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Dietary Fiber Consumption Patterns and their Association with Self-Reported Health Outcomes: A Survey in Misrata City

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Abstract

Dietary fiber is an important component of a healthy diet and plays a key role in gastrointestinal function and overall health. However, fiber consumption patterns and their relationship with gastrointestinal outcomes remain insufficiently studied in Libya. This study aimed to assess dietary fiber consumption patterns and examine their associations with selected self-reported health outcomes among adults in Misrata City, Libya.

A cross-sectional survey was conducted among adults in Misrata City using a structured questionnaire covering sociodemographic characteristics, dietary fiber sources, consumption patterns, and self-reported gastrointestinal and health outcomes. The final dataset included 234 participants. Descriptive statistics were used to summarize the data. Pearson's chi-square test was used to examine associations between categorical variables, while the Mann–Whitney U test compared body weight according to self-reported irritable bowel syndrome (IBS) diagnosis. Statistical significance was set at $p < 0.05$.

The study showed variation in reported dietary fiber sources and gastrointestinal responses to high-fiber meals. No statistically significant association was found between the examined categorical variables ($\chi^2(3) = 4.994$, $p = 0.172$). Body weight also did not differ significantly between participants with and without self-reported IBS ($U = 3903.50$, $p = 0.649$).

No significant associations were identified in the examined analyses. Further studies with larger samples, quantitative dietary fiber assessment, and objective clinical measures are recommended to clarify the relationship between fiber consumption and health outcomes in the Libyan population.

I. Introduction

DF definitions, including the one not using the term DF, but rather uses 'non-starch polysaccharides' (NSP), identify DF as carbohydrate (CHO) polymers and oligomers materials that escape digestion in the small intestine and pass into the large intestine, where they are slightly or nearly completely fermented. DFs per se and their fermentation products contribute to the many physiological benefits associated with their consumption. DF can directly influence the colon and microbiome, and its fermentation products can be absorbed from the large bowel to exert systemic influence in various parts of the body [1].

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Soluble fiber attracts water and turns to gel during digestion. Once in gel form, it slows digestion and softens stool, which helps to prevent diarrhea and constipation. It can also work to lower blood sugar and bad cholesterol. Insoluble fiber adds bulk to the stool and appears to help food pass more quickly through the stomach and intestines. People who suffer from constipation or irregular bowel movements may want to increase their intake of insoluble fiber [2].

Table (1): Food Sources of Dietary Fiber [3]

Food, Standard Amount	Dietary Fiber (g)
Navy beans, cooked, ½ cup	9.5
Bran ready-to-eat cereal (100%), ½ cup	8.8
Kidney beans, canned, ½ cup	8.2
Split peas, cooked, ½ cup	8.1
Lentils, cooked, ½ cup	7.8
Black beans, cooked, ½ cup	7.5
Pinto beans, cooked, ½ cup	7.7
Lima beans, cooked, ½ cup	6.6
Artichoke, globe, cooked, 1 each	6.5
White beans, canned, ½ cup	6.3
Chickpeas, cooked, ½ cup	6.2
Great northern beans, cooked, ½ cup	6.2
Cowpeas, cooked, ½ cup	5.6
Soybeans, mature, cooked, ½ cup	5.2
Bran ready-to-eat cereals, various, ~1 oz	2.6-5.0
Crackers, rye wafers, plain, 2 wafers	5.0
Sweet potato, baked, with peel, 1 medium (146 g)	4.8
Asian pear, raw, 1 small	4.4
Green peas, cooked, ½ cup	4.4
Whole-wheat English muffin, 1 each	4.4
Pear, raw, 1 small	4.3
Bulgur, cooked, ½ cup	4.1
Mixed vegetables, cooked, ½ cup	4.0
Raspberries, raw, ½ cup	4.0
Sweet potato, boiled, no peel, 1 medium (156 g)	3.9
Blackberries, raw, ½ cup	3.8
Potato, baked, with skin, 1 medium	3.8
Soybeans, green, cooked, ½ cup	3.8
Stewed prunes, ½ cup	3.8
Figs, dried, ¼ cup	3.7
Dates, ¼ cup	3.6
Oat bran, raw, ¼ cup	3.6
Pumpkin, canned, ½ cup	3.6
Spinach, frozen, cooked, ½ cup	3.5
Shredded wheat ready-to-eat cereals, various, ~1 oz	2.8-3.4
Almonds, 1 oz	3.3
Apple with skin, raw, 1 medium	3.3
Brussels sprouts, frozen, cooked, ½ cup	3.2
Whole-wheat spaghetti, cooked, ½ cup	3.1
Banana, 1 medium	3.1
Orange, raw, 1 medium	3.1
Oat bran muffin, 1 small	3.0
Guava, 1 medium	3.0
Pearled barley, cooked, ½ cup	3.0
Sauerkraut, canned, solids, and liquids, ½ cup	3.0
Tomato paste, ¼ cup	2.9
Winter squash, cooked, ½ cup	2.9
Broccoli, cooked, ½ cup	2.8
Parsnips, cooked, chopped, ½ cup	2.8
Turnip greens, cooked, ½ cup	2.5
Collards, cooked, ½ cup	2.7
Okra, frozen, cooked, ½ cup	2.6
Peas, edible-podded, cooked, ½ cup	2.5

