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Factors affecting consumer preference for healthy diet and functional foods

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Abstract:
An inadequate diet and lifestyle are major causes of various diseases. A healthy diet can prevent diseases and maintain a good health status. The present research objective was to test young consumers for their preference for healthy diets and their intention to purchase functional foods, as well as to identify factors that affect their attitudes.
The study involved 720 consumers (average 20 years old), a structured questionnaire, and a specially-developed scientific methodology. The results were grouped based on sex and body mass index. The analysis focused on the points where consumers' interest in healthy diet overlapped with health-related diet needs and how each of them corresponded with their knowledge on the following spheres: nutrition and health risks, labelled data use in food choice, preference for foods fortified with vitamins, minerals, dietary fibers, or functional foods with a poor sensory quality. The data were processed using descriptive statistics, Z-test, and correlation tests.
All the consumers demonstrated healthy diet preferences and a significant positive relationship ($p < 0.01$) with the factors. They made an informed choice based on the labelled data and preferred foods fortified with vitamins, minerals, and dietary fibers, as well as functional products with a lower sensory quality. All respondents, regardless of sex and body mass index, demonstrated nutrition and health risk awareness. The health-related diet needs also affected their food preferences ($p < 0.05$), with some exceptions.
The young consumers possessed sufficient basic knowledge on food quality, nutrition, and health. Their attitudes depended on their preference for healthy diets and functional foods. The novel methodology can be applied to other studies of consumer preferences.

Keywords: Consumer preference, influencing factors, healthy diet, food product quality, labeling, fortified food

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INTRODUCTION

Basic dietary habits are established early in childhood but continue to form under the effect of various environmental factors. An inadequate diet and sedentary lifestyle are major causes of some specific diseases, morbidity, and mortality. Obesity is responsible for such noncommunicable diseases as cardiovascular disease, type II diabetes, hypertension, osteoporosis, and certain cancers [1–5]. They increase health care costs, decrease treatment efficiency, and cause unemployment, as well as major lifestyle changes [6]. Some of these conditions, however, can be prevented by radical and timely changes in individual lifestyle and eating habits.

Food consumption is usually based on a few ingredients or food products that can satisfy intake standards if combined. Nutritionists recommend to optimize the traditional daily nutrition model with balanced nutrients and bioactive compounds to prevent diseases and maintain a healthy life [3]. Young consumers remain a challenge for the food industry as their nutrient intake recommendations and diet improvement require interaction between different sectors, e.g., food producers, marketing experts, and nutritionists [7–11]. Fortified foods seem to be the most appropriate preventive approach so far. However, its success depends on consumer preferences.

Before product formulation and modeling, producers identify food properties that can be assigned as beneficial for target consumers [12–14]. A healthy diet is popular when it includes tasty foods with acceptable sensory quality. Food producers have an obligation to

improve the availability and attractiveness of healthy food products if they want to gain consumers' trust [4, 9, 15, 16].

Different researches confirmed that consumer habits on the target market could be sources of innovative ideas for novel foods [12, 17]. To choose from available products, consumers rely on their eating habits, preferences, or expectations, which usually differ according to life-style, interest, and motivation to eat some particular type or category of food [18, 19]. This study featured young consumers, their preferences for healthy diets, and their intention to purchase food products with improved nutritive quality, as well as to identify factors that affect their attitudes.

Hypotheses and research design. Food producers are food market participants that shape the assortment. They can use the preferences of their target consumers for a healthy diet and functional foods to determine food quality parameters or ideas for novel functional foods [4, 20–23]. Most consumers are familiar with foods with added value or fortified with vitamins, minerals, or nutritive fibers. However, factors that affect food choice or interest in nutrients and food intake could differ within groups of consumers even inside the country or region [10, 12, 24–26]. Therefore, new consumer-oriented health-focused products require surveys of choice factors and their interaction. Body mass index is calculated based on human body weight and body height and expressed in kg/m^2. It can serve as an indicator of diet-related risk factors. An improper diet and inability to follow recommendations cause health issues manifested as increased or insufficient body mass.

Various studies that featured young consumers included an analysis of their preferences for a healthy diet, their intention to purchase functional foods, and the factors that shaped their consumer habits [12, 26, 27]. Consumer preferences for a healthy diet and specific food quality can be the factors that define their attitudes. We formulated them as questions (Qx). Before the experiment, we came up with two main hypotheses and two additional hypotheses to be tested.

Respondents do not differ in consumer attitude toward a healthy diet and functional foods:
H1: All respondents have the same consumer attitude regardless of sex;
H2: All respondents have the same consumer attitude regardless of body mass index;
H2a: All male respondents have the same consumer attitude regardless of body mass index; and
H2b: All female respondents have the same consumer attitude regardless of body mass index.

The null hypothesis could be tested by crossing the grouped answers based on respondents' sex (men and women) and body mass index (normal and inadequate) for each question and a Z-test.

