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## Benefits of Dietary Fibre to Human Health: Study from a Multi-Country Platform

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## Abstract

**Purpose:** Because dietary fibre has been recognized as a major ally to the maintenance of a healthy body as well as to help against the development of some chronic diseases, this work aimed at studying the level of knowledge of a relatively wide range of people about the health effects related to the ingestion of dietary fibre in appropriate dosages.

**Methodology:** A descriptive cross-sectional study was undertaken on a non-probabilistic sample of 6010 participants. The data were collected from 10 countries in 3 different continents (Europe, Africa and America) and measured the level of knowledge regarding different health benefits from dietary fibre. The questionnaires were applied by direct interview after verbal informed consent.

**Findings:** The results obtained considering the general level of knowledge revealed a considerable degree of information about the benefits of fibre (average score of  $3.54 \pm 0.5$ , on a scale from 1 to 5). There were significant differences between genders ( $p < 0.001$ ), with higher average score for women, and also for level of education ( $p < 0.001$ ), with higher score for university level. The living environment also showed significant differences ( $p < 0.001$ ), with people living in urban areas showing a higher degree of knowledge. Also for countries the differences were significant ( $p < 0.001$ ), with the highest score obtained for Portugal (3.7), and the lowest for Croatia, Italy, Latvia, Macedonia and Romania (3.5). However, despite these differences, the results showed that for all the countries the degree of knowledge was good (above 3.5), corresponding to a minimum level of knowledge of 70%.

**Originality/Value:** This work is considered important due to the wide coverage, including so many countries inclusive with different social and cultural settings. The study allowed concluding that, in general, the participants in the study were quite well informed about the benefits of dietary fibre for the improvement of human health, regardless of gender, level of education, living environment or country. This finding is very relevant considering the diversity of people that composed the sample

56 and reinforces the necessity of continuing with educational policies aimed at providing the general  
57 population with the knowledge that might help them make appropriate food choices.

58

59 **Keywords:** Dietary fibre, health effect, cardiovascular disease, diabetes, obesity, survey.

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## 63 INTRODUCTION

64 Dietary fibre comprises a category of non-digestible food ingredients originating from vegetable  
65 products and includes, among other polysaccharides, non-starch polysaccharides, oligosaccharides,  
66 and lignin. Dietary fibre can be classified into water soluble (pectins, some hemicelluloses, gums) or  
67 insoluble (cellulose, lignin and some hemicelluloses) (Chylińska et al., 2016; Guiné et al., 2014;  
68 Kaczmarczyk et al., 2012; Martinho et al., 2013).

69 Various health benefits are related to an adequate intake of dietary fibre, which is a pivotal  
70 element of a healthy diet. The positive relationship between dietary fibre intake and human health  
71 has been scientifically established (Macagnan et al., 2015).

72 The benefits associated with an adequate intake of dietary fibre are numerous, and include the  
73 improvement of bowel functions such as regulation of the transit and prevention of constipation;  
74 prevention of diverticular disease; prevention of inflammatory bowel disease (Crohn's disease);  
75 prevention or treatment diabetes, cardiovascular disease and gastro-intestinal related types of cancer.  
76 Furthermore, it reduces the risk of obesity, hyperlipidaemia, hypercholesterolaemia and  
77 hyperglycaemia (Kaczmarczyk et al., 2012; Kendall et al., 2010).

78 Some nondigestible carbohydrates like fructo-oligosaccharides are easily and rapidly fermented,  
79 and they have been associated with an increase in the number of bifidobacteria in feces, being thus  
80 beneficial for the colonic health. Yen et al. (2011) evaluated the long-term effects of isomalto-  
81 oligosaccharide supplementation on fecal microbiota, bowel function, and biochemical indicators of  
82 nutritional status in constipated elderly subjects and observed a positive effect of fibre intake in  
83 improving the colonic microbiota profile and bowel movement.

84 High-fibre diets, particularly those with insoluble fibre, help to increase stool bulk and moisture  
85 and reduce travel time through the gastrointestinal tract, thus providing considerable defense against  
86 the development of diverticulosis. A low-fibre diet can increase the risk for developing diverticula

87 because of the resulting reduction in colon lumen size, resulting in the diffusion of muscular  
88 contraction forces to the colon wall, thus increasing pressure and producing herniation (Mulligan,  
89 2015).

