Original article

Saudi Arabian Women's Knowledge of Probiotics and Prebiotics

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Summary. *Objectives:* In view of the potential positive role of probiotics and prebiotics in prevention and management of various diseases, understanding the perceptions of probiotics/prebiotics and their benefits on health among Saudi Arabian women is important. The purpose of this study was to investigate the knowledge of probiotic and prebiotic among Saudi Arabian women. *Methods:* Participants were invited to complete an online survey to evaluate their knowledge about probiotic and prebiotic. The online survey was distributed via email and social media platforms. A total of 206 Saudi Arabian women responded to the survey. *Results:* Most of the participants were aged 18-25 years. The analysis of the responses' level of knowledge resulted in a mean of 3.27 (between medium knowledge and good knowledge). Most of the participants were familiar with the definition, facts, and benefits of probiotic and prebiotic. The most recognized source of information about probiotic and prebiotic was books and studies. *Conclusion:* The overall level of knowledge of probiotic/prebiotic among Saudi Arabian women is slightly above average. Improved nutritional knowledge of Saudi Arabian women tasked with taking care of their own nutrition, and that of their families, has implications for the adoption of health eating patterns.

Key words: Saudi Arabia, Women, Probiotic, Prebiotic

Introduction

Probiotics such as lactic acid bacteria are defined as living microorganisms that have beneficial effects on hosts (1). They are a non-harmful microorganism that when consumed in adequate amounts either in a mixture or as a single organism will exert a beneficial impact on the host's health and physiology (2,3). They can be ingested in a form of regular food such as fresh uncooked vegetables and fruit, fermented pickles and dairy products (4). The human probiotic microorganisms have its place mainly in the following gene: *Lactobacillus, Bifidobacterium, Lactococcus, Streptococcus and Enterococcus* (3,5). Many studies have revealed that probiotics do have many advantageous functions in the human body, like the blocking of pathogen development, which increases the immune system competence (5,6). Moreover, they have a significant role in enhancing vitamins and mineral absorption and producing them, for instance, the *Bifidobacterium pseudocatenulatum* is known as a natural producer of vitamins B group (B1, B2, B3, B6, B8, B9, B12) (7).

On the other hand, prebiotics such as inulin and omega 3 are non-digestible food ingredients that mostly fibers and have beneficial effects on the host's health by stimulating the growth of microorganisms in the colon (2,4). Beyond being a source of nutrition, these prebiotics influence the host's health positively by selectively promoting the development and activity of certain types of gut probiotic microorganisms, commonly lactobacilli and bifidobacteria (2,8). Prebiotics are existed natural in a wide range of foods, but can also be added manufactory to food products, for example: breast milk, soybeans, inulin sources (soluble

dietary fiber as chicory roots), raw oats, unrefined wheat and barley, resveratrol (polyphenolic compound as grapes) and in particular non-digestible carbohydrates (3,9).

Evidence showed the beneficial role of probiotics for the prevention and treatment of diseases such as diarrheal diseases, lactose intolerance, allergic diseases, and colon cancer (10). In addition to probiotics, prebiotics also play an important effect on gut microbiota composition and diversity. Thus, probiotics and prebiotics can be recognized as potential functional foods, as they provide health benefits. Their potential positive role in health need to be recognized by people around the world, and Saudi Arabian is no exception.

Saudi Arabia has experienced significant economic growth that has led to great changes in lifestyle, including eating habits (11). Unhealthy eating patterns have been found to be significantly high among Saudi Arabians, especially in women (12). This unhealthy eating lifestyle has resulted in increased consumption of fast and processed food that include fewer nutritious foods as well as a poor or less interest in consumption of healthy food, such as probiotics and prebiotics (13,14). However, Saudi Arabian women knowledge influences their selection and consumption of functional food. These women play a critical role in the nutrition of Saudi families as they are responsible for the well-being of the family in the traditional setting of Saudi Arabian society.

