

## OPTIMIZATION OF DIAGNOSTIC CRITERIA FOR LIVER AND PANCREAS DISEASES IN SMOKERS

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### ABSTRACT

This study comprehensively explored the association between liver and pancreatic diseases and the consumption of tobacco products. A total of 45 patients diagnosed with liver diseases were included in the analysis, with detailed attention given to their tobacco use patterns and levels of nicotine dependence. Among these patients, 21 (46.7%) were identified as tobacco users. Similarly, an analysis of pancreatic diseases revealed that 23 (45.0%) patients with such conditions also reported using tobacco products.

To quantify nicotine dependence, the Fagerström Nicotine Dependence Test (FNDDT) was employed. The results indicated that 25 (26.0%) patients exhibited moderate nicotine dependence, while 10 (10.4%) were categorized as having high dependence. These data highlight the prevalence of tobacco use and its potential to exacerbate or contribute to the pathogenesis of hepatic and pancreatic disorders.

The findings provide robust evidence of the significant role tobacco consumption plays in the development and progression of liver and pancreatic diseases. Tobacco is known to induce oxidative stress, promote inflammation, and impair cellular metabolism, mechanisms that are crucial in the pathophysiology of these organ systems. Additionally, tobacco-related compounds can directly damage hepatocytes and pancreatic cells, leading to fibrosis, steatosis, and an increased risk of malignancies such as hepatocellular carcinoma and pancreatic adenocarcinoma.

This study underscores the importance of integrating tobacco cessation programs into the prevention and management strategies for liver and pancreatic diseases. Public health initiatives focused on reducing tobacco use could substantially decrease the burden of these conditions. Furthermore, the data highlight the need for tailored clinical interventions to address nicotine dependence among patients, particularly those with moderate and high levels of dependence, as part of a comprehensive therapeutic approach.

**Key words:** tobacco, FNNDT scale, nicotine, liver, pancreas, hepatocellular carcinoma, pancreatic adenocarcinoma, fibrosis, steatosis, oxidative stress, promote inflammation, cellular metabolism, public health, pancreatic cells, hepatocytes.

## INTRODUCTION

According to the World Health Organization (WHO), more than 1.3 billion people worldwide use tobacco. Smoking kills more than 8 million people each year. Tobacco products, including hookahs, contain more than 7,000 chemicals, at least 250 of which are toxic or carcinogenic. Smoking negatively affects almost all organs of the human body: it leads to heart attacks, strokes, cancer (oral cavity, throat, lungs), asthma, tuberculosis, type 2 diabetes, mental retardation and other diseases. 80 percent of smokers live in poor countries, where the diseases caused by smoking are more severe. As of January 2024, the number of adult smokers in the world reached 1.25 billion. The highest prevalence of smokers is in Southeast Asia (26.5%). China accounts for 79% of smokers in the Western Pacific region. In Europe, the proportion of smokers is 25.3%, while Africa has the lowest proportion of smokers, from 18% in 2000 to 10% in 2022.

Tobacco smoke damages lung and respiratory tract tissues, leading to the development of emphysema, bronchitis, and chronic obstructive pulmonary diseases (COPD). Globally, tobacco consumption causes economic losses of \$600 billion annually due to health damage and decreased productivity. Tobacco products also negatively affect the liver and pancreas.

According to WHO and other research, nicotine, manganese, carbon dioxide, acetone, benzene, toluene, and numerous harmful chemicals in tobacco smoke impact not only the lungs but also the liver and pancreas. Tobacco smoke interferes with the liver's detoxification functions, increasing the activity of liver microsomal enzymes. This results in prolonged retention of toxins and damages metabolic processes. Studies indicate that the risk of developing hepatitis in tobacco users is 1.5 times higher than in non-smokers. This leads to greater accumulation of fats in the liver and the onset of inflammatory processes. Tobacco consumption is considered a factor that can contribute to liver cirrhosis and liver cancer. The risk of liver cancer in smokers is 20% higher than in non-smokers.

