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BEHAVIOR OF CONSUMERS TOWARDS PROBIOTIC CONTAINING PRODUCTS AND ITS RELATED FACTORS

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ABSTRACT

Probiotics are live microbial food supplements that beneficially affect the host by improving its intestinal microbial balance. It is available in the form of food and dietary supplements like dairy products. The aim of the present study was to assess behavior of consumers towards probiotic containing products and factors affecting such behavior including their knowledge and attitude towards probiotic.

The study was a cross sectional study using a predesigned pilot tested interview questionnaire. It was designed to elicit personal and socioeconomic data, Respondents' knowledge, attitudes and behavior towards probiotic foods. Following filling the questionnaire data were coded and analyzed using SPSS v.16 program for statistical analysis. It was found that (3.6%) of the studied individuals had satisfactory knowledge level about probiotics and teachers significantly had the highest mean score of knowledge (18.9 ± 2) compared to other occupations whereas employee had the lowest mean score (15.5 ± 3). It was found that the higher level of education, the better knowledge about probiotics as those

with post graduate educational level had a significant high mean score compared to others (18.2 ± 3). Most of the participants involved (58.6%) had poor behavior, while only 5% had good behavior. Older individuals aged 38 years or more had a significant high mean score of behavior (4.6 ± 2), while younger individuals aged less than 28 years had the lowest mean behavioral score (2.4 ± 2). Males had a significant higher mean score of behavior than females. Most of those with poor behavior (56.3%) were students compared to other occupations. As regard attitude, it was found that 16.6% of individuals involved in the study had positive attitude towards probiotic and 81.8% were neutral. There was a significant association between the level of knowledge about probiotic and having positive attitude towards it. The stepwise multiple regression shows that factors entered the regression of individuals' behavior were: knowledge, attitude, age, sex, occupation, income, education and only age and attitude predicted individuals' behavior towards probiotic.

Keywords: Probiotic, Microbial Food Supplements, Microbial Balance, Dietary Supplements, Dairy Products, Behavior

INTRODUCTION

Many factors affect the composition of the large-intestinal microbiota in humans. These include the age, susceptibility to infections, nutritional requirements, immunologic status of the host, the pH, transit time, interactions between flora components, and presence and availability of fermentable material in the gut. Probiotics are live microbial food supplements that beneficially affect the host by improving its intestinal microbial balance. In most countries, probiotic products are classified as foods or food supplements and are freely available through supermarkets, pharmacies and health stores. Effects of these micro organisms have been rumored in different studies in the equalizing the intestinal flora, elevating lactose tolerance and ingestion,

decreasing cholesterol levels, synthesis of B complex vitamins, modulating the immune system, regression of tumors and reduction in carcinogen and mutagen production [1]. Also, probiotics have several benefit effects such as prevention and treatment inflammatory bowel disease, diarrheal diseases, and lactose intolerance [2]. It is available in the form of food and dietary supplements like dairy products [3]. Consumer surveys are extremely important to the food industry, they allow for the identification of the level of knowledge about a determined subject and also for increasing the level of consumer awareness [3].

Most research is directed toward understanding of mechanisms by which

probiotic organisms mediate their beneficial effects [4]. The probiotic mechanism which prevents gastrointestinal disturbances, is still not completely understood. Knowledge of gut ecology suggests several mechanisms including the suppression of harmful bacteria and viruses, stimulation of local and systemic immunity and the modification of gut microbial metabolic activity [5]. The characteristics essential for a probiotic are: adherence to human cells; gastric acid and bile stability; production of antimicrobial substances; and activity against pathogenic bacteria. Adherence to human intestinal cells is the first step in the mechanism of probiotic action then colonise. Moreover, to reach and colonise the intestine, the bacteria have to be resistant to acid pH and to biliary acids. Activity against pathogenic bacteria can be by several different mechanisms: directly by producing bacteriocins or antibiotics, by a competitive mechanism of adhesion, by competitive nutrition or indirectly by modulating the local immune system [6].

