



THE ROLE OF HYGIENE IN THE PREVENTION OF NON-INFECTIOUS DISEASES

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Abstract

The article discusses the main aspects of the prevention of non-communicable diseases (NCDs), including risk factors, modern methods of prevention and the importance of hygiene measures. Particular attention is paid to the primary and secondary prevention of cardiovascular diseases, oncology, diabetes mellitus and chronic respiratory diseases. Data on the impact of lifestyle on the reduction of non-communicable diseases are provided.

Keywords: Non-communicable diseases, prevention, hygiene, risk factors, healthy lifestyle.

INTRODUCTION

Non-communicable diseases (NCDs) represent a leading global health challenge, constituting the primary cause of mortality and disability within the population. According to statistics from the World Health Organization (WHO), over 70% of all fatal outcomes, equivalent to approximately 41 million cases annually, are attributable to NCDs. The most prevalent among these are cardiovascular diseases, oncological processes, type 2 diabetes mellitus, and chronic obstructive pulmonary diseases. The increased incidence of NCDs is associated with the transformation of lifestyles, increased life expectancy, and the impact of environmental factors. In contrast to infectious diseases, the etiopathogenesis of NCDs is largely determined by modifiable behavioral risk factors such as tobacco smoking, irrational nutrition, hypodynamia (lack of physical activity), and alcohol abuse.

Objective:

This work is dedicated to a comprehensive analysis of modern and innovative strategies for the prevention of non-communicable diseases (NCDs). The research focuses on the defining role of hygiene as a key element in preventing these diseases. The analysis examines the main risk factors contributing to the development of NCDs, various approaches and effective strategies aimed at their prevention, and provides specific examples of successful implementation of prevention programs in various contexts and countries. Particular attention is paid to the integration of hygienic practices into everyday life and medical practice to achieve long-term results in reducing morbidity and improving public health.

In the context of global demographic changes characterized by population ageing and increasing burden on health systems worldwide, prevention of noncommunicable diseases (NCDs) is





becoming a priority. Despite significant progress in the treatment of various diseases, including NCDs, the focus on preventing their development is considered the most effective and cost-effective approach. Preventive measures can not only reduce the economic burden associated with the treatment of chronic diseases, but also improve the quality of life of the population as a whole. Hygiene, considered as a scientific discipline and a set of practical measures, plays a key role in creating favorable conditions for maintaining health at the individual and societal levels. Ensuring sanitary and hygienic well-being includes a wide range of activities aimed at reducing the impact of risk factors and strengthening the health of the population. An integrated approach to the prevention of NCDs involves the implementation of primary prevention strategies aimed at eliminating or minimizing risk factors, and secondary prevention aimed at early detection and timely treatment of diseases. In this context, hygiene measures occupy a central place, providing the basis for the effective implementation of all preventive strategies.

This review article is devoted to the analysis of modern strategies and approaches to the prevention of non-communicable diseases, with a special emphasis on the importance of hygiene. The goal of the work is to identify the most effective methods and practices that help reduce morbidity and improve public health. The study will consider the main risk factors contributing to the development of NCDs, modern strategies and interventions aimed at their prevention, and also provide examples of successful implementation of preventive programs in various countries and regions of the world. Particular attention will be paid to the integration of hygiene principles and practices into everyday life, educational programs and medical practice, which will create sustainable conditions for reducing the burden of NCDs and improving the quality of life of the population.

Non-communicable diseases: Non-communicable diseases (NCDs), also known as chronic non-communicable diseases, are a large group of diseases that are not caused by infectious agents and are not transmitted from person to person. These diseases are characterized by a complex pathogenesis caused by the interaction of genetic, physiological, environmental and behavioral risk factors. The main categories of NCDs include: cardiovascular diseases (e.g. coronary heart disease, myocardial infarction, stroke), cancer (malignant neoplasms of various localizations), chronic respiratory diseases (e.g. chronic obstructive pulmonary disease (COPD), asthma) and diabetes mellitus type 2. Characteristic features of NCDs are a long latent period of development, chronic progressive course and significant negative impact on the quality of life of patients, leading to disability and premature mortality. According to the World Health Organization (WHO), cardiovascular diseases remain the leading cause of death worldwide (about 17.9 million deaths per year), followed by cancer (about 9.3 million deaths per year) and diabetes mellitus (about 1.5 million deaths per year). Given the significant contribution of NCDs to global morbidity and mortality, the development and implementation of effective preventive strategies is of paramount public health importance.