**Literature review:** it is well known that smoking has a detrimental effect on the health of any individual. In addition to numerous diseases specifically associated with smoking, smokers have a lower overall health status, which manifests in more frequent visits to medical services and increased absenteeism from work due to illness [5,6].

A comprehensive manifestation of the impact of smoking on health is the reduced life expectancy of smokers compared to non-smokers. Smoking is a cause

of several groups of diseases: cancers of various organs, cardiovascular diseases, chronic lung diseases, and other conditions. These diseases occur not only in organs that come into direct contact with tobacco smoke, such as the oral cavity, throat, and lungs, but also in organs affected by the most "mobile" components of tobacco smoke and their metabolites, such as the heart, blood vessels, gastrointestinal tract, kidneys, and bladder [5,7,11,12].

According to estimates by the World Health Organization, approximately 5 million people die annually from tobacco-related diseases. If current trends in smoking prevalence persist, by 2030, 10 million people will die from tobacco each year. Published results of many studies indicate that nearly half of regular smokers die due to their habit, and a quarter die before the age of 70, losing 10 years of life expectancy (WHO, 2019) [1,14,17].

In the Russian Federation, among a group of one thousand 20-year-old smokers who continue smoking throughout their lives, it is expected that by the age of 70, one will die in a road traffic accident, nine will die from other causes, and 250 will die due to smoking. Studies in the United States have shown that among a group of 15-year-old American boys, tobacco is projected to kill three times more individuals before they reach the age of 70 than drugs, murders, suicides, AIDS, road traffic accidents, and alcohol combined [4,9,10].

In a review conducted by specialists from the American Cancer Society, it is stated that in the United States, smoking, particularly of industrially manufactured cigarettes, is responsible for most cases of lung cancer, cancers of the oral cavity, pharynx, larynx, and esophagus, as well as one-third of cancers of the pancreas, kidneys, bladder, and cervix. The first signs of oral cancer are usually white patches detected during dental visits. In the U.S., a diagnosis of oral cancer is made for 18,000 people annually. According to research, the risk of oral cancer is 25 times higher in smokers compared to non-smokers. The risk increases with smoking intensity and duration. Epidemiological studies show that among those who quit smoking, the risk decreases, but it takes many years for the risk level to approach that of non-smokers [15,17].

**The purpose of the study:** study of the effects of smoked tobacco products on the morphological and morphometric characteristics of the liver and pancreas of white rats.

**Research methodology:** methods of early diagnosis of pathological conditions caused by tobacco in the liver.

**Analysis and results.** Within the framework of this study, a comprehensive clinical and diagnostic examination was conducted on 96 patients aged 22 to 68 years (mean age  $46.9 \pm 6.3$ ) with liver and pancreas diseases. The patients were

registered at the 2nd Family Polyclinic dispensary, and all of them were examined for their anamnesis, clinical, laboratory, instrumental, and other examination results.

All patients in the study were divided into two main groups for comparative analysis:

**Table 1**

<b>Groups</b>	<b>Diseases</b>	<b>Number of patients</b>
<b>I</b>	Patients with liver diseases	45
<b>II</b>	Patients with pancreatic diseases	51
<b>Control</b>	Conditionally healthy patients	20
<b>Total</b>		<b>116</b>

The study analyzed data on the duration of the disease, the frequency of attacks, the nature and intensity of symptoms. The patients' age, professional activity, marital status, and level of education were also taken into account. Laboratory parameters, including the results of biochemical blood tests and C-reactive protein, were also analyzed.

The age distribution of patients in the study group (n=96) is presented in Table 2. Of the patients in the study group, 59 were male and 37 were female. Of the males, 22 (37.3%) were between 18 and 44 years of age, 29 (49.1%) were between 44 and 59 years of age, and 8 (16.6%) were between 60 and 74 years of age. The majority of males were between 44 and 59 years of age.

