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Research Article

MODERN HEALTH EDUCATION: THE MODEL OF RISK FACTORS FOR THE UNDERSTANDING OF PATHOLOGICAL MECHANISMS

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A R T I C L E I N F O

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A B S T R A C T

Many diseases of the earlier times, especially communicable diseases, are no longer a problem for mankind today. Nowadays at the forefront are acute conditions, caused by germs that transmit diseases.The main problem of our days is the so-called cultural diseases. As with infectious diseases, here too, a cause of the disease can not be uniquely defined. So instead of the causes, risk factors are investigated. The purpose of this study was to approach, analyze and ultimately examine the model of risk factors for the understanding of pathological mechanisms, and there by help to prevent and promote health.

The method adopted for the study was a review of the bibliography. Based on this study, it is found that the so-called risk factor model has provided valuable services for understanding pathological mechanisms that are responsible for many diseases.

A modern health education, in the sense of promoting health, should also take into account the conditions of the social context, as well as the interests of specific social groups and individual motivations of behavior. At this point, however, Medicine reaches the limits of its potential.For this reason, aspects of health and attitudes concerning health must also be enlightened by social sciences. In summary, we can say that the medical model of risk factors and health education programs based on it provide a basis for planning and implementing targeted preventive measures to influence health.

INTRODUCTION

The analysis of the creation of medical theory shows that Medicine is primarily trying to explain pathogenic mechanisms in order to aid health. This method has its roots in the historical development of Medicine. The fact that many diseases of the earlier times, especially communicable diseases, are no longer a problem for humanity today, is certainly a result of modern science that is oriented to the natural sciences.

Today there has been a panoramic change as regards diseases. Nowadays at the forefront are acute conditions, caused by germs that transmit diseases, rather than chronic conditions, due, among other things, to the living conditions in industrialized countries that aim at performance, and whose origination often goes back many decades ago. The essential problem of our days is the so-called civilization diseases (BOOTH *et al*., 2000).

The concept of risk factor was first used in publications of the FRAMINGHAM study (KANNEL, 1961), which among other things tried to find the scales that affect coronary heart disease. As with infectious diseases, here too, a cause of the disease can not be uniquely defined. So, instead of the causes, the risk factors are being investigated, which, according to scientists, have an effect on the onset of coronary heart disease.

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METHODOLOGY

The present research is a bibliographic review study, presenting the critical points of the existing knowledge about the risk factors model for understanding pathological mechanisms, and thereby aid health. In the relevant bibliography, there is no specialized and comprehensive work on this subject. This work endeavors to cover this gap, and will perhaps also be a useful aid for those who in the future will attempt similar efforts. The main aim of the bibliographic review is to frame the study within the "body" of the relevant literature. The review of the current study concerns clearly formulated questions and uses systematic and explicit criteria for critically analyzing a body of published papers by summarizing, sorting, grouping and comparing.

Bibliographic review study

Risk factors

Risk factors have both a statistical and causal relationship to coronary artery disease. It is important to clearly emphasize

this separation so as to avoid misinterpretations of the importance of a risk factor, something that often happens. Therefore, a risk factor is somehow a warning for an impending disease without having to act causally for the disease (GRUNDY, 1998). Clearly there is, at least initially, a statistical rather than a causal connection. The existence of a risk factor does not necessarily lead to a disease. The existence of a risk factor only gives the risk measure, based on a statistical probability, as it results from a large number of scientific studies.

Because of the complexity of many possible magnitudes that affect the existence of chronic-degenerative diseases, the so-called diseases of our civilization, which include atherosclerotic diseases and coronary heart disease, it is very difficult to make epidemiologically the direct proof of causality.