90 Scientific research suggests a possible protective effect of dietary fibre against the development  
91 of oesophageal and gastric types of cancer (Gonzalez and Riboli, 2010; Jessri et al., 2011; Navarro  
92 Silvera et al., 2014; Zhang et al., 2013). There is also evidence that there is a relationship between  
93 dietary fibre ingestion and colorectal cancer prevention (Azuma et al., 2013; Ben et al., 2014; Khalid  
94 et al., 2014; Ma et al., 2013).

95 O'Neil et al. (2010) investigated the association of whole grain consumption with prevalence of  
96 overweight and obesity in adults, and their results confirmed that those who consumed higher  
97 amounts of whole grains, and hence higher fibre dosages, had lower body weight. Experimental  
98 studies have further associated dietary fibre with a favourable influence on cardiovascular risk  
99 factors, reduced risk of coronary heart disease, and significant lowering of total and LDL cholesterol  
100 (Mann and Cummings, 2009).

101 Despite the positive effects mentioned above, there is also evidence of some possible negative  
102 effects resulting from the intake of fibre, such as some slight interference with the absorption of  
103 some vitamins and minerals (Hernández et al., 1995). However, it is unlikely that healthy adults who  
104 consume dietary fibre within the recommended dosages have problems relatively to nutrient  
105 absorption (Slavin, 2008).

106 The aims of the present work were to investigate to what extent the population is aware of the  
107 positive health effects associated with the ingestion of dietary fibre, and also in what way factors  
108 such as gender, level of education, living environment or country can influence the perceptions of  
109 people about the relations between fibre and health.

110

111 **MATERIALS AND METHODS**

112

113 *Instrument*

114 The questionnaire was designed to access on one hand the socio-demographic characteristics like  
115 age, gender, level of education, country and living environment, and on the other hand the  
116 knowledge about the relation between dietary fibre and possible beneficial effects to treat and  
117 prevent diseases. For this, a group of questions were included and the respondents were asked to  
118 state their accordance measured on a 5-point Likert scale varying from 1 (totally disagree) to 5  
119 (totally agree). Hence, the respondents were asked to indicate their extent of agreement towards the  
120 following statements: “Eating dietary fibres in appropriate amounts can prevent and/or treat  
121 diseases”, “Fibres can prevent and/or treat cardiovascular diseases”, “Fibres can prevent and/or treat  
122 cholesterol”, “Fibres can prevent and/or treat bowel cancer”, “Fibres can prevent and/or treat  
123 obesity”, “Fibres can prevent and/or treat breast cancer”, “Fibres can prevent and/or treat  
124 constipation”, “Fibres can prevent and/or treat vision problems”, “Fibres can prevent and/or treat the  
125 deficiency of vitamins and minerals” and “Fibres can prevent and/or treat diabetes”.

126

127 *Data collection*

128 Before application of the questionnaire to the participants in the study, it was submitted for approval  
129 by the Ethics Committee for use in human subjects. The participation in the survey was voluntary,  
130 and the questionnaire was applied by direct interview only to adult citizens, after verbal informed  
131 consent was obtained. All answers were anonymous, so as to protect the participants and all ethical  
132 issues were strictly fulfilled when preparing and and applying the questionnaire. The questionnaire  
133 was applied in 10 different countries simultaneously, after the translation to the native languages in  
134 each country.

135

136 *Statistical Analysis*

137 For the analysis of the data, several basic descriptive statistical tools were used. Also the crosstabs  
138 and the chi square test were used to assess the relations between some of the variables under study.

139 For all data analysis the SPSS software, from IBM Inc. (version 22), was used. The level of  
140 considered significance was 5%.

141

## 142 RESULTS AND DISCUSSION

### 143 *Sample Characterization*

144 This study was undertaken simultaneously in 10 different countries originating from 3 different  
145 continents (Europe, America, Africa). This study accounted for a global participation of 6010  
146 individuals. The number of participants from Argentina was 847, from Croatia was 2530, from Egypt  
147 281, from Hungary 296, from Italy 312, from Latvia 180, from Macedonia 312, from Portugal 382,  
148 from Romania 670 and from Turkey was 200.

149 Regarding gender, 65.7% were female and 34.3% were male.

150 The average age of the participants was  $34.5 \pm 13.7$  years, ranging from 17 to 84 years. The  
151 average age of the female participants was slightly lower ( $33.5 \pm 13.3$  years) when compared to the  
152 average age of the male participants ( $36.5 \pm 14.4$  years).