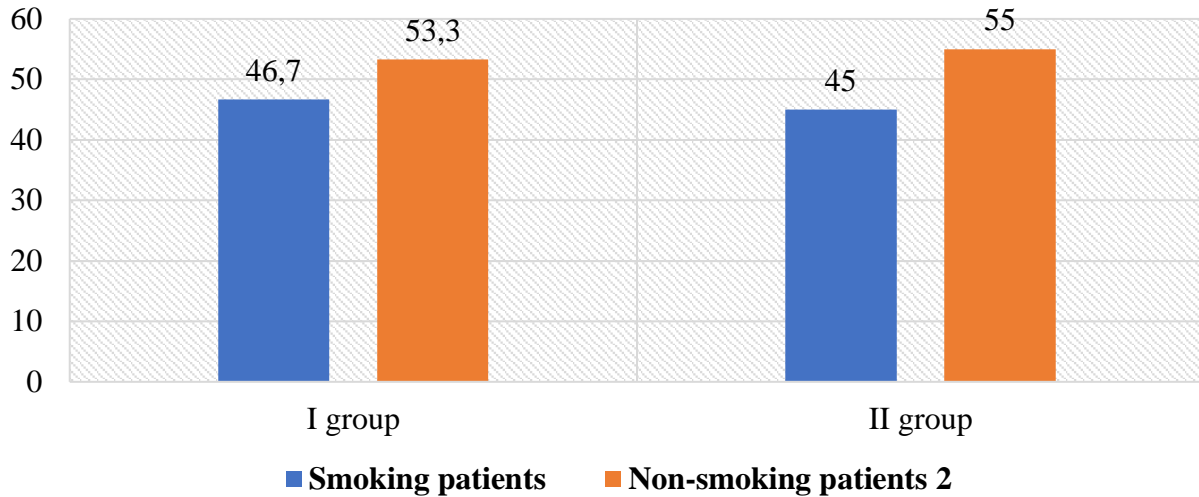
**Table 2**

### **Classification of patients by age and gender**

<b>Young</b>	<b>Male (n=59)</b>		<b>Female (n=37)</b>	
	<b>Abs.</b>	<b>%</b>	<b>Abs.</b>	<b>%</b>
18-44	22	37.3	18	48.6
44-59	29	49.1	13	35.2
60-74	8	16.6	6	16.2

It was noted that 18 (48.6%) of the women were between 18-44 years old, 13 (35.2%) were between 44-59 years old, and 6 (16.2%) were between 60-74 years old.

Data on smoking and non-smoking patients in the study group are presented in Figure 3. Of the patients with liver disease (n=45), 21 (46.7%) and 23 (45.0%) with pancreatic disease were found to be smokers.



**Figure 1. Distribution of patients in the study group according to tobacco consumption, %**

Non-smoking patients comprised 24 (53.3%) in group I and 28 (55.0%) in group II. Of the smokers in group I, 20 were male and 1 was female, while of the smokers in group II, 19 were male and 4 were female. Liver and pancreatic diseases were more common among smokers.

The period of initiation of tobacco use in patients in the study group is presented in Table 3.

**Table 3**

**Time to start smoking**

Duration	Group I (n=21)		Group II (n=23)	
	Abs.	%	Abs.	%
>1 year	3	14.3	2	8.7
1-3 years	2	9.52	4	17.4
3-5 years	4	19.0	3	13.0
5-10	5	23.8	8	34.8
10<	7	33.3	6	26.1

The largest proportion of patients in group I (33.3%) started smoking 10 years or more ago, which is a higher indicator than in group II (8.7%). In group II, there were more people who started smoking within 5-10 years (34.8%). In group I, the number of people who started smoking less than a year was higher than in group II (14.3% and 8.7%). It was noted that there were more people in group II (17.4%). The time of initiation of smoking showed significant differences between patients in groups I and II. While in group I, the majority of patients started smoking 10 years or more ago, in group II, those who started smoking within 5-10 years prevailed. These results confirm the relationship between the duration of smoking and its impact on health. Early initiation and duration of tobacco use increases the level of nicotine dependence and increases the risk of diseases in organs such as the liver and pancreas.