The three main hypotheses (H 3–5) were formulated for correlation testing for each group of respondents (all, men, women) or for all respondents, men, and women grouped according to body mass index. The first group was marked as Hxa-f, while the second was marked as BHxa-f, where x stood for the hypothesis number, and letters a-f were related to the dependent variables, i.e., questions. All the hypotheses were focused on the research objective. Hypotheses 4 and 5 were subdivided into six additional hypotheses, related to the dependent variables, i.e., questions Qx:
B/H3: Consumer interest in healthy diet (Q1) is not connected with individual health-related diet needs (Q8);
B/H4: Consumer interest in healthy diet (Q1) is not connected with B/H4a-f; and
B/H5: Individual health-related diet needs (Q8) are not connected with BH5a-f,

Where B/Hxa-f are:
B/H4/H5/a: food labels (Q2);
B/H4/H5/b: labels use in food choice (Q3);
B/H4/H5/c: purchasing foods fortified with vitamins and minerals (Q4);
B/H4/H5/d: purchasing foods fortified with dietary fibers (Q5);
B/H4/H5/e: products with an improved nutritive content but a poor sensory quality (Q6); and
B/H4/H5/f: nutrition and health risk awareness (Q7).

STUDY OBJECTS AND METHODS

Participants' profile. Different ideas for innovations in food development or reformulation of existing products could be identified by researching the target market. However, before food producers make the final decision on the type of quality improvement of a completely new or existing product, they must find out about the habits and preferences of real consumers of the selected food category and the factors that affect their attitudes.

This study involved 720 young adults who live in the Republic of Srpska (Bosnia and Herzegovina). They were selected as representatives of target twenty-year-old consumers (Table 1) who are independent in their choice of food. They were identified as representatives suitable for studies regarding future activities on food product development or nutritive quality improvement. They were recruited for the research from public secondary and higher educational institutions, based on expressed individual interest for participation. The questionnaires were printed for direct self-reporting data and distributed in secondary schools and higher public educational institutions in Banja Luka, Bijeljina, East Sarajevo, Prijedor, and Zvornik.

The questionnaire started with demographic data. They were used as variables for the research and included sex, age, and education. The list also included economic status, health- induced dietary needs, body weight, and height. Table 1 illustrates the data we used to calculate the body mass index (kg/m^2).

The respondents were grouped based on the calculated body mass index (kg/m^2):
≤ 18.5 kg/m^2 – underweight;
18.5–24.9 kg/m^2 – normal;

25–29.9 kg/m^2 – overweight; and
≥ 30 kg/m^2 – obese.

Two groups of respondents were formed based on body mass index, namely normal body mass index and inadequate body mass index. The second group included underweight, overweight, and obese respondents all together as the number of respondents in each subgroup was relatively low [24].

The second part of the questionnaire contained questions regarding consumer preference for healthy diet, their intention to purchase food products with improved nutritive quality, and factors that affected their attitudes. The data were grouped based on consumers' sex, age, and body mass index.

Economic status may also have an impact on food choice, so we included this question in our questionnaire. The distribution appeared to be homogeneous: all the respondents were unemployed students from public educational institutions. Based on the general economic environment, the expected economic status was satisfactory or low. The data analysis revealed that most respondents shared a satisfactory economic status. Thus, no conditions for sub-groups based economic status were revealed (Table 1).

Procedure and questionnaire design. The questionnaire for the target market research was based on an extensive review of scientific publications that featured the preferences that young consumers have for a healthy diet, their intention to purchase functional foods, and factors that affect their attitudes. All the questions that referred to personal data and preferences at the time of purchase were precise and unambiguous. The questions related to the interest in healthy diet and food products quality were general questions that required *Yes/No* answers (Table 2). They served to define the overlapping points of consumers interest in healthy diet (Q1) with individual health-related diet needs (Q8), and where each of them overlapped with

Table 1 Demographic characteristics (n = 720)

Demographic characteristics	Variable	Average age ± SD*	Frequency	Frequency, %
Sex	Male	18.50 ± 2.80	290	40.3
	Female	19.50 ± 2.73	430	59.7
Men, age	≤ 18	16.48 ± 0.67	155	53.4
	18–20	19.08 ± 0.98	55	19.0
	≥ 21	22.50 ± 1.62	80	27.6
Women, age	≤ 18	16.50 ± 0.58	147	34.2
	18–20	19.40 ± 0.87	94	21.9
	≥ 21	22.00 ± 1.63	189	43.9
Education: high school students	Male	16.72 ± 0.64	184	51.1
	Female	16.73 ± 0.63	176	48.9
Education: university undergraduates	Male	22.61 ± 2.27	106	33.1
	Female	21.69 ± 1.41	254	66.9
Economic status	Satisfactory		661	91.8
	Low		59	8.2
Needs for special health-related diet	Yes		137	19.0
	No		583	81.0
Body mass index**	Underweight (< 18.5 kg/m^2)		63	8.7
	Normal (18.5–24.9 kg/m^2)		571	79.3
	Overweight (25–29.9 kg/m^2)		76	10.6
	Obese (> 30 kg/m^2)		10	1.4

*SD = standard deviation

**Body mass index = body mass index expressed as body weight/heigh

Source: compiled by the authors based on research data

Table 2 Questions used to identify factors that affect consumers' preference in healthy diet and functional foods

Question (Qx)	*Yes/No* questions on preferences, awareness, and food choice habits
Q1	Do you prefer a healthy diet?
Q2	Do you read labeled information about food product ingredients?
Q3	Do you compare the labeled data when choosing between similar food products?
Q4	Do you prefer to purchase products fortified with vitamins and minerals?
Q5	Do you prefer to purchase products fortified with dietary fibers, e.g., integral cookies?
Q6	Would you like to buy foods that are not particularly attractive, but have an improved nutritive content?
Q7	Can inadequate nutrition affect one's health?
Q8	Do you need a special diet because of health problems?

their interest in the labeled composition (Q2), the way the used labels in their food choice (Q3), their intention to purchase products fortified with vitamins and minerals (Q4) or dietary fibers (Q5), their preference for products with nutrient-fortified content but a lower sensory quality (Q6), individual awareness of nutrition and health risks (Q7), and individual health-related diet needs (Q8) (Table 2). The respondents took about 10 min to fill in the data.