The level of knowledge and the desirability of choosing functional food affected by some demographic changes like age, education, and income level. For this reason, functional food producers should take these factors into account (15). Educational strategies including nutrition education and media campaign can be a crucial intervention to educate Saudi Arabian women on the benefits and the usage of probiotics. While most research in Saudi Arabia is directed toward the perception of the pathological effect of probiotics/prebiotics, little is known about the perception and benefits of functional food among Saudi Arabians. Therefore, this study aimed to investigate the knowledge of probiotic and prebiotic among Saudi Arabian women.

Methods

Study Population

The population of Saudi Arabia was estimated to be 31 million people (16). Currently, about 13 million (44.8%) Saudi Arabian women live in Saudi Arabia (16). The study population included Saudi Arabian women, who were above 18 years old. The study participants consisted of 206 Saudi Arabian women ages 18 years and above. Saudi Arabian adult women were recruited through online.

Eligibility Criteria

Eligible participants in this study included Saudi Arabian women. Additional inclusion criteria were: minimum of 18 years old and able to read Arabic.

Design

An online-based cross-sectional survey was conducted to collect data on the knowledge of probiotics and prebiotic among Saudi Arabian women. The online survey was distributed through email and social media platforms using snowball sampling. It was divided into three sections. First section was the demographic information (age and education level). The second section, participants' knowledge of probiotics and prebiotic, was adapted (17). This section included eight items to measure participants' knowledge of probiotics and prebiotic. The item response options included a 5-point Likert scale ranging from 1 (*No Knowledge*) to 5 (*Very Good Knowledge*). The participants were asked to estimate their knowledge of probiotics/prebiotics on the scale. The item was scored as *No Knowledge* = 1, *Little Knowledge* = 2, *Medium Knowledge* =3, *Good Knowledge* = 4, *Very Good Knowledge* = 5. The participants were then asked about the definition of and facts about probiotics/prebiotics. Also, they were asked about the source of information/food about probiotics/prebiotics. The last section was adapted (18) to include four items to measure the perceived benefits of probiotics and prebiotic. A total of 206 participants filled out the survey regarding the knowledge of probiotics and prebiotic.

Data Collection Procedures

The data were collected after the study was approved by the Institutional Review Boards (IRB's) of King Saud University. The survey was anonymous. The participation in the study was voluntary. Participants were fully informed about the research and were required to agree on a consent form before answering the survey questions. All collected data was kept strictly confidential. The survey research was conducted online during the months of November and December in 2019.

Data Analysis

Statistical analysis was performed using SPSS Version 22. Descriptive statistical analysis was applied in the study with $p < 0.05$ considered significant. Frequencies were run to identify participants' demographic characteristics including identification of age and educational level. In addition, frequencies were run to determine participants' knowledge of probiotics and prebiotics. The Pearson Correlation Coefficient was applied to specify how two variables vary together, demographic characteristics and participants' knowledge of probiotics and prebiotics.

Results

A total of 206 women were included in the study. A total of 206 surveys were usable for data analysis. None of the survey were excluded because all the data was completed through the online survey that works by the mechanism of non- sending the questionnaire unless all answers are completed. Descriptive statistics, frequencies, and Pearson Correlation were used for statistical analyses. Ages ranged from 18 to 65 years. As shown in Table 1, most of the participants were aged 18-25 years and a low percentage were aged 46-65 years.

More than half of the study participants (53.4%) had received a bachelor's degree, 38.2% had received at least a high school diploma or its equivalent, while a smaller segment of the sample had an educational level below high school. The participants had gained their knowledge of probiotics/prebiotics from variety sources including books or studies 42%, health practitioners 31.2%, social media 19.4%, and family and friends 7.4%. Dairy products were the highest scored of food source of probiotics/prebiotics by 44.3%, followed by vegetables and fruits by 29.5%, grain by 17.4%, meat by 6.2%, while chocolate was the lowest scored of food source by only 2.6% of the study participants. Approximately half of the participants 56% reported food as the most common source of prebiotic/probiotic consumption and supplements were identified by 41%, while 3% reported that they did not know. As shown in Figure 1 and 2, probiotics were defined correctly by the majority of participants as useful bacteria for health when ingested and prebiotics as foods stimulate the growth of beneficial bacteria.