benefits of dietary fibre on gastrointestinal health through consumption of unrefined whole foods, such as wholegrains, legumes, vegetables and fruits. Mechanistic studies and clinical trials on isolated and

extracted fibres have demonstrated promising regulatory effects on the gut (for example, digestion and absorption, transit time, stool formation) and microbial effects (changes in gut microbiota composition and fermentation metabolites) that have important implications for gastrointestinal disorders. In this Review, we detail the major physicochemical properties and functional characteristics of dietary fibres, the importance of dietary fibres and current evidence for their use in the management of gastrointestinal disorders [4].

1.Global intake and recommendations of dietary fiber [5]

Table 2summarizes the updated average levels and recommended amounts of dietary fiber intake worldwide. Generally, the global average levels range from 15 to 26 g/day, lower than the recommended 20 to 35 g/day in most countries. As shown in Table 1, the highest levels of dietary fiber intake were observed in Northern Europe (e.g., Denmark, Norway) Central Europe (e.g., Germany), and Australia), probably due to widespread consumption of whole grain rye, oat, and wheat in these countries [5].

Table (2): Global intake and recommendations of dietary fiber [5]

	Intake Level (g/day)				Recommendation (g/day)			
Region	M	F	Over all	Reference	M	F	Over all	Reference
Asia								
China	19.4	17.6	-	China Health and Nutrition Survey (2011)	-	-	30-25	Chinese Dietary Reference Intake (2017)
Japan	19.9	18.0	18.8	National Health and Nutrition Survey in Japan (2019)	21	18	10g/kcal	Dietary Reference Intake for Japanese (2020 Edition)
North America								
Usa	18.1	15.2	16.6	What We Eat in America (2017–2020)	38	25	14 g/kcal	Dietary Guidelines for Americans (2020–2025)
Canada	18.4	16.2	_	Canadian Community Health Survey (2015)	38	25	_	Canada's Dietary Guidelines (2019)
Oceania								
Australia	24.8	21.1	___	Australian Health Survey (2011–2012)	38	28	__	Australian Dietary Guidelines (2013)
Europe								
UK	_	_	19.9	UK National Diet and Nutrition Survey (2016–2019)	_	_	30	Eatwell Guide (2016)
European Union	_	_	_	___	_	_	25	Scientific Opinion on Dietary Reference Values (EFSA-2010)
France	21.6	17.7	19.6	National Individual Food Consumption 3 (2014–2015)	_	_	30	Guidelines: development of nutritional references (2016)
Denmark	_	_	22	Dietary habits in Denmark (2011–2013)	30	25	30 g/10MJ	Nordic Nutrition Recommendations (2012)
Norway	26	22	24	Norkost 3 (2010–2011)	--	--	--	-----
Germany	24.8	23.1	___	National Consumption Research II (2005–2007)	--	---	30 or 14.6 g/kcal	The D-A-CH reference for nutrient intake (2021)
Russia	15	12	----_	Russia Longitudinal Monitoring Survey (2018)	--	--	30	Center for hygienic education of the population

Discrepancies in body size and tolerance to high-fiber diets across populations may also account for differences in average levels of intake and recommendations. For example, in Japan, the average dietary fiber intake is 18.0 g/day in women and 19.9 g/day in men, very close to the domestic recommended intake (18 g/day for women and 21 g/day for men), but much lower than the average levels in Western populations. This may be explained by the relatively smaller bodies of the Japanese

