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Research Article

The Relationship of Non-Alcoholic Fatty Liver Disease with Diseases of the Cardiovascular System

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Abstract

Purpose of the Study: To study the relationship between fatal cardiovascular events and non-alcoholic fatty liver disease (NAFLD) among the population of the Irkutsk region.

Materials and Methods: To study the possible relationship, a retrospective analysis of the results of 2220 autopsies performed over 3 years: 2010 - 2012 in the pathoanatomical department of Irkutsk Regional Clinical Hospital was carried out. The object of the study was medical documentation - "Act of pathoanatomical autopsy". The analysis of the data obtained was carried out in the Statistica 13.0 program.

Results: Signs of non-alcoholic fatty liver disease (NAFLD) according to morphological studies were identified in 271 cases. As a result of the retrospective analysis, a statistically significant relationship between NAFLD and CVD was established.

Keywords: *Non-Alcoholic Fatty Liver Disease; Atherosclerosis; Cardiovascular Diseases; Cardiovascular Risk; Steatohepatitis, Steatosis*

Abbreviations

FLD: Fatty Liver Disease; NAFLD: Non-Alcoholic Fatty Liver Disease; CVD: Cardiovascular Disease; AMI: Acute Myocardial Infarction; NASH: Non-Alcoholic Steatohepatitis; MS: Metabolic Syndrome; TC: Total Cholesterol; AH: Arterial Hypertension

Introduction

Non-alcoholic fatty liver disease (NAFLD) is characterized by excessive accumulation of hepatic lipids associated with metabolic disorders in the absence of excessive alcohol consumption. Histological lesions of NAFLD can be divided into isolated steatosis, non-alcoholic

steatohepatitis (NASH) and fibrosis with subsequent development to cirrhosis and hepatocellular carcinoma [1-4]. NAFLD is increasingly diagnosed worldwide and is considered the most common liver pathology in Western countries. By 2018, an estimated 1.7 billion people worldwide were suffering from NAFLD, which corresponds to a prevalence of ≈25% of the disease [5]. Patients with NAFLD are more likely to have cardiometabolic risk factors, including diabetes, insulin resistance, obesity, dyslipidemia, and hypertension. NAFLD is currently considered as a hepatic manifestation of metabolic syndrome [4]. NAFLD occurs in all age groups, but women aged 40 - 60 who have signs of metabolic syndrome (MS) are most at risk of developing it [7].

According to the results of the Russian study DIREG 1 (2007), the prevalence of NAFP in outpatients was 27%, of which 80.3% were diagnosed with steatosis, 16.8% - steatohepatitis, 2.9% - cirrhosis of the liver [7,8]. The DIREG 2 study (2015) showed that the prevalence of NAFLD was already 37.3%, showing an increase of 10% over 7 years compared to DIREG 1 data, while the number of patients with cirrhosis of the liver in the outcome of NAFLD increased to 5% [8]. The prevalence of fatty liver disease among residents of the Irkutsk region is 22.1% and does not depend on gender: in women, 21.8% and in men, 22.3% [11].

Cardiovascular disease (CVD) accounts for the largest proportion (17.8 million or 43.3%) of deaths attributed to noncommunicable diseases. Despite a significant decline in CVD mortality in most developed countries over the past decade, the number of CVD deaths in developing countries continues to rise rapidly, making CVD the leading and growing cause of morbidity and mortality worldwide [6]. It has been proven that the diagnosis of NAFLD is associated with a lower life expectancy and is the main cause of increased mortality from CVD, with stage fibrosis being the strongest predictor of the disease [9]. A number of clinical studies confirm the high risk of developing cardiovascular events in NASG, in particular with an increase in total cholesterol (TC) levels of more than 8.5 mmol/l (or above 330 mg/dL), the risk of fatal cardiovascular diseases increases 4 times, with combination with arterial hypertension (AH) - 9 times, in the presence of hypercholesterolemia, smoking and hypertension - 16 times [10].