Data analysis. The descriptive statistics included means, standard deviations (SD) (Table 1), and frequencies (n; %) within each group of respondents. The responses regarding consumer interest in the healthy diet and food products were ranked in descending order based on the frequency or percentage of the possible *Yes*-responses on each of the eight questions for all respondents (n = 720) covered by survey and for respondents grouped based on sex.

The data base for the research and analysis was formed by grouping affirmative responses as follows: all participants; participants grouped based on sex (men and women); participants grouped based on body mass index (participants with normal body mass index, participants with inadequate body mass index); participants grouped based on body mass index and sex (male participants with normal body mass index, male participants with inadequate body mass index; female participants with normal body mass index, female participants with inadequate body mass index).

The null hypothesis that predicted no significant difference in the consumer attitude towards specified information was tested by crossing the grouped data and performing the Z-test ($p < 0.05$). The data from the questionnaires were grouped to analyze preferences for healthy diet and intention to purchase functional foods. The descriptive statistics and correlation tests (Pearson's correlation coefficient r) were used to test the relationship between selected variables and identify factors that affected consumer attitudes ($p < 0.05$). The data processing involved the statistical software *3BStat* Gold Edition, Version 1.01 [28].

RESULTS AND DISCUSSION

Healthy diet and food preferences. Safe consumption has a long history. It covers nutrients that are essential for human well-being when consumed within a certain range or at the levels recommended in balanced human diets. Recommendations for a healthy diet usually cover optimal nutrients, energy, and water intake. A varied diet provides sufficient amounts of proteins, vitamins, and minerals, while balancing the amount of carbohydrates, dietary fiber, and fat. These substances should be bioavailable for absorption or accessibility to normal metabolic and physiological processes [1, 4, 29].

People develop their own individual criteria for quality parameters which are processed in food choice. They include sensory properties, food origin, and its possible effect on their health [8, 9, 14, 26]. Food producers can improve the nutrient profile of their products by introducing healthy ingredients or reducing the content of some other ingredients. The amount of a nutrient which must be consumed on a regular basis to maintain good health are indicated by dietary reference values. They serve as scientific bases for nutrition recommendations, dietary guidelines, diet assessment and planning, or reference values in food labelling [29]. Food science and technology offer a new framework for health-focused product design or reformulation within the areas of food physics, food storage, preservation, nutrient restoration, and fortification [6].

Young people's lifestyle is a complex of behavior patterns and opinions, which must be analyzed and incorporated into research and development together with cultural interpretations [7, 10, 27]. For example, eating habits of young consumers usually include a lot of energy-rich bakery products with a poor fiber content and a lot of simple sugars and fats, which may cause obesity [30–32].

Different factors may affect consumer behavior and interest in specific product characteristics [5, 8, 14, 26, 20]. Our study examined the consumer interest in healthy diet, nutrition and health risk awareness, food labeling, and preference for functional foods. The difference in preferences for a healthy diet and foods was investigated by comparing questionnaire responses grouped according to sex or body mass index. We also analyzed consumer intention to purchase foods with improved nutritive quality and some factors that affect their attitudes, which were included in the group of questions related to the food quality and healthy diet.

Consumer interest in a healthy diet and food products ranking. Optimal nutrition means that the diet is healthy and able to ensure one's well-being. The respondents' interest in a healthy diet and functional foods was determined by ranking their responses to each question with specified data and comparing the total number (n) and percentage of affirmative answers on each of the eight questions for all respondents (n = 720) and respondents grouped according to sex (Table 3).

The analysis of affirmative responses for all respondents (Table 3) confirmed that most of them possessed some basic knowledge on the causal relationship between inadequate nutrition and health risks (Q7). They indicated individual healthy diet preferences (Q1) as their good purchasing behavior, which ranked second in total answers. Consumers have access to product information, but the risk of misinformation remains quite significant. Practical application of scientific findings needs more appropriate activities than recommendations for nutrient intake. The food industry may offer health benefits by modeling food products and nutrient content [33].

