



Awareness and Consumption Patterns of Functional Foods among Residents in Alexandria, Egypt: Insights from a Community Survey

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How to cite this paper: Abd-Rabou, H.S. and El-khalifa, Z.S. (2024) Awareness and Consumption Patterns of Functional Foods among Residents in Alexandria, Egypt: Insights from a Community Survey. *Open Access Library Journal*, 11: e11856. <https://doi.org/10.4236/oalib.1111856>

Received: June 21, 2024

Accepted: July 23, 2024

Published: July 26, 2024

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Abstract

“Functional foods” contain active components like vitamins, antioxidants, fiber, omega-3 fatty acids, probiotics, and minerals to help maintain good health, lower disease risk, and enhance well-being. There has been an increase in the demand for these foods, mainly since the COVID-19 pandemic, when people realized the importance of choosing products and supplements that boost immunity. Thus, the primary objective of this study is to determine the Egyptian community’s familiarity with functional foods. Based on the data, they were received via an online survey (n = 201) conducted in Alexandria governorate, Egypt, between March 2021 and July 2021. The majority of respondents are between the ages of 20 and 40, with 61.7% being females and 38.3% being males, according to the results. In addition, even though consumers are unfamiliar with the term “functional foods,” they always consumed functional foods such as dairy products (39.3%) and vegetables and fruits (31.8%), as they were aware of their health benefits.

Subject Areas

Agricultural Economics & Food Science

Keywords

Nutritional Information, Health Claim, Functional Food, Awareness, Questionnaire, Egypt

1. Introduction

Food is increasingly used to satisfy hunger, provide important human nutrients, prevent nutrition-related disorders, and enhance physical and mental health. Particularly following the COVID-19 pandemic, which played an indispensable role in influencing consumers to choose immunity-boosting products and supplements, the demand for healthy foods and beverages has grown and is expected to grow further in the future [1] [2].

Therefore, consumers are increasingly aware that good health could be maintained by eating the right foods, prompting them to seek out foods that, in addition to primary feeding, lower the risk of disease and enhance well-being [3] [4]. This trend toward healthier eating has resulted in changes in how foods are processed [5] [6], giving rise to functional foods.

In Japan in the 1980s, the term “functional food” was coined to describe foods that contain ingredients that aid specific health functions in addition to being nutritious [6]-[10]. According to the Japanese, food can serve functions other than enjoyment and nutrient and energy supply to the human organism [11]. Furthermore, functional foods and nutraceutical products assist in improving health, reducing healthcare costs, and promoting economic development in rural areas [9] [12]. Moreover, many functional foods are fortified with active components such as vitamins, antioxidants, fiber, omega-3, fatty acids, probiotics, and minerals, which help individuals reach the necessary intakes of these vital nutrients and preserve their overall health [2] [4] [13]. These products can be found in pharmacies, supermarkets, and hypermarkets [14]. Fruits and vegetables are naturally functional foods because they include a high concentration of bioactive compounds like polyphenols and carotenoids, which have antioxidant activity in protecting cells from oxidative damage and lowering the risk of certain cancers [5] [13]. When consumed at the recommended serving size, functional foods may contain significant amounts of biologically active components beneficial to health [15]. An excess of functional foods may result in nutritional imbalance. Regular consumption of functional foods, on the other hand, should reduce the risk of numerous chronic diseases such as diabetes, hypertension, osteoporosis, and cancer [11]. Thus, investing in malnutrition is one of the core investment strategies (the World Health Assembly Resolution) (“Global nutrition targets, 2025”).

Therefore, the market for functional foods is dynamic and snowballing, with Japan leading the way, followed by the United States and Europe [14] [16]. Also, the global market for functional foods is expected to rise to US\$ 137.1 billion by 2026 (“Functional Food Ingredients Market Industry Trends, 2021”), especially in European countries. Consumers are increasingly mindful of the link between their health and consumed foods.

Therefore, functional foods are becoming more popular, and their demand is growing even in developing countries [3]. Consumers are becoming more aware that food has a more significant impact on health. As consumers’ health con-

sciousness grows, so does the popularity of functional foods. This recent nutritional shift is heavily influenced by demographic changes such as increased life expectancy, an increase in the proportion of the aging population, rising health-care costs, and a desire for a higher quality of life [7].