Most retrospective and prospective cohort studies have shown that NAFLD is independently associated with increased prevalence of CVD or CVD-related events in the general population, in old age, or in patients with metabolic dysfunctions. However, epidemiological data on the role of NAFLD as an independent risk factor for mortality from CVD remain inconclusive, and further research is needed. Thus, even in the next few years, NAFLD will make a significant contribution to the overall burden of the CVD.

Objective of the Study

To study the relationship between fatal cardiovascular events and NAFLD among the population of the Irkutsk region.

Materials and Methods

Tasks:

1. To study the prevalence of NAFLD among the deceased population from cardiovascular events in the Irkutsk region, to assess the ratio of fatal cardiovascular events among the total number of deaths.
2. Determine the frequency of occurrence of NAFLD in different age groups, and compare it among men and women.
3. Determine the morphological signs of NAFLD in the study group.
4. To assess body weight in patients with NAFLD among men and women, to conduct a comparative assessment of these indicators.
5. To identify the correlation between the thickness of the subcutaneous fat and the mass of the liver in NAFLD in men and women.

Type of research: Hypothesis-putting one-time passive retrospective.

The object of research: Medical documentation - "Act of post-mortem examination".

Inclusion criteria: The presence of an established pathoanatomical diagnosis of NAFLD, the presence of an established pathoanatomical diagnosis of CVD, one of the complications of which was the cause of death.

Exclusion criteria: Viral hepatitis B and C, tuberculosis, syphilis, HIV; patients who received chemotherapy and had a history of alcohol use, the presence of alcohol stigmas.

Statistica 13.0 for Windows was used for statistical analysis.

Results and Discussion

To study the possible relationship, a retrospective analysis of the results of 2220 autopsies performed over 3 years: 2010 - 2012 in the pathoanatomical department of Irkutsk Regional Clinical Hospital was carried out. Signs of non-alcoholic fatty liver disease according to morphological studies were identified in 271 cases.

The average age was 60.7 ± 14.8 years (min 17, max 96, Me 61 [53.0; 72.0]). There were 130 men (48.0%), 59.9 ± 13.3 years (min 18, max 92, Me 59 [53.0; 69.0]). There were 141 women (52.0%), mean age 61.5 ± 16.1 years (min 17, max 96, Me 62 [53.0; 73.0]). The assessment of anthropometric features showed the following results: overweight was detected in 113 (41.7%) cases, normal in 126 (46.5%), insufficient in 32 (11.8%).

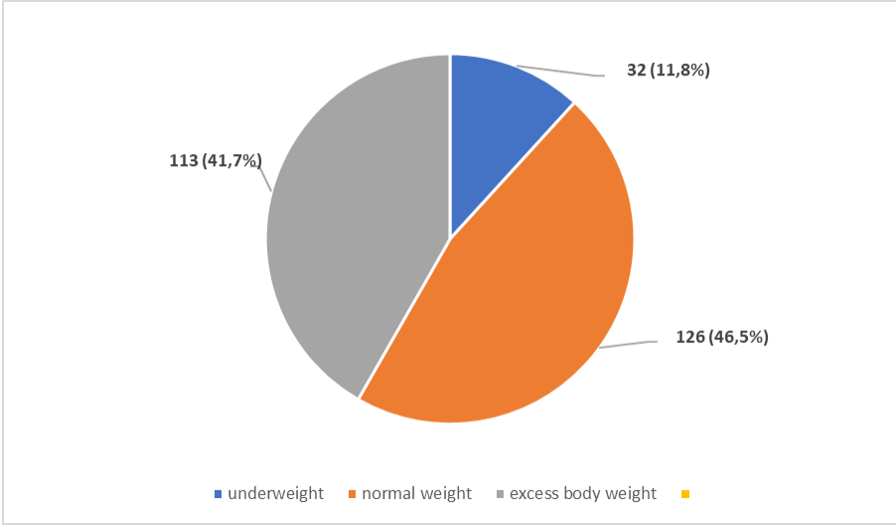

Figure 1: *Assessment of body weight of the subjects (%).*

Among overweight persons, women prevailed -74 (65.5%), the proportion of men with obesity was 39 (34.5%) (p = 0.001).