In recent years, worldwide interest in the use of functional foods containing probiotic has enhanced. There are an increasing number of probiotic products on the market and consumers are at a disadvantage in attempting to choose between them. These products may be underutilized due to a shortage of public knowledge with probiotic

products and low awareness of their benefits [7]. Following an education program, most consumers show an interest in increasing intake of functional foods including yogurt. Age, gender and health benefit awareness influence participants' intention to change dietary habits. Previous study reported that providing health benefit information concerning a probiotic juice increased consumer acceptance [8]. In a study by [9], there was a strong association between nutrition knowledge and intake of fruits, vegetables and fats.

The aim of the present study was to assess behavior of consumers towards probiotic containing products and factors affecting such behavior including their knowledge and attitude towards probiotic.

MATERIALS AND METHODS

Study design, settings and population: the study was carried out at Riyadh city by random sample from different areas as King Saud University and markets. The sample size was 138 individuals. The tool used for the study was a predesigned pilot tested interview questionnaire. It was designed to elicit the following information:

1. **Personal and Socioeconomic Data**
2. **Respondents' knowledge about probiotic foods** consisted of 28 yes/no statements pertaining to patients' knowledge about knowing of **probiotic foods**, availability and feasibility of **probiotic foods**,

appropriateness of their price compared to other products, if the **probiotic foods** ease digestion, prevent inflammation, increase blood fluency, may cause congenital malformation, empower immune system, regulate colon evacuation, act as diuretics, contribute to weight gain, decrease metastasis of cancer cells, help in alleviation of asthmatic attacks, help blood coagulation, help digestion in children, decrease immunity in children, large quantity cause colon distention, decrease cholesterol in the blood, decrease blood pressure, increase stomach acidity, increase constipation, decrease symptoms of lactase deficiency, cause skin rash, decrease diarrhea duration, alleviate some types of allergies, neutralize the level of beneficial bacteria in GIT, cause insomnia, help in alleviation of symptoms of irritable colon. Another knowledge question was asking about sources of probiotic foods.

Each question of the 29 was scored from (0-1). The total knowledge score ranged from (0-29). Standardized item alpha reliability coefficient (ARC) was 0.797 for knowledge instrument. The total

score of knowledge was divided as follows: poor knowledge (from score 0-14), fair knowledge (15-22), and satisfactory knowledge (23-29).

3. Respondents' Attitudes Towards Probiotic Foods

This was measured through Likert type statements scored from 1 to 3 with higher score for positive attitude. This included 3 items that **probiotic foods** cause side effects, the person get the wanted results **from using probiotic foods**, and that they had good taste. The score ranged from 3 to 9, $ARC=0.768$, and it was divided as follows: negative attitude (from score 3-4), neutral attitude (5-7), and positive attitude (8-9).

4. The Respondents' behavior scale:

included 6 yes/no statements pertaining to patients' behavior of **probiotic foods**, use of any probiotics as (activia, vital amaraai), use of them for knowing their benefits, using as complementary foods supplements, tablets or capsules, use of dairy products containing probiotics, use of other products fortified with probiotics and use for treatment of disease symptoms. Each item scored from 0-1. Another One multiple choice

item regarding frequency of probiotics use. It was scored from 0 to 4 with higher score for the daily use practice as judged by two professors of nutrition. The total score ranged from 0 to 10 and divided into: poor behavior (from 0-3), fair (from 4-7) and good (from 8-10).

Statistical Analysis

Following filling the questionnaire data were coded and analyzed using SPSS v.16 program for statistical analysis. Differences between the groups were analyzed using ANOVA test for continuous variables and the chi square test, Fisher's exact or Monte Carlo test for categorical variables. A multiple logistic regression was performed to determine the influence of the independent variables on behavior of participants towards probiotic. Statistical significance was considered when $P \leq 0.05$

RESULTS

Table 1 demonstrates some sociodemographic characteristics of the sample involved in this study. Nearly three quarters of the sample were young adults aged less than 28 years, while individuals aged 48 years or more were only 5.8% of that sample. Male to female ratio was nearly 1:1. As regards educational level, more than half of the studied sample was university educated, only 6% of the sample were not

working, while half of them were students. As regard income, half of the sample had income of less than 2500 SR per month.

Table 2 shows knowledge score regarding probiotic in relation to occupation and educational level. It was found that only 5 individuals (3.6%) had satisfactory knowledge level, while most of the sample (59.1%) had fair knowledge about probiotics. The Table revealed that teachers significantly had the highest mean score of knowledge (18.9 ± 2) compared to other occupations whereas employee had the lowest mean score (15.5 ± 3). It was found that the higher the level of education, the better the knowledge about probiotics as those with post graduate educational level had a significant high mean score compared to others (18.2 ± 3).