and their habits of eating rice (refined grain) and seafood. Many countries have adopted energy-adjusted levels of dietary fiber as the recommended amounts. As presented in Table 1, the daily recommended intake of dietary fiber is 14 g/kcal in the US, 14.6 g/kcal in Germany, and 10 g/kcal in Japan [5].
Studies have indicated that a high-fiber diet can increase stool weight, resulting in a decreased colon transit time, while poorfiber diet induces constipation. Moreover, it has been revealed that increased fiber diet could improve symptoms in patients with normal colonic transit and anorectal function, while constipated patients with delayed colonic transit patients have not improved by increasing dietary fiber [6]. Obesity is a complex chronic disease resulting from a long-term energy imbalance, where energy intake exceeds expenditure. This is accompanied by disruptions in the hormonal and neurological signals that regulate appetite and satiety. Epidemiological studies and clinical trials have demonstrated that increased dietary fiber intake is associated with a reduced risk of obesity and improved metabolic indicators. Dietary fiber exerts its anti-obesity effect through several integrated physiological mechanisms. Physically, soluble fiber increases the viscosity of gastric and intestinal contents, slowing gastric emptying and delaying nutrient absorption, thus prolonging satiety and reducing energy expenditure. It also contributes to improved post-meal glucose control and reduced insulin volatility, factors associated with limiting body fat accumulation. Fermentable fiber promotes the growth of beneficial gut bacteria, which increases the production of short-chain fatty acids (SCFAs), such as acetate, propionate, and butyrate. These metabolites act as metabolic signaling molecules that influence energy balance, improve intestinal barrier integrity, reduce low-grade inflammation associated with obesity, and stimulate the release of appetite-regulating gut hormones like GLP-1 and PYY, leading to decreased appetite and improved satiety. Evidence also suggests that dietary fiber consumption contributes to modifying the composition and function of the gut microbiota, increasing the abundance of microorganisms associated with metabolic health and promoting the production of beneficial metabolites, which improves insulin sensitivity and reduces insulin resistance, key features associated with obesity and metabolic syndrome. Clinical studies confirm that the effectiveness of dietary fiber depends not only on the quantity consumed but is also influenced by its physical and chemical properties, such as solubility, viscosity, and fermentability. Therefore, the metabolic response varies among different types of fiber, supporting the trend toward personalized nutritional strategies that take into account individual characteristics and gut microbiota composition to maximize the therapeutic benefits of fiber in obesity management [7]. Evidence from a systematic review and meta-analysis of 22 randomized controlled trials (RCTs) involving 911 patients with type 2 diabetes mellitus (T2DM) suggests that increased dietary fiber intake leads to significant improvements in glucose control and insulin sensitivity. The results showed that consuming an average daily amount of fiber (approximately 10 grams) for an average of 8 weeks resulted in a significant reduction in glycated hemoglobin (HbA1c) and blood glucose levels Fasting blood glucose (FBG), fasting insulin concentration, and a decrease in the HOMA-IR insulin resistance index were also assessed. Subgroup analysis showed that soluble fiber was more effective than fiber from natural foods in improving both HbA1c and fasting blood glucose. These results suggest that increasing dietary fiber intake, particularly soluble fiber, is an effective dietary intervention for improving glycemic control and insulin sensitivity in patients with type 2 diabetes. However, further long-term studies are needed to confirm the sustainability of these benefits [8]. Several proposed mechanisms shed light on how dietary fiber might impact blood pressure. One such mechanism is attributed to soluble fibers, including beta-glucans and pectins, which can form viscous gels in the gastrointestinal tract, potentially slowing down carbohydrate digestion and glucose absorption. Such an effect could potentially modulate insulin sensitivity and improve glycemic control, thereby influencing blood pressure. Secondly, the fermentation of dietary fiber by gut microbiota results in the synthesis of short-chain fatty acids (SCFAs), particularly propionate and butyrate, which have been linked to blood pressure reduction. SCFAs might exert vasodilatory effects through the relaxation of blood vessel walls or modulation of the renin-angiotensin-aldosterone system (RAAS). Additionally, the ability of dietary fiber to modulate the composition of the gut microbiota may be a factor in blood pressure regulation, as there is a growing body of evidence linking gut dysbiosis to hypertension [9]. The evidence gathered in this comprehensive review indicates that increased dietary fiber intake is associated with a marked improvement in blood lipid profiles, particularly a reduction in total cholesterol and low-density lipoprotein cholesterol (LDL-C) levels, thus contributing to a lower risk of cardiovascular disease. This effect is attributed to the physical and functional properties of fiber, especially soluble fiber,