Whole-grain bakery products are recommended as part of a healthy diet. They can be consumed in large quantities with basic bakery products, e.g., cakes or cookies. Whole-grain flour contains carbohydrates and dietary fibres, which are inherent in a healthy diet. Also,

Table 3 Affirmative responses for all respondents (n = 720), men (n_M = 290), and women (n_F = 430)

Question (Q_x)	*Yes*-responses for all respondents (n = 720)		*Yes*-responses for men (n = 290)		*Yes*-responses for women (n = 430)	
	n_{Qx} [a]	% [b]	n_{MQx} [a]	% [b]	n_{FQx} [a]	% [b]
Q1	617	85.81	251	86.55	367	85.35
Q2	521	72.46	191	65.86	331	76.98
Q3	296	41.17	136	46.90	161	37.44
Q4	588	81.78	229	78.97	360	83.72
Q5	362	50.35	116	40.00	246	57.21
Q6	444	61.75	166	57.24	279	64.88
Q7	689	95.83	273	94.14	417	96.98
Q8	137	19.05	56	19.31	82	19.07
[c]$Sum_{1–7}$	3517	69.78	1362	27.02	2161	42.88

[a] Number of affirmative responses (n_{Qx}) to each question (x = 1–8)

[b] Percentage of affirmative responses to each question (x = 1–8) calculated based on the possible number of affirmative responses

[c] Percentage of affirmative responses to all questions (x = 1–7) calculated based on 5040 *Yes*-responses for all 720 respondents

Source: calculated by the authors based on the research data

it is source of proteins, fats, vitamins, and mineral. Its optimal quantity depends on the row grain type and flour processing method [13]. Dietary fibres possess numerous positive physical and physiological properties and are valuable ingredients in human nutrition. Like vitamins or minerals, they are recommended as components of healthy diet.

The attitudes for fortified and health-promoting foods ranked third in this research based on the responses to questions regarding the sufficient intake of foods that are rich in vitamins and minerals (Q4). A higher fiber content was known to improve consumers' diet and meet their expectations [31, 32]. In our study, respondents were less interested in dietary fiber intake regarding such products as integral cookies (Q5), which ranked sixth. General awareness of and preference for particular subjects and habits in food choice were investigated using other questions. Consumer interest in information labeled on packed foods, and especially in product composition and ingredients, proved to be valuable data in food quality evaluation and food choice for healthy diet planning.

Affirmative responses regarding the attitude to labeled data in food choice (Q3) were on the seventh place. The respondents confirmed a greater interest in labeled information (Q2), which ranked fourth (Table 3). Other studies that used questionnaires to investigate consumer knowledge on nutrition and labeled data on functional foods confirmed different levels of dietary awareness, labeled data use, motivation, and ability to process and understand them [23, 24, 34–36].

The technological and sensory quality of a food product depends on the type and amount of ingredients, formulation, and processing methods. Healthy foods often have a poor sensory profile, which limits consumer appeal. We analyzed attitudes to buying functional foods with a poor sensory quality (Q6): half of the respondents accepted the compromise while the other half did not, ranking it fifth.

The respondents were additionally asked about their health-related special diet needs (Q8) to identify factors that affected their interest in a healthy diet and functional foods (Table 3). Nutrients improve human health and can prevent chronic disease, if optimally ingested. Correct attitudes to improving individual diets and healthy activities are very important for disease prevention. Individual diets should be based on recommended dietary intake, individual needs, and personal goals. They should be adapted to a particular lifestyle, which, in its turn, interacts with numerous external factors [5, 37, 38].

Differences in attitude between all respondents, men, and women. Various competent institutions play an important role in food control and legislation. They are responsible for food quality, safety, packaging, and labeling [22, 23, 34]. Labeling means a mandatory indication of specific information on packaged food products. This information appears in a standardized format on food labels or packages. It is consumer-friendly and guides consumers in their search for particular foods and nutrients. Labels give information on the ingredients, technological and nutritive quality, recommended or restricted intake of nutrients, etc. They may also contain various nutritional and health claims that emphasize some special characteristics of the product that are important for diet planning. However simple this information might be, consumers should have at list some basic knowledge to be able to use it for adequate choices.

Table 3 analyzes the affirmative responses for all participants grouped based on sex. It tested hypothesis H1, which predicted no difference in consumer attitude toward a healthy diet and functional foods regardless of sex. All respondents (affirmative responses to Q 1–7) were grouped based on sex. The results indicated an obvious statistically significant difference between men and women ($Z = 3.5681$; $p < 0.05$). As a result, hypothesis H1 was rejected.

Both men and women (Z-test) were familiar with the principles of proper nutrition and claimed very good knowledge on health and nutrition (Q7). They also preferred a healthy diet (Q1) and healthy foods fortified with vitamins and minerals (Q4). No statistically significant difference ($p > 0.05$) was recorded between male and female responses to questions Q7, Q1, and Q4.

Similar studies show a widespread consumer interest in labeled nutritive quality. Most consumers understood common labeling formats and knew how to use labeled data on nutrition [4, 9]. Another research confirmed these findings and reported that consumers liked it when products were visually different and had attractive labels. However, men were less interested in personalized nutrition than women [19]. According to some publications, most consumers analyze and compare nutrient status, fiber, fat, and calorie content labeled on foods [30–32, 37, 39].

In our research, most respondents read labeled composition data (Q2), but women demonstrated a significantly higher interest in it ($Z = 3.2759$; $p < 0.05$). An opposite relationship with significant difference ($Z = 2.5275$; $p < 0.05$) was observed between male and female affirmative answers (Table 3): men were more likely to compare labeled data on similar food products (Q3) before making the final choice. However, all respondents demonstrated little interest in comparing labeled data, only 41.17% of all respondents included in the research. Each consumer had individual preferences for specific food products, depending on their approach and motivation. They processed the labelled information depending on their knowledge and awareness in the sphere of healthy foods.

