ORIGINAL PAPER

The Role of Diet Therapy in the Treatment of Liver Disease

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ABSTRACT

Introduction: The liver is the largest gland in the human body, and serves to store nutrients and neutralize harmful compounds. The liver plays a very important role in a number of metabolic, both catabolic and anabolic processes, and is therefore called the „central laboratory" of the organism. If liver disease occurs, they can affect all its parts–liver cells, bile ducts, blood and lymph vessels. The liver is damaged by various toxins, drugs, infections, disturbances in the blood supply and other disorders. Diet therapy has been a part of the process in the treatment of liver disease for a while. The therapeutic principle is better known as the „liver diet". The liver diet not only means the replenishment of calories and nutrients, but it significantly affects the course of the disease. **Aim:** The aim of the research is to show that diet therapy plays an important role in the treatment of liver disease as a component for faster recovery of the liver and restoration of its normal function, as well as protecting the liver after overcoming the disease. **Results:** Among the respondents, there were 39 men (64%) and 22 women (36%) who had liver disease as a chronic condition. Most respondents are between 51 and 65 years old (28 and 46%, respectively), while the least number of respondents are in the 20 to 30 age group. The largest number of respondents cited alcohol as the cause of the disease, 31 of them (50.8%), while the virus was the cause of the disease in 15 respondents (24.5%). Of the total sample, most respondents answered that they sometimes (45.9%) or often (47.5%) overeat. The results of the questionnaire showed that 85.2% of the respondents were smokers before the diagnosis of the disease. In most respondents, the food they ate before diagnosis was moderately fatty (52.5%). Using chi-square tests, it was found that there are statistically significant differences in the consumption of almost all foods before the diagnosis of the disease and after the obtained dietary recommendations (p<0.05). **Conclusions:** The aim of the research was confirmed that diet therapy plays an important role in the treatment of liver disease as a component for faster recovery of the liver and restoration of its normal function, and after overcoming the disease it still protects the liver. The main purpose of creating a diet therapy program and plan proved to be significant and necessary because more than half of the respondents rated our advice as excellent. As most causes of liver disease can be prevented, it is necessary to work on familiarizing the population with risk factors, promote a healthy lifestyle and proper nutrition, and identify at-risk patients who must enter the monitoring system for early detection of liver disease.
Keywords: liver disease, diet therapy, treatment, outcome.

1. INTRODUCTION

The liver is the largest gland in the human body, and serves to store nutrients and neutralize harmful substances. The liver plays a very important role in a number of metabolic, both catabolic and anabolic processes, and is therefore called the „central laboratory" of the organism. It is responsible for a large part of the metabolism of carbohydrates, lipids, proteins and other nitrogenous substances. In the liver are also performed processes of detoxification, conjugation and esterification. Metabolic functions are performed in parenchymal cells, hepatocytes, while Kupffer cells are part of the reticuloendothelial system and have the ability to phagocytose. Today, it is already known which subcellular organelles perform some of the above functions (1).

Metabolic functions involve the normal metabolism of carbohydrates, proteins and fats and have a great influence on the normal circulation

of water, vitamins and electrolytes.

Secretory functions include the formation and secretion of bile and its essential components–bile acids, cholesterol and bilirubin. Bile is essential for the breakdown of fats and the absorption of fat-soluble substances including vitamins A, D, E and K.

The liver also serves as a reservoir of blood, vitamins A, D and B12, folic acid and iron as well as a short-term reservoir of small amounts of sugar in the form of glycogen, protein and fat. The liver plays the main role in detoxifying the body from harmful substances.

If liver disease occurs, it can affect all its parts–liver cells, bile ducts, blood and lymph vessels. The liver is damaged by various toxins, drugs, infections, disturbances in the blood supply and other disorders. This creates disorders of liver function that disrupt the metabolic balance of the body, the consequences of which today can be treated with varying degrees of success. The liver has a great ability to regenerate, and it performs its functions even when only half of the liver tissue is preserved. Liver diseases often have an insidious course without characteristic symptoms, progressing imperceptibly causing severe damage to this important organ, when a new liver transplant is the only solution. Liver diseases can be divided into focal or diffuse, depending on whether they affect only individual parts of the liver or the entire liver. Thus, the duration can be acute–they occur suddenly and last for a limited, shorter time (up to 6 months), or chronic–characterized by slow progression and duration longer than 6 months, usually years.

