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# NON-ALCOHOLIC FATTY LIVER DISEASE

Non-alcoholic fatty liver disease (NAFLD) is a condition caused by the excessive accumulation of fat in the liver tissue. One of the causes of NAFLD is a sustained excessive supply of energy, fats, and simple sugars in the diet. It is often associated with metabolic disorders, such as type 2 diabetes or obesity. Patients with NAFLD may develop NASH (non-alcoholic steatohepatitis), i.e. liver inflammation and damage. The consequences of NASH include the progression of fibrosis and, at the end-stage, cirrhosis.

## Diet

Modification of lifestyle, including diet change, increased physical activity, and body mass normalization, play a crucial role in the treatment of non-alcoholic fatty liver disease. Studies have shown that body mass reduction by 5% significantly reduces liver steatosis, while reduction by  $\geq 7\%$  improves histopathological parameters characteristic for NASH. Additionally, research indicates that the Mediterranean diet has positive effects both in terms of NAFLD prevention, as well as the reduction of the risk of NASH, irrespective of body mass change. However, patients with NASH and other gastrointestinal comorbidities may need to change their diet to one that is easily digestible. The diet should match the individual needs of every patient. Therefore, consider consulting a dietitian who will help change your eating habits.

## Key nutritional guidelines










- 1 Patients who are overweight or obese should gradually reduce their body mass to obtain the appropriate BMI between 18.5 and 24.9 kg/m<sup>2</sup>.
- 2 Keep regular intervals between your meals, i.e. every 3 to 4 hours. Avoid eating too much or sneaking a bite in between regular meals. Do not skip breakfast. Have your supper 2 to 3 hours before bedtime.



- 3 The Mediterranean diet is characterised by a low intake of animal fat and meat, moderate intake of dairy products and fish, and high intake of vegetables and fruit, legumes, whole grain cereal products and olive oil.
- 4 Try to compose your meals as presented on the **Healthy Eating Plate**. Make sure that approximately half of your plate is always occupied by vegetables and/or fruit. Products that are the source of carbohydrates (bread, groats, rice, pasta, cereal flakes and potatoes) should occupy approximately 1/4 of the plate, while products that are the source of protein (meat, fish, eggs, milk and dairy products, legumes) should occupy the other 1/4.
- 5 Eat at least 400 g of vegetables and fruit (3/4 of vegetables and 1/4 of fruit). Eat varied vegetables as often as you can, preferably raw or cooked al dente (let them be only slightly hard).
- 6 Choose whole grain cereals, as they are the source of fiber, B vitamins and minerals.
- 7 Choose lean meats and skimmed dairy products. Replace meat with fish and legumes as often as you can.
- 8 Eat two portions of natural dairy products daily, preferably fermented, as they are a rich source of protein and calcium (e.g. 1 portion equals 1 cup of yogurt). Choose skimmed products containing up to 3% fat and make sure they contain no sweet fruit mousses or chocolate.
- 9 Introduce adequate quantities of products containing unsaturated fatty acids (Omega-3, Omega-6 and Omega-9 fatty acids) into your diet. So, eat fish, especially sea fish, such as salmon, halibut, herring, mackerel, at least twice a week. Choose plant oils – olive oil, canola oil, linseed oil. Add it cold to raw salads or other dishes. You can use olive oil or refined canola oil for cooking. Another source of unsaturated fatty acids are nuts, seeds and avocado. Nuts are known to reduce the risk of incidents such as heart attack or stroke, if consumed in the quantity of 30 g/day.
- 10 Reduce the consumption of harmful trans fats to zero. They can be found in hard margarines, ready-made confectionery products, instant soups and dressings, salty and sweet snacks, fast-food.
- 11 Limit the amount of sugar, sweets, jams and honey in your diet. Simple sugars are a substrate used in the synthesis of triglycerides in the liver. Always read product labels and avoid products that contain sugar, glucose syrup, fructose syrup, glucose-fructose syrup, corn syrup, high-fructose syrup.
- 12 Drink at least **1.5-2 litres of fluids a day**. Replace sweetened drinks with sugar-free drinks, preferably water, as well as light tea and herbal infusions. Make sure to keep your body well hydrated by drinking small amounts of fluids more often.
- 13 Moderate consumption of coffee provides liver protective effect and reduces the risk of liver cirrhosis and cancer.









