

Population Study on the Impact Food Chemical Composition on Patients with Non-Alcoholic Fatty Liver Diseases

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Non-alcoholic fatty liver disease (NAFLD) has become of major interest worldwide, it is estimated that more than 20% of the general population suffer from liver steatosis. NAFLD is highly associated with metabolic risk factors like type 2 diabetes mellitus, obesity and dyslipidemia, the patients diagnosed with NAFLD should adopt a high fiber low calorie diet, with reduced saturated fat and carbohydrates content, leading to weight loss and improvement of metabolic profile. Our study is aiming to shape the profile of the patient interested in being informed related to food quality and chemical composition and to evaluate the aspects on the food products label which are important for the customer. Between June 2017 and December 2017, 83 patients diagnosed with NASH were included in the study, representing the study group, while 33 subjects, without metabolic syndrome or digestive diseases, selected from patient list belonging to two general practitioners, constituted the control group. Related to the interest of being informed about the chemical composition and nutritional value of the products bought, the study showed a low interest for the provided information on nutritional value. Lack of confidence in the provided information and complexity of the information are understandable, the high number of subject reasoning through lack of immediate clinical benefit is surprising. Among the healthy population the willingness to pay attention to this aspect is extremely low.

Keywords: fatty acids, oligosaccharides, dyslipidemia, chemical composition, nutritional value, metabolic syndrome, liver fibrosis

Approximately 30 million people around Europe suffer from chronic liver disease, while the death rate from liver cirrhosis covers 1,8%, according to WHO data [1, 2]. Among the causes of chronic liver disease, non alcoholic fatty liver disease (NAFLD) has become of major interest worldwide, considering it represents an entity with increasing prevalence and -due to the associated conditions- leads to increased risk of developing cirrhosis, liver cancer, type 2 diabetes mellitus, atherosclerosis and related cardiovascular disease [3-10]. The prevalence of NAFLD in Europe is estimated between 20-44%, for diabetic patients it reaches worrying levels: 42.6-69.5% [1-3, 11].

In Romania, the prevalence of obesity is increasing, even beginning with young age and it is estimated that more than 20% of the general population suffer from liver steatosis, it is estimated that there will be a rapid increase in the prevalence of this disease, in parallel with a dramatic increase of diabetes and obesity [4, 11].

Taking into account that NAFLD is highly associated with metabolic risk factors like type 2 diabetes mellitus, obesity and dyslipidemia, the patients diagnosed with NAFLD should adopt a high fiber low calorie diet, with reduced saturated fat and carbohydrates content, leading to weight loss and improvement of metabolic profile [2, 3, 12]. Recent studies have shown that changing dietary behavior may lead to reducing liver steatosis and biochemical parameters, even in the absence of weight loss [13-15].

The concern for improving food labeling methods for better knowledge on products' content together with promoting healthy eating habits in the general population represent effective methods to combat obesity, dyslipidemia, diabetes mellitus, liver steatosis and cardiovascular disease [16-20].

Experimental part

Aim and objectives

Related to the previously mentioned aspects, we conducted an observational study, aiming to shape the profile of the patient interested in being informed related to food quality and chemical composition and to evaluate the aspects on the food products label which are important for the customer. Moreover, we followed the ability of the subjects to correctly interpret the data on the label, regarding the nutrient content and their practical applicability. The interest of the subjects both for qualitative and quantitative data on the label was also interpreted.

Study groups and methods

Between June 2017 and December 2017, 83 patients diagnosed with NASH were included in the study, representing the study group, while 33 subjects, without metabolic syndrome or digestive diseases, selected from patient list belonging to two general practitioners, constituted the control group. Only the patients who have signed the informed consent form were included.

The subjects from the study group were selected among the patients who have been diagnosed with NASH for at least 6 month prior to the enrollment and who had received the specific dietary recommendations (low sugar, low fat, low calories diet). All subjects included in the study have filled in a questionnaire regarding their landmarks in picking up food products and their interest for the information provided by the producer, concerning the chemical composition and energetic value of the product.

For all subjects included in both groups, socio-demographic parameters were registered in the database, while for the patients in the study group patient history and clinical, ultrasound and biological parameters (metabolic and hepatic function) were registered, as well as data

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documenting the degree of liver fibrosis (either through FibroMAX, Fibroscan or Shear Wave elastography), which correlate with the severity of liver disease, considering the currently available protocols.