More than a half of all consumers would buy functional foods with a lower sensory quality (Q6), but women gave more affirmative responses than men, with a significant difference between them ($Z = 2.0700$; $p < 0.05$). About half of all respondents (50.35%) were interested in products fortified with nutritive fibers (Q5). Again, women expressed more interest than men, with a significant difference ($Z = 4.5297$; $p < 0.05$), which indicated their eagerness to meet the recommended higher intake of whole-grain and fiber-fortified foods. Studies that determine how consumers make decisions and what affects their food choice can yield solutions to some important food industry problems [2, 40]. Consumers are often prone to the so-called impulsive purchasing, which can be corrected by educating them in the matters of healthy nutrition and functional foods [41].

Differences in attitude between respondents grouped based on body mass index. Hypothesis H2 also tested the difference in attitude toward a healthy diet and functional foods. The Z-test ($p < 0.05$) involved crossing the answers of all respondents with normal and inadequate body mass index (Table 4). Hypothesis H2a tested the difference for all men with normal body mass index and inadequate body mass index (Table 5). Hypothesis H2b tested the difference for women with normal body mass index and inadequate body mass index (Table 6).

Table 4 illustrates attitudes toward specific information related to healthy foods expressed with affirmative answers. It revealed no statistically significant difference ($Z = 0.0923$; $p > 0.05$) between respondents with normal body mass index and inadequate body mass index. However, not enough evidence was obtained to reject hypothesis H2. Another analysis revealed no statistically significant difference ($Z = 0.3855$; $p > 0.05$) between affirmative responses given by all consumers and those with normal body mass index (Table 4) or inadequate body mass index ($Z = 0.8596$; $p > 0.05$).

Table 4 Affirmative responses for all respondents (n = 720), respondents with normal body mass index ($n_N = 572$), and respondents with inadequate body mass index ($n_I = 148$)

Question (Q_x)	*Yes*-responses for all respondents (n = 720)		*Yes*-responses for normal body mass index ($n_N = 572$)		*Yes*-responses for inadequate body mass index ($n_I = 148$)	
	n_{Qx} [a]	% [b]	n_{NQx} [a]	% [b]	n_{IQx} [a]	% [b]
Q1	618	85.83	490	85.66	128	86.49
Q2	522	72.50	419	73.25	103	69.59
Q3	297	41.25	238	41.61	59	39.86
Q4	589	81.81	473	82.69	116	78.38
Q5	362	50.28	285	49.83	77	52.03
Q6	445	61.81	360	62.94	85	57.43
Q7	689	95.83	548	95.80	142	95.95
Q8	138	19.17	108	18.88	30	20.27
[c]$Sum_{1–7}$	3522	69.88	2813	55.81	710	14.08

[a] Number of affirmative responses (n_{Qx}) to each question (x = 1–8)

[b] Percentage of affirmative responses to each question (x = 1–8) calculated based on the possible number of affirmative responses

[c] Percentage of affirmative responses to all questions (x = 1–7) calculated based on 5040 *Yes*-answers for all 720 respondents

Source: calculated by the authors based on research data

Table 5 Affirmative responses for all men (n_M = 290), men with normal body mass index (n_{NM} = 217), and men with inadequate body mass index (n_{IM} = 73)

Question (Q_x)	*Yes*-responses for all male respondents (n_M = 290)		*Yes*-responses for men with normal body mass index (n_{NM} = 217)		*Yes*-responses for men with inadequate body mass index (n_{IM} = 73)	
	n_{Qx} [a]	% [b]	n_{NQx} [a]	% [b]	n_{IQx} [a]	% [b]
Q1	251	86.55	190	87.56	61	83.56
Q2	191	65.86	142	65.44	49	67.12
Q3	136	46.90	104	47.93	32	43.84
Q4	229	78.97	173	79.72	56	76.71
Q5	116	40.00	86	39.63	30	41.10
Q6	166	57.24	122	56.22	44	60.27
Q7	273	94.14	203	93.55	70	95.89
Q8	56	19.31	43	19.82	13	17.81
[c]$Sum_{1–7}$	1362	67.09	1020	50.25	342	16.85

[a] Number of affirmative responses (nQx) to each question (x = 1–8)

[b] % of affirmative responses to each question (x = 1–8) calculated based on the possible number of affirmative responses

[c] of affirmative responses to all questions (x = 1–7) calculated based on 2030 Yes-responses for 290 male respondents

Source: calculated by the authors based on research data

Table 6 Affirmative responses for all women (n_F = 430), women with normal body mass index (n_{NF} = 355), and women with inadequate body mass index (n_{IF} = 75)

Question (Q_x)	*Yes*-responses for all female respondents (n_F = 430)		*Yes*-responses for women with normal body mass index (n_{NF} = 355)		*Yes*-responses for women with inadequate body mass index (n_{IF} = 75)	
	n_{Qx} [a]	% [b]	n_{NQx} [a]	% [b]	n_{IQx} [a]	% [b]
Q1	367	85.35	300	84.51	67	89.33
Q2	331	76.98	277	78.03	54	72.00
Q3	161	37.44	134	37.75	27	36.00
Q4	360	83.72	300	84.51	60	80.00
Q5	246	57.21	199	56.06	47	62.67
Q6	279	64.88	238	67.04	41	54.67
Q7	417	96.98	345	97.18	72	96.00
Q8	82	19.07	65	18.31	17	22.67
[c]$Sum_{1–7}$	2161	71.80	1793	59.57	368	12.22