This is clearly demonstrated in the following terms, which must be satisfied in order to ascertain the definitive proven conclusion:

1. In the groups of the exposed subjects, there should be, first of all, greater prevalence and incidence of the disease, than in the group of those not exposed (high relative risk).
2. All possible risk factors must be checked to avoid possible interactions.
3. There must be a clear relationship between dose and effect.
4. Quantitative and qualitative agreements of correlations found have to be confirmed in different populations.
5. Several research areas (clinical observation, epidemiological studies, pathological findings, experimental studies) should lead to the same conclusions and provide plausible mechanisms for the action of the risk factor at the cellular level.
6. A corresponding exposure should be apparent before the development of the disease.
7. Target reduction in risk factors in interventional studies should lead to a reversal of the cause-effect relationship and therefore a reduction in incidence.

In this regard, it is important to recall that in order to document chronic-degenerative diseases, responsible is most often a chain of causes where all the attending causes can never be known and individual differences must be accepted with the importance they have. Therefore, the decision on the significance of a risk factor should be taken on a case by case basis (BOOTH *et al*., 2000).

Based on their importance, risk factors are divided into two groups. First-order risk factors have a direct effect on the causative pathogenesis of atherosclerosis. Second-order risk factors are mainly characterized by their effect on first-order risk factors. It is also possible to subdivide on the basis of the ability to influence. This gives the following general picture of the risk factors:

Table 1 Risk factors for atherosclerotic disease or coronary artery disease (THEWS *et al*. 1999)

Non-modifiablerisk factors	Modifiable risk factors
	1st order
α) Genetic predisposition	a) high cholesterol levels
β) Male gender	b) high LDL cholesterol levels
γ) Age	c) highHDLcholesterol levels
	d) hypertension
	e) smoking cigarettes (inhalation)
	2nd order
	a) goutyarthritis / hyperuricemia
	b) diabetes melitus
	c) obesity / overweight
	d) psychological and social anxiety factors
	e) abnormaldiet
	f) absence of physical activity

Here no account is taken of possible risk factors that have recently become the subject of discussion, such as thrombosis tendency, left ventricular arterial hypertension, sleep apnea, and contraceptives taken by mouth (Anti-Baby-Pill). The risk assessments presented below are essentially based on data from the Framingham study, which, due to its long duration and the large population involved, is among the most important epidemiological studies.

Non-modifiable risk factors

Genetic predisposition

The risk of cardiovascular disease is increased from two to five times for people with a family history of hyperlipemia (in siblings, parents, grandparents) and with the occurrence of coronary heart disease before the age of 50 in one or more family members (GRUNDY *et al*., 1999).

It is not clear if the increased risk of coronary heart disease exists in this family only by increasing risk factors such as, for example, with elevated total cholesterol or LDL cholesterol level and the pathological consequences of arteriosclerosis (Kannel, 1983). It is accepted that potential family patterns of behavior affecting coronary heart disease (sports and nutrition) play a role. Genetic factors are an important dimension in the study of risk factors. However, because here we present mainly modifiable factors, we will not analyze them more despite the rich scientific knowledge.

Male gender

According to the data from the Framingham study, the risk of coronary heart disease is significantly increased for men, compared to women. Until women reach menopause, the risk of coronary artery disease in men is more than twice as high. After women's menopause, the level of risk increases for them, but it does not reach that of men.

Table 2 Frequency of coronary heart disease by sex and age (KANNEL *et al*., 1987).

Age at the time of the study	Frequency of coronary heart disease per 1000 people per year	
	Men	Women
29-34	3,4	0,8
35-39	2,9	0,7
40-44	5,7	1,3
45-49	9,1	3,1
50-54	16,5	6,1
55-59	25,1	10,2
60-64	27,6	18,1
65-69	26,7	22,1
70-74	37,8	26,2
75-79	53,0	50,4

There as on for the significantly lower risk of coronary heart disease in women of child bearing age, according to KANNEL (1983), is the effect of the female hormone on lipoproteins. Results from the study of Lipid Research Clinics (LRC) show elevated HDL cholesterol levels in women aged 20-59 in comparison to men. Women's LDL cholesterol levels until menopause are lower than those of men at the same age, but after menopause they are higher than men, although the women's LDL-to-HDL cholesterol ratio does not reach that of men. After analyzing many studies, KANNEL (1983) attributes to the elevated LDL cholesterol levels, a lesser effect on the incidence of coronary heart disease among women than on the lower post-menopausal HDL cholesterol levels.