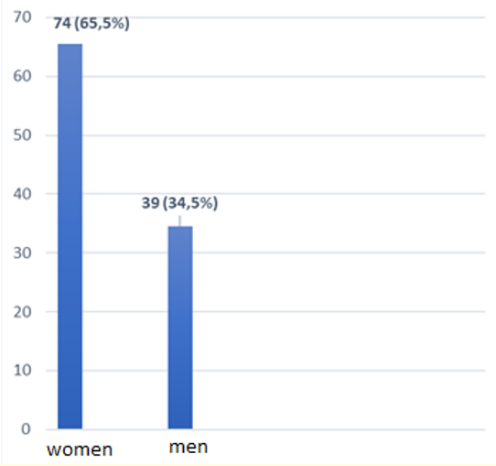

Figure 2: *Assessment of the sexual composition in subjects with excess body weight (%).*

The correlation analysis revealed a moderate positive correlation between the thickness of subcutaneous fat measured in the anterior abdominal wall and the mass of the liver ($r = +0.41$; $p < 0.05$), in women this correlation was not observed.

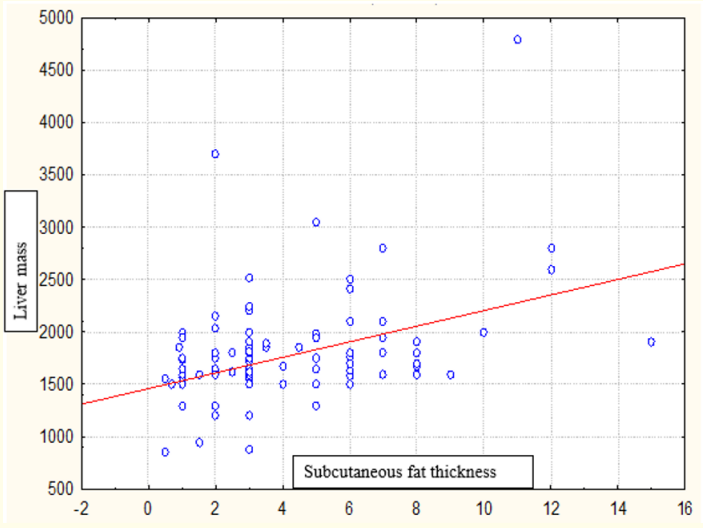

Figure 3: *Correlation analysis between the subcutaneous fat and liver mass in the subjects.*

Morphological signs of NAFLD: coarse fatty dystrophy was detected in 179 (66%) cases, small fatty dystrophy - 49 (18.1%), mixed form in 43 (15.9%).