The epidemiological transition that began in the 21st century has dramatically changed the structure of morbidity on a global scale. Whereas previously infectious diseases played the leading role in morbidity statistics, non-communicable diseases (NCDs) now pose the main threat to public health. The Russian Federation fully reflects these global trends: about 60% of deaths are due to

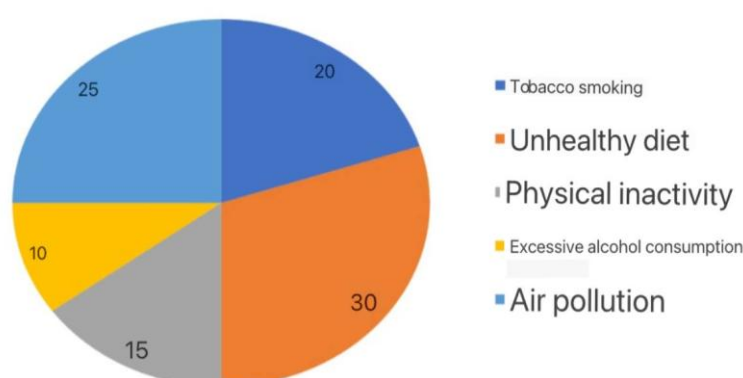


cardiovascular diseases, with cancer being the second most common. Such a shift in the structure of morbidity highlights the urgent need to increase the emphasis on preventive measures, especially in the context of limited resources allocated to healthcare. Effective prevention appears to be the most rational approach to reducing the burden of NCDs and optimizing the use of available resources.

Risk factors for non-communicable diseases: A key feature of most NCDs is the presence of common, modifiable risk factors that can be corrected through lifestyle modification and environmental improvement. The main modifiable risk factors include:

1. Tobacco smoking. Tobacco smoking is a leading risk factor for cancer, especially lung cancer, and cardiovascular diseases. According to the World Health Organization (WHO), smoking causes about 8 million deaths worldwide every year.
2. Poor nutrition. Excessive consumption of salt, sugar and trans fats in food contributes to the development of such pathological conditions as obesity, hypertension and type 2 diabetes. Insufficient consumption of fruits and vegetables in the diet aggravates existing health problems.
3. Hypodynamia (sedentary lifestyle). Insufficient physical activity is closely associated with a 30% increase in the risk of cardiovascular diseases and a 27% increase in the risk of type 2 diabetes.
4. Alcohol abuse. Excessive alcohol consumption significantly increases the likelihood of developing liver cirrhosis, cancer and hypertension.
5. Adverse environmental factors. Air pollution, especially in large cities, contributes to an increased risk of developing respiratory and cardiovascular diseases.

The share of the main risk factors for NCDs



The influence of risk factors on the development of non-communicable diseases (IND) is often synergistic, in which the joint influence of several factors greatly enhances the negative effect on health. For example, the combination of smoking and obesity significantly increases the risk of developing myocardial infarction compared to the impact of each of these factors separately. It should be emphasized that, according to experts, up to 80% of cases of premature NCD mortality are potentially preventable by targeted elimination or a significant reduction in the influence of these risk factors. This fact emphasizes the huge potential of preventive measures in reducing the





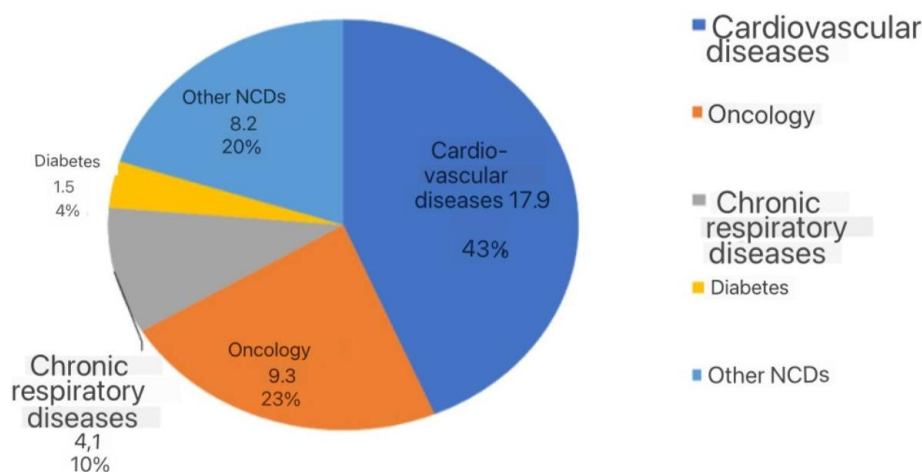
burden of NCDs. In a further review, the main attention will be paid to NCD prevention methods, where hygiene aspects occupy one of the central places. Preventive measures are divided into primary and secondary prevention, each of which plays an important role in ensuring the health of the population. Primary prevention is focused on preventing the development of diseases at the earliest stages, through the formation of healthy habits and improving living conditions and the environment. Secondary prevention, on the contrary, focuses on early detection and effective control of existing pathological conditions. It is important to note that both of these approaches are inextricably linked with hygienic principles that can reduce the impact of negative risk factors and improve the effectiveness of medical interventions. Methods and materials: multi-level prevention of NCDs Prevention of non-communicable diseases (IND) is a multi-level system that includes various strategies and measures aimed at reducing the morbidity and mortality from these pathologies. Each level of prevention plays a unique role in ensuring the health of the population.