153 The majority of the participants, 55%, had a university degree, while 42% had completed  
154 secondary school and just 3% had the lowest level of education (primary school).

155 Most of the participants lived in an urban environment (79.7%), while 19.6% lived in rural  
156 areas.

157

### 158 *Knowledge about Health Benefits of Dietary Fibre*

159 According to Anderson et al. (2009) dietary fibre intake provides many health benefits. **Table 1**  
160 reveals the statistics and results of the chi-square test relating to the knowledge about the health  
161 benefits of ingesting dietary fibre. It was observed that the women were more aware of these benefits

162 than men (average 4.1 against 3.9), and this difference was statistically significant ( $P < 0.001$ ),  
163 although the relation between the variables was low (Cramer's  $V = 0.081$ ). Typically, values of  
164 Cramer's  $V$  coefficient around 0.1 are small, meaning that the association between the variables is  
165 weak, values around 0.3 are medium and of 0.5 or over are large, and in that case the association  
166 between the variables is strong (Maroco, 2012). Also significant differences were observed  
167 according to educational level, so that people with a university degree showed a higher level of  
168 knowledge about the benefits of dietary fibre for human health. These variables were significantly  
169 related but also with a low degree of association ( $P < 0.001$  and Cramer's  $V = 0.076$ ). Regarding the  
170 living environment, people residing in urban areas tended to be more informed than those living in  
171 rural areas, being these differences significant ( $P < 0.001$  and Cramer's  $V = 0.094$ ).

172 Because this study was undertaken in 10 different countries, it was interesting to see the  
173 differences among them. Hungary showed the highest average score (4.1) for knowledge about the  
174 fibre benefits, while Egypt, Latvia and Macedonia presented the lowest values (3.8). These  
175 differences were statistically significant ( $P < 0.001$ ) and the Cramer's  $V$  indicated the degree of  
176 association between these variables to be 13%, and therefore also weak.

177 Anderson & Jhaveri (2012) presented epidemiological studies about dietary fibre and  
178 cardiovascular diseases. The relation between fibre and cardiovascular diseases was also investigated  
179 in the present study and the results are shown in **Table 1**. Significant differences were found between  
180 genders, levels of education, living environments and countries. The women were more aware of the  
181 effects of fibre on cardiovascular diseases, and so were those with a university degree and those  
182 living in urban areas. Participants from Argentina and Portugal showed the highest average scores  
183 for this effect of fibre (3.9, for both) while participants from Italy showed the lowest score (3.4).  
184 Although these differences were significant ( $P < 0.001$ ) the association between the variables was weak  
185 (Cramer's  $V = 0.129$ ).



186 Solá et al. (2010) demonstrated the influence of dietary fibre in lowering plasma low-density  
187 lipoprotein (LDL) cholesterol, triglycerides, insulin, oxidised LDL and systolic blood pressure. **Table**  
188 **1** shows that the participants in this study were generally aware of these effects of dietary fibre, with  
189 average scores above 3.6 on a scale from 1 to 5. Again statistically significant differences were  
190 encountered between all the demographic variables studied (Gender, Level of Education, Living  
191 Environment or Country). The participants from Argentina and Portugal showed once more the  
192 highest level of knowledge about this fact (4.0), against Italy with a score of 3.6.

193 Many studies have shown that colorectal cancers can be attributable to insufficient fibre intake  
194 (Azuma et al., 2013; Ben et al., 2014; Khalid et al., 2014; Ma et al., 2013; Nagle et al., 2015). **Table**  
195 **2** reveals the results obtained for the knowledge about this effect of fibre. Gender, level of education,  
196 living environment and country all influenced significantly the knowledge of the respondents. For  
197 this case, Portugal and Turkey appeared with the highest scores (4.1) while Egypt and Latvia  
198 evidenced the lowest awareness of this fact (3.5). Although there were significant differences for all  
199 demographic variables, the association was slightly less weak for the variable country, with the  
200 highest Cramer's coefficient (0.139).

201 Adam et al.(2015) demonstrated that increasing the amount of fibre in the diet proportionately  
202 decreased food intake, body weight gain and body fat content. The participants in this study revealed  
203 a considerable knowledge about this effect, although with significant differences between women  
204 and men, among levels of education, living environments or countries (**Table 2**). While in Egypt the  
205 knowledge was good but not very high (3.4), in Turkey and Portugal the scores obtained were higher  
206 (4.1, in both cases).