which increases the viscosity of intestinal contents and limits the absorption of cholesterol and dietary fats. Fiber also binds to bile acids in the intestine and increases their absorption Its excretion in feces stimulates the liver to utilize more cholesterol to produce new bile acids, leading to a decrease in blood cholesterol levels. Furthermore, the fermentation of fiber by the gut microbiota produces short-chain fatty acids, particularly propionate, which may inhibit cholesterol synthesis in the liver, as well as improve lipid metabolism and reduce inflammation associated with atherosclerosis. The review confirms that these combined mechanisms make increasing dietary fiber intake one of the most effective dietary interventions for preventing hyperlipidemia and promoting cardiovascular health [10]. The review explains that dietary fiber is essential for maintaining gut health through its role as a prebiotic, stimulating the growth and diversity of beneficial bacteria in the gut, thus contributing to a balanced gut microbiota. Furthermore, the fermentation of fiber by these bacteria leads to the production of short-chain fatty acids (SCFAs), particularly butyrates, which are a primary source of energy Fiber benefits colon cells, improves intestinal barrier integrity, reduces inflammation, and supports the immune response. Conversely, low fiber intake is associated with reduced microbial diversity, impaired intestinal barrier function, and increased intestinal permeability, which may contribute to the development of gastrointestinal disorders and chronic diseases. The review confirms that increasing fiber intake according to individual needs can improve gut health and contribute to the prevention of many chronic diseases [11]. Higher dietary fiber intake is associated with a reduced risk of several chronic diseases and improved overall health outcomes. Stronger evidence (Class I) has shown a clear association between increased fiber intake and reduced mortality from cardiovascular disease, pancreatic cancer, and diverticular disease. Stronger evidence (Class II) also supports the association between higher fiber intake and reduced all-cause mortality A reduced risk of cardiovascular disease, coronary heart disease, and ovarian cancer was also noted. Additionally, the review indicated supporting evidence for a reduced risk of type 2 diabetes and several other cancers, although the strength of the evidence varied across different health outcomes. The researchers concluded that a high-fiber diet is one of the most important dietary strategies for promoting overall health, reducing premature mortality, and lowering the burden of chronic diseases. However, global average fiber intake remains below recommended levels, necessitating enhanced public health policies that encourage increased consumption of fiber-rich foods [12].

a. Knowledge Gap:

Although numerous international studies have demonstrated that adequate dietary fiber intake is associated with improved gastrointestinal health, reduced risk of cardiovascular disease, type 2 diabetes, obesity, certain cancers, and better overall well-being, the majority of this evidence originates from high-income countries with dietary patterns, socioeconomic characteristics, and healthcare systems that differ substantially from those of North African populations.

I n Libya, and particularly in Misrata City, there is a notable lack of population-based studies investigating dietary fiber consumption patterns among adults. Furthermore, there is limited evidence regarding whether fiber intake is associated with individuals' self-reported health outcomes, including gastrointestinal health, bowel habits, perceived energy levels, body weight status, hypertension, diabetes, and overall well-being. Existing Libyan nutrition research has primarily focused on obesity, diabetes, anemia, or general dietary habits, with insufficient emphasis on dietary fiber as a distinct dietary component and its relationship with perceived health status.

In addition, no previous survey conducted in Misrata has comprehensively assessed habitual dietary fiber intake using a structured dietary assessment tool while simultaneously examining multiple self-reported health outcomes within the same population. Therefore, the present study aims to address this knowledge gap by evaluating dietary fiber consumption patterns and investigating their association with self-reported health outcomes among adults in Misrata City, thereby providing locally relevant evidence to support future nutritional interventions and public health strategies.

b. Study Objective:

i. Primary Objective:

to assess dietary fiber consumption patterns and investigate their association with self-reported health outcomes among adults in Misrata City, Libya.

ii. Specific Objectives:

- To assess the frequency and adequacy of dietary fiber intake among adults in Misrata City.
- To identify the main dietary sources of fiber consumed by the study population.

 To evaluate participants' knowledge and awareness regarding dietary fiber recommendations and health benefits.
 To examine the association between dietary fiber intake and self-reported gastrointestinal health outcomes, including bowel regularity and constipation.
 To investigate the relationship between dietary fiber consumption and self-reported chronic health conditions, including overweight/obesity, hypertension, type 2 diabetes, and cardiovascular disease.
 To evaluate the association between dietary fiber intake and participants' perceived general health and well-being.
 To provide baseline evidence that may inform future nutrition education programs and public health policies aimed at increasing dietary fiber intake in Misrata City.

Materials and working methods:

1. Study design:

T his study employed a cross-sectional analytical survey design to assess dietary fiber consumption patterns and their association with self-reported health outcomes among adults residing in Misrata City, Libya. Data were collected using both paper-based and electronic self-administered questionnaires during the study period. The cross-sectional design enabled the assessment of dietary fiber intake and health outcomes at a single point in time.