It is noted that statistically the risk of coronary artery disease is significantly increased in men, compared to women. For this reason, many conclusions of epidemiological studies also apply to men.

Age

It is accepted that arteriosclerotic processes start as early as childhood. Already at the age of 10-20, veins containing fat are considered as precursors to arteriosclerosis. Autopsies of young men killed in the war, show early stages of atherosclerosis at the age of early puberty (AMERICAN HEART ASSOCIATION, 1992). Elements of the Framingham study show a linear increase in the incidence of coronary heart disease as the age grows. From the 35th year of age, the increase becomes steeper and the highest clinical manifestation occurs between the ages of 50 and 60 years. In women the highest incidence of coronary artery disease is between the ages of 60 and 70 years. Similarly, as the age increases, death rates also increase (LIOYD-JONES *et al*., 2006).

Modifiable risk factors

Lipoproteins

In the area of hyperlipidemia, the following lipoproteins are mentioned as being important for increasing the risk of coronary artery disease:

1. high concentration of total cholesterol,
2. high concentration of LDL cholesterol,
3. low HDL cholesterol concentration, and
4. high triglyceride concentration.

It is found that lipoproteins are caused by other risk factors:

1. genetic predisposition,
2. hypertension,
3. obesity,
4. diabetes mellitus,
5. smoking with inhalation,
6. abnormal nutrition and
7. lack of physical activity.
   (NCEP, 2001 & DGFF, 2005)

High levels of total cholesterol

Elevated total cholesterol values are considered to be an independent risk factor for the onset of coronary heart disease. Furthermore, they are also considered as the most important risk factor for coronary heart disease. Everyone agrees that a unique risk limit can not be identified (KANNEL, 1987). However, there is a steady increase in the risk of coronary heart disease at values above 200 mg / dl (GRUNDY *et al*., 1999). GRUNDY (*et al*., 1999) found a double increase in the risk of coronary heart disease at values above 260 mg / dl. The most favorable area, with regard to the incidence of coronary heart disease, was at levels below 180 mg/dl (NCEP, 2001).

High levels of LDL cholesterol

The level of LDL cholesterol values correlates positively with total cholesterol values and coronary heart disease. LDL cholesterol is referred to as the lipoprotein with the highest effect on atherosclerotic processes and is considered to be an independent risk factor for coronary heart disease. Cholesterol levels above 160 mg / dl indicate a high risk of coronary heart disease. It is considered best to pursue values below 130 mg / dl (NCEP, 2001).

Low levels of HDL cholesterol

HDL cholesterol has a protective effect as regards coronary heart disease. Many studies showed a significant reduction (up to 50%) in the risk of coronary heart disease for any increase in HDL cholesterol by 10 mg/dl. HDL cholesterol concentrations above 65 mg / dl present the lowest risk, and values below 35 mg / dl are associated with a high risk. Risk reduction is almost continuous. Low concentration of HDL cholesterol can be considered as an independent risk factor (NCEP, 2001 & DGFF, 2005).

According to data from the Framingham study (KANNEL *et al*., 1987), the risk of developing coronary artery disease is doubled at concentrations of HDL cholesterol at values between 20 and 25 mg/dl, while the protective effects of HDL cholesterol already start at concentrations above 45 mg/dl. Accurate risk assessment for coronary heart disease is particularly difficult due to the association of cholesterol types with each other. A lower total cholesterol (<200 mg / dl), combined with a lower HDL cholesterol (<40 mg / dl), may indicate a higher risk than relatively high concentrations of total cholesterolcombined at the same time with high HDL cholesterol levels. This has led to a risk assessment for coronary heart diseasebased on the ratio

$$\frac{\text{Total cholesterol}}{\text{HDL cholesterol}}$$

The optimum fractional value is less than 3.5. A high risk for coronary heart disease occurs with values above 4.5 and low risk with values between 3.5 and 4.5. KANEL (1983) describes similar relationships for LDL and HDL cholesterol and gives this fraction a great predictive value.