The definition of functional food in Egypt is still relatively new, so the Egyptian market still needs to grow. Egyptian consumers appear hesitant to consume functional foods, most likely due to their high price compared to conventional alternatives or lack of awareness of their health benefits. In addition, the current state of food imperfection in Egypt results from a decline in the average per capita food supply and the expectation of a further reduction. These facts necessitated using food as medicine for disease prevention and protection due to population growth and GDP decline [17]. Furthermore, one of Egypt's Vision 2030 goals is for all Egyptians to live healthy and secure lives [18].

Consequently, this study aimed to determine how socio-demographic factors affect Egyptians' consumption of functional foods, perceptions, awareness, and comprehension of the health benefits of these products.

2. Methodology

2.1. Data Collection

This research is primarily based on data gathered through an online survey conducted from March 2021 until July 2021 and carried out in Alexandria governorate, the second-largest city after Cairo in Egypt. The information was gathered from a random sample of 201 community-dwelling participants aged 8 to 60. This sample was chosen because it is representative of the community, the community is homogeneous, and it makes data collection easy. Additionally, it is located in the authors' research area.

Questionnaires based on close-ended questions were used to make quantitative and qualitative data on functional food awareness based on the study's objectives. The questionnaire consists of three sections, including a total of 31 questions. The first section contains data on socio-demographics such as gender, age, area, family size, education level, income, and marital status. The second section of the questionnaire focuses on consuming functional foods during meals and sports activities. At the same time, the third section includes the factors influencing consumption, such as price, taste, appearance, availability of functional foods, and the awareness levels of functional foods.

Pretesting is preferable to do in preparation for the data collection. A pretest was carried out on a small sample ($n = 30$) to identify the questionnaire problems as difficulties in understanding the questions and improving and refining the questionnaire. Following the pretesting, no changes were deemed necessary, and the questionnaire was used in its original form.

2.2. Methods

Excel spreadsheets were used to enter and code the questionnaire data and ana-

lyzed using the IBM SPSS Statistics version 25 (“SPSS,” 1968). Cronbach’s alpha was used to assess questionnaire reliability. Cronbach’s alpha coefficients range from 0 to 1 (1 means there is reliability, and 0 indicates no reliability) [19] [20]. Pearson’s chi-squared test assayed independence among qualitative variables such as income, gender, and education as fundamental socio-demographic factors to influence functional food perceptions [21], with a yes/no response regarding functional food information and awareness of Pearson’s correlation between variables (values between +1 and -1). Stepwise regression analysis was used to determine the most influential factors in the purchase of functional foods.

3. Result and Discussion

3.1. Socio-Demographic Factors of Respondents

Table 1 describes the socio-demographic factors of respondents. 65.7% of respondents’ ages ranged from 20 to 40 years old; 22.9% from 40 to 60 years; the remaining about 11.5% were between 8 and 19 years old. The highest respondents in the total sample were females at 61.7%, while males were 38.3%. Moreover, most respondents have high-level education; about 33.3% were college graduates, and 29.4% had a post-graduate degree. Also, about 30.8% earned a monthly income ranging between 108 \$ and 216 \$; Egypt’s legal monthly minimum wage is 171 \$. Around 58.2% of respondents were married and had more than five members in their family. In addition, almost 72.1% of respondents do not suffer from diseases.

Table 1. Demographic characteristics of the sample study (N = 201).

Characteristics	Demographic Variables	n	%
Gender	Male	77	38.3
	Female	124	61.7
Age (years)	8 - 12	8	4.0
	13 - 19	15	7.5
	20 - 40	132	65.7
	40-60	46	22.9
Education level	less than high school	35	17.4
	High school graduate	25	12.4
	Some college	15	7.5
	College graduate	67	33.3
	Post-graduate degree	59	29.4
Income	Nothing	52	25.9
	Less than 108 \$	20	10
	108 \$ and 216 \$	62	30.8
	206 \$ to 325\$	32	15.9
	325 \$ and above	35	17.4

Continued

Marital status	single	70	34.8
	married	117	58.2
	divorced	8	4.0
	Widowed	6	3.0
Family size	1	4	2.0
	2	14	7.0
	3	22	10.9
	4	69	34.3
	5+	92	45.8
Health condition	Yes	56	27.9
	No	145	72.1

Source: data of the questionnaire.