207 Low fibre intake constitutes a risk factor for developing breast cancer, according to many studies  
208 (van Gemert et al., 2015; Peltzer and Pengpid, 2014). **Table 2** shows that, on average, the participants  
209 were informed about this, with a general score of  $3.0 \pm 1.0$ , on a scale up to 5. Again the women got a  
210 higher score (3.0) when compared to men (2.9), with statistically significant differences. The same

211 happened for level of education, with higher education corresponding to the highest score (3.1), and  
212 hence the highest knowledge. For the relation between fibre and breast cancer no significant  
213 differences were found for living environments. However, the country of residence exerted a  
214 statistically significant influence over the level of knowledge, with Egypt showing the highest score  
215 (3.5) contrarily to Italy, with only 2.7.

216 Dietary fibre has an important role against constipation (Collins and O'Brien, 2015; Rao et al.,  
217 2015). According to the results in **Table 3**, women revealed a higher knowledge of this when  
218 compared to men (average scores of 4.2 and 3.9, respectively), with significant differences among  
219 genders. The level of education also revealed a significant influence, so that the participants with  
220 higher education showed higher score (4.2). The people in urban areas showed again a significantly  
221 higher degree of information when compared to those living in rural areas. Regarding the influence  
222 of country, Hungary and Portugal showed the highest scores (4.4) contrarily to Egypt with 3.7, being  
223 these differences statistically significant.

224 There is no evidence whatsoever about any benefits of ingesting dietary fibre and improvement  
225 of vision. Hence, this question was aimed at accessing the knowledge of the population about this,  
226 and in this case the lowest score would mean the highest degree of knowledge. Although with an  
227 average overall score lower than in other cases, still the value was high,  $2.9 \pm 1.0$ , meaning that people  
228 had a wrong idea about the effect of fibre to treat vision problems (**Table 3**). There were statistically  
229 significant differences for all demographic variables considered: women with higher score in  
230 comparison to men, and, surprisingly, higher level of education also corresponding to the highest  
231 score, and therefore to a lowest level of knowledge. Regarding the differences between countries,  
232 they were also statistically significant ( $P < 0.001$ ) and the lowest score was for Latvia (2.6) contrarily  
233 to Egypt that got the highest score (3.3). In this case, the most informed would be the participants  
234 from Latvia. Again the association between these variables was weak, given the low value of  
235 Cramer's V (0.115).

236 Several *in vitro* studies have shown that both insoluble and soluble fibres have mineral-binding  
237 properties, thus potentially interfering with mineral absorption (Baye et al., 2015). Hence, the results  
238 in **Table 3** suggest that the respondents are not aware of this fact, because the overall score obtained  
239 was  $3.3 \pm 1.1$ , thus indicating agreement with the false statement evaluated. The differences were  
240 statistically significant among genders ( $P < 0.001$ ) or countries ( $P < 0.001$ ), but not between different  
241 education levels or living environments ( $p > 0.05$ ).

242 The type as well as quantity of dietary fibre ingested have shown to play an important role in the  
243 management of diabetes and improvement of insulin sensitivity (Li and Uppal, 2010). According to  
244 the results in **Table 3**, the degree of information about this positive effect of fibre on diabetes was  
245 relatively elevated ( $3.4 \pm 1.0$ ). There were significant differences among genders, with higher average  
246 score for women, and also among education levels, for which those with a university degree showed  
247 a higher knowledge. The living environment also induced significant differences, being those who  
248 lived in urban areas slightly more informed when compared to those from rural areas. Regarding the  
249 differences between the countries, they were also significant, with Turkey showing the highest score  
250 ( $3.8$ ) and Italy the lowest ( $3.1$ ).

251 To assess the global knowledge about the effect of dietary fibre on human health, a new variable  
252 was created as the average value considering all the ten statements, but after inverting the scores for  
253 the two statements that were false. In this way the new variable would be on a scale from 1,  
254 corresponding to the lowest degree of knowledge, to 5, corresponding to the highest degree of  
255 knowledge. From the obtained data (Table 11) it was observed that the global knowledge varied from  
256 a minimum value of 1.7 to a maximum of 5.0, with an average of  $3.5 \pm 0.5$ .