1.1. Area of study:

The study was conducted in Misrata City, Libya, one of the country's largest urban centers with a diverse population. Participants were recruited from different residential areas, workplaces, educational institutions, and public locations to obtain a heterogeneous sample representing adults living in the city. Data collection was performed through face-to-face distribution of printed questionnaires as well as an online questionnaire shared via social media platforms and electronic communication channels.

1.2. Study Population

The study population consisted of adult residents of Misrata City aged 18 years and older. Eligible participants included both males and females who were able to understand Arabic and voluntarily agreed to participate in the study by completing either the paper-based or electronic questionnaire.

1.3. Inclusion Criteria:

- Adults aged 18 years or older.
- Residents of Misrata City.
- Able to read and understand Arabic.
- Willing to provide informed consent.
- Completed the questionnaire independently.

1.4. Exclusion Criteria

- Individuals younger than 18 years.
- Non-residents of Misrata City.
- Participants with incomplete questionnaires (>20% missing responses).
- Duplicate electronic submissions.
- Individuals unable to provide informed consent.

1.5. Sample Size:

A total of **233 participants** were included in the final analysis.

1.6. Questionnaire Development:

The questionnaire was developed following an extensive review of the scientific literature and previously validated dietary assessment questionnaires. It consisted of five main sections:

1. Sociodemographic characteristics.
2. Lifestyle characteristics.
3. Dietary fiber consumption patterns and food frequency.
4. Knowledge and awareness regarding dietary fiber.
5. Self-reported health outcomes, including gastrointestinal health, constipation, hypertension, type 2 diabetes, cardiovascular disease, body weight status, and general well-being.

1.7. Pilot Study:

Before the main survey, a pilot study was conducted among a small group of participantsrepresentative of the target population to evaluate the clarity, comprehensibility, relevance, and completion time of the questionnaire. Feedback obtained during the pilot phase was used to improve the wording and

organization of the questionnaire. Data collected during the pilot study were excluded from the final statistical analysis.

1.8. Reliability:

Reliability was assessed using Cronbach's alpha coefficient, with values ≥0.70 considered acceptable.

1.9. Validity:

The questionnaire was reviewed by experts in clinical nutrition, public health, and epidemiology to establish content validity. Their comments and recommendations were incorporated to improve the relevance, clarity, and comprehensiveness of the questionnaire. Face validity was further evaluated during the pilot study.

1.10. Statistical Analysis:

Data were entered into Microsoft Excel, checked for completeness and consistency, and analyzed using IBM SPSS Statistics (Version 25). Descriptive statistics were used to summarize participants' characteristics, dietary fiber intake, and self-reported health outcomes. Continuous variables were expressed as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages.

Associations between dietary fiber consumption patterns and categorical health outcomes were assessed using the Chi-square test or Fisher's exact test when appropriate. Independent-samples t-tests or one-way analysis of variance (ANOVA) were used to compare continuous variables between groups, where applicable. Binary logistic regression analysis was performed to identify independent factors associated with self-reported health outcomes after adjusting for potential confounding variables. A p-value of <0.05 was considered statistically significant.

1.11. Results and Discussion:

1.11.1. Sociodemographic characteristics:

Table 1 presents the descriptive statistics for the study sample demographics and primary dietary fiber sources (N = 234). Out of the total participants, 233 valid responses were recorded for both gender and the highest level of education (1 missing case for each, 0.4\%). For gender, the mean response score was calculated with a standard deviation (SD = 0.331) and a standard error of mean (SE = 0.022). Regarding the highest level of education, responses ranged from 1 to 4 with SD = 0.860 and SE = 0.056. In terms of the primary source of dietary fiber, 232 valid responses were obtained (2 missing cases, 0.9\%), with scores ranging from 1 to 3 (SD = 0.446, SE = 0.029).

Table (3): Descriptive Statistics for Study Sample Demographics and Dietary Fiber Source (N=233).

Variable	Missing	Min	Max	(SD)
Gender	1	1	2	0.331
Highest level of education	1	1	4	0.860
Primary source of dietary fiber	1	1	3	0.446

The present study examined the demographic characteristics of participants in relation to their reported dietary fiber sources. Gender and educational level were considered important sociodemographic characteristics because previous research has suggested that dietary fiber intake and dietary patterns may vary according to these factors. Consistent with this perspective, a recent cross-sectional study published in Frontiers in Nutrition found that higher dietary fiber intake was significantly associated with gender and higher educational attainment (P < 0.001). Participants in the highest dietary fiber intake category had a greater proportion of individuals with more than 12 years of education compared with those in the lowest intake category. These findings suggest that educational attainment may influence dietary choices, potentially through differences in nutrition knowledge, health awareness, food accessibility, and dietary practices.