## Recommended and not recommended in non-alcoholic fatty liver disease

Remember that the overall profile of your diet, the composition of individual meals and the quality of individual products are all important aspects. In the table below you will find examples of products that should be the basis of your diet as well as those which you should limit to the bare minimum. Treat it as a guide to changing your dietary habits to healthier ones.

Products group	Recommended	Not recommended
<b>Vegetables</b> 	<ul style="list-style-type: none"> <li>all fresh and frozen</li> </ul>	<ul style="list-style-type: none"> <li>vegetables served with greasy sauces, roux</li> </ul>
<b>Fruit</b> 	<ul style="list-style-type: none"> <li>all fresh and frozen</li> <li>dried fruit in moderate quantities</li> </ul>	<ul style="list-style-type: none"> <li>candied fruit</li> <li>fruit in syrups</li> </ul>
<b>Grain products</b> 	<ul style="list-style-type: none"> <li>wholegrain flour</li> <li>whole grain bread and graham bread</li> <li>natural cereal flakes, e.g. oat, barley, spelt, rye</li> <li>wheat, rye and oat bran</li> <li>groats: buckwheat, hulled barley, bulgur, quinoa</li> <li>rice: brown, wild, red</li> <li>wholegrain pasta: wheat, rye, buckwheat, spelt</li> </ul>	<ul style="list-style-type: none"> <li>refined flour</li> <li>confectionery breads, light bread (toast bread, Kaiser roll, bread, butter rolls)</li> <li>sweetened breakfast cereals (cornflakes, chocolate flakes, muesli, crunchy flakes)</li> <li>fine-grained groats: farina, couscous, cornmeal</li> <li>white rice</li> <li>light pasta: wheat pasta, rice noodles</li> </ul>
<b>Potatoes</b> 	<ul style="list-style-type: none"> <li>boiled</li> <li>oven baked</li> </ul>	<ul style="list-style-type: none"> <li>potatoes with fatty additives like cream or butter</li> <li>fried potatoes</li> <li>French fries, chips</li> <li>fried potato pancakes</li> </ul>
<b>Milk and dairy products</b> 	<ul style="list-style-type: none"> <li>reduced-fat milk (up to 2% fat)</li> <li>dairy products: natural (sugar-free), fermented, with up to 3% fat (e.g. yogurt, kefir, buttermilk, skyr, cottage cheese, soured milk)</li> <li>skimmed and semi-skimmed cottage cheese</li> <li>mozzarella light</li> <li>cheese for sandwiches in moderate quantities</li> </ul>	<ul style="list-style-type: none"> <li>whole milk</li> <li>condensed milk</li> <li>sour cream, coffee cream</li> <li>sweetened fruit yogurts, dairy desserts</li> <li>cheese: full-fat curd cheese, processed cheese, feta cheese, soft cheese, e.g. brie, camembert, roquefort, full-fat mozzarella cheese, mascarpone</li> </ul>
<b>Eggs</b> 	<ul style="list-style-type: none"> <li>soft-boiled eggs, hard-boiled eggs, poached eggs, scrambled eggs and omelettes fried without fat or with a small amount of fat</li> </ul>	<ul style="list-style-type: none"> <li>eggs fried in a large amount of fat, e.g. butter, bacon, lard or salo (slanina)</li> <li>eggs served with mayonnaise</li> </ul>
<b>Meat and meat products</b> 	<ul style="list-style-type: none"> <li>lean skinless meat, e.g. veal, chicken, turkey, rabbit</li> <li>lean beef and pork (pork loin, tenderloin) in moderate quantities</li> <li>lean cold cuts, preferably home-made e.g. tenderloin, cooked ham, poultry cold cuts, roasted pork loin, roasted turkey/chicken breast</li> </ul>	<ul style="list-style-type: none"> <li>fatty meats such as beef, pork, mutton, goose, duck</li> <li>fatty cold cuts e.g. gammon, salami, brawn, bacon, spam</li> <li>canned meat, offal cold cuts, pâtés, hot dogs, kabanos sausages, sausage</li> </ul>
<b>Fish, fish products and seafood</b> 	<ul style="list-style-type: none"> <li>lean or fatty sea fish and freshwater fish, e.g. cod, sole, hake, blue grenadier, zander, bream, pike, perch, mackerel, salmon, halibut and carp</li> <li>herring and other fish in plant oil, smoked fish in moderate quantities</li> </ul>	<ul style="list-style-type: none"> <li>canned fish</li> <li>herring and other fish in cream and mayonnaise-based sauce</li> </ul>
<b>Legumes and legume products</b> 	<ul style="list-style-type: none"> <li>all, e.g. soybeans, chickpeas, peas, lentils, beans, broad beans</li> <li>legume spreads</li> <li>soy flour, sugar-free soy drinks, soy products: tofu, tempeh</li> <li>legume pastas (e.g. from beans or peas)</li> </ul>	<ul style="list-style-type: none"> <li>low-quality, ready-made legume products, e.g. soy sausages, breaded soy cutlets, soy pâtés, vege burgers</li> </ul>