All liver diseases can be conditionally divided into inflammatory: acute and chronic hepatitis; non-inflammatory: hepatic steatosis, toxic lesions, cirrhosis, vascular diseases and liver tumors. The most common viral liver diseases are caused by hepatitis A, B, C and D, but they can also be caused by other viruses such as Epstein-Barr virus, Cytomegalovirus and others. The disease can occur as acute and chronic (2).

During our lives, we eat tons of food, drink thousands of liters of various beverages, take many different pills, syrups, antibiotics, consume various substances–among them extremely harmful–and all this passes through the liver. Its health is reflected in poor life habits. It will react if we don't eat properly, if we eat in walk, if we cram in large amounts of fatty and baked foods, french fries, chips, donuts, puff pastry, and large amounts of alcohol. Impaired liver function affects the overall health, including the digestive organs that are responsible for quality detoxification of the body. If the liver slows down, the body gradually enters a state of chronic poisoning.

It has been known for a long time that a proper diet can have a beneficial effect on various diseases or mitigate their consequences. Diet therapy has been a part of the process in the treatment of liver disease for a while now. The therapeutic principle is better known as the „liver diet". The liver diet not only mean the replenishment of calories and nutrients, but it significantly affects the course of the disease. Adequate diet therapy, which includes a sufficient number of calories and the proper ratio of essential nutrients with special emphasis on protein content, stems from an understanding of metabolic disorders in the liver.

The diet is not unique to all liver diseases. The main difference is in the amount of protein and the caloric value it contains (3).

However, for all liver diseases (except for patients with portal encephalopathy), the following recommendations developed by ESPEN in 1997 in order to facilitate the achievement of dietary goals apply.

* Most energy should originate from carbohydrates (60-65%) which are rich in cereals, fruits, vegetables and honey.

* Protein should provide 12-15% (1.0-1.2 g/kg) of total energy per day. The recommended sources of protein are: lean meat, lean cottage cheese, skim milk, eggs and fish.

* The amount of fat should be reduced as much as possible (40-60 grams per day), and it is best to use vegetable fats (e.g. olive oil).

* Vegetables and fruits can be eaten raw or cooked. The salad is prepared with a few drops of olive oil and lemon juice.

* It is desirable to salt the food in moderation, and in case of edema and accumulation of fluid in the abdominal cavity (ascites), an unsalted diet is carried out.

* It is recommended not to prepare dishes with grits, grilled dishes and frying and pouring dishes over heated, cooked or fried fat.

* Food should be taken in more frequent, smaller meals.

* Smoking is not recommended.

* Alcohol is strictly forbidden (4).

2. AIM

The aim of the research is to show that diet therapy plays an important role in the treatment of liver disease as a component for faster recovery of the liver and restoration of its normal function, and after overcoming the disease it still protects the liver.

3. METHODS

The sample was collected from patients of the specialist Clinic „Mo-Med" Mostar, from the internal department of Public Institute, Cantonal Hospital „Dr. Safet Mujić", from the General Internal Medicine Clinic, the Gastroenterology Subspecialist Clinic and the Subspecialist Gastroenterology Intervention Clinic. The study was carry out in the period from June 5, to December 5, 2018.

The initial survey study involved 61 respondents, 39 men and 22 women. All respondents had some of the chronic liver disease which was taken as the main inclusion criterion. After the analysis of eating habits, they were given recommendations on diet of their own making and after 6 months a re-examination of eating habits was conducted to see the current condition of patients and how much impact the given own making of diet therapy had. The second study involved 43 respondents who fully stated their experience with the proposed diet therapy.

As a research tool for the role of diet therapy in the treatment of liver disease, a questionnaire created by the author of the study, which contains 30 questions was used. The questionnaire investigated the general data of the respondents (gender, age, body weight and height) as well as the eating habits of consuming certain foods according to the group to which they belong (proteins, fats, carbohydrates).

Respondents also answered questions about what type of diet they used (fast food, restaurant food, homemade cooked food, etc.).

To assess the success of treatment before and after the follow-up period, all respondents who remained in the study underwent liver tests: determination of bilirubin, aspartate aminotransferase–AST and alanine aminotransferase–ALT, alkaline phosphatase–AF and gamma-glutamyl transpeptidase–γ-GT during regular check-ups, and in accordance with the type of liver disease.