I n the present study, the distribution of participants according to gender and educational level provides an important context for interpreting the reported primary sources of dietary fiber. However, because the present analysis was primarily descriptive, differences in dietary fiber sources according to gender or educational level should not be interpreted as statistically significant unless confirmed by appropriate inferential tests [13].

1.11.2. the association between gender and self-reported constipation:

A Pearson’s chi-square test was conducted to examine the association between gender and self-reported constipation among the study participants (N = 233). The analysis showed no statistically

significant association between gender and constipation status, χ^2 (3) = 4.994, p = 0.172. Therefore, the observed distribution of constipation across the gender categories did not differ significantly from that expected by chance. One cell (12.5%) had an expected count below 5, with a minimum expected count of 3.11.

Table (4): Chi-Square Tests for the Association Between Gender and Self-Reported Constipation

Variables	χ^2 Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.994[a]	3	0.172
Likelihood Ratio	5.360	3	0.147
Linear-by-Linear Association	2.840	1	0.092
N of Valid Cases	233	_	_

In the present study, no statistically significant association was observed between the examined categorical variables (Pearson's χ^2 = 4.994, df = 3, p = 0.172). This finding suggests that the distribution of the outcome variable did not differ significantly across the categories of the explanatory variable in this sample.

The present finding differs from the results of a large NHANES-based study, which reported a significantly higher prevalence of constipation among women than men (10.2% vs. 4.0%, p < 0.001). The discrepancy may be related to differences in sample size, population characteristics, constipation definitions, dietary patterns, age distribution, and other lifestyle factors. In the present study, the absence of a statistically significant association may also reflect the relatively smaller sample size (N = 233), which may limit the statistical power to detect modest differences between groups [14].

1.11.3. Association between Educational Level and Perceived Importance of Dietary Fiber

A chi-square test of independence was conducted to examine the association between participants' educational level and their perception of the importance of dietary fiber. The analysis showed that there was no statistically significant association between educational level and perceived importance of dietary fiber, χ^2 (6, N = 233) = 4.03, p = 0.673. Thus, the null hypothesis was not rejected, indicating that participants' perceptions of the importance of dietary fiber did not differ significantly according to their educational level.

It should be noted that 4 cells (33.3%) had expected frequencies below 5, with a minimum expected frequency of 0.48. Therefore, the result should be interpreted with caution, and collapsing categories with very small frequencies may be considered in further analysis.

Table (5): Association Between Educational Level and Perceived Importance of Dietary Fiber Among Participants (N = 233)

Variables	χ^2	df	p
Educational level × Perceived importance of dietary fiber	4.030[a]	6	.673

In the present study, no statistically significant association was observed between educational level and participants' perceived importance of dietary fiber (χ^2 = 4.03, df = 6, p = 0.673). This finding suggests that the perception of the importance of dietary fiber was relatively similar across different educational groups in the studied population.

This finding differs from previous research suggesting that higher educational attainment is associated with greater nutrition and dietary-fiber knowledge. Guiné et al. (2016), in a multicountry study involving 6,010 participants from 10 countries, reported differences in dietary-fiber knowledge according to educational level, with participants with higher education generally demonstrating better knowledge. Similarly, De Vriendt et al. (2009), among 803 Belgian women, identified educational level as one of the most important determinants of nutrition knowledge. In addition, Fullmer et al. reported that consumers with higher education demonstrated better understanding of diet–disease-related health messages, while knowledge of dietary fiber was positively related to understanding health messages.

The discrepancy between the present findings and previous studies may be explained by differences in study populations, educational systems, sources of nutrition information, cultural factors, and the way dietary-fiber knowledge or perceived importance was measured. In particular, educational attainment does not necessarily indicate exposure to specific nutrition education. Individuals with different educational backgrounds may obtain information about dietary fiber through healthcare professionals, social media, family, or other sources. Therefore, general educational level may not necessarily translate into greater awareness of the specific health importance of dietary fiber.

Furthermore, the present finding should be interpreted cautiously because 33.3% of the contingency-table cells had expected frequencies below 5, with a minimum expected frequency of 0.48. This violation of the assumptions of the Pearson chi-square test may have reduced the reliability of the statistical inference. Future studies with larger samples and/or fewer educational categories may provide a more robust assessment of this association [15,16].