The protocol for implementing the questionnaire

The questionnaire implementation procedure was identical for all subjects. All data were systematized in a 10 item questionnaire, for which every subject had a 20 min time in order to fill in. The questionnaire included questions regarding the way and place to buy food, the features each product should have in order to be appealing and the interest for the chemical composition and energetic value of each product found on the label. All demographic, clinical, biological, imaging data as well as the results of the questionnaire were statistically analyzed.

Results and discussions

The mean age of the subjects included in the study was 47.3 years \pm 9.7SD. With reference to patients distribution considering age among the two study groups there were no statistically significant differences between the groups ($F = 0.0089$, $p = 0.92$, 95%CI), with a mean of 47.5 years \pm 8.9 SD in the study group (min 24, max 77 years) and 46.3 years \pm 10.9 SD in the control group (min 21, max 80). The two groups had similar structure regarding the other socio-demographic parameters as well (sex, education level, provenance), with no statistically significant differences.

An overall analysis taking into account answers provided by all study participants has revealed that, related to the place for buying food products, young people from urban area preferred the supermarket or the neighbourhood stores, while the elder shopped more frequently from the grocery or the closest store. The decision to buy a product is influenced by sales in the first place and by product brand, while a long best before period is of lower interest. There were no statistically significant differences between the two groups.

Related to the interest of being informed about the chemical composition and nutritional value of the products bought, the study showed a low interest for the provided information on nutritional value. Among the total number of subjects, 62 subjects (53.44%) admitted they only, *rarely* or *never* read the information regarding nutritional value on the product label and only 54 (46.55%) declared they *often* or *always* read this type of information on the label. Other studies, which aimed to evaluate the use of nutritional value written on product label reported variable results, depending on the type of subjects (students, retired people, etc) [17-21]. The comparative analysis between the two groups has shown that 50.60% of the NASH patients read the product label *often* or *always*, while in the control group only 33.33% of the subjects responded similarly. Applying the significance tests, there is evidence that patients with NASH show a significantly higher interest on nutritional value of food products they buy ($\chi^2 = 15.44$, $p = 0.00008$, $r = -0.76$, 95%CI), compared to the control group.

In what concerns the capacity to understand the information listed on the product label, 70.68% consider the information is clear or it is *mostly* clear, while 29.31% considered that the information is *hardly* or „not at all” easy to understand. A low level of understanding the information provided on the labels of food products was also reported by other studies [21, 22].

The high number of subjects not interested in the data on the label related to composition of food products was

surprising and consequently we followed shaping the profile of the subject paying attention to characteristics of food products (considering the demographic data and also the clinico-biological parameters in the study group).

Analyzing subjects distribution according to gender, the percentage of the subjects not reading the label was similar in men and women, without statistically significant differences between the study group and the control group ($\chi^2 = 0.177$, $p = 0.67$, $r = -0.11$, 95%CI). Consequently, patient's gender does not represent a predictor for the will to get informed. Moreover, neither did the home region (urban or rural) correlate with the interest for nutritional value of food products. Similar results were reported by other authors as well [23-26], although there are studies on large groups of subjects highlighting an increased concern for nutritional information of food products among women, especially the ones who have a family to support [20, 27-29].

Related to subjects' age correlated to the interest for *often* or *always* reading nutritional data on food products label, the subjects belonged to 29 - 63 years (mean 47.3 years \pm 9.7 SD). Our study found an increased interest for this type of information especially among the subjects in the 31-35, 46-50 years age groups, with a confidence interval of 95%. Consequently, young age represents a positive predictor for the willingness to get additional information on the products bought results which are in accordance with other similar studies [24-26].

By analyzing the level of education, there were no statistically significant differences between subjects with middle studies and the ones who have graduated college, whereas there were significant differences between these categories and subjects who only finished 4-8 years of studies. The highest percentage of subjects showing no interest for nutritional and energetic value of food products was registered among the subjects with low education and, consequently, the low level of education may be considered a negative predictive factor for the willingness to get properly informed. The concern of highly educated people for the quality and composition of the food products they acquire was reported by other authors as well [23, 24].

In the study group, among patients with NASH, the ones who also had disturbances of glucose metabolism (especially the ones under the surveillance of a diabetologist), the ones with changes in liver function tests and the ones with advanced liver fibrosis were more concerned to get detailed nutritional information, compared to the control group. The concern for a healthy diet among patients with type 2 diabetes mellitus was also highlighted in other studies [23, 30].

There may be an inversely proportional correlation between the length of disease course and the concern for the information on the food products label (the recently diagnosed patients read labels more frequently and pay more attention to the food products composition). This may be due to a routine created by these patients, but also by reducing the alert state which distinguishes the recently diagnosed patients.