# Recommended and not recommended products in insulin resistance

Products group	Recommended	Not recommended
<b>Fats</b> 	<ul style="list-style-type: none"> <li>olive oil,</li> <li>canola oil, linseed oil</li> <li>butter and vegetable oils mix</li> <li>soft margarines</li> </ul>	<ul style="list-style-type: none"> <li>butter and clarified butter</li> <li>lard, сало (slanina), tallow</li> <li>hard margarine (blocks)</li> <li>tropical oils: palm, coconut</li> <li>mayonaise</li> </ul>
<b>Nuts and seeds</b> 	<ul style="list-style-type: none"> <li>nuts (e.g. walnuts, hazelnuts, almonds)</li> <li>seeds (e.g. pumpkin, sunflower)</li> </ul>	<ul style="list-style-type: none"> <li>nuts and seeds: salted, in chocolate, in caramel, honey, sprinkled, breaded, in chips</li> </ul>
<b>Sugar and sweets, salty snacks</b> 	<ul style="list-style-type: none"> <li>dark chocolate, at least 70% cocoa</li> <li>natural yogurt with fresh fruit</li> <li>natural sweeteners e.g. xylitol, stevia, erythritol</li> <li>fruit purees, mousses and sorbets, jams with no added sugar in limited quantities as an element of a meal</li> <li>kissel and jellies without added sugar</li> <li>home-made pies and cakes without added sugar</li> </ul>	<ul style="list-style-type: none"> <li>sugar, e.g. white, cane, brown, coconut</li> <li>honey, maple syrup, date syrup, agave syrup</li> <li>sweets high in sugar and fat, e.g. cakes, cookies, chocolate bars, milk and white chocolate, halva, donuts, Angel wings, candies</li> <li>high-sugar jam</li> <li>salty snacks, e.g. chips, salty sticks, crispy flakes, crackers, nachos, crisps</li> </ul>
<b>Beverages</b> 	<ul style="list-style-type: none"> <li>water</li> <li>sugar-free beverages, e.g. coffee, cereal coffee, tea, herbal and fruit infusions, kompot, cocoa</li> <li>vegetable and fruit juices in limited quantities as an element of a meal</li> <li>homemade lemonade with no sugar</li> </ul>	<ul style="list-style-type: none"> <li>alcohol drinks</li> <li>sweet sparkling and still beverages</li> <li>energy drinks</li> <li>nectars, high-sugar fruit syrups</li> <li>drinking chocolate</li> </ul>
<b>Spices and sauces</b> 	<ul style="list-style-type: none"> <li>fresh and dried single-ingredient herbs, e.g. basil, oregano, turmeric, cinnamon, ginger</li> <li>salt-free spice mixtures (e.g. herbs de Provence)</li> <li>home-made salad dressings based on a small amount of oil or yogurt, herbs, lemon</li> </ul>	<ul style="list-style-type: none"> <li>salt (e.g. table salt, Himalayan salt, sea salt)</li> <li>spice mixtures containing large amounts of salt</li> <li>bouillon cubes</li> <li>liquid spices to enhance flavour</li> <li>ready-made sauces</li> </ul>
<b>Soups</b> 	<ul style="list-style-type: none"> <li>soups based on vegetable or lean meat broths</li> <li>soups whitened with yogurt or milk up to 2% fat</li> </ul>	<ul style="list-style-type: none"> <li>soups based on fatty meat broths</li> <li>soups whitened with sour cream and with roux</li> <li>instant soups</li> </ul>
<b>Prepared meals</b> 	<ul style="list-style-type: none"> <li>frozen stir-fry vegetables mix, frozen fruit mix</li> <li>groats and legume blends</li> <li>cream soups</li> <li>ready-made vegetable stir-fry foods</li> <li>vegetable pastes and purees</li> </ul> <p><i>*Read labels, compare ingredients and pay attention to added sugar, salt and fat content</i></p>	<ul style="list-style-type: none"> <li>fast food, e.g. toasted open-faced sandwiches, hot dogs, hamburgers, kebab</li> <li>frozen pizzas, toasted open-faced sandwiches</li> <li>ready-made food products in breadcrumbs, fatty sauces, from refined flour</li> <li>instant oatmeal</li> <li>instant meals, e.g. sauces, soups</li> </ul>
<b>Technological processing of food</b> 	<ul style="list-style-type: none"> <li>boiling, steaming (cereals, vegetables cooked al dente)</li> <li>grilling (electric grill, grill pans)</li> <li>baking in foil, parchment paper, roasting bags, heat-resistant dish</li> <li>no-fat frying</li> <li>stewing without pre-frying</li> </ul> <p><i>*Small amounts of the recommended vegetable fat, e.g. olive oil or canola oil are acceptable if used occasionally.</i></p>	<ul style="list-style-type: none"> <li>deep frying</li> <li>stewing with prior deep-frying</li> <li>baking in large amounts of fat</li> <li>breadding</li> </ul>