1.11.4 compare body weight between participants with and without a self-reported diagnosis of irritable bowel syndrome (IBS)

A Mann–Whitney U test was performed to compare body weight between participants with and without a self-reported diagnosis of irritable bowel syndrome (IBS). The analysis showed no statistically significant difference in body weight between the two groups (Mann–Whitney U = 3903.50, Z = −0.455, p = 0.649).

Table (6): Comparison of body weight between participants with and without self-reported irritable bowel syndrome using the Mann–Whitney U test

Variable	Test statistic (U)	Z	p-value
Body weight (kg)	3903.500	-0.455-	0.649

In the present study, no statistically significant difference in body weight was observed between participants with and without a self-reported diagnosis of irritable bowel syndrome (IBS) (Mann–Whitney U = 3903.50, Z = −0.455, p = 0.649). This finding suggests that body weight alone was not significantly associated with IBS status in the present study population. The finding is consistent with a recent systematic review and meta-analysis of 27 studies, which found no significant association between overweight or obesity and IBS overall. The pooled odds ratios were 1.02 for overweight (p = 0.772) and 1.11 for obesity (p = 0.309), suggesting that excess body weight may not be a primary determinant of IBS risk.

However, the present finding differs from evidence from a large prospective cohort study of 416,124 participants, in which obesity was associated with a modestly increased risk of incident IBS (HR = 1.07, 95% CI 1.01–1.13). Higher measures of central adiposity, including waist circumference and visceral adipose tissue, were also associated with increased IBS risk.

The discrepancy between the present study and previous research may be explained by differences in the anthropometric measures used. The present analysis evaluated body weight in kilograms, whereas previous studies have frequently used BMI, waist circumference, or measures of visceral adiposity. These measures may provide more meaningful information regarding adiposity than body weight alone. In addition, differences in sample size, study design, diagnostic criteria for IBS, age and sex distribution, dietary patterns, and lifestyle factors may contribute to the inconsistent findings [17].

1.11.5. Association between Educational Level and Perceived Importance of Dietary Fiber

A Chi-square test was performed to examine the association between educational level and participants' perceived importance of dietary fiber. The analysis showed no statistically significant association between educational level and perceived importance of dietary fiber (Pearson's χ^2 = 12.086, df = 12, p = 0.439, n = 233). Similarly, the likelihood-ratio test did not indicate a statistically significant association (p = 0.346), while the linear-by-linear association was also non-significant (p = 0.726). Therefore, the findings suggest that participants' educational level was not significantly associated with their perception of the importance of dietary fiber in this study. However, 40.0% of the cells had expected frequencies below 5, with a minimum expected frequency of 1.08; therefore, the Pearson chi-square result should be interpreted with caution.

Table (7): Association Between Participants' Educational Level and Perceived Importance of Dietary Fiber.

Variable	χ^2	df	p-value	N
Educational level × Perceived importance of dietary fiber	12.086	12	0.439	233

In the present study, educational level was not significantly associated with participants' perceived importance of dietary fiber ($\chi^2 = 12.086$, df = 12, p = 0.439). This finding suggests that participants' recognition of the importance of dietary fiber did not differ significantly according to their educational attainment. However, this result should be interpreted cautiously because 40.0% of the contingency-table cells had expected frequencies below 5, which may reduce the reliability of the Pearson chi-square approximation.

The present finding differs from previous research suggesting that educational attainment may influence knowledge and awareness of dietary fiber. A large cross-country study involving 6,010 participants from 10 countries reported differences in dietary-fiber knowledge according to educational level, with higher knowledge observed among participants with higher education. Similarly, research using a validated dietary-fiber knowledge scale reported significant differences in knowledge across sociodemographic characteristics, including educational level. These studies suggest that formal education may contribute to greater exposure to nutrition-related information and consequently improve knowledge of dietary fiber and its health benefits.

In contrast, the absence of a significant association in the present study may indicate that awareness of the importance of dietary fiber is not determined solely by formal educational attainment. Access to health information through healthcare professionals, social media, family practices, and other sources may provide nutrition information across educational groups. This interpretation is consistent with findings from studies showing that nutrition knowledge and awareness can be influenced by multiple personal, academic, and environmental factors rather than education alone.

Another possible explanation is that the present study assessed participants' perceived importance of dietary fiber rather than a comprehensive validated score of dietary-fiber knowledge. Perceiving fiber as important may therefore be relatively widespread across educational groups, even when more detailed knowledge regarding fiber sources, recommended intake, physiological effects, and disease prevention differs. Consequently, the lack of a statistically significant association in this study should not necessarily be interpreted as evidence that educational level has no influence on dietary-fiber knowledge.