Other studies have shown that high severity of changes in the biological parameters is associated with increased concern for adopting a healthy diet, fact which was also highlighted by our study [19, 30]. One of the current research objectives was to establish the influence of several factors on the decision the read food products label, especially regarding the chemical composition of food products and to prioritize them, in order to shape some prognostic features

Table 1
MULTIPLE CORRELATION INTEREST FOR READING NUTRITIONAL VALUE PARAMETERS ON FOOD PRODUCTS LABEL

Multiple correlation	estimated value
Multiple correlation coefficient <i>r</i>	0.72785
Multiple <i>R</i> ²	0.52976
F(6, 1161)	20.11758
<i>p</i>	0.00000
Std. Err. of Estimate	0.57943

Partial correlation	Correlation coefficient (Beta)	Std.Err.	t	<i>P</i> 95% confidence interval
Intercept			-6.54998	0.000000
Sex	0.093035	0.065924	1.41125	0.160654
Age	0.348487	0.070137	3.54287	0.000557
Home region (urban or rural)	-0.102692	0.066169	-1.55198	0.123196
Level of education	0.565067	0.066849	6.95704	0.000000
Length of disease course	-0.010585	0.067656	-0.15646	0.875925
Changes in biochemical parameters of level of fibrosis	0.450815	0.062466	5.61612	0.000000

Several potentially involved parameters were studied, including age, gender, level of education, time lapse from diagnosis, the presence and degree of biochemical changes, presence of disease complications, disease status (level of fibrosis). Analyzing the concern for nutritional value parameters to these parameters was performed using multivariate analysis.

The multiple correlation coefficient (*R*²) shows that 52.9% of the decision to read nutritional value parameters on food products label was influenced by the evaluated parameters. The analysis of partial correlation coefficients indicates that a significant influence on the decision to get this information is due to the level of education (*r*_{partial} = 0.56, *p* < 0.01), then to the presence of changes in the biological parameters or disease complications (*r*_{partial} = 0.45, *p* < 0.01), and lastly to age (*r*_{partial} = 0.34, *p* < 0.000557). On the other hand, the concern for reading nutritional value parameters on food products label did not correlate with gender, home region or length of disease course (*p* > 0.05). Overall, other studies have demonstrated that the young people with an increased level of education, coming from the US, the patients with metabolic disorders have an increased concern for food products composition compared to elder people, with lower level of education, coming from the EU and Asian countries [20-27].

The second objective was to analyze the main aspects followed by the subjects, when reading food products labels and choosing one type of product. For the patients who read information provided on the label, the main product features which influence the decision to buy are the low fat content, followed by sugar and energetic value.

For the subjects belonging to the control group, energetic value was the first feature to influence the decision to buy a food product, followed by fat and sugar content. A significant percentage (42.24%) among the subjects stated their interest for avoiding food additives. The concern for a healthy, additive-free diet and following the fat and sugar content were reported by other studies on food behaviour as well [26, 30, 31].

Another aspect of interest was analyzing the motivation for ignoring the information regarding nutritional content

found on food product labels. Ranked according to frequency, we identified the following reasons for which the subjects included in the study admitted not to read the information on food product labels: the complexity of the information (32.6%), lack of confidence in the provided information (29.2%), lack of clinical benefit (16.7%), lack of time (11.1%), others (10.4%).

While reasons such as lack of confidence in the provided information and complexity of the information are understandable, the high number of subject reasoning through lack of immediate clinical benefit is surprising. This fact reveals a deficiency in education for a healthy diet. This is a key aspect, which can be improved both through making information on food products label clearer and through elaborating educational programmes, following the pattern of programs aiming to reduce smoking or to prevent cardiovascular disease [19, 31-33].

Conclusions

The current study demonstrates that although some of the patients with metabolic disease and NASH show concern regarding the nutritional value of the food products they buy, among the healthy population the willingness to pay attention to this aspect is extremely low.

Considering the importance of diet in the pathogenesis of many diseases, education of the young is of high value, in order to promote acquiring nutritional information from food products label; this measure could represent a primary prevention step towards reducing the prevalence of metabolic disorders and their long term consequences, not only regarding liver dysfunction but also of cardiovascular importance. Moreover, improving information provided by labels of food products regarding the nutritional content may have an important role in choosing healthy food. Of high importance is simplifying the nutritional information, which might help consumers evaluate the contribution of several food products to their diet.

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