257 The results in **Table 4** indicated significant differences for all demographic variables considered  
258 and the values of Cramers's V indicate that when the global degree of knowledge was considered,  
259 the association between the variables was in general higher than for the knowledge about a specific  
260 topic. The highest score for overall knowledge was obtained for the participants from Portugal ( $3.7$ ),

261 whereas the lowest score was for Croatia, Italy, Latvia, Macedonia and Romania (3.5, in all cases).  
262 However, the differences were quite small, and the results showed that for all the countries at study  
263 the degree of knowledge was good (above 3.5), corresponding to a minimum level of knowledge of  
264 70%.

265 Another aspect evaluated was the possible differences among regions of the globe. For that the  
266 average knowledge was considered for 4 regions, according to the geographical disposition of the  
267 countries, in this way: Mediterranean countries (Croatia, Egypt, Italy, Portugal, Turkey), Central  
268 Europe (Hungary, Macedonia, Romania), North Europe (Latvia) and Latin America (Argentina). The  
269 results presented in **Table 4** indicate that the general level of knowledge about the health benefits of  
270 dietary fibre showed statistically significant differences among the regions considered, being the  
271 knowledge higher for Latin America and lower for Central Europe. Mediterranean and Northern  
272 Europe countries showed a similar level of knowledge. However, it is worth noticing that in some of  
273 these regions the number of countries was not entirely representative of the region considered. Only  
274 one country was considered in Latin America and also in Northern Europe.

275

## 276 CONCLUSION

277 The results obtained in this work allowed concluding that there were in general differences in the  
278 level of knowledge about the health benefits of dietary fibre regarding gender, for which the women  
279 showed a higher level of knowledge; regarding the level of education, with the higher education  
280 corresponding to a higher level of knowledge; and also regarding living environment, with urban  
281 residents showing more knowledge about these matters in relation to rural residents.

282 In relation to the differences among the countries, the results for each of the particular topics  
283 addressed varied, but when the overall level of knowledge was accessed, the highest score was  
284 obtained for the participants from Portugal, although the countries with the lowest score (Croatia,  
285 Italy, Latvia, Macedonia and Romania) also showed a high level of knowledge. Some differences

286 were also observed for different regions of the globe, with Latin America showing the highest global  
287 level of knowledge as compared to the other regions considered.

288 In general, the results allowed concluding that the participants in the study were well informed  
289 about the benefits of dietary fibre to the general wellbeing and for improved health conditions.

290 This study provided valuable information regarding the level of information of a wide range of  
291 people about the health benefits of an adequate intake of dietary fibre. The fact that the study was  
292 undertaken in several countries, including North, Central and South Europe, North Africa and Latin  
293 America, is a positive indicator of the globally accepted benefits of fibre. However, interventions  
294 should be planned so as to address those groups who revealed a slightly lower level of knowledge,  
295 such as the men, the people with lowest levels of education or those living in rural areas.

296 There are, however, some limitations of the present work, namely: although the number of  
297 participants was high, over 6 thousand, there were some countries with a lower representation. Also,  
298 and in view of the obtained results, a wider distribution of the participating countries would be  
299 advisable in future works.

300

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304

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397 Table 1. Relation between demographic characteristics and knowledge and beliefs towards dietary  
 398 fibre and health.

		Statement (A) <sup>1</sup>		Statement (B) <sup>2</sup>		Statement (C) <sup>3</sup>	
Variable		Score <sup>4</sup>	Statistic <sup>5</sup>	Score <sup>4</sup>	Statistic <sup>5</sup>	Score <sup>4</sup>	Statistic <sup>5</sup>
		<i>p-value</i>		<i>p-value</i>		<i>p-value</i>	
Gender	Female	4.1±0.8	<0.001	3.7±0.9	<0.001	3.9±0.8	<0.001
	Male	3.9±0.9		3.6±1.0		3.7±1.0	
Level of Education	Primary	3.9±0.9	<0.001	3.6±0.9	<0.001	3.7±0.8	<0.001
	Secondary	3.9±0.9		3.6±1.0		3.7±0.9	
	University	4.1±0.8		3.7±0.9		3.9±0.9	
Living Environment	Rural	3.9±0.9	<0.001	3.6±0.9	0.001	3.7±0.9	<0.001
	Urban	4.0±0.9		3.7±0.9		3.8±0.9	
Country	Argentina	4.0±0.9	<0.001	3.9±0.9	<0.001	4.0±0.8	<0.001
	Croatia	4.0±0.8		3.6±0.9		3.7±0.8	
	Egypt	3.8±1.0		3.7±0.8		3.6±0.9	
	Hungary	4.2±0.9		3.8±0.9		3.9±1.0	
	Italy	3.9±0.8		3.4±0.9		3.6±0.9	
	Latvia	3.8±0.7		3.6±0.8		3.9±0.7	
	Macedonia	3.8±0.9		3.6±0.9		3.9±0.9	
	Portugal	4.3±0.6		3.9±0.8		4.0±0.8	
	Romania	4.0±1.1		3.5±1.2		3.7±1.2	
	Turkey	3.9±0.8		3.8±0.8		3.9±0.8	
<b>Total</b>		<b>4.0±0.9</b>		<b>3.7±0.9</b>		<b>3.8±0.9</b>	

