of all deaths. 8 people died due to cancers and the same number passed away as a result of injuries, accidents and poisoning (8 people). 4 people committed suicide. It was determined that 3 deaths were due to diseases of the digestive system.

Tab. 4 displays an analysis of the risk factors of deaths in total and deaths due to cardiovascular diseases in the period of 9 years.

The risk factors of all deaths of men in one-factor analysis included age, income per person, consumption of carbohydrates and alcohol. The risk of death grew considerably with the increase of age, income and alcohol consumption and it decreased with the growth of the consumption of carbohydrates. In the performed multi-factor analysis age, marital status and alcohol remained as risk factors.

The risk of death due to a cardiovascular disease (in one-factor analysis) grew with age, increasing income and decreasing consumption of carbohydrates and vitamin C. The occurrence of arterial hypertension increased the risk of death in that group of causes almost 3 times.

The predictors of death due to myocardial infarction (in

one-factor analysis) were age and most of all the occurrence of arterial hypertension which caused a 6 times increase of the risk of death from myocardial infarction.

## Discussion

Applying the analysis method of the Cox Proportional Hazards Model allowed to determine the risk factors of death in the examined group of 997 men observed over the period of 9 years.

Performing one-factor analysis of all deaths (40 deaths) as a whole without considering their causes revealed that their predictors comprised: age, income per family member, increasing consumption of alcohol, decreasing consumption of carbohydrates. Applying a multi-factor analysis allowed to eliminate less significant factors which proved to be income per capita and the consumption of carbohydrates. At the same time it allowed to reveal factors that were connected to a larger extent with deaths in general which finally included age, single marital status and the consumption of alcohol. The single marital status was indicated by other researchers as a risk factor of deaths in

general as well as deaths due to a cardiovascular disease [14,15]. The unfavourable influence of the single marital status can result from an increase of unhealthy behaviour by men remaining in the free status which include among others a smaller consumption of fruit and vegetables (hence a smaller consumption of vitamin C as well) and a larger consumption of alcohol [16]. The fact that the married status led to positive changes of dietary habits was also confirmed by other researchers [14,15]. Some Polish authors emphasise the positive influence of the marriage not only because the changes in dietary habits but also due to the support given by the spouse which often contributes to a considerable reduction in psychological and social stress, especially in the case of men [14,15].

Many authors do research on the issue of alcohol as a risk factor of diseases especially in relation to deaths in general and deaths due to cardiovascular diseases [5,17,18]. A positive influence of alcohol consumption on the death rate due to cardiovascular diseases was shown in Pol-MONICA research [19]. A number of authors underline the fact that only small doses of alcohol have a positive influence on a death rate in general and the death rate due to ischaemic heart disease while larger doses do not have such an effect. This dependence takes the form of a curve "U" or "J" [17,20-24]. However, no positive effect of alcohol consumption was observed in the research "Seven Countries Study" [25]. Finally, the approach that alcohol has a negative effect based on its detailed influence on particular systems and organs prevailed in the medical world [26-28].

The risk factors of death due to a cardiovascular disease in the model of one-factor analysis were age, increasing income per family member, arterial hypertension and a small consumption of carbohydrates and vitamin C. Age and arterial hypertension as a predictor of death due to a cardiovascular disease also turned out to be statistically significant in the research "Seven Countries Study" (covering Finland, Japan, Greece, Holland, Italy and Yugoslavia) [1]. Consumption of fruit and vegetables decreased the risk of falling ill with a cardiovascular disease among 120 000 people living in the USA in an 8-year long observation period [29].

Proving a connection between nutrition and later deaths is extremely difficult. Only in the research "Seven Countries Study" the authors showed a protective role of carbohydrates – it was observed that people consuming larger amounts of carbohydrates had a lower mortality rate from cardiovascular diseases [1]. A similar tendency was also confirmed in the case of fatty acids after 20 years of observation [1].

The research done by the authors of this work revealed that the predictors of death due to myocardial infarction were age and arterial hypertension (6.35-fold risk increase). The results of the research Pol-MONICA Kraków [9] carried out in the country showed that arterial hypertension increased the risk of death from ischaemic heart disease 2,38 times. The research Pol-MONICA Warszawa demonstrated also a significant role played by blood pressure. Arterial hypertension diagnosed in men aged 35-64 at the start of a 10 year observation period increased the chances of their death twofold [15,30]. Such an effect is a result of damages caused by hypertension to many organs mainly the heart and blood vessels [9,18,28].

## Conclusions

There were mainly two or three risk factors of ischaemic heart disease occurring simultaneously among the examined men and at the same time the group of men with 4 or more risk factors increased by 10%. After the period of 9 years an increase in the number of people suffering from arterial hypertension and ischaemic heart disease was witnessed.

Over the 9 year long observation period the largest number of deaths – 17 people (42.5%) was recorded due to cardiovascular diseases; in that group 5 men died of myocardial infarction.

The risk of all deaths significantly grew with age, increased consumption of alcohol and single marital status. A nutrition factor increasing the risk of death of an cardiovascular disease was small consumption of carbohydrates and vitamin C together with other factors such as age, income and arterial hypertension.

The population of almost 1000 men was covered by the presented research findings and the observation period was 9 years long. That allowed to demonstrate an influence of social and economic conditions as well as the dietary habits on later deaths of the examined men.

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