However, the significance of the ratios has been questioned, against the use of the fractions, because the same quotient values can be based on large differences in the concentrations of total cholesterol, LDL and HDL cholesterol. These fractional values alone do not provide information on the concentration of LDL cholesterol, a major risk factor for coronary heart disease. Therefore, for the accurate risk assessment, both the concentration values and the fraction values should be considered. In order to sub-categorize the HDL cholesterol (HDL2 and HDL3) and the risk assessment based on these, there are still insufficient studies to draw conclusions (NCEP, 2001 & DGFF, 2005).

Triglycerides

The role of triglycerides as a risk factor for coronary heart disease is controversial. An independent role is not ascribed to them, but they have a close relationship with other cholesterol parameters. Triglycerides are simply weak indicators of coronary heart disease. However, their association with risk increases significantly if there are also elevated concentrations of total cholesterol (LEWING *et al*., 2007).

In the Framingham study (KANNEL *et al*., 1987) appears only a small effect on coronary heart disease with mean or elevated HDL cholesterol. Increased risk, due to increased triglyceride concentration, occurred only at low HDL cholesterol concentrations (<40 mg/dl). There is an inverse relationship between the triglyceride concentration and the HDL cholesterol value, which confirms that low triglyceride values and high HDL cholesterol values favor a low risk of coronary heart disease. The triglyceride concentration of less than 200 mg/dl is considered not to indicate a risk and should therefore be pursued (LEWING *et al*., 2007).

Hypertension (high blood pressure)

Hypertension (according to the World Health Organization: contraction ≥ 160 mm Hg and / or dilation ≥ 95 mmHg) is considered as the primary risk factor for coronary heart disease. Three times higher risk for coronary heart disease appears in the aforementioned values. Blood pressure between 140/90 and 160/95 shows a double risk. For women, the dangerous values are not so high. Basically, there is no unique risk threshold, so the lowest blood pressure values should be pursued. There is a positive correlation between blood pressure and the incidence of coronary heart disease. According to data from the Framingham study, systolic and diastolic blood pressure have the same importance in terms of a potential risk for coronary heart disease. Hypertension is considered as a cardiovascular disease, which significantly affects morbidity and mortality, especially in industrialized countries (GOHLKE, 2002).

Cigarette smoking

Cigarette smoking is considered as an independent risk factor and is classified as a major risk factor for coronary heart disease. Many studies show the relationship of increased risk for coronary heart disease among smokers of inhaled cigarettes. Pipe smokers have only a little increased risk, probably due to the absence of inhalation of smoke. The increased daily consumption of cigarettes seems to be associated with an increased risk, as even a low consumption of up to 4 cigarettes leads to a significant increase in risk. In the case of smoking more than 10 cigarettes a day, there is a 1.6 times higher risk than non-smokers. With concurrent systolic blood pressure ≥ 130 mmHg, the risk of death from cardiovascular disease is doubled. The risk of a chain smoker (≥ 45 cigarettes a day) suffering a myocardial infarction is four times as great as a non-smoker. The relative risk of coronary heart disease is reduced for ex-smokers and after a few years it reaches the level of non-smokers. A follow-up study of one million people for 6 years presents the risk of mortality for 40-80-year-old men and women from coronary heart disease (KANNEL *et al*., 1987).