399 <sup>1</sup>(A) Eating dietary fibres in appropriate amounts can prevent and/or treat diseases.

400 <sup>2</sup>(B) Fibres can prevent and/or treat cardiovascular diseases.

401 <sup>3</sup>(C) Fibres can prevent and/or treat cholesterol.

402 <sup>4</sup>Score: Mean ± Standard deviation; Scale from 1= totally disagree to 5= totally agree.

403 <sup>5</sup>Statistical information: p-value corresponding to the chi square test with a level of significance  
 404 of 5%. Sample size = 6010 participants.

406 Table 2. Relation between demographic characteristics and knowledge and beliefs towards dietary  
 407 fibre and health.

Variable		Statement (D) <sup>1</sup>		Statement (E) <sup>2</sup>		Statement (F) <sup>3</sup>	
		Score <sup>4</sup>	Statistic <sup>5</sup> <i>p-value</i>	Score <sup>4</sup>	Statistic <sup>5</sup> <i>p-value</i>	Score <sup>4</sup>	Statistic <sup>5</sup> <i>p-value</i>
Gender	Female	3.9±0.9	<0.001	3.0±1.0	<0.001	3.9±0.9	<0.001
	Male	3.7±1.0		2.9±1.0		3.7±1.0	
Level of Education	Primary	3.6±1.0	<0.001	3.0±0.9	0.013	3.7±0.9	<0.001
	Secondary	3.7±1.0		3.0±1.0		3.7±0.9	
	University	3.9±0.9		3.1±1.0		3.9±0.9	
Living Environment	Rural	3.6±1.0	<0.001	3.0±1.0	0.387	3.7±0.9	<0.001
	Urban	3.8±1.0		3.0±1.0		3.9±0.9	
Country	Argentina	3.8±0.9	<0.001	3.0±1.0	<0.001	3.9±0.9	<0.001
	Croatia	3.7±0.9		3.0±0.9		3.8±0.9	
	Egypt	3.5±0.9		3.5±1.2		3.3±0.9	
	Hungary	4.0±0.9		2.8±1.1		4.0±1.0	
	Italy	3.6±1.0		2.7±0.7		3.7±0.9	
	Latvia	3.5±0.9		2.8±0.8		4.0±0.8	
	Macedonia	3.7±1.0		3.3±1.0		3.7±1.0	
	Portugal	4.1±0.8		3.0±0.8		4.1±0.7	
	Romania	3.9±1.3		3.0±1.1		3.8±1.2	
	Turkey	4.1±0.8		3.2±0.9		4.1±0.8	
<b>Total</b>		<b>3.8±1.0</b>		<b>3.0±1.0</b>		<b>3.8±0.9</b>	

408 <sup>1</sup>(D) Fibres can prevent and/or treat bowel cancer.

409 <sup>2</sup>(E) Fibres can prevent and/or treat breast cancer

410 <sup>3</sup>(F) Fibres can prevent and/or treat obesity

411 <sup>4</sup>Score: Mean ± Standard deviation. Scale from 1= totally disagree to 5= totally agree.

412 <sup>5</sup>Statistical information: p-value corresponding to the chi square test with a level of significance  
 413 of 5%. Sample size = 6010 participants.

414

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416 Table 3. Relation between demographic characteristics and knowledge and beliefs towards dietary  
 417 febre and health.