Overall, the findings highlight the importance of providing accessible nutrition education to the general population regardless of educational level. Future studies should consider using validated dietary-fiber knowledge scales and examining other determinants, such as age, sex, socioeconomic status, exposure to nutrition education, healthcare contact, and sources of health information, to better explain differences in dietary-fiber awareness [15,18,19].

1.11.6. Association between vegetable consumption and satiety after a high-fiber meal

A Spearman's rank-order correlation was performed to assess the association between the frequency of daily vegetable consumption and the level of satiety reported after consuming a high-fiber meal. The analysis showed a very weak negative correlation between the two variables (Spearman's $\rho = -0.028$, p = 0.673, n = 233). This association was not statistically significant ($p > 0.05$), indicating that the frequency of daily vegetable consumption was not significantly associated with the reported feeling of fullness after a high-fiber meal among the study participants.

Table (8): Spearman's Rank-Order Correlation Between Daily Vegetable Consumption Frequency and Satiety After a High-Fiber Meal

Variables	Spearman's ρ	p-value	N
Frequency of daily vegetable consumption × Satiety after a high-fiber meal	-0.028-	0.673	233

In the present study, no statistically significant association was observed between educational level and the perceived importance of dietary fiber (Spearman's ρ = [0.673], p = [0.673]). This finding suggests that educational attainment alone was not significantly associated with participants' perception of the importance of dietary fiber in the present sample.

This result differs from findings reported by El-Shenawy et al., who observed significant differences in dietary-fiber knowledge according to educational level among 6,010 participants from 10 countries, with higher levels of knowledge generally observed among participants with higher educational attainment. The discrepancy may be related to differences in study populations, cultural and educational contexts, the measurement of dietary-fiber awareness, and access to nutrition information. Importantly, the present finding does not necessarily indicate a lack of awareness among participants with lower educational attainment; rather, it suggests that educational level alone may not adequately explain differences in perceived importance of dietary fiber within this population [20,21].

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أنماط استهلاك الألياف الغذائية وعلاقتها بالنتائج الصحية المبلغ عنها ذاتياً: دراسة استقصائية في مدينة مصراتة

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الكلمات المفتاحية:
الألياف الغذائية؛ الأنماط الغذائية؛ صحة الجهاز الهضمي؛ الإمساك؛ الانتفاخ؛ متلازمة القولون العصبي؛ البالغون

الملخص

تُعد الألياف الغذائية مكونًا أساسيًا في النظام الغذائي الصحي، وترتبط بوظائف الجهاز الهضمي والعديد من الجوانب الصحية. ومع ذلك، لا تزال أنماط استهلاك الألياف وعلاقتها بالنتائج الهضمية غير مدروسة بشكل كافٍ في ليبيا. هدفت هذه الدراسة إلى تقييم أنماط استهلاك الألياف الغذائية ودراسة ارتباطها ببعض النتائج الصحية المبلغ عنها ذاتيًا لدى البالغين في مدينة مصراتة، ليبيا. أُجريت دراسة مقطعية باستخدام استبيان منظم شمل الخصائص الاجتماعية والديموغرافية، ومصادر الألياف الغذائية وأنماط استهلاكها، والنتائج الهضمية والصحية المبلغ عنها ذاتيًا. شملت قاعدة البيانات النهائية 234 مشاركًا. استُخدمت الإحصاءات الوصفية لتلخيص البيانات، واختبار كاي تربيع بيرسون لدراسة الارتباطات بين المتغيرات الفئوية، بينما استُخدم اختبار مان–ويتني U لمقارنة وزن الجسم وفقًا للتشخيص المبلغ عنه ذاتيًا لمتلازمة القولون العصبي. اعتُبرت قيمة p < 0.05 ذات دلالة إحصائية.

أظهرت الدراسة اختلافًا في مصادر الألياف الغذائية المبلغ عنها والاستجابات الهضمية بعد تناول الوجبات الغنية بالألياف. ولم يظهر ارتباط ذو دلالة إحصائية بين المتغيرات الفئوية المدروسة ($\chi^2(3) = 4.994$، $p = 0.172$). كما لم يختلف وزن الجسم بشكل معنوي بين المشاركين الذين أبلغوا عن الإصابة بالقولون العصبي وغير المصابين به ($U = 3903.50$، $p = 0.649$).

	لم تُظهر التحليلات المدروسة ارتباطات ذات دلالة إحصائية. وتوصي الدراسة بإجراء بحوث مستقبلية على عينات أكبر، مع قياس كمي لاستهلاك الألياف واستخدام مؤشرات سريرية موضوعية.