Table 3 The relation between coronary heart disease mortality rate and the number of cigarettes smoked daily (KANNEL *et al*., 1987)

Age	Men's mortality risk				
in years	Non-smokers	1-9 Cigarettes per day	10-19 Cigarettes per day	20-39 Cigarettes per day	> 40 Cigarettes per day
40-49	1,00	1,60	2,59	3,76	5,51
50-59	1,00	1,59	2,13	2,40	2,73
60-69	1,00	1,48	1,82	1,91	1,79
70-79	1,00	1,14	1,41	1,49	1,47

Age	Women's mortality risk				
in years	Non-smokers	1-9 Cigarettes per day	10-19 Cigarettes per day	20-39 Cigarettes per day	> 40 Cigarettes per day
40-49	1,00	1,31	2,08	3,62	3,31
50-59	1,00	1,15	2,37	2,68	3,73
60-69	1,00	1,04	1,79	2,08	1,02
70-79	1,00	0,76	0,80	1,27	-

KANNEL (*et al*., 1987) found in his research lower cholesterol HDL values in smokers than non-smokers. Total cholesterol values and LDL cholesterol values were higher in smokers than non-smokers. Passive smoking is also considered a potential risk factor for coronary artery disease.

Gout / Hyperuricemia

Gout and hyperuricemia (elevated blood uric acid) are hereditary disorders of uric acid metabolism, the appearance of which is definitely favored by overweight, hypertension and diabetes mellitus. No risk assessment from gout and hyperuricemia for coronary heart disease or atherosclerotic processes is reported in the scientific literature. For this reason, gout and hyperuricemia are referred to as risk factors only for the sake of completeness.

The effects of overweight, hypertension and diabetes mellitus should be further examined in this regard (GOHLKE, 2002).

Diabetes mellitus

Diabetes mellitus is considered to be an independent risk factor for coronary heart disease. Morbidity and mortality rates from coronary heart disease are elevated for both type I diabetics and type II diabetics. Coronary heart disease is the leading cause of death for Type I diabetes. The effect of diabetes on atherosclerotic diseases is significantly higher in women than in men. Statistically, mortality is twofold in the case of diabetes mellitus, although the risk for diabetes is lower overall in countries with a lower incidence of coronary heart disease (Africa, Japan). Often there are also risk factors other than diabetes, particularly disorders of fat metabolism, which further increase the incidence of coronary heart disease (WABITSCH *et al*., 2004).

Obesity (overweight)

Particular importance in the consideration of risk factors is given to the problem of body weight. Since the BROCA type [height in cm minus 100 = normal weight] is outdated, the body mass index (BMI) is now used to assess the weight. This is not so easy to calculate, but it is scientifically more valid, because very short or very tall individuals can be objectively classified to it.

The body mass index is equal to $\frac{\text{Body weight in kg}}{\text{Height in m2}}$

Without calculating the age according to DGE (2003) we have the following weight classification. The expected lifespan in a certain weight class is indicated.

Table 4 Estimation of the body mass index according to the maximum life expectancy, without taking into account the age (DGE, 2003)

	BMI	
Classification	Men	Women
Underweight	< 20	< 19
Normal weight	20 - 25	19 - 24
Overweight	25 - 30	24 - 30
Obesity	30 - 40	30 - 40
Extreme obesity	> 40	> 40

Recently, age has also been taken into account. There are two reasons for this:

1. Analyses indicate that the body mass index, which is associated with lower mortality, increases with age.
2. As the age increases, especially around the age of 50, the body mass that contains no fat is reduced almost as a natural process and body fat increases (TROSCHKE, 2008).

DGE (2003) calculates the body mass index according to the highest life expectancy, taking into account the age as follows:

Table 5 Estimation of the body mass index according to the maximum life expectancy (DGE, 2003)

Age group	Desired BMI
19-24	19-24
25-34	20-25
35-44	21-26
45-54	22-27
55-64	23-28
≥ 65	24-29

Obesity (BMI ≥ 30) is recognized as an independent risk factor. Everyone agrees that overweight is closely related to the main risk factors, so that the elimination of overweight is proven to be associated with the reduction of further risk factors and hence the risk of coronary heart disease. In particular, the relationship of body weight with the cholesterol level has been documented. Thus, a weight loss of 5 kg with a low-fat diet leads to a reduction in total cholesterol of 20 mg/dl of the people participating in the survey. If everyone had the ideal weight, then there would be 25% fewer coronary heart disease incidents. But it is questionable whether overweight can be considered an independent risk factor. Recent knowledge for the evaluation of this matter does not address the extent of overweight but rather the distribution of fatty tissue (BERGMANN & MENSINK, 1999).