3.2. Perception and Consumption Rate of Functional Foods

The sample revealed that they had no understanding of the term “functional foods,” so we changed the question to choose a food with health benefits beyond the essential nutrition they ate. **Figure 1** shows that respondents who always consumed dairy products (cheese, yogurt, and rayeb) daily about 39.3%, and this is consistent with [4] reported that the Egyptian consumers consumed 36% consumed dairy products, especially probiotic yogurt. Also, the respondents always consume vegetables & fruits daily, 31.8%; this finding is among those [3] who reported that approximately 37% of respondents consume functional foods daily. Additionally, results show the respondents sometimes consume these functional foods about 27.4% as a snack. As a result, despite functional foods in their diet, they are unfamiliar with the terminology. Therefore, about 21.9% of respondents always seek information about these products from food labels, while about 27.4% sometimes read food labels. However, other functional foods products, such as gluten-free products (oats, quinoa, and Chia-based products) and protein-fortified products (protein bars, soy protein, vitamins, and minerals), were never consumed by 33.8% and 31.8%, respectively. **Figure 2** shows that most respondents bought their food products from the local marketplace by 40.8%, followed by 25.4% of respondents who bought from both the marketplace and supermarket.

Additionally, **Figure 3** shows that the sports activity of respondents was about 78.6% did not do any sports. In comparison, 21.4% did, and about 17.9% of respondents who did sports consumed these food products to support their sports activity which confirmed a significant positive correlation of about 0.39 between sports activity and functional foods consumption at ($\rho = 0.01$). It means that the consumption of functional foods has contributed to increasing athletic activity. Moreover, [4] reported that sports activity is an appropriate medium for learning about functional foods, owing to the shared experience of training partners

and dietitians or coaches who assist athletes.

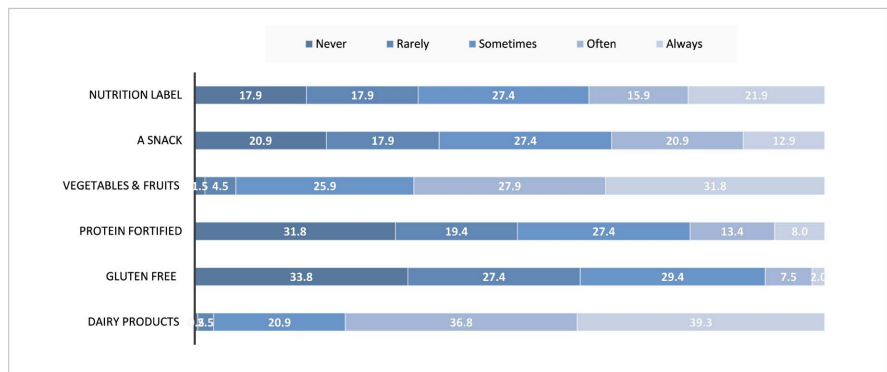


Figure 1. Functional foods products and consumption rate.

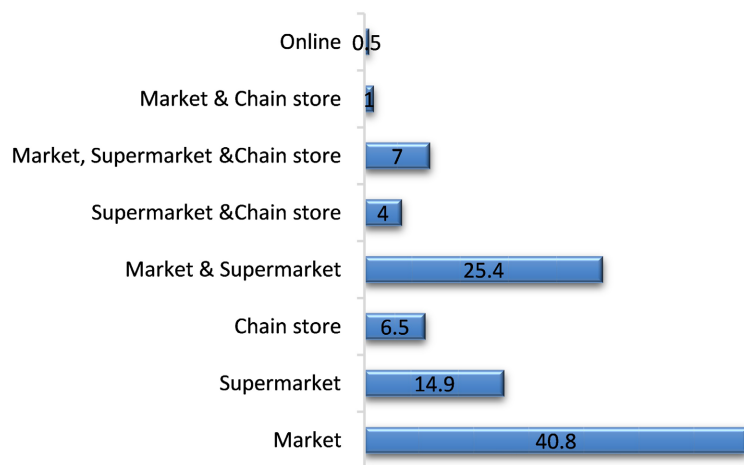


Figure 2. Shopping for food products.

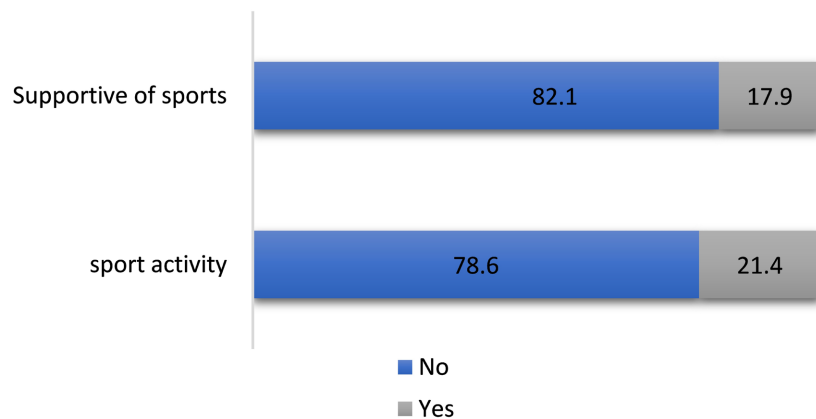


Figure 3. Sport activity.