- **Primary prevention:** The main goal of primary prevention is to prevent the occurrence of diseases until the moment of their clinical manifestation. This level of prevention includes a wide range of activities aimed at educating the population in matters of health, the formation of a healthy lifestyle and the elimination or minimization of risk factors. As an example of successful primary prevention measures, anti-tobacco campaigns are cited, which include the introduction of a ban on smoking in public places, an increase in excise taxes on tobacco products, and information campaigns about the dangers of smoking. The implementation of such measures has led to a significant reduction in the prevalence of smoking in many countries around the world. Thus, in Australia, thanks to the implementation of the Quitline comprehensive program and the introduction of strict legislative measures, the share of smokers in the total population decreased from 24% in the 1990s to 11% by 2020. Similarly, the active promotion of the principles of healthy eating, aimed at reducing salt and trans fat intake, has proven to be highly effective in the fight against arterial hypertension and obesity, which are important risk factors for the development of cardiovascular disease and sugar Type 2 diabetes.
- **Secondary prevention:** The main task of secondary prevention is the early detection and timely control of existing diseases. This level of prevention is implemented through the organization and conduct of screening programs aimed at identifying persons with a high risk of NCD development or in the early stages of the disease. The most common and effective screening programs include: mammography for early diagnosis of breast cancer, measurement of blood glucose levels to identify prediabetes and type 2 diabetes, and blood pressure measurement to identify arterial hypertension. Early detection of diseases allows you to start treatment in a timely manner and significantly improve the prognosis for the patient. for example, in Japan, where the mass check of the arterial pressure was introduced as part of a national program aimed at reducing the incidence of cardiovascular diseases, it was possible to achieve a significant reduction in the incidence of strokes (by 20%) over the past decades.

Tertiary prevention: This level of prevention is aimed at preventing the development of complications in patients already suffering from NCDs, as well as improving their quality of life and prolonging its duration. However, in the context of primary prevention of NCDs, the role of tertiary prevention seems to be less significant.



Mortality from NCDs in the world (according to WHO)



In addition to individual measures, public hygiene plays an important role in the prevention of non-communicable diseases (NCDs), which covers a wide range of activities aimed at creating a healthy environment. Such activities include providing the population with clean drinking water, monitoring the quality of atmospheric air, compliance with sanitary norms and rules in the workplace, as well as organizing a waste disposal system. Of particular relevance in modern conditions is the problem of air pollution, which, according to the World Health Organization (WHO), annually causes about 7 million deaths worldwide. A significant portion of these deaths is associated with the development of NCDs, such as lung cancer, chronic obstructive pulmonary disease (COPD) and cardiovascular diseases. In this regard, the introduction of modern filtration systems for air purification, as well as active greening of urban areas are important hygiene measures that have already demonstrated their effectiveness in a number of large cities, such as Seoul (South Korea) and Singapore. In addition, an important component of preventive programs is hygiene education of the population, which helps to increase citizens' awareness of NCD risk factors and motivate them to lead a healthy lifestyle, thereby enhancing the effectiveness of preventive measures and making people active participants in the process of maintaining their own health. Figure 1 shows the structure of mortality from NCDs in the world, according to the World Health Organization (WHO). Data analysis shows that the largest share of deaths is due to cardiovascular diseases (44%), followed by cancer (23%) and other categories of NCDs. * (Note: here you should insert a description or brief analysis of the data presented in the figure. If there is no figure, you can simply refer to the WHO data).