[a] Number of affirmative responses (n_{Qx}) to each question (x = 1–8)

[b] % of affirmative (*Yes)* responses to each question (x = 1–8) calculated based on the possible number of affirmative responses

[c] % of affirmative (*Yes)* responses to all questions (x = 1–7) calculated based on 3010 *Yes*-responses for 430 female respondents

Source: calculated by the authors based on research data

Two additional hypotheses were tested by crossing the answers divided according to body mass index on order to analyze the difference between men (hypothesis H2a) (Table 5) and women (hypothesis H2b) (Table 6). However, the analysis revealed no significant difference ($Z = 0.0923$; $p > 0.05$) between men with normal body mass index and inadequate body mass index in attitude related to healthy foods. Similarly, no difference was recorded between women with normal body mass index and women with inadequate body mass index ($Z = 0.9520$; $p > 0.05$). Not enough evidence made in impossible to reject hypotheses H2a and H2b.

Identifying factors that affect attitudes towards healthy diets and functional foods. The relationship between respondents' interest in healthy diet (Q1), their health-related special diet needs (Q8), and some variables (Q2–7) made it possible to identify factors that affected their attitudes. Correlation was chosen as a method that can reveal the relationship between two variables. Pearson's correlation coefficient (*r*) was used to measure the strength of the association between two variables. Differences in correlation intensity or existence were analyzed for all consumers and for each group based on sex and body mass index for all respondents and for men and women grouped according to body mass index.

This analysis tested main hypotheses H3–5 for each group of respondents (all, men, women). It indicated Hxa-f for all respondents and BHxa-f for men and women grouped according to body mass index, where x stood for the ordinal number of hypotheses, and letters a-f indicated dependent variables.

Attitudes of consumers grouped based on sex. Hypothesis H3–5 was tested to identify factors that affected consumer attitudes related to healthy diet and functional foods and the significance of their relationships. Pearson's correlation coefficient (*r*) was applied to the data selected as an independent variable for further research (Q1 and Q8). It was analyzed by crossing consumer interest in healthy diet (Q1) with individual health-related diet needs (Q8) for all respondents (n = 720) and those grouped based on sex (Table 7). Individual health-related diet needs (Q8) were selected for the second independent variable in the correlation analysis, because a relatively larger part of respondents (Table 1) confirmed it.

We examined the relationship between responses regarding consumer interest in a healthy diet (Q1) as an independent variable and health-related diet needs (Q8). The analysis revealed a significant moderate positive correlation ($p < 0.05$) for all respondents and a very high monotonic correlation ($p < 0.01$) for men and women (Table 7). As a result, we rejected hypothesis H3 that regarded health-related diet needs as a factor that affects consumer attitude to a healthy diet. The positive correlation coefficient (*r*) revealed a significant linear relationship in the basic set and that both variables increased or decreased together.

Consumers who prefer a healthy diet usually look for food components with nutritional benefits, e.g., fortified with vitamins, minerals, fibers, and bioactive compounds. They know that the total nutritional value of a common diet may be improved by functional foods where some ingredients are partially or completely replaced with those recommended [17, 32, 35, 36].

Health-focused products have a positive effect on purchase decisions. A better product quality gives better results. This analysis tested the correlation coefficient for the relationship between an independent variable and a number of dependent variables. The independent variable was expressed in the question about consumers' interest in a healthy diet (Q1). The list of dependent variables included the questions about their interest in labeled food composition (Q2), the way they used labels in their food choice (Q3), their intention to purchase products fortified with vitamins, minerals (Q4), and dietary fibers (Q5) or nutrient-fortified products with a lower sensory quality (Q6), as well as their nutrition and health risk awareness (Q7). The analysis indicated a very high significant monotonic correlation ($p < 0.01$) for all respondents, as well as for men and women (Table 7). Therefore, hypotheses H4a-f could be rejected. The dependent variables proved to be factors that affect consumer attitudes to healthy diet. The obtained results confirmed a significant relationship between the examined indicators of consumer attitudes related to the healthy diet and functional foods.

Novel foods often fail on the market because producers skip some important activities or make decisions without appropriate research [40, 42, 43]. Numerous studies featured food product development and fortification [6, 12, 20, 44]. They confirmed the importance of integrating food science and technology with marketing in consumer-oriented healthy food development. Wonderlich-Tierney *et al.* analyzed food advertising as an influencing factor and proved that it did not increase food consumption among college-aged women and men [45]. However, the effect depended on personal preferences, and women were more susceptible to food advertising than men.

We used the question about health-related diet needs (Q8) as an independent variable to test its relationship with dependent variables defined in other questions: interest in labeled composition (Q2), the way participants used labels in their food choice (Q3), and their nutrition and health risk awareness (Q7). The analysis revealed a significant moderate positive correlation ($p < 0.05$) between them for all respondents. Therefore, health-related diet needs proved to be a factor that affect consumer preferences in healthy diet and functional foods.