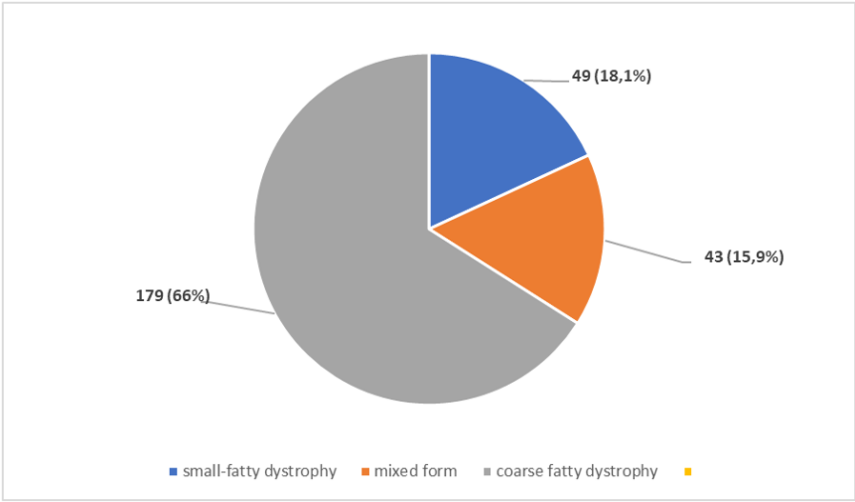

Figure 4: *Morphological features of NAFLD.*

CVD as the direct cause of death in NAFLD was identified in 133 cases, which amounted to (49.1%): among men - 74 (55.6%), which is statistically significantly more common than in women - 59 (44.4%) (p = 0.001).

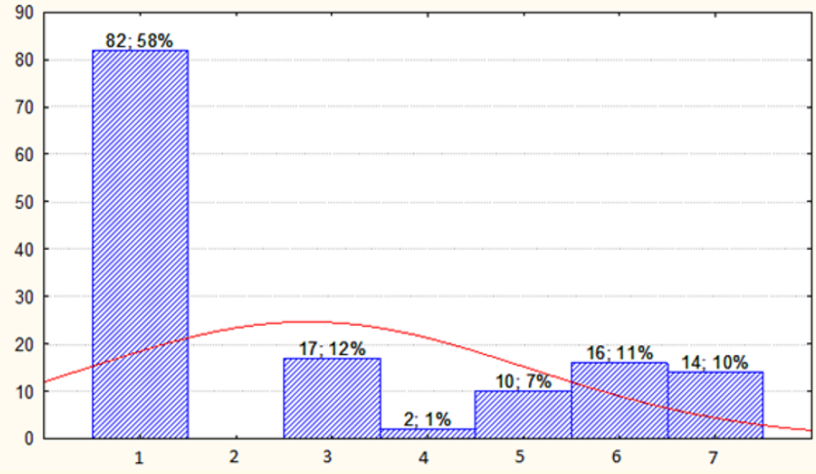

Figure 5: *CVD that caused death in women.*

1- other reasons; 2- coronary heart disease (no acute cause); 3- acute myocardial infarction; 4- coronary heart disease with acute cardiovascular failure; 5- acute cardiovascular failure (no CHD); 6- stroke or brain attack (CVA); 7- pulmonary embolism.

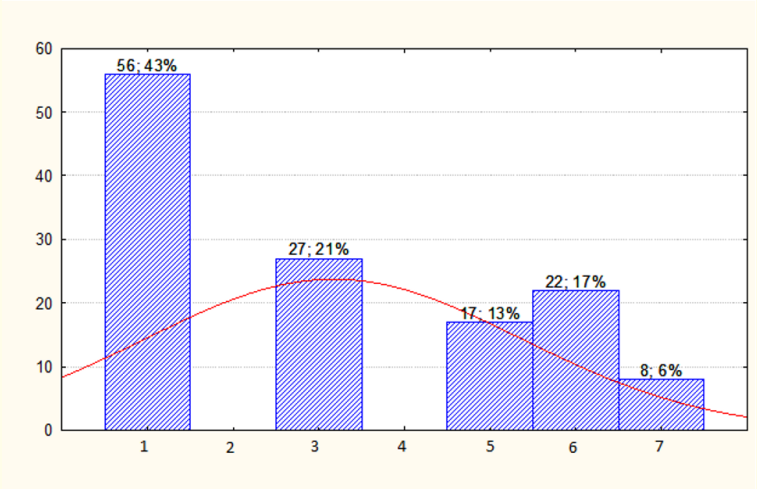

Figure 6: *CVD that caused death in men.*

1- other reasons; 2- coronary heart disease (no acute cause); 3- acute myocardial infarction; 4- coronary heart disease with acute cardiovascular failure; 5- acute cardiovascular failure (no CHD); 6- stroke or brain attack (CVA); 7- pulmonary embolism.