Efficiency of NCD prevention: international experience

The high efficiency of preventive measures in reducing morbidity and mortality from NCDs is confirmed by numerous programs successfully implemented at the national and international levels. One of the most striking and illustrative examples is the fight against cardiovascular diseases (CVD), which was successfully implemented in Finland as part of the large-scale North



Karelia project. In the 1970s, the North Karelia region had an extremely high mortality rate from myocardial infarction, which was due to the widespread prevalence of smoking among the population, high levels of saturated fat consumption and low physical activity (physical inactivity). As part of the program, comprehensive measures were taken, including active education of the population about CVD risk factors and a healthy lifestyle, restrictions on tobacco advertising, the introduction of low-fat products in school and work canteens, and active encouragement of physical activity among the population. Thanks to the implementation of this program, over a period of 25 years it was possible to achieve an impressive reduction in mortality from cardiovascular diseases by 80%, which made the Finnish experience a standard for many other countries in the world and confirmed the high effectiveness of preventive measures in the fight against NCDs. In the area of cancer prevention, the vaccination program against the human papillomavirus (HPV), which is the main cause of cervical cancer, deserves special attention. The implementation of a large-scale immunization program for girls and boys in Australia, launched in 2007, has led to impressive results: by 2020, the incidence of precancerous conditions of the cervix among young people had decreased by 90%. This example clearly demonstrates how effective primary prevention, supported by comprehensive hygiene education of the population and wide availability of medical services, allows us to almost completely eliminate a disease that poses a serious threat to women's health.

Prevention of type 2 diabetes mellitus has also demonstrated significant success, especially for people at high risk of developing this disease. In the United States, the Diabetes Prevention Program (DPP) has convincingly demonstrated that lifestyle changes that include moderate physical activity (at least 150 minutes per week) and a 5-7% reduction in body weight from baseline can reduce the risk of developing type 2 diabetes by 58% in people with prediabetes. It is important to note that to achieve sustainable results, such measures require not only significant individual efforts on the part of patients, but also comprehensive hygiene support from society and the state, including ensuring the availability of healthy and balanced food, access to clean drinking water, and the creation of safe and comfortable conditions for physical education and sports.

Integrating Hygiene into NCD Prevention: A Systemic Approach

In modern conditions, hygiene goes beyond traditional sanitary norms and rules, becoming an effective tool for the systemic prevention of non-communicable diseases (NCDs). At the individual level, hygiene integration involves developing sustainable healthy habits, such as a balanced and rational diet, regular physical activity, and quitting smoking and alcohol abuse, which requires targeted hygiene education and awareness-raising, starting from an early age. The implementation of specialized school programs aimed at teaching children the basics of a healthy lifestyle is already yielding tangible results: for example, in Sweden, thanks to the introduction of comprehensive hygiene and physical education lessons, it was possible to stabilize the level of childhood obesity, which is a serious public health problem.

At the societal level, hygiene is closely linked to the development and maintenance of modern infrastructure that provides favorable conditions for the life and health of the population. An example of the successful implementation of public hygiene principles is the large-scale campaign "Clean India" (Swachh Bharat), which has been implemented in India since 2014 and is aimed at

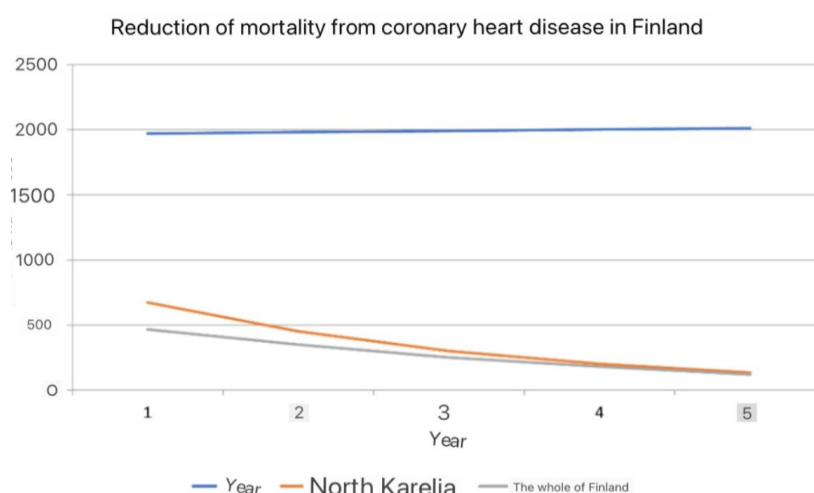


improving access to sanitary facilities (toilets and sewerage systems) for more than 500 million people. This campaign not only improves the sanitary and epidemiological situation in the country, but also indirectly helps reduce stress levels and the risk of infectious diseases, which are also known to have a negative impact on the development of NCDs. In large cities, an important role is played by the fight against air pollution, which includes the installation of modern air filters, the transition to environmentally friendly public transport (e.g., electric vehicles), and the implementation of programs for greening urban areas. These measures help reduce the incidence of chronic obstructive pulmonary disease (COPD) and lung cancer, which pose a serious threat to public health. An important component of preventive programs is hygiene education of the population, which, in combination with large-scale media campaigns, allows us to strengthen the effect of the measures being implemented and make the prevention of NCDs widespread and sustainable.