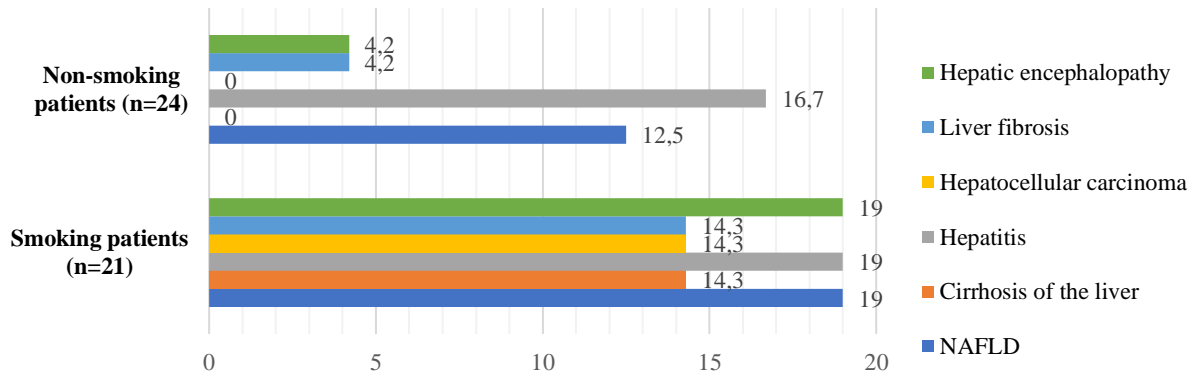
The internationally accepted FNDT (Fagerström Nicotine Dependence Test 1991) test was used to assess the level of nicotine dependence in smokers. This test is designed to determine the intensity, duration, and nicotine need of the patient. The results of the FNDT are presented in Table 5.

**Table 4****Results of determining nicotine dependence using FNDT**

Level of nicotine addiction	Points	Group I (n=21)		Group II (n=23)	
		Abs.	%	Abs.	%
Nicotine addiction is low	0-3	4	19	5	21.7
Moderate nicotine addiction	4-6	13	61.9	12	52.2
High nicotine addiction	7<	4	19	6	26.1

Low-level nicotine dependence was similar in groups I and II (19% and 21.7%), indicating that the number of patients with low-level dependence was similar in both groups. Moderate-level dependence was higher in both groups: 61.9% in group I and 52.2% in group II. This indicates that moderate nicotine dependence is the most common degree. High-level dependence was more common in group II (26.1%), indicating that nicotine consumption in this group is high. According to the results of the study, moderate nicotine dependence is more common in both groups. This indicates that there is a moderate need for nicotine consumption and additional help is required to quit.