Table 3 demonstrates Knowledge score regarding probiotics in relation to the source of information. It was found that 54% of individuals involved in the study had their information from advertisements while about 20% of them from newspapers and magazines. Only 9% of them had their information from the internet.

Table 4 demonstrates behavioral score regarding probiotics in relation to sex, age and occupation. It was found that most of the sample involved (58.6%) had poor behavior, while only 5% had good behavior. The Table revealed that older individuals

aged 38 years or more had a significant high mean score of behavior (4.6 ± 2) and most of individuals with good behavior (57%) belonged to this age group, while younger individuals aged less than 28 years had the lowest mean behavioral score (2.4 ± 2). These differences were statistically significant (Chi square test $X^2 = 16.1$, $p < 0.05$). Males had a significant higher mean score than females (3.4 ± 2 versus 2.4 ± 2 respectively). Most of those with poor behavior (56.3%) were students, who had the lowest mean score (2.1 ± 2) compared to other occupations, while teachers had a significant higher mean score than other occupations (5.1 ± 2). These differences were statistically highly significant (ANOVA test $F = 5$, $p < 0.01$).

Table 5 demonstrates distribution of behavioral score of individuals involved in the study according to their knowledge regarding probiotic. There was a significant association between the level of knowledge about probiotic and having good behavior towards its use as the Table revealed that about half of those who had poor behavior had poor knowledge, while all individuals who had good behavior towards the use of probiotic had fair knowledge about it. These differences were statistically significant ($X^2 = 11.3$, $p < 0.05$).

As regard attitude, it was found that 16.6% of individuals involved in the study had positive attitude towards probiotic and 81.8% were neutral. **Table 6** demonstrates association between attitude towards probiotic and the level of knowledge regarding it among individuals involved in the study. There was a significant association between the level of knowledge about probiotic and having positive attitude towards it as the Table revealed that all individuals who had negative attitude had poor knowledge, while 82.6% of individuals who had positive attitude had fair knowledge. These differences were statistically significant ($X^2 = 13.3$, $p < 0.05$). It was also found that attitude towards probiotic significantly affects behavior, as 65.5% of those with neutral attitude had poor behavior and about 70% of those with positive attitude had fair or good behavior. These differences were statistically significant ($X^2 = 13.2$, $p < 0.05$).

The stepwise multiple regression in **Table 7** shows that factors entered the regression of models of individuals' behavior were: knowledge, attitude, age, sex, occupation, income, education and only age and attitude predicted individuals' behavior towards probiotic.

Table 1: Sociodemographic Characteristics of the Sample Involved in the Study

Variable	No (138)	%
Age group (years)	18-<28	100
	28-<38	12
	38-<48	18
	≥48	8
Gender	Female	72
	Male	65
Education	Primary or high school	43
	University	76
	Postgraduate	19
Occupation	Not working	8
	Student	66
	Teacher	13
	Employee	34
	Others	13
Income	<2500	62
	2500-<6000	20
	6000-<10000	21
	10000-<16000	9
	≥16000	16

Table 2: Knowledge Score Regarding Probiotics in Relation to Occupation and Educational Level

Variable	Knowledge Score			Mean knowledge score X ±SD	ANOVA Test
	Poor	Fair	Satisfactory		
	No. (%)	No. (%)	No. (%)		
Occupation					F= 4.8**
Not working	4 (8.2%)	3 (3.8%)	1 (20%)	16.5 ± 5	
Students	28 (57.1%)	36 (45%)	2 (40%)	16.1 ± 3	
Employee	12 (24.5%)	21 (26.3%)	1 (20%)	15.5 ± 3	
Physician	4 (8.2%)	7 (8.8%)	1 (20%)	16.5 ± 3	
Teacher	0 (0%)	13 (16.3%)	0 (0%)	18.9 ± 2	
Others	1 (2%)	0 (0%)	0 (0%)	2 ± 0.0	
	Chi square test X ² =15.02				
Education					F= 3.2*
Primary or high school	15 (29.4%)	27 (32.9%)	1 (20%)	15.9 ± 4	
	33 (64.7%)	40 (48.8%)	3 (60%)	15.7 ± 3	
University	3 (5.9%)	15 (18.3%)	1 (20%)	18.2 ± 3	
Postgraduate	Chi square test X ² =5.4				