Based on the results of the liver examination, the success of the treatment is divided into 4 categories: improvement, partial improvement, deterioration and unchanged condition.

Before the statistical processing of the results, the normality of the distribution of the results was tested with the Shapiro-Wilks test. It was determined that the results were not normally distributed ($p<0.01$), which is why nonparametric procedures were used in further processing of the results. Frequencies (N) and percentages (%) were used to determine the distribution of participants. To determine the descriptive parameters, the arithmetic mean, minimum and maximum were used. To test the significance of differences in food consumption before disease diagnosis and after dietary recommendations were obtained, chi-square dough ($\chi2$) was used. A significance level of 0.05 was used to assess the significance of the obtained results. The statistical software Statistica 7.0 was used to process the results.

4. RESULTS

A total of 61 respondents participated in the study, of which 39 were men (64%) and 22 women (36%). Most respondents are between 51 and 65 years old (28 and 46%, respectively), while the least number of respondents are in the 20 to 30 age group (6 and 9.8%, respectively).

The average height of the respondents was 178 cm, with a range of 159 cm to 190 cm. The average weight of the respondents is 66 kg, while the range is from 49 kg to 76 kg.

In most respondents, the disease started 3 years ago (25 and 41%, respectively), while the least have been sick for 5 years or more, 6 of them (9.8%). Most respondents cited alcohol as the cause of the disease, 31 of them (50.8%), while the virus was the cause of the disease in 15 respondents (24.5%). All respondents received dietary advice at the beginning of treatment.

Using chi-square tests, it was determined that there are statistically significant differences in the consumption of

		N	%
Gender	Male	39	63.9
	Female	22	36.1
Age	20-30 years	6	9.8
	31-50 years	18	29.5
	51-65 years	28	45.9
	Over 65 years	9	14.8
		Mean	Min-Max
Body weight and height	Height	178	159-190
	Weight	66	49-76

Table 1. Basic characteristics of the respondents

		N	%
Time since the onset of the disease	Up to 1 year	8	13.1
	Up to 2 years	13	21.3
	Up to 3 years	25	41
	Up to 4 years	9	14.8
	5 or more years	6	9.8
Cause of the disease	Alcohol	31	50.8
	Drugs and toxins	2	3.3
	Virus	15	24.5
	Metabolic disorder	2	3.3
	Immunological disorder	4	6.6
	Hereditary/genetic	3	4.9
	Nutritional causes	2	3.3
	Other causes – echinococcus of the liver	2	3.3
Advices on diet at the beginning of the therapy	Yes	61	100
	No	0	0

Table 2. Basic characteristics of the disease

		N	%
Smoking		52	85.2
Overeating	No, never	4	6.6
	Occasionally	28	45.9
	Yes, often	29	47.5
Salt consumption – food salinity	Almost unsalted	3	4.9
	Moderately salty	30	49.2
	Very salty	28	45.9

Table 3. Habits of the respondents before the disease

almost all foods before the diagnosis of the disease and after the obtained dietary recommendations ($p<0.05$).

Of the total number of respondents who remained in the study after the follow-up period, the largest number had a partial improvement in 34.9% of cases, while a significant improvement was recorded in 13.9% of respondents (total improvement–48.8). The laboratory findings remained unchanged in 20.2% of respondents, while deterioration was recorded in 20.9% of respondents.

Comparison based on adherence to the prescribed dietary regimen shows that out of 5 respondents who did not adhere to the dietary regimen, deterioration was recorded more often (in 2 or 40.0%) compared to respondents who adhered to the dietary regimen (7 or 18.4%), as well as that improvement and partial improvement were more frequently observed in respondents who adhered to the dietary regime (49.9%: 20.0%). The analysis by chi-square test does not show a statistically significant difference in the treatment outcome after six months ($\chi2=2.011$ p = 0.570), which in any case can be attributed to the small number of respondents who did not adhere to the prescribed diet.

