

The Effects of Second-hand Smoke on Liver Cancer

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Abstract. Secondhand tobacco smoke contains at least 69 carcinogens, such as nitrosamines, hydrocarbons, tar, and vinyl chloride. The liver is the main metabolic organ for these products. When the human body is exposed to these carcinogens for a long time, the carcinogens will cause "mutations" in the genes in the body and gradually accumulate, causing the cells to be unable to "function" normally, eventually leading to the occurrence of malignant tumors. Harmful substances such as nicotine in tobacco can activate cytokines and intermediate products of fiber formation, which accelerate the process of liver fibrosis and hinder the recovery of liver function in patients with liver disease. The condition will worsen with the increase in daily smoking, promoting the occurrence of liver cancer.

Keywords: Second-hand Smoke; Liver Cancer; Nicotine; Smoking hazards.

1. Introduction

The liver is a very important internal organ of the human body. It is responsible for synthesizing, utilizing and transporting fat, generating and storing blood, secreting bile, storing glycogen and other functions to keep the human body healthy. If you do not protect your liver well, liver cells may become malignant and cause liver cancer. In most cases, patients only discover the disease in the middle or late stages, missing good opportunities for treatment. Cigarettes contain more than 40 carcinogens. Whether smoking first-hand or second-hand smoke will greatly increase a person's risk of developing cancer. Drinking alcohol can also cause irritation and damage to liver cells after the body consumes too much alcohol. Especially people who drink a lot of alcohol for a long time can cause alcoholic liver disease, which greatly increases the chance of people suffering from liver cancer. Therefore, everyone should try to avoid smoking, inhaling second-hand smoke and drinking alcohol to protect their liver and avoid liver cancer.

The risk of liver cancer death increases with the length and amount of smoking. This also explains why elderly patients who smoke are more seriously ill than young patients who smoke. In addition to low self-resistance or multiple underlying diseases, it is also closely related to the long-term accumulation of nicotine content in the body.

Mainstream smoke refers to the smoke directly inhaled into the body when tobacco is burned, which is the so-called "first-hand smoke". Exhaled smoke is easy to understand, it is the smoke exhaled by smokers. Sidestream smoke is generally overlooked. It is the smoke produced by the cigarette butt that directly enters the air when tobacco is burned. Therefore, secondhand smoke includes not only exhaled smoke, but also sidestream smoke.

2. Second Hand Smoke

Secondhand smoke: When a smoker lights a cigarette, the smoker inhales filtered smoke, leaving most of the unfiltered smoke. This becomes "second-hand smoke". Secondhand smoke is a mixture of two types of smoke: Side-stream smoke and mainstream smoke. Side-stream smoke refers to the smoke that comes directly from cigarettes, cigars or pipes, while mainstream smoke refers to the smoke exhaled from the smoker's mouth. In the literature published in the magazine "Modern

Preventive Medicine", scholar Liu Yinmei conducted an in-depth analysis of 50 domestic and foreign literature discussing the relationship between smoking and the incidence of liver cancer. The number of cases and controls studied were 10,228 and 22,312 respectively.

There are more than 4,000 harmful substances and dozens of carcinogens in second-hand smoke. Not only that, compared to first-hand smoke, second-hand smoke is often produced by less complete combustion and is not filtered by cigarette filters, so the release rate of many compounds is higher. These include at least: 2 times the nicotine, 3 times the tar irritants, 5 times the carbon monoxide and 50 times the carcinogens.

The risk of liver cancer for smokers is 1.37 times that of non-smokers. The risk of liver cancer for smokers in the Chinese population is 1.32 times that of non-smokers; the risk of liver cancer for those who smoke <20 cigarettes and ≥20 cigarettes per day is 1.54 times and 1.92 times that of non-smokers respectively. "China Smoking Health Report 2020" "The summary clearly points out: The greater the amount of cigarettes smoked, the longer the smoking years, and the younger the age at which smokers start smoking, the higher the risk of liver cancer and death.

Nicotine in cigarettes greatly promotes the growth and metastasis of cancer cells by inducing the secretion of stem cell factors. Relevant studies report that the liver cancer mortality rate for current smokers is 1.29 times that of non-smokers (95% CI: 1.23 to 1.34; P < 0.00001); for former smokers, the liver cancer mortality rate is 1.2 times that of non-smokers. (95% CI: 1.00 - 1.42; P = 0.04), smoking has a significant mortality relationship with liver cancer, and is positively correlated.^[1]

Table 1. Comparison of second hand smoke in liver cancer group and normal group

			Is the second-hand smoke environment closed?		Secondhand smoke concentration level			Are you often exposed to second-hand smoke?		
			YES	NO	Higher	Generally	Lower	Often	Occasionally	Less
L i v e r c a n c e r p a t i e n t s	YES	A m o u n t	36	164	9	103	88	32	82	84
		Proport ion	18%	82%	4,5%	51.5%	44 %	17 %	41%	42%
	NO	A m o u n t	106	142	50	122	76	16 0	64	44
		Proport ion	42.7%	57.3 %	22. 2%	49.2%	30. 6%	56.5 %	25.8%	17.7 %
pearsonBangla			31.305		26.131			75.012		