Finland has demonstrated outstanding results in reducing cardiovascular disease (CVD) mortality thanks to the successful implementation of the innovative North Karelia Project. The project, which began in 1972, was a comprehensive programme aimed at reducing the prevalence of major CVD risk factors, such as excess saturated fat intake and high tobacco smoking, through significant changes in the lifestyle and dietary habits of the region's population. The project covered a wide range of activities, including educational campaigns, changes in the food industry and collaboration with local communities.

Impressive reduction in ischemic heart disease (IHD) mortality: Between 1969–1971 and 1995, thanks to the North Karelia Project, the age-standardized mortality rate from IHD in the North Karelia region showed an impressive 73% reduction, decreasing from 672 to 185 cases per 100,000 population. At the same time, positive dynamics were also observed throughout Finland as a whole: mortality from coronary heart disease decreased by 65%, from 465 to 165 cases per 100,000 population. These statistics clearly demonstrate the high effectiveness of the measures taken in reducing the incidence and mortality from CVD.

Significant reduction in overall mortality: Between 1969 and 2006, overall mortality among men aged 35–64 in Finland decreased by more than 80%, indicating a significant improvement in the health of the population and an increase in life expectancy. This fact emphasizes the systemic nature of the measures taken and their positive impact on various aspects of health.



**Positive changes in risk factors:**

- Reduction in cholesterol levels: The average serum cholesterol level among the Finnish population showed a significant decrease: by 21% in men and by 23% in women. This fact indicates a change in the dietary habits of the population towards a decrease in the consumption of saturated fats and cholesterol.
- Reduction in the prevalence of smoking: The prevalence of smoking among men in Finland has decreased significantly, decreasing from 52% to 30%. This fact is the result of an active anti-smoking campaign carried out in the country.
- Reduction in blood pressure: Diastolic blood pressure has decreased by an average of 9 mmHg among the Finnish population. This fact indicates improved control of arterial hypertension and a decrease in the risk of developing cardiovascular complications.

Visualization of results:

To clearly present the achieved results, it is advisable to construct a line graph showing the dynamics of the decrease in mortality from coronary heart disease (CHD) in the North Karelia region and throughout Finland in the period from 1970 to 2010. This graph will allow a visual assessment of the effectiveness of the measures taken and demonstrate the impressive success achieved in reducing mortality from CVD. It is also possible to construct separate graphs showing the dynamics of changes in risk factors (cholesterol levels, smoking prevalence, blood pressure) during the project implementation period.

Finland's successful experience in the North Karelia project provides compelling evidence that the development and implementation of comprehensive, multi-component programmes aimed at stimulating changes in population lifestyle and reducing the prevalence of modifiable risk factors can lead to a significant reduction in mortality from noncommunicable diseases. This strategy can serve as a guide for other countries striving to improve population health indicators and increase life expectancy.

Noncommunicable diseases (NCDs) continue to pose a major challenge to the global community, causing millions of deaths each year and putting significant pressure on health systems worldwide. This review highlights that NCD prevention is not only a medical but also a complex socio-economic challenge that requires a coordinated approach across different areas of society. Key risk factors contributing to the development of NCDs, such as tobacco smoking, poor nutrition, physical inactivity and environmental pollution, can be eliminated or minimised through targeted interventions. At the same time, effective programs implemented in Finland, Australia, the United States of America and other countries confirm that such efforts can bring tangible results. Primary prevention, aimed at eliminating the root causes of diseases, and secondary prevention, focused on early diagnosis and timely treatment, have demonstrated their effectiveness in reducing morbidity and mortality rates.

Conclusion

In the context of implementing NCD prevention strategies, hygiene is of particular importance, acting as a unifying element between individual human efforts and actions taken at the societal





level. In particular, the development of personal hygiene skills, from rational and balanced nutrition to the rejection of bad habits, is the foundation of a healthy lifestyle.

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