Another test studied the correlation between responses regarding consumers' health-related diet needs (Q8) taken as an independent variable with

Table 7 Correlation test (Pearson's correlation coefficient *r*) and significance of relationship between variables: number of affirmative responses to each question (Q_x) for all respondents (n = 720) and respondents grouped based on sex (men $n_M = 290$, women $n_F = 430$)

Dependent variable Question (Q_x)	Independent variable (Question Q_x) and correlation coefficient (*r*)					
	Q1	Q8	Q_M1	Q_M8	Q_F1	Q_F8
Q1	1	0.6925*	1	0.8556**	1	0.8195**
Q2	0.9713**	0.5881*	0.9749**	0.7666**	0.9983**	0.8137**
Q3	0.8760**	0.6764*	0.9559**	0.8376**	0.9593**	0.8093**
Q4	0.9863**	0.7377**	0.9964**	0.8647**	0.9898**	0.8584**
Q5	0.8730**	0.4546	0.9701**	0.8130**	0.9530**	0.7093**
Q6	0.9378**	0.5134	0.9785**	0.7869**	0.9848**	0.8120**
Q7	0.9922**	0.6934*	0.9973**	0.8524**	0.9959**	0.8549**
Q8	0.6925*	1	0.8556**	1	0.8195**	1

Statistically significant correlation: moderate *$p < 0.05$, very high monotonic correlation **$p < 0.01$, perfect direct monotonic correlation = 1

Source: calculated by the authors based on research data

a number of dependent variables. The dependent variables were expressed in questions about their interest in purchasing products fortified with vitamins and minerals (Q4) and labeled composition (Q2), the way they used labels in their food choice (Q3), their preferences for foods fortified with dietary fibers (Q5) and functional foods with a lower sensory quality (Q6), and their nutrition and health risk awareness (Q7). The analysis revealed a very high significant monotonic correlation ($p < 0.01$) for all respondents, as well as for those grouped according to sex (Table 7). These findings indicated that hypotheses H5a-f could be rejected due to a significant correlation ($p < 0.05$). Therefore, health-related diet needs proved to be a factor that affect consumer attitudes to healthy foods.

However, we revealed no correlation ($p > 0.05$) between responses of all consumers regarding health-related diet needs (Q8) and their interest in purchasing products fortified with dietary fibers (Q5) or functional foods a with lower sensory quality (Q6) (Table 7). Therefore, these factors had no effect on their food choice. Other studies confirmed that food quality parameters, nutrition awareness, and health motivation affected purchase behavior. Collecting, analyzing, translating, and providing nutrition information based on scientific evidence remains an important professional challenge for food producers [9, 33, 36]. Similar marketing studies about new food products, purchasing intention, preferences, and perception can provide information on the efforts that consumers make to improve their personal nutritional status [21].

Attitudes of consumers grouped based on body mass index. The growing concerns that consumers express about health-related nutrition are focused on the composition and quality of foods that they expect to find on the market. This situation provides an opportunity for contemporary food R&D in the area of new functional foods [6, 35]. Table 8 illustrates the correlation coefficient and significance of relationship between consumer interest in indicators of healthy diet and functional foods. The analysis tested hypothesis BH3–5 for all respondents (n = 720) with normal body mass index ($n_N = 572$) and inadequate body mass index ($n_I = 148$); men with normal body mass index ($n_{NM} = 217$) and inadequate body mass index ($n_{IM} = 73$); women with normal body mass index ($n_{NF} = 355$) and inadequate body mass index ($n_{IF} = 75$). The analysis also identified differences in correlation intensity or its existence.

One's diet depends on the basic knowledge on nutrition and individual health condition: a certain type of food or nutrient can be recommended in larger/smaller quantities or totally forbidden. Hypothesis BH3 featured health problems and their effect on purchase decisions. The analysis revealed no relationship between the independent variable of the interest in healthy diet (Q1) and individual health-related diet needs (Q8) for respondents grouped based on body mass index. The correlation was significant moderate positive ($p < 0.05$) only for all respondents and for men with normal body mass index (Table 8). Individual health-related diet needs tested as an dependent variable proved to be a factor that affected the attitudes to healthy diet for all respondents and men with normal body mass index. Therefore, hypotheses BH3 could be rejected. However, no significant correlation ($p > 0.05$) was revealed between women with normal body mass index and inadequate body mass index (Table 8), and enough evidence was obtained to reject hypothesis BH3.

We performed a correlation analysis for relationship between the independent variable of interest in healthy diet (Q1) and the number of dependent variables for consumers grouped according to body mass index. The list of dependent variables included their interest in labeled ingredients (Q2), the way they used labels in their food choice (Q3), preferences for products fortified with vitamins and minerals (Q4), dietary fibers (Q5), and functional foods with a lower sensory quality (Q6), and their nutrition and health risk awareness (Q7).