		Statement (G) <sup>1</sup>		Statement (H) <sup>2</sup>		Statement (I) <sup>3</sup>		Statement (J) <sup>4</sup>	
Variable		Score <sup>5</sup>	Statistic <sup>6</sup>	Score <sup>5</sup>	Statistic <sup>6</sup>	Score <sup>5</sup>	Statistic <sup>6</sup>	Score <sup>5</sup>	Statistic <sup>6</sup>
		<i>p-value</i>		<i>p-value</i>		<i>p-value</i>		<i>p-value</i>	
Gender	Female	4.2±0.9	<0.001	3.9±1.0	0.005	3.3±1.1	<0.001	3.4±1.0	<0.001
	Male	3.9±1.0		2.8±1.0		3.2±1.1		3.3±1.0	
Level of Education	Primary	3.9±0.9	<0.001	2.8±1.0	0.032	3.2±1.1	0.097	3.4±0.9	<0.001
	Secondary	4.0±1.0		2.9±1.0		3.3±1.0		3.3±1.0	
	University	4.2±0.9		2.9±1.0		3.3±1.1		3.5±1.0	
Living Environment	Rural	4.0±0.9	<0.001	3.0±1.0	0.002	3.3±1.1	0.864	3.3±1.0	0.003
	Urban	4.1±0.9		2.9±1.0		3.3±1.1		3.4±1.0	
Country	Argentina	4.1±1.0	<0.001	2.9±1.0	<0.001	3.2±1.1	<0.001	3.6±1.0	0.121
	Croatia	4.1±0.8		2.9±1.0		3.2±1.0		3.3±0.9	
	Egypt	3.7±1.0		3.3±1.0		3.8±0.9		3.4±0.9	
	Hungary	4.4±1.0		2.8±1.1		3.6±1.2		3.6±1.1	
	Italy	4.3±0.9		2.8±0.8		3.1±1.0		3.1±0.9	
	Latvia	4.1±0.8		6.6±0.8		3.1±1.0		3.3±0.8	
	Macedonia	3.8±1.0		3.1±1.0		3.4±1.1		3.3±1.1	
	Portugal	4.4±0.7		2.9±0.8		4.1±1.0		3.5±0.9	
	Romania	3.9±1.1		2.9±1.2		3.4±1.2		3.4±1.2	
	Turkey	4.3±0.9		3.1±0.9		3.5±0.7		3.8±0.8	
<b>Total</b>		<b>4.1±0.9</b>		<b>2.9±1.0</b>		<b>3.3±1.1</b>		<b>3.4±1.0</b>	

418 <sup>1</sup>(G) Fibres can prevent and/or treat constipation.

419 <sup>2</sup>(H) Fibres can prevent and/or treat vision problems

420 <sup>3</sup>(I) Fibres can prevent and/or treat the deficiency of vitamins and minerals.

421 <sup>4</sup>(J) Fibres can prevent and/or treat diabetes.

422 <sup>5</sup>Score: Mean ± Standard deviation. Scale from 1= totally disagree to 5= totally agree.

423 <sup>6</sup>Statistical information: p-value corresponding to the chi square test with a level of significance  
 424 of 5%. Sample size = 6010 participants.

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427 Table 4. Measurement of the general level of knowledge.

Variable	General level of knowledge		
	Score <sup>1</sup>	Statistic <sup>2</sup> <i>p-value</i>	
Gender	Female	3.6±0.5	<0.001
	Male	3.5±0.5	
Level of Education	Primary	3.5±0.4	<0.001
	Secondary	3.5±0.5	
	University	3.6±0.5	
Living Environment	Rural	3.5±0.5	<0.001
	Urban	3.6±0.5	
Country	Argentina	3.6±0.5	<0.001
	Croatia	3.5±0.4	
	Egypt	3.3±0.4	
	Hungary	3.6±0.5	
	Italy	3.5±0.4	
	Latvia	3.5±0.4	
	Macedonia	3.5±0.5	
	Portugal	3.7±0.4	
	Romania	3.5±0.7	
	Turkey	3.6±0.4	
<b>Total</b>		<b>3.5±0.5</b>	
World region	Mediterranean countries	3.53±0.43	<0.001
	Central Europe countries	3.52±0.59	
	Northern Europe countries	3.53±0.41	
	Latin American countries	3.62±0.49	

428 <sup>1</sup>Score: Mean ± Standard deviation. Scale from 1= totally disagree to 5= totally agree.

429 <sup>2</sup>Statistical information: p-value corresponding to the chi square test with a level of significance  
 430 of 5%. Sample size = 6010 participants.

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