5. DISCUSSION

Malnutrition is expressed in many people who consume alcohol, and also due to improper diet or alcohol and its toxic by-products, which prevent the body from properly di-

	Groceries	Before	After	χ2	P
Fats	Veal	12	59	71.293	0
	Beef (hamburger, steak)	55	0	96.541	0
	Pork (fat, bacon, ham)	33	0	42.536	0
	Lamb	43	2	56.335	0
	Liver	44	0	65.728	0
	Dried meat (sausages, salami)	55	0	96.541	0
	Whole milk and dairy products	40	1	53.047	0
	Cheese with high percentage of milk fat	51	2	76.863	0
	Margarine/butter	60	10	80.473	0
	Olive or pumpkin oil	61	56	3.337	0.068
	Sunflower, rapeseed and other herbal oils	61	56	3.337	0.068
Proteins	Poultry (chicken, turkey)	43	60	15.959	0
	Fish	20	59	51.86	0
	Eggs	55	20	40.009	0
	Soy products	1	2	0.342	0.559
	Skim milk and fermented milk products	10	56	66.843	0
	Fresh lean cheese, grainy cheese, whey, buttermilk	13	55	55.85	0
	Legumes	18	53	38.948	0
Carbohydrates	Biscuit	2	49	71.293	0
	Sweets (pastries, cake, cookies)	50	2	74.038	0
	Whole grains	22	55	36.054	0
	Fresh/raw vegetables	38	59	20.124	0
	Cooked vegetables	12	58	67.871	0
	Fruit (fresh or frozen)	33	61	33.791	0
	Canned fruit and vegetables	15	60	67.005	0
Other	Fast food	51	0	84.231	0
	Restaurant food	47	2	66.031	P
	Frozen food	50	12	44.897	0
	Homemade cooked food	32	59	29.235	0
	Food with additional sweeteners/sugar	10	52	55.13	0
Drinks	Strong drinks (brandy, cognac…)	51	0	84.231	0
	Red wine	43	0	63.352	0
	White wine	59	0	110.414	0
	Beer	47	0	73.235	0
	Fizzy drinks	31	5	24.629	0
	Syrups (for dilution)	10	5	1.216	0.270
	Naturally squeezed juices	12	39	22.776	0
	Water (regular/mineral, from the tap/bottled)	60	61	1.008	0.315
	Coffee (instant, Turkish, from the bag cappuccino)	58	55	0.48	0.488
	Tea (all kinds)	30	60	35.626	0

Table 4. Distribution of respondents according to which foods and beverages they consumed before and after the diagnosis of the disease, and testing the significance of differences in food consumption before diagnosing the disease and after receiving dietary recommendations (Chi-square test) (N = 61)

	Adherence to a diet		Non-adherence to the diet regime		Total	
Current state	N	%	N	%	N	%
Improvement	6	15.7	0	0.0	6	13.9
Partial improvement	13	34.2	2	20.0	15	34.9
Deterioration	7	18.4	2	40.0	9	20.9
Unchanged	12	31.6	1	20.0	13	20.2
Total	38	65.1	5	11.6	43	100

Table 5. Evaluation of treatment success based on adherence to the obtained dietary recommendations.

gesting nutrients, especially proteins, certain vitamins and fats. In both cases, nutrient deficiency contributes to malnutrition (5).

However, anything that is consumed in moderate quantities, can be tolerated by the liver, but alcohol is a possible cause of liver disease in any person who consumes more than 80 grams of alcohol per day. This statement is supported by the fact that most respondents cited alcohol as the cause of the disease, 31 of them (50.8%), while the virus was the cause of the disease in 15 respondents (24.5%). In the column, the other 2 respondents stated that echinococcus of the liver was the cause and was not treated in this paper because it is a rare case but not non-specific for this area.

The feeling of pain on the right side below the ribs is one of the signs of liver disease. The liver covers most of the abdominal cavity, and its fatty end is on the right side, and if it is damaged or inflamed, pain occurs. Patients describe the pain as stabbing pain. Yellow eyes or skin (jaundice)–when the body breaks down old blood cells, the bilirubin in the blood rises. And while a healthy liver has no problem disposing of bilirubin, a sick liver allows bilirubin to accumulate in the blood, and the symptom is yellow sclera or skin (jaundice). Dark urine color and light stool color are also signs of jaundice. Ankle pain–nausea, vomiting, fatigue and loss of appetite are interrelated symptoms of liver disease–especially autoimmune hepatitis. Autoimmune hepatitis is a condition in which the immune system mistakenly attacks liver cells and tissues, and is more common in women than in men, according to the U.S. National Institutes of Health (6).