In the context of body measurements, importance is given to the waist-hip ratio for women. Furthermore, the unfavorable proportion is given the role of an independent risk factor, due to a high percentage of fat in the torso area. The fat of the skin fold in the abdomen correlated significantly and negatively with HDL cholesterol. It has been found that android fat deposition (in the abdomen area) is more important for the risk of cardio-circulatory diseases than gynoid fat deposition (in the thigh-buttocks area) (GRUNDY, 1998).

Therefore, in the study of risk factors, particular attention is paid to the distribution of fatty tissue. We accept that fatty tissue in the abdomen area should be considered a potential risk factor. The waist-to-hip-ratio (FANZKOWIAK, 1996) is used as a simple way to measure local fat.

Waist-to-hip-ratio
Waist circumference: in the pelvis between the lower edge of the lateral arch and the upper edge of the iliac crest.
Measurement of the hip circumference: at the trochanter height
The android obesity occurs in men for values greater than 1, for women at values greater than 0.85.

Finally, the immense importance of obesity as a risk factor, due to its close relationship with other risk factors, especially with blood fat, arterial hypertension, diabetes and hyperuricemia (GRUNDY, 1998), must be stressed once again.

Psychological and social anxiety factors

In addition to medical and physical risk factors, psychological and social factors become increasingly important for the explanation of coronary heart disease. Many factors, such as social status, job responsibilities, mobility and anxiety, are being examined in relation to coronary heart disease. Of course, they are crucial when we are talking about long-lasting influences and not temporary emotions. There is an increased risk of coronary heart disease incidence due to oppressed hostility, overload in work, many professional responsibilities, lack of job satisfaction, high degree of sadness, and stressful behavioral patterns. This research area gives importance to the so-called type A and type B behavioral patterns.

Type A generally corresponds to a sympathicotonic person, which presents behaviours such as extraordinary effort, high professional expectations, anxiety and competitive thoughts. On the other hand, type B is distinguished by a looser, less aggressive behavior that is not bound by deadlines. But there is no strict, precise separation of these two patterns of behavior. The discussion of the effects of psychological and social factors on coronary disease becomes more intense. Even if due to scientific difficulties it is not possible to produce significant evidence, because psychological and social factors are not medical-physical factors that can be proved, these factors are considered very important. Furthermore, it should be noted that coronary heart disease incidence increases mainly at younger age, although physical risk factors do not have a remarkable presence (GOHLKE *et al*., 2002).

CONCLUSIONS

The so-called risk factor model has provided valuable services for understanding the pathological mechanisms that are responsible for the incidence of heart attack. Based on the results of epidemiological studies, smoking, hypertension and hypercholesterolemia can be characterized as primary risk factors and therefore determined to cause disease. Although dangerous behaviors are recognized as such, this doesnotresultinach ange in behavior. People change their behavior partly on the basis of external behavioral requirements in the form of rewards or punishments. Our health care system does not provide such measures for dangerous behaviors, such as smoking (TROSCHKE & STOESSEL, 2012).

On the other hand, we should not overlook the fact that some behaviors that are objectively considered dangerous to health - such as smoking - can be experienced and considered subjectively by individuals as beneficial and relaxing, depending on the social context and the situations.A modern health education, in the sense of promoting health, should also

take into account the conditions of the social context, as well as the interests of specific social groups and individual motivations of behavior. At this point, however, Medicine reaches the limits of its potential. For this reason, aspects of health and attitudes concerning health must also be enlightened by social sciences. In summary, we can say that Medicine has laid the foundation for the understanding of many diseases of the modern age. In particular, the medical model of risk factors and the health education programs based on it provide a basis for planning and implementing targeted preventive measures to influence health.

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