NOTE: *p <0.05; ** p<0.01

Table 3: Knowledge Score Regarding Probiotic in Relation to the Source of Information

Source of Information	Knowledge Score			Total
	Poor n=51	Fair n=82	Satisfactory n=5	
	No. (%)	No. (%)	No. (%)	
Newspapers & magazines	9 (6.5%)	16(11.6%)	2 (1.4%)	19.6%
Advertisement	18 (13%)	54 (39.1%)	3 (2.2%)	54.3%
Family member or friends	7 (5.1%)	11 (8%)	1 (0.7%)	13.8%
Website	4 (2.9%)	8 (5.8%)	1 (0.7%)	9.4%
Others	2 (1.4%)	2 (1.4%)	0 (0%)	2.9%
Total	37%	59.1%	3.6%	100%

Table 4: Behavioral Score Regarding Probiotic in Relation to Sex, Age and Occupation

Variable	Behavioral Score			Mean Score X ±SD	ANOVA Test
	Poor	Fair	Good		
	No. (%)	No. (%)	No. (%)		
Age Group	67 (82.7%)	30 (60%)	3 (43%)	2.4 ± 2	F=6.3**
	18-5 (6.2%)	7 (14%)	0 (0%)	3 ± 2	
	28-7 (8.6%)	8 (16%)	3 (43%)	4.6 ± 2	
	38-2 (2.5%)	5 (10%)	1 (14.3%)	4.6 ± 2	
	Chi square test X ² = 16.1*				
Sex	46 (57.5%)	22 (44%)	4 (57.1%)	2.4 ± 2	F= 5.7**
	Female 34 (42.5%)	28 (56%)	3 (42.9%)	3.4 ± 2	
	Chi square test X ² = 2.3				
Occupation	45 (56.3%)	20 (41.7%)	1 (16.7%)	2.1 ± 2	F=5**
	Students 4 (5%)	6 (12.5%)	3 (50%)	5.1 ± 2	
	Teachers 17 (21.3%)	16 (33.3%)	1 (16.7%)	3.4 ± 2	
	Employee 8 (10%)	4 (8.3%)	0 (0%)	2.5 ± 2	
	Physicians 5 (6.3%)	2 (4.2%)	1 (16.7%)	2.8 ± 3	
	Non workers 1 (1.3%)	0(0%)	0 (0%)	0	
	Chi square test X ² = 19.5*				
Total	81 (58.6%)	50(36.2%)	7 (5%)	2.8 ± 2	

Table 5: Distribution of Behavioral Score of Individuals Involved According to their Knowledge Regarding Probiotic

Knowledge Score	Behavior Score			Chi Square Test
	Poor No (%)	Fair No (%)	Good No (%)	
Poor	38 (46.9%)	31 (26%)	0	X ² = 11.3*
Fair	41 (50.6%)	34 (68%)	7 (100%)	
Satisfactory	2 (2.5%)	3 (6%)	0	
Total	81 (100%)	50 (100%)	7 (100%)	

Table 6: Association Between Attitude Towards Probiotic and the Levels of Knowledge and Behavior Among Individuals Involved in the Study

Variable		Attitude Score			Chi Square Test
		Negative No (%)	Neutral No (%)	Positive No (%)	
Knowledge Score	Poor	2 (100%)	47 (41.6%)	2 (8.7%)	X ² = 13.3*
	Fair	0 (0%)	63 (55.8%)	19 (82.6%)	
	Satisfactory	0 (0%)	3 (2.7%)	2 (8.7%)	
Behavior Score	Poor	0 (0%)	74 (65.5%)	7 (30.4%)	X ² = 13.2*
	Fair	2 (100%)	34 (30.1%)	14 (60.9%)	
	Good	0 (0%)	5 (4.4%)	2 (8.7%)	
	Total	2 (100%)	113 (100%)	23 (100%)	

Table 7: Summary of Stepwise Multiple Regression Analysis for Variables Affecting Behavior Towards Probiotic