P value	0.000	0.000	0.000
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The "Report on the Health Hazards of Smoking in China" points out that non-smoking women who are exposed to second-hand smoke because their spouses smoke have a risk of liver cancer that is 1.27 times higher than that of those who are not exposed to second-hand smoke. There is a strong causal relationship between secondhand smoke exposure and liver cancer. Studies have found that if a person inhales secondhand smoke for more than 15 minutes a day, his or her risk of developing liver cancer is the same as that of a smoker.^[2]

3. Effects of second-hand smoke on liver

Smoking or second-hand smoke can induce or aggravate hepatopulmonary syndrome, leading to the progression and worsening of the disease. Hepatitis B carriers are not recommended to smoke, and second-hand smoke should be avoided as much as possible. Many people think that smoking has no impact on liver disease. In fact, like drinking, smoking has a clear impact on various liver diseases.

Thousands of harmful compounds produced by smoking require liver metabolism, directly or indirectly damaging the liver! After harmful substances in tobacco and smoke (nicotine, etc.) enter the human body, they need to be detoxified in the liver. Therefore, smoking and second-hand smoke will increase the burden on the liver. Smoking can inhibit lymphocyte proliferation and accelerate lymphocyte apoptosis, thereby reducing the body's immunity! The benzopyrene and nitrosamines produced by smoking are strong carcinogens and can induce liver cancer!^[3]

Non-alcoholic fatty liver disease is the most common cause of chronic liver disease, with an estimated global prevalence of 25%. The occurrence and development of the disease are determined by both genetic and environmental factors. There is growing evidence that smoking has a negative impact on the progression of fatty liver disease. We recommend and help all smokers with liver disease to actively quit smoking.

Dyslipidemia and smoking are both independent risk factors for fatty liver. Smoking may aggravate the occurrence of fatty liver and metabolic syndrome. Smoking may deplete glutathione in the body, promote peroxidation, cause abnormal liver function, and induce steatohepatitis. Smoking will affect liver lipid metabolism, increase fat content in the blood, increase harmful cholesterol, decrease beneficial cholesterol, and induce hepatic steatosis. After nicotine in tobacco is absorbed by the human body, it can cause vasospasm, increase blood viscosity, and cause insufficient blood and oxygen supply to the liver, which is not conducive to the recovery of liver function.^[4]

Liver fibrosis is a major determinant of morbidity and mortality in patients with chronic liver disease. Individual risk for fibrosis is critical for personalized clinical management. Among the various environmental factors that exacerbate liver fibrosis, it is primarily evidence that smoking may play a profibrotic role. Smoking can lead to the development of chronic lung disease. The patient will be in a state of hypoxia for a long time, and the liver will also become hypoxic. The occurrence of ischemia and hypoxia can easily induce liver inflammation and aggravate liver disease. Harmful substances such as nicotine can also activate cytokines and intermediate products of fiber formation, accelerating the process of liver fibrosis. Harmful substances in tobacco and smoke will hinder the recovery of liver function in patients with liver disease. The condition will worsen with the increase in daily smoking and can promote the occurrence of liver cancer.^[5]

Liver cancer is a major contributor to the global cancer burden. The global incidence rate is estimated at 9.3/100,000 person-years, and the mortality rate accounts for 22% of global cancer-related deaths. A large number of studies have shown that smoking is associated with an increased incidence of HCC in patients with cirrhosis.^[6]

Smoking can inhibit T cell activity and reduce the immune surveillance effect on tumor cells. The carcinogens such as benzopyrene, nitrosamines, radioactive radon and polonium produced by it can inhibit the expression of p53 gene and increase the incidence of tumors such as hepatocellular carcinoma.^[7]

Nicotine produced by smoking can excite the sympathetic nerves and adrenal medulla. It can cause vasoconstriction and increase blood viscosity, which can easily form thrombus and block small arteries. This will cause insufficient blood supply to the liver and affect the liver's absorption of nutrients, which is not conducive to recovery. For patients taking oral antiviral drugs, smoking can induce hepatitis B virus gene mutation and reduce the antiviral effect. It can also induce genetic mutations and induce liver cancer.

4. Summary

Liver cancer is a malignant tumor that occurs in the liver and may be related to long-term smoking, drinking, hepatitis virus infection and other factors. Patients may experience symptoms such as abdominal pain, loss of appetite, and nausea. Cigarettes contain large amounts of nicotine, tar and other harmful substances. If patients with liver cancer smoke, it may increase the burden on the liver, leading to damage to liver function, which is not conducive to recovery.

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