Over the past few years, scientists have greatly expanded their knowledge of the mechanisms by which alcohol damages the liver parenchyma. Approximately 10–35% of alcoholics develop alcoholic hepatitis, while 10–20% of them develop liver cirrhosis (7). In the United States, cirrhosis ranks on the 7th place in terms of causes of death in young and middle-aged people. Approximately 10,000-24,000 deaths can be attributed to alcohol consumption, in the United States alone (8). According to the results of the questionnaire, most respondents suffer from alcoholic liver diseases (31 and 50.8%, respectively), where most of them have alcoholic hepatitis (21.3%). After alcoholic ones, most respondents suffer from infectious liver diseases (27.9%), where 15 suffer from viral hepatitis (24.6%).

Based on the epidemiological study, it is estimated that in Bosnia and Herzegovina, about 50,000 carriers of the hepatitis C virus, or about 1.3% of the population, are infected with the virus. People with a special risk of HCV (hepatitis C virus) or HBV (hepatitis B virus) infection in BiH are: a) Persons who received blood transfusions during the war (RVI, civilian victims of war), b) Persons who in the period 1992 -1995 were operated, c) Dialysis patients, d) Children born by HCV or HBV infected mothers, e) Persons who are tattooed with non-sterile needles, f) Persons who use drugs through needles and enter them directly into the blood, g) Persons with risky sexual behavior, h) Healthcare workers due to pinprick with infected needles.

Hepatitis B and C can be successfully treated if the diagnosis is made in time. Therefore, this disease should be openly discussed and people, who may be at risk of contracting these viruses, should be encouraged to get tested. Thanks to the program of the Government of the Federation of B&H, patients from the Federation of B&H have been exempted from the costs of diagnosis and treatment of chronic hepatitis C since 2005. In 2006, this funding program was extended to diagnosis and treatment of chronic hepatitis B (9).

Laboratory findings and ultrasound were used to diagnose liver disease for all respondents, and CT was used for 59 of them. A biopsy was used to diagnose the disease in the fewest respondents (8 of them). Diagnostic tests such as ultrasound (US) of the abdomen, which has become a daily diagnostic test in a modern approach to the analysis of pathomorphological changes in the liver, are also very important. It is complemented by other imaging methods such as computed tomography (CT) and magnetic resonance imaging (MR), and more recently by ultrasound elastography, but the application of one method does not preclude another (10).

When asked, „Do you use medication?“, almost all respondents answered that they use medication, and only two of them answered that they do not use medication at all. Among the most commonly used drugs are hepatoprotectives. Plants high in polyphenols, such as green tea (lat. *Camellia sinensis*), also show effectiveness in protecting the liver. These compounds have been found to protect liver cells from various toxins (11). Most attention is paid to the plant Milk thistle, a colorful weevil (lat. *Sylibum marianum*) that contains silymarin. It helps to alleviate the symptoms of liver dysfunction caused by alcoholism, infectious inflammation of the liver (hepatitis). Silymarin is used for liver damage caused by drugs (paracetamol, anticancer drugs, some antipsychotics). Silymarin can also be used for diseases of the gallbladder and bile ducts, liver poisoning of various origins, fatty liver degeneration, liver inflammation of viral origin and other damage the same. It is also used in type 2 diabetes, digestive problems, bile secretion (12).

Overeating and excessive daily food intake is one of the common causes of decreased liver function. Intemperance in food and drink requires the liver to "work overtime", and a tired liver is not as effective in detoxifying harmful substances as when this organ is relieved. It is recommended to consume smaller, but frequent meals (4-7 meals per day) (13). Among our respondents, the majority of respondents answered that they sometimes (45.9%) or often (47.5%) overeat.

It is recommended to limit the daily intake of table salt to 5-6 g (1 teaspoon) per day, and according to the ADA (American Diabetes Association) recommendations for people with diabetes to less than 2.3 g. In people with a damaged liver, it is necessary to further reduce the intake of salt that retains excess water in the body, which increases the pressure on the damaged liver (14).

Smoking causes a number of side effects on organs that do not have direct contact with the smoke itself, such as the liver. This causes three main negative effects on the liver: direct or indirect toxic effects, immune effects, and oncogenic effects. In addition, smoking causes suppression of T-cell responses and is associated with reduced surveillance for tumor cells. Furthermore, heavy smoking has been shown to affect the sustained virologic response to interferon (IFN) therapy in patients with hepatitis C that can be improved by repeated phlebotomy (15). The results of the questionnaire showed that 85.2% of the respondents were smokers before the diagnosis of the disease. While some respondents gave up smoking, according to the research, there were also those respondents who still smoke after being diagnosed with the disease.