3.3. Functional Foods Consumption & Socio-Demographic Factors

To investigate the relationship between functional food consumption and socio-demographic characteristics. The study classified consumption into low, medium, and high. A Chi-square test was used to see a link between respon-

dents' consumption of functional foods and their socio-demographic characteristics.

Table 2 shows a significant relationship between functional foods consumption and the age, education level and income of respondents. The age ($\rho = 0.007$), with 22% of young people between 20 - 40 years, have a low level, while 20.4% have a high level of consumption. Also, an education level ($\rho = 0.000$), with 9.5% of college graduates having a low level, while 11.4% have a high level consumed these foods. Furthermore, income ($\rho = 0.000$), with 6.5% of respondents earned monthly between 108 \$ to 216 \$, has a high level of consumption, while 12.9% have a low level.

A positive and significant correlation between age, educational level and income had been proved with the rate of functional foods consumption, concluding that low incomes range from 108 \$ to 216 \$ resulting in low consumption of functional foods, particularly among young people aged 20 to 40 who have a high level of education. Also, [3] reported that educated respondents and wealthy households were more aware of the benefits of functional foods and were willing to consume more of them. Meanwhile, [4] [6] reported that age was not significantly related to consumer knowledge of functional foods.

3.4. Awareness of the Health Benefits of Functional Foods

Functional foods have health benefits such as lowering cholesterol and assisting in bone and tooth formation and maintenance, acting as a dietary antioxidant and promoting overall health. As a result, according to the findings, respondents were aware of the health benefits of food products.

Figure 4 shows that the most benefit was bone and tooth preservation by 70.1% because the respondents always consume dairy products, which could be attributed primarily to the fact that calcium benefits bone health [4], followed by the immune system, is strong by 63.2% and thirdly by 60.2% for functional foods is the source of vitamins and minerals. It means that most respondents were aware of healthy eating principles and linked with broader long-term health benefits; this is consistent with the results [14]. Furthermore, Regular consumption of such foods will aid in the efficient management of diseases such as cardiovascular disease, tumors, diabetes and hypertension [22].

A Chi-square test was used to declare the link between the awareness of the health benefits of functional foods and socio-demographic characteristics; awareness was classified into low, medium, and high levels. **Table 3** shows a significant relationship between the awareness levels and the marital status and education level of respondents. The marital status ($\rho = 0.03$), with 25.4% of married have a low level of awareness, while 18.4% have a high level. As well as the educational level ($\rho = 0.000$), 14.9% of college graduates have a high level of awareness compared with 11% who have a low level.

These findings confirmed a positive correlation between marital status and educational level with the awareness levels of respondents. [21] affirmed that those with a higher level of education in Canada were more likely to be aware of

health claims.

Therefore, only 37.8% of the consumers have a high level of awareness of the health benefits of food products depending on marital status and educational level. Meanwhile, they are unaware of the term “functional foods”; our results are consistent with [7], who confirmed that over 70% of the consumers surveyed consumed functional foods, unaware of the terminology in Greece. Also, [15] found that consumers were unfamiliar with the term functional foods in Egypt. Moreover, [14] reported that individuals with a high level of education and income are more aware of functional foods than those with a lower or middle level of education and income. Moreover, [23] conveyed that in developing countries, community-based health promotion programs are considered a low-cost, feasible and long-term approach to changing health knowledge and practice to improve participants’ knowledge of food safety and healthy diet.