The graph of causes of death shows that the dominant cause is myocardial infarction, which in men is 27 (21%), and in women 17 (12%).

Distribution by age groups of deaths from CVD: 17 - 24 years - 0 (0%), 25 - 44 years - 2 (1.8%), 45 - 59 years - 41 (39.9%), 60 - 74 years - 52 (46.8%), 75 - 90 years - 15 (13.5%), > 90 years - 1 (0.9%), the peak mortality occurs in middle and old age.

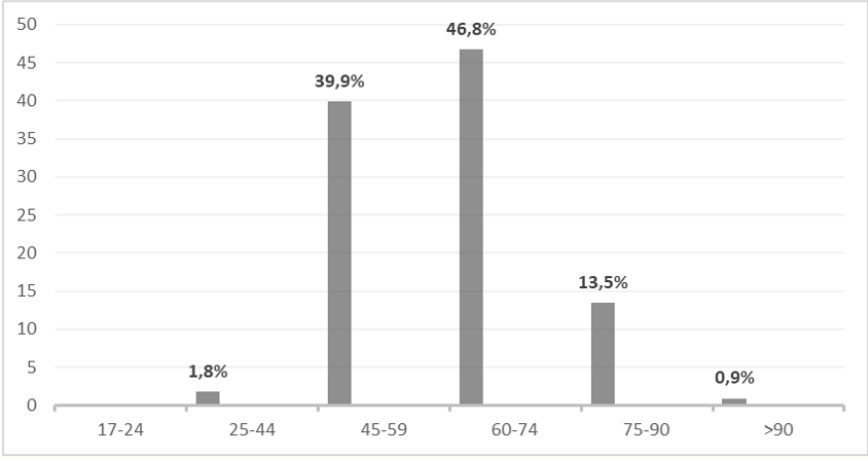

Figure 7: *Distribution of deaths from CVD by age.*

Cardiovascular pathology and type 2 diabetes mellitus, which occurred in patients with NAFLD (n = 271): morphologically atherosclerosis was detected in 176 cases (64.9%), coronary artery disease in 157 cases (57.9%), postinfarction cardiosclerosis - 57 (21%), Cerebrovascular accident in 19 cases (7%), arterial hypertension in 189 (69.7%), type 2 diabetes mellitus - 44 (17.1%).

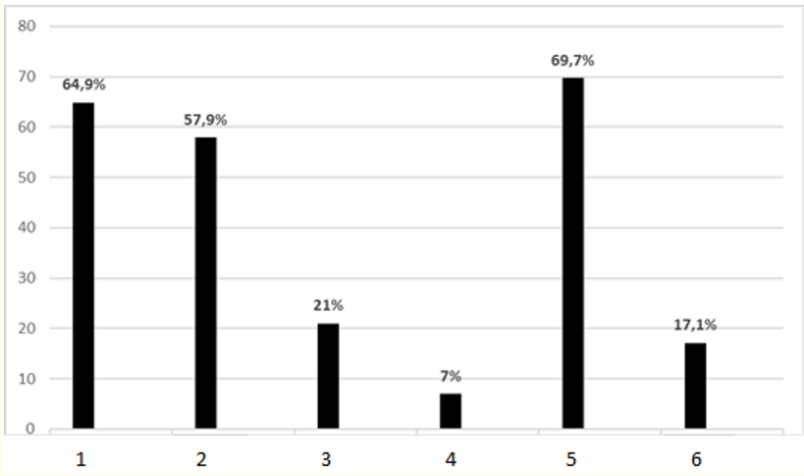

Figure 8: *Distribution of concomitant pathology in patients with NAFLD.*

1- vascular atherosclerosis; 2- coronary artery disease; 3- postinfarction cardiosclerosis; 4- cerebrovascular accident; 5- arterial hypertension; 6- type 2 diabetes mellitus.