In most respondents, the food they ate before diagnosis was moderately fatty (52.5%). After receiving recommendations from meat, the respondents completely stopped consuming beef, pork and liver. Only two respondents continued to consume lamb, and all those who responded after the recommendations were given began to consume veal. The recommendation is based on the fact that in addition to having a high protein content, red meat also has a high fat content, which can be problematic for the liver. „Even the sweetest cuts of meat are high in fat“, says Melissa Palmer, a doctor who writes on LiverDisease.com. „In fact, approximately 50 to 75% of the calories from most red meats actually come from fat. Although fat should be present in the diet, red meat contains saturated fats, which can contribute to high cholesterol and heart disease and can be especially harmful when the disease is already diagnosed liver“ (16).

From a nutritional's point of view, meat importance in the diet is given by the content of high-value proteins that contain all the essential amino acids. Also, meat is an excellent source of vitamin B12 and iron which have a very high efficiency. Meat is rich in B-group vitamins, necessary in the process of energy creation, as well as minerals zinc and magnesium. Meat, however, does not have a favorable fatty acid profile and due to the relatively high content of saturated fatty acids, its limited intake is indicated. Due to the above, when creating a menu, preference should be given to lean meat, skinless poultry meat and wild animals' meat (17).

Olive and rapeseed oil are imposed as „ideal“ fats in the diet due to their nutritional composition (18).

Protein should provide 12-15% (1.0-1.2 g/kg) of total energy per day. The recommended sources of protein are: lean meat, lean cottage cheese, skim milk, eggs and fish. Milk and dairy products are certainly one of the most important foods in terms of their presence in the daily diet

of the world's population, but also from the point of view of health protection. Its importance is not debatable in a balanced good diet, both because of the high biological value of proteins and their amino acid composition, especially because of the essential lysine and branched chain amino acids (19).

From the group of carbohydrates, food consumption increased except in the group of sweets, where consumption dropped significantly, but there are still those who cannot resist them. The source of carbohydrates is suggested to be from foods that naturally contain sugar.

Using chi-square tests, it was found that there are statistically significant differences in the consumption of almost all foods before the diagnosis of the disease and after the obtained dietary recommendations (p <0.05).

In the part where the consumption of beverages was examined, there is a significant statistical difference between consumption before and after the given recommendations. All respondents gave up alcohol and increased their intake of freshly squeezed juices, water and tea. Increased consumption of tea correlates with the respondents' response that they mostly cited tea as a method of alternative medicine and with which they had a significant impact on the disease. According to the results of our research, the respondents did not reduce their coffee intake and continue to drink coffee as before they were diagnosed with the disease. Coffee is associated with many positive effects on the body, some research suggests that it is good in the prevention of malignant diseases, some say that it is an excellent aphrodisiac. A study published in the journal Archives of Internal Medicine suggests that drinking two cups of coffee a day can reduce the risk of developing liver cirrhosis by up to 43% (20).

The results of our study show that adherence to the prescribed diet regime has an effect on treatment in terms of reducing the proportion of respondents who have worsening disease, and a higher proportion of respondents who have improved or partially improved and unchanged compared to the beginning of the diet. Yet the small number of respondents who did not adhere to the diet regime precludes statistical confirmation of this claim.

These findings are confirmed by the results of a review by Perdomo et al. who, based on a meta-analysis of the impact of nutritional changes on nonalcoholic fatty liver disease, concluded that a diet regimen adapted to each macronutrient could lead to an improvement in the condition and contribute to the outcome of treatment (21).

Sidiq and Khan, evaluated the nutrition as a part of therapy in liver and concluded that poor nutritional status is related to worse prognosis and increases the mortality rates in liver cirrhosis. Malnutrition is usual in patients and is associated with a poor outcome. Therefore, nutrition therapy for liver cirrhotic patients should be planned on an assessment of their complications, nutritional state, and dietary intake. Late evening snacks, branched-chain amino acids, zinc, vitamin and mineral supplementation, medium chain triglycerides, vegetable protein and probiotics are considered for effective nutritional use (22).

6. CONCLUSION

After analyzing the data of the research conducted on patients with liver diseases through a questionnaire on general and eating habits before diagnosing the disease and after giving their own recommendations, the following conclusions were drawn:

Liver diseases are a major public health problem as a mass non-communicable disease, the percentage of patients is significant, and treatment is long-lasting and is not always available and affordable to everyone and therefore most often leads to death.