Table 2. Chi-square test result for the rate of functional foods consumption and demographic data.

levels	Age%				Total	χ^2	R	
	8 - 12	13 - 19	20 - 40	40 - 60				
Low	3.5	5.0	22.0	8.5	38.8			
Medium	0.50	2.5	23.4	9.0	35.3	0.007	0.009	
High	0	0	20.4	5.5	25.9			
	Education level%							
	>high school	High school graduate	Some college	College graduate	Post-graduate degree	Total	χ^2	R
Low	13.9	9.0	2.5	9.5	4.0	38.8		
Medium	3.0	3.0	3.5	12.4	13.4	35.3	0.000	0.000
High	0.5	0.5	1.5	11.4	11.9	25.9		
	Income%							
	Nothing	>L.E. 2000	L.E. 2000 - 4000	L.E. 4000 - 6000	< L.E. 6000	Total	χ^2	R
Low	14.9	5.5	12.9	4.0	1.5	38.8		
Medium	8.0	1.0	11.4	9.0	6.0	35.3	0.000	0.000
High	3.0	3.5	6.5	3.0	10.0	25.9		

Source: The authors’ calculations using SPSS V.25 program.

Table 3. Chi-square test result for the proportion of functional foods awareness and demographic data.

levels	Marital status%				Total	χ^2	R
	single	married	divorced	Widowed			
Low	8.5	25.4	1.5	0.5	35.8		
Medium	9.5	14.4	0.5	2.0	26.4	0.030	0.055
High	16.9	18.4	2.0	0.5	37.8		

Continued

	Education level%						0.000	0.000
	> high school	High school graduate	Some college	College graduate	Post-graduate degree			
Low	10.0	8.0	2.5	11.0	4.5	35.8		
Medium	7.50	2.5	1.0	7.5	8.0	26.4	0.000	0.000
High	0.0	2.0	4.0	14.9	16.9	37.8		

Source: The authors' calculations using SPSS V.25 program.

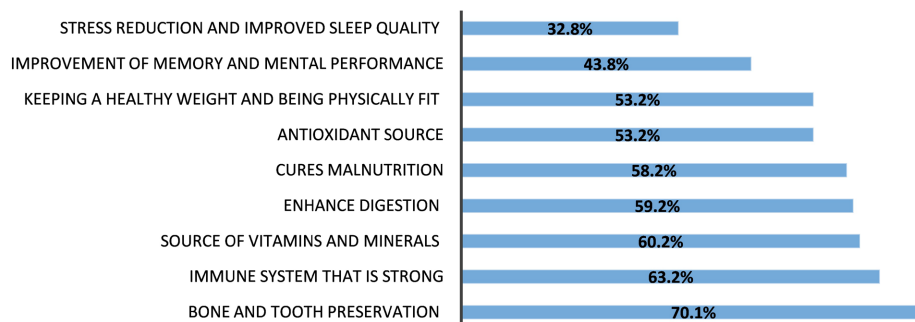


Figure 4. Responders' awareness of the health benefits of functional foods.

3.5. The Factors Influencing the Purchase of Functional Foods

This study chose a set of factors that we thought might impact respondents' consumption of functional foods. They include functional foods' taste, price, appearance and availability. This study therefore utilized stepwise regression analysis to determine the most important factors influencing the purchase of functional foods.

The following equation explains the most important factors influencing the purchase of functional foods:

Equation	R-2	F
$\hat{Y}_t = 20.4 - 2.87p + 1.74A$ (-6.5)*** (5.0)***	0.27	37.6***

where: ^a \hat{Y}_t = functional food consumption in the study sample. P = the price of functional food. A = the appearance of functional food. (***) Statistically significant at 0.001.

According to the previous equation, the most influential factors on the purchase of functional foods are price (P) and appearance (A), in that order. It demonstrates that price has a substantial and negative effect on the purchase of functional foods. This indicates that a 1% increase in price results in a 2.87% decrease in the purchase of functional foods. This indicates that the price of functional foods is high, preventing their consumption, and this result is consistent with [6]. Furthermore, [3] confirmed that price impedes the purchase of functional food for approximately 73% of respondents. In addition, the appearance of functional foods was mediocre and did not encourage purchase. Where the

appearance of functional foods has a significant and positive influence on their purchase. This indicates that a 1% increase in appearance results in a 1.74% increase in the purchase of functional foods. Furthermore, [14] [24] found that higher education and consumer knowledge of functional foods products significantly impact their trust in and purchase of these products.

4. Conclusion

About 37.8% of Egyptian consumers are aware of the health benefits of functional food products, but they are unfamiliar with the terminology used to describe these products. Price and appearance were the two most influential factors in functional food purchases. As a result, programs aimed at raising Egyptians' awareness of functional foods and their role in disease prevention must be put in place. This could help the Egyptian functional food market grow as consumer demand rises in the future.

Conflicts of Interest

The authors declared that they have no conflict of interest.

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