Over half of the participants recognized the effect of prebiotic on health as useful 51.4% and the majority of them identified prebiotics and probiotics as useful for the digestive system. On the scale of 1 (*No Knowledge*) to 5 (*Very Good Knowledge*), the question response options include as *No Knowledge* = 1, *Little*

Table 1. Frequency Distribution by Age Category (n=206)

Age Category	*N*	%
18-25	136	66
26-35	51	25
36-45	15	7
46-65	4	2
Total	206	100.0

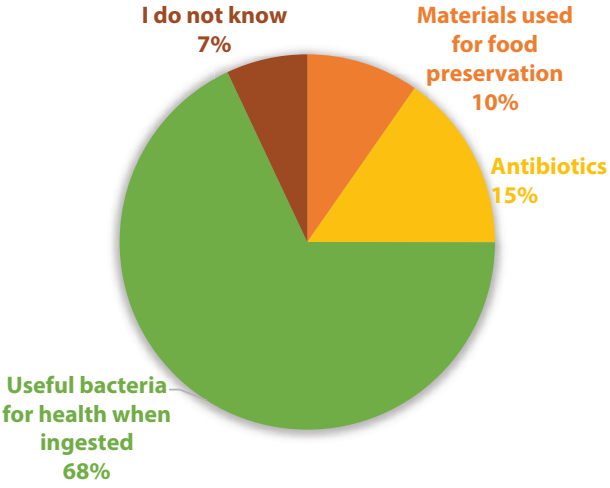

Figure 1. Definition of Probiotics

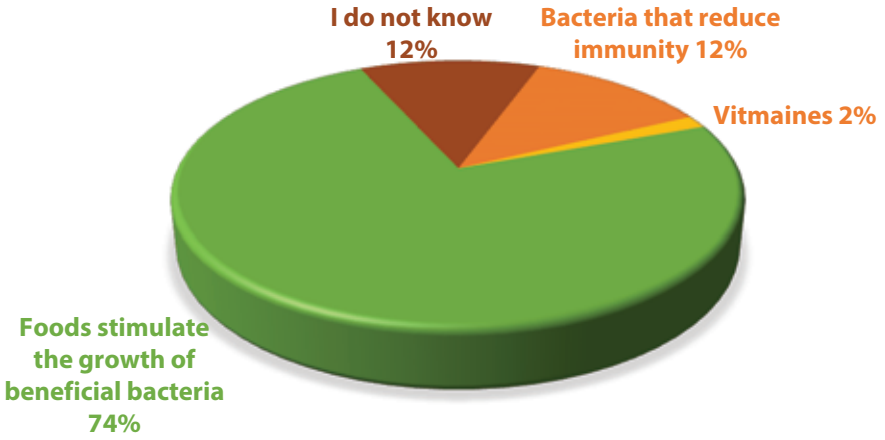

Figure 2. Definition of Prebiotics

Knowledge = 2, *Medium Knowledge* =3, *Good Knowledge* = 4, *Very Good Knowledge* = 5 with an average score 2.5. A higher score on this scale indicated a higher level of knowledge among the participants. The analysis of the responses resulted in a mean of 3.27 (between medium knowledge and good knowledge). The range of this scale score was 1–5.

Shapiro-Wilk tests found that all data were normally distributed. A Pearson Correlation (r) test was used to specify how two variables vary together, demographic changes and knowledge of probiotics and prebiotics. This study showed a moderate negative correlation ($r = -.366$, $p<0.05$) between age and prebiotic knowledge and a moderate negative correlation ($r = -.358$, $p<0.05$) was between age and probiotic knowledge. Also, the study indicated a high association between education level and probiotic knowledge ($r = .912$, $p<0.001$). This suggests that Saudi Arabian women with higher education level are more knowledgeable than participants with lower education level. An association was found between education level and prebiotic knowledge ($r = .409$) with $p<0.01$. This study showed a significant positive correlation between prebiotic knowledge and probiotic knowledge ($r = 0.83$, $p<0.001$).