Alcohol consumption, excessive alcohol consumption, alcohol dependence and other addiction-related complications are a huge public health problem of any society.

The aim of the research was confirmed that diet therapy plays an important role in the treatment of liver disease as a component for faster recovery of the liver and restoration of its normal function, and after overcoming the disease it continues to protect the liver.

The main purpose of creating a diet therapy program and plan proved to be significant and necessary because more than half of the respondents rated our advice as excellent.

As most causes of liver disease can be prevented, it is necessary to work on introducing risk factors to the population, promote healthy lifestyles and proper nutrition, and identify patients at risk who must enter the monitoring system for early detection of liver disease.

REFERENCES

1. Guyton i Hall: Medicinska fiziologija, Medicinska naklada Zagreb, 2012.
2. Vrhovac B. i suradnici: Interna medicina, Senat Sveučilišta u Zagrebu, 2003.
3. Martinis I. i sur. Dijetoterapija bolesti jetre, 2008. Medicus Vol. 17, No. 1, 113-122.
4. Ferenci P, Kondrup J, Merli M, Muller MJ, Plauth M , Weimann A. ESPEN guidelines for nutrition in liver disease and transplantation, Clinical Nutrition,1997; 16: 43-55.
5. Watch Tower Bible and Tract Society of Pennsylvania: Zlouporaba alkohola i zdravlje, 2018: 4-10.
6. Fluge O. Metabolic profiling indicates impaired pyruvate dehydrogenase function in myalgic encephalopathy/chronic fatigue syndrome. Journal of Clinical Investigation, 2016.
7. Ali Zayen M, Wolf P. Liver Cancer, Hyperthermia Centre Hannover, 2015.
8. Higuchi H, Isghii H, Kurose I, Kato S, Miura S. Ethanol-induced oxidative stress in the liver. Alcoholism: Clinical and Experimental Research 1996; 20(1): 77A-85A.
9. Kurtagić-Pepić E, Mesirović H, Stević E. Hepatitis B I C Prirucnik za pacijente. Sarajevo, 2008.
10. Jurinčić I, Marijić B, Milič S, Mikolašević I, Štimac D. Pristup bolesniku sa sumnjom na jetrenu bolest, medicina fl uminensis 2010; 46: 2.

11. Domitrović R. Hepatoprotektivno djelovanje fitokemikalia, Medicinski fakultet Sveučilišta u Rijeci, 2012.

12. Rodriguez- Serrano F, Rosario Dj, Rodriguez-Perez F, Torres M, Toro Dh. Does Sylibum marianum play a role in the treatment of chronic hepatitis C? Puerto Rico health sciences journal. 2004; 23: 69-74.

13. Vučelić B. Gatroenterologija i hepatologija, Medicinska naklada, Zagreb, 2002.

14. Pavić E. Posljedice prekomjerng unosa soli, Osijek, 2016.

15. El-Zayadi AR. Heavy smoking and liver. World J Gastroenterol. 2006; 12(38): 6098-6101.

16. Nall R. Red Meat & Its Effect on the Liver, livestrong.com, 2017.

17. Hasanagić M, MašićI. i sar. Pravilnom ishranom do zdravlja. Avicena, Sarajevo. 2011. 144. str.

18. Jirka Alebić I. Prehrambene smjernice i osobitosti osnovnih skupina namirnica, Medicus. 2008; 17(1): 37-46.

19. Havranek JL. Značenje mlijeka i mliječnih. Mljekarstvo. 1995; 45(4): 253-261.

20. Buchanan R, Fallowfield JA, Hayes PC, Kennedy OJ,Parkes J, Roderick P. Coffee, including caffeinated and decaffeinated coffee, and the risk of hepatocellular carcinoma: a systematic review and dose –response meta-analysis, University of Southampton, Southampton, UK, 2017.

21. Perdomo CM, Frühbeck G, Escalada J. Impact of Nutritional Changes on Nonalcoholic Fatty Liver Disease. Nutrients. 2019 Mar 21; 11(3): 677. doi: 10.3390/nu11030677.

22. Sidiq T, Khan N. Nutrition as a Part of Therapy in the Treatment of Liver Cirrhosis. J Nutr Food Sci. 2015: 5. doi:10.4172/2155-9600.1000S11004