Model	R	R ²	Adjusted R ²	Beta	SE	P
(constant)						
Age	0.486	0.236	0.223	0.368	2.08	0.000 ^b
Attitude				0.289		

NOTE: a: Predictors: (constant), Age; b: Predictors: (constant), Age, Attitude; c: Dependent variable: Behavior

Variables Entered the Regression Models: Knowledge, Attitude, Age, Sex, Occupation, Income, Education

DISCUSSION

There has been a progressive increase in interest on the use of natural remedies to prevent or treat human ailments. The growth of probiotic products in the developed world has been rapid. Research on probiotics continues to increase on daily basis typified by over 1600 probiotic publications [10]. The present study showed that 59.1% of participants had fair knowledge about probiotics and 35.5 % (n=80) had poor knowledge. However, only a minority 3.6 % (n=5) had satisfactory knowledge level. Results from this study are comparable to results found from previous study. Survey by [11] found that 42.72% people defined probiotic foods as those that contribute in reduction in weight; 23.63% associated probiotic foods with cures of physiological problems and 14.54% failed to express any concept. Only 19.1 % defined probiotic foods correctly as foods contributing to the equilibrium of intestinal flora. The higher score of knowledge about probiotics found in those with post graduate educational level had a significant high mean score compared to others (18.2 ± 3). [12] reported a lack of knowledge about probiotic foods by 71 and 82% of men and women, respectively, resident in Greece. Similar to the present study, the authors reported that the level of knowledge about probiotic foods was related to the educational level.

The awareness among people regarding commercially available probiotic food products; 54% of the population involved in the study had their information from advertisements while about 20% of them from newspapers and magazines. Only 9% of them had their information from the internet suggesting a strong need of creating awareness among people (Table 3). A recent study by [4] found that The majority of consumers had been recommended to use probiotic supplements, most frequently by the media, but also commonly by doctors and friends, with 80% of non-users saying that they would use probiotics if recommended by a doctor.

From the Table 4, it could be seen that most of the sample involved (58.6%) had poor behavior, the individuals aged 38 years or more had a significant high mean score of behavior while younger individuals aged less than 28 years had the lowest mean behavioral score. Males had a significant higher mean score than females. Teachers had a significant higher mean score than other occupations. On the contrary, There were a few of studies, the results of these stud show that probiotic users are more likely to be female, educated and younger [13, 14, 15]. Consumers who are aware of probiotics tend to be more accepting of their potential Benefits [16]. Attitudes toward

probiotics range from knowledgeable and believing, to unaware and even repulsed.

The present study demonstrates that 16.6% of participants had positive attitudes (**Table 6**). Several studies regarding consumer attitude for functional foods have been carried out with subjects of different age groups. [17] found that 25% consumers to prefer functional orange juice preparations containing probiotic cultures to orange juices. However, only 11% reported this food as their first option – these participants were mostly elderly. [18] carried out a study involving consumers in USA, with respect to probiotic foods. Different responses were obtained with respect to knowledge about probiotic microorganisms, such as *Lactobacillus* and *Bifidobacterium*, and many consumers did not feel the need to ingest this type of food to strengthen their immunological systems. The results also disclosed that foods containing probiotic cultures should not be sold at a higher price and should provide information on their labels related to health aspects and possible effects on diseases, such as decreased cholesterol.

It was found that (3.6%) of the studied individuals had satisfactory knowledge level about probiotics and teachers significantly had the highest mean score of knowledge (18.9 ± 2) compared to other occupations whereas employee had the lowest mean

score (15.5 ± 3). It was found that the higher the level of education, the better the knowledge about probiotics as those with post graduate educational level had a significant high mean score compared to others (18.2 ± 3).

CONCLUSION

It was concluded that most of the sample had fair knowledge about probiotics and most of them had poor behavior, while only 5% had good behavior. Older individuals had a significant high mean score of behavior. Most of those with poor behavior (56.3%) were students. There was a significant association between the level of knowledge about probiotic and attitude towards it. The stepwise multiple regressions shows that only age and attitude predicted individuals' behavior towards probiotic.

It was recommended that health education programs about probiotics is highly needed to improve knowledge and correct attitudes and behavior toward them especially at television and for young and female students population to increase the benefits from probiotic use

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