## Quality menu ideas in non-alcoholic fatty liver disease

### BREAKFAST:

#### Hummus and vegetable sandwiches

- wholemeal rye bread
- hummus
- red bell pepper
- cocktail tomatoes
- coriander

### LUNCH:

#### Pasta salad with mozzarella

- whole grain pasta (penne)
- mozzarella light
- broccoli
- cucumber
- tomato
- olive oil
- herbs de Provence

### DINNER:

#### Baked salmon with herbs, pearl barley and beetroot

- salmon
- spices, e.g. basil, thyme, rosemary, parsley, garlic
- pearl barley
- cooked or baked beetroot



### AFTERNOON SNACK:

#### Fruit kefir

- natural kefir 2% fat
- banana
- blueberries
- rolled oat flakes

### SUPPER:

#### Whole grain pancake with grilled turkey, vegetables and yogurt sauce with dill

- |  |                          |
|--|--------------------------|
| • pancake batter: whole grain wheat flour, milk, sparkling water, one egg, oil | • skinless turkey fillet |
|  | • iceberg lettuce        |
|  | • tomato                 |
|  | • bell pepper            |
|  | • cucumber               |
|  | • natural yogurt 2% fat  |
|  | • dill                   |



## Physical activity

- 1 Make sure you exercise regularly. Physical activity has numerous benefits, e.g. helps achieve and maintain the appropriate body mass, helps reduce liver steatosis and decreases the concentration of laboratory markers of liver cell damage. Try to be physically active for at least 30 minutes a day.
- 2 Adapt your activity to your abilities. Remember that simple activities, such as walking, climbing stairs, active housework, activities with children, are also beneficial.

## Other lifestyle elements

- 1 Eliminate alcohol from your diet, as it has an extremely negative effect on liver function. Frequent alcohol use is linked to high triglyceride serum concentrations and the progression of liver fatty disease.
- 2 Quit smoking.
- 3 If you are under stress, learn how to manage it effectively. Some relaxation techniques based on mindfulness and meditation may help, as well as breathing techniques or yoga.
- 4 Get enough good quality sleep (7-8 hours a day). Try to go to sleep and wake up at about the same time every day. Avoid using electronic devices (smartphone, tablet, computer, TV) one hour before bedtime.

### References:

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