To analysis CVD mortality in patients with NAFLD in more detail, we calculated the proportion of all deaths from CVD, and it was 423cases (19%) of the total number of autopsies (n = 2220).

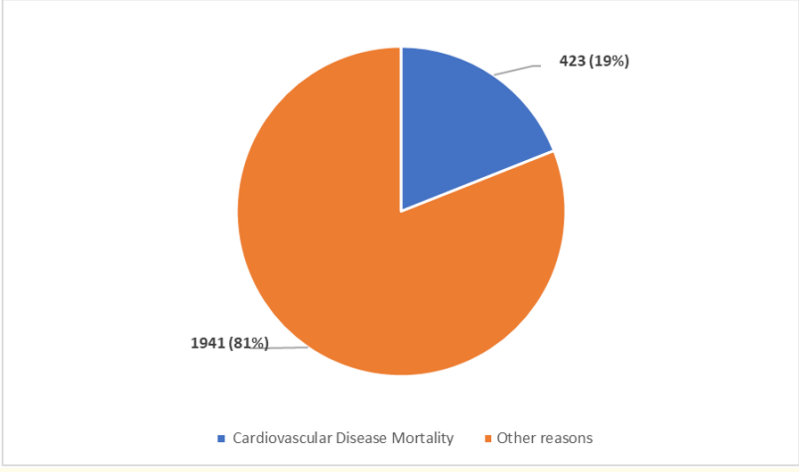

Figure 9: *The ratio of mortality from CVD from common causes.*

Of these, NAFLD was detected in 133 people, which amounted to 31.4%. At the same time, among those who had NAFLD, cardiovascular diseases caused the death of 49.1% of cases. Thus, it can be concluded that in those who died from CVD (n= 423) in every third according to autopsy data, taking into account anamnestic data, NAFLD is detected. And every second patient with NAFLD (n = 271) dies from CVD, men more often than women.

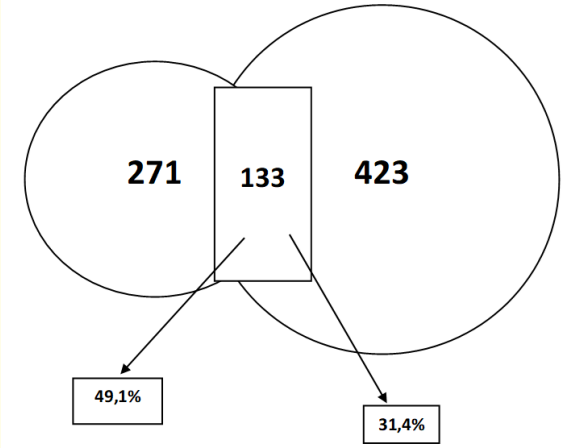

Figure 10: *Relationship between NAFD and CVD mortality.*

Findings:

1. In patients with NAFLD, body weight may be equally normal and elevated. Among patients with increased body weight, women predominate.
2. In men, there is a moderate positive correlation between the thickness of the subcutaneous fat and the mass of the liver, in women there is no such connection.
3. Morphologically, coarse fatty dystrophy is more common (66%).
4. One in 2 patients with NAFLD (49%) died of CVD. Among the dead, men reliably predominate. The dominant cause of death is CVD (AMI), in second place cerebrovascular accident. The peak of mortality is in middle and old age.
5. The total mortality from CVD for 3 years according to the pathoanatomical department of Irkutsk Regional Clinical Hospital was 423 cases (19%) (n = 2220). Among all deaths from CVD in every 3rd (133 cases (31.4%) were identified fatty changes in the liver.

Conclusion

The results obtained confirm the hypothesis about the existing relationship between NAFL and CVD, which is based on disorders of fat metabolism, which develop as a result of a violation of the normal function of hepatocytes against the background of their fatty lesion. In accordance with this statement, it is necessary to think about considering NAFLD as a component of metabolic syndrome

Conflict of Interest

The authors have no conflicts of interest.

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