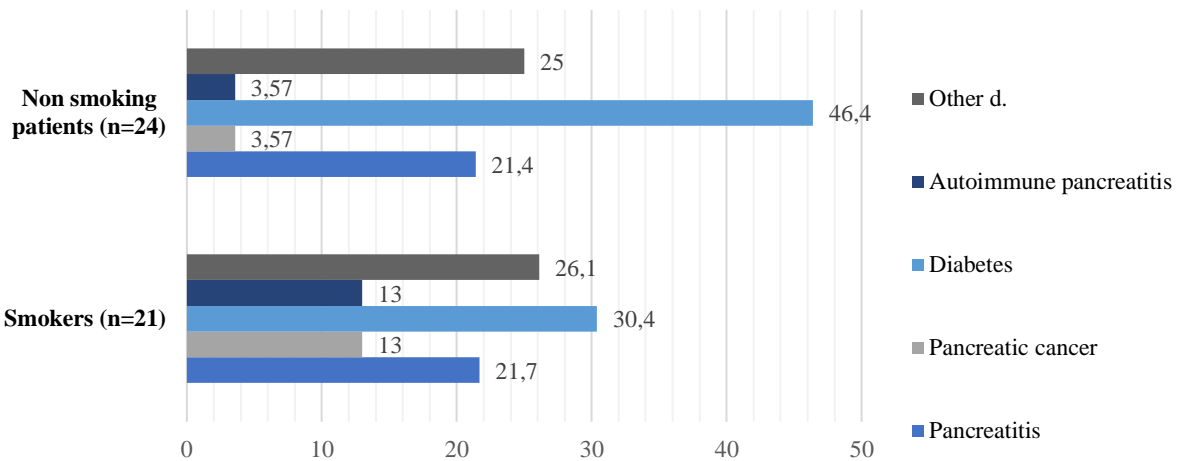
The analysis of the incidence of liver diseases in patients who smoke and do not smoke is presented in Figure 4. In smokers (smokers are people who voluntarily actively smoke tobacco (according to the WHO definition, a smoker is a person who has used tobacco products at least once in the last 30 days), nicotine disrupts lipid metabolism in liver cells, which leads to the accumulation of fat and, as a result, a feeling of heaviness in the liver, general fatigue and weakness. Non-alcoholic fatty liver disease (NAFLD) was noted in 4 (19.0%) of smokers, while in non-smokers this figure was 1.5 times less (12.5%).



**Figure 2. Frequency of liver diseases in patients who use and do not use tobacco, %**

Liver cirrhosis and liver fibrosis were found only in smokers (14.3%). Hepatitis was recorded 1.13 times more often in smokers (19.0%) than in non-smokers (16.7%). Liver fibrosis was observed in 3 (14.3%) of smokers, 3.4 times less (4.2%) in non-smokers. Liver encephalopathy was found in 19.0% of smokers, 4.5 times less in non-smokers, 4.2%.

Analysis of data on the incidence of pancreatic diseases in patients who smoke and do not smoke is presented in Figure 3. Pancreatitis was detected in 5 (21.7%) of smokers, and slightly less in 6 (21.4%) of non-smokers. Pancreatic cancer was mainly observed among smokers (13.0%). Diabetes mellitus was detected in 46.4% of non-smokers and 30.4% of smokers.



**Figure 5. The incidence of pancreatic diseases in patients who use and do not use tobacco, %**

Autoimmune pancreatitis was noted in 3 (13.0%) of smokers, and in 3.57% of non-smokers. Other diseases were recorded in almost the same percentages in both groups (26.1% and 25.0%, respectively).

### Conclusions:

1. In the study group, liver diseases were found in 45 patients, of whom 21 (46.7%) were smokers, and pancreatic diseases were found in 51 patients, of whom 23 (45.0%) were smokers. When assessing the level of nicotine dependence of patients using the FNDDT scale, moderate nicotine dependence was detected in 25 (26.0%) patients, and high nicotine dependence in 10 (10.4%) patients, indicating that tobacco products are of great importance in the etiology of diseases related to the pancreas and liver.

2. According to the results of the analysis, in patients who smoke (19.0%) NAFLD was 1.52 times more common than in non-smokers (12.5%), liver fibrosis was 3.4 times more common (14.3% in smokers, 4.2% in non-smokers), and hepatic encephalopathy was 4.5 times more common (19.0% in smokers, 4.2% in non-smokers). The fact that liver cirrhosis and hepatocellular carcinoma (14.3%) were observed only in smokers confirms that tobacco use is the main factor causing the formation and complications of liver diseases. In patients in group II, pancreatic cancer and autoimmune pancreatitis were found to be 3.6 times more common in smokers (13.0%) than in non-smokers (3.57%). In non-smokers, the incidence of diabetes mellitus was mainly higher (46.4%).



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