Table 8 Correlation test (Pearson's correlation coefficient *r*) and significance of relationship between variables: number of affirmative responses to each question (Q_x) for all respondents (normal body mass index $n_N = 572$, inadequate body mass index $n_I = 148$); men (normal body mass index $n_{NM} = 217$, inadequate body mass index $n_{IM} = 73$); women (normal body mass index $n_{NF} = 355$, inadequate body mass index $n_{IF} = 75$)

Dependent variable Question (Q_x)	Independent variable (Question Q_x) and correlation coefficient (*r*)							
	Q_N1	$Q_{NM}1$	$Q_{NF}1$	Q_N8	$Q_{NM}8$	$Q_{NF}8$	Q_I1	Q_I8
Q1	1	1	1	0.6538*	0.8789*	0.1429	1	0.3003
Q2	0.9637**	0.9570**	0.9996**	0.5266	0.7528	0.1506	0.1989	0.1592
Q3	0.8771**	0.9238**	0.8391*	0.6653*	0.9363**	0.2101	–0.4952	–0.7477
Q4	0.9806**	0.9987**	0.9616**	0.6870*	0.8010*	0.3111	0.1399	0.2978
Q5	0.8887**	0.9590**	0.8398*	0.4338	0.7997	–0.2026	0.7897	0.7000
Q6	0.9554**	0.9737**	0.9640**	0.5429	0.7775	0.1076	0.6714	–0.105
Q7	0.9893**	0.9952**	0.9836**	0.6652*	0.8659*	0.2955	0.2311	0.5936
Q8	0.6538*	0.8789*	0.1429	1	1	1	0.3003	1

Statistically significant correlation: moderate *$p < 0.05$, very high monotonic correlation **$p < 0.01$, perfect direct monotonic correlation = 1

Source: calculated by the authors based on research data

The analysis revealed statistically significant and very high monotonic correlation ($p < 0.01$) for all respondents, men with normal body mass index, and women with normal body mass index. The results were slightly different, with a significant moderate positive correlation ($p < 0.05$), for responses on label use in food choice (Q3) and purchasing foods fortified with dietary fibers (Q5). Based on Table 8, additional hypotheses BH4a-f could be rejected: in this case, the dependent variables really affect consumer attitudes to healthy diet. In similar studies, most respondents claimed to examine the labels when making the purchase decision and evaluate the food based on the labelled nutritional composition in order to avoid food-related diseases [4, 11, 12, 22, 39].

Our study also indicated that the simple correlation coefficient (r) was not statistically significant ($p > 0.05$) for the same relationships between separately analyzed responses for all respondents with inadequate body mass index (Table 8). We detected no linear relationship and enough evidence to reject additional hypotheses BH4a–f. No further correlation analyses were necessary to test the relationship between responses grouped based on consumers body mass index.

We tested the relationship between responses grouped based on body mass index for health-related diet needs (Q8), which served as an independent variable, and labeled data comparing between similar products in food choice (Q3). The analysis revealed a very high significant correlation ($p < 0.01$) for men with normal body mass index, while this correlation was significant moderate positive ($p < 0.05$) for all respondents with normal body mass index. A statistically significant moderate positive correlation ($p < 0.05$) was detected between health-related diet needs (Q8), preferences for functional products fortified with vitamins and minerals (Q4), and nutrition and health risk awareness (Q7). Therefore, health-related diet needs proved to affect consumer attitudes to functional foods for all respondents and men with normal body mass index. As a result, additional hypotheses H5b,c,e were rejected.

We also revealed no correlation ($p > 0.05$) between health-related diet needs (Q8) and the interest in labeled ingredients (Q2), foods fortified with dietary fibers (Q5), or functional foods with a lower sensory quality (Q6) for all respondents and men with normal body mass index. No correlation ($p > 0.05$) was registered between the independent variable of health-related diet needs (Q8) and all dependent variables for women with normal body mass index and all respondents with inadequate body mass index (Table 8). The research revealed differences in respondents' attitudes to a healthy diet and functional foods and their positive relation to healthy food habits. Food producers should do more to raise consumer preferences for healthy products and design functional foods with appropriate sensory quality [4, 10, 21, 36, 46]. Health-aware consumers prefer recommended functional foods, but their taste and smell are still important and may result in their rejecting products with a poor sensory quality.

CONCLUSION

Consumers have individual criteria and different habits that affect their behavior in food choice. However, inadequate diet and lifestyle may trigger some noncommunicable diseases. Basic nutrition and health risk awareness is important for health. We analyzed and identified factors that affect consumer preferences for healthy diet and functional foods. We grouped affirmative responses as follows: all participants; participants grouped based on sex (men and women); participants grouped based on body mass index (normal body mass index and inadequate body mass index); participants grouped based on body mass index and sex (men with normal body mass index, men with inadequate body mass index; women with normal body mass index, women with inadequate body mass index).

We identified differences in consumer preferences between various groups. The obtained data may be useful for food producers to synchronize the quality of their new functional products with the actual situation on the market. New data on factors that affect consumer preferences in a healthy diet and functional foods may help develop novel fortified foods.

This research tested a new scientific approach to food preference analysis and purchase behavior on the target market. This approach is a tool for identifying nutritive and sensory quality parameters of healthy food products that are of interest for particular target consumers. Healthy foods developed for target consumers should be based on scientific evidence integrated with recommendations on healthy nutrition. New healthy food products require appropriate technological, nutritive, and sensory quality, which depends on ingredients, formulation, and processing methods. The presented methodology of testing and processing can be applied to other marketing studies aimed at different groups of consumers and with different objectives.

CONTRIBUTION

S. Grujić developed the research concept, designed the article, and wrote the manuscript. S. Grujić and M. Grujčić reviewed scientific literature, collected and analyzed the data, read and approved the final version of the manuscript.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this article.

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