Discussion

The purpose of the present study was to investigate the knowledge of prebiotic and probiotic among Saudi Arabian women. Nowadays it is well known that there is a strong association between diet and health. Unhealthy eating habits, namely increased caloric, sugar and high dietary fat intake in lieu of the traditional high-fiber are developing in Saudi Arabian women (19,20). The review of research has suggested that Saudi Arabian women are at greater risk for many diseases due to a high prevalence of unhealthy eating patterns (21). On the other hand, a growing attention has been recognized on food that is highly associated with health benefits to promote healthy eating behavior through consumption of functional food. The nutritional problems are attributed to a change in eating habits, illiteracy, and ignorance (22). A deeper understanding of Saudi Arabian women's knowledge of and benefits about probiotics/prebiotics is prerequisite to establishing healthy eating patterns among these women.

To counteract these trends, interventions should be implemented that increase Saudi Arabian women's awareness of the benefits of probiotics/prebiotics on human health under the current trend in consuming unhealthy foods. Therefore, this study was conducted to evaluate the knowledge of prebiotic and probiotic among Saudi Arabian women. Results of this study may be used to inform health care providers to discuss functional food with their patients and promote the potential benefits of probiotics and prebiotics consumption.

Women's lack of knowledge may result in poor motivation for adopting healthy behavior 23). Thus, research on the knowledge of the role and usefulness

of probiotics and prebiotics on health improvement should be more emphasized among the target population. Research on the knowledge of prebiotic and probiotic among Saudi Arabian women will enrich the existing research on nutritional health in Saudi Arabia. The findings of the research will be crucial in developing interventions to educate Saudi Arabian women on healthy food selection and consumption. The findings of this study will help the Saudi Arabian women rediscover the importance of healthy eating choices. Dieticians and nutrition/health educators in Saudi Arabia could potentially provide a tremendous impact on Saudi Arabian women by promoting the benefits of probiotics and prebiotics.

The major findings of this study revealed that participants' level of knowledge was above average, which could suggest that the participants are likely to adopt healthy food choices behaviors. Similar results were also found in two different studies, which indicated that that most of the study participants evaluated their knowledge of probiotics as medium and females showed better knowledge than males about probiotics (24). Also, this seems to confirm an Irish study indicating that female consumers tend to more knowledgeable than men regarding probiotics (25).

The study showed a moderate negative correlation between age and knowledge of probiotics and prebiotics. The correlation is statistically significant with a significance level of $p<0.01$. This suggest that older participants are more likely to be less knowledgeable about probiotics and prebiotics. Moreover, a significant positive correlation was found between education level and probiotics/prebiotics knowledge. This suggests that Saudi Arabian women with higher educational level are more likely to be knowledgeable about probiotics and prebiotics. This result concurs with previous research indicating that more educated participants were more likely to know more about probiotics (7).

In this study, most of the participants reported prebiotics and probiotics as useful for the digestive system and recognized the effect of prebiotic on health as useful. This result supports the literature that highest proportion of participants identified the beneficial effect of probiotics (17). Scientific source (book and studies) was the highest source of information about probiotics/prebiotics among the participants of the study. However, these results do not concur with two different studies indicating that mass media is the greatest source of knowledge on probiotics and family members and mass media were the most two sources of health information, including prebiotic and probiotic (21, 26).

There are some limitations in this research. The current study was a cross-sectional study; therefore, no inference of cause and effect can be made. This study could not address the potential over-reporting of the knowledge of prebiotic and probiotic since the variables of interest were measured by self-report. The study was conducted among Saudi Arabian women. Thus, the findings cannot be generalized beyond the study sample.

Conclusion

This study offers new insights about the knowledge about probiotics and prebiotics. It founds that participants' level of knowledge was above average, which could suggest that the participants are likely to adopt healthy food choices. These findings can help health care providers, specifically, dieticians to design appropriate programs, awareness messages, and community campaigns to increase the knowledge and health beliefs about functional food. The results of this study indicate that continued research in this area is warranted. Future research could, for example to investigate individuals experience with probiotics/prebiotics and factors that influence their use among the target population.

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