MEDICAL SCIENCE

Health professionals' knowledge, attitude and practice regarding probiotics use in Saudi Arabia: A cross-sectional study

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ABSTRACT

Background: Probiotics are living microorganisms that, when given to a host in sufficient amounts, have a positive impact on their health, currently being considered as viable therapy options because of research. The purpose of this-paper was to assess the knowledge, attitude, and practice about probiotic use among health professionals in KSA. *Method:* A cross-sectional study was conducted on 237 health care workers from Saudi Arabia using a self-administered online disseminated questionnaire for data collection. SPSS 23.0 for Windows was used to gather, tabulate, and statistically analyze all the data. Absolute and relative frequencies were used to express qualitative data. Relative and absolute frequencies were used to express the qualitative data. Categorical variables were compared using either the chi-squared or Fisher's exact test. Statistical significance was set at $P < 0.05$. *Results:* The outputs showed that, 14.3% of participants have good knowledge and 3% have very good knowledge. Knowledge of probiotics was significantly-associated with their residence region, gender, marital status, and professional position ($P < 0.05$). 48.9% of participants consumed a probiotic product previously. 51.1% recommend the patient/family/close relative to consume probiotics. *Conclusion:* This study offers insightful information about Saudi Arabian healthcare providers' probiotic knowledge and practice. Healthcare professionals from different locations of Saudi Arabia have significantly distinct knowledge gaps and practice patterns with regard to the definition, knowledge, and usage of probiotics.

Keywords: Probiotics, healthcare workers, bacteria, GIT

1. INTRODUCTION

Numerous bacteria that exhibit a symbiotic relationship with their hosts are found in the human oral cavity and gastrointestinal tract. These bacteria perform crucial tasks, such as regulate immune responses, energy production, and lipid metabolism. Commercial products such as probiotics and prebiotics, which are "living microorganisms", alter the gut flora and are advantageous for the host's health (Patait et al., 2022). The term "probiotic" is a combination of "pro" (Latin for "for") and "bios" (Greek for "life"). Probiotic is used to contrast the term "antibiotic", which was first used in the 1960s (Arshad et al., 2021).

Élie Metchnikoff won the Nobel Prize in Medicine in 1908 for his research into the immune system and gut bacteria. Yakult is a Japanese dairy probiotic that has been commercially available since 1935. They are also prebiotics, which are substances that have been carefully fermented to allow for alterations in the gut-microbiota's-composition and/or activity. They positively benefit the host's health and well-being (Patait et al., 2022).

The Food and Agriculture Organization/World Health Organization working committee created guidelines in 2002 to aid in the interpretation of the interpretation of the original definition of probiotics established in 2001. The term prebiotic and probiotic have been widely used by the scientific community for approximately 20 years. The International Scientific Association for Probiotics-released a report in 2014, Prebiotics-released the current and most frequently used definition of probiotics, which is as follows: live bacteria that, when given to a host in proper quantities, boosts their health (Patait et al., 2022).

According to a 2019 systematic review and meta-analysis, probiotics may play a role in regulating adult overweight/obesity and related metabolic parameters. Probiotic supplementation can decrease weight gain and enhance some related metabolic parameters, making it a useful tool for the prevention and management of adult obesity (Wang et al., 2019). Probiotics, however, may have different effects on the body weight. It has been demonstrated that female-university students are more concerned about controlling their body-mass-index, eating more-fruits and-vegetables, exercising more, choosing meals with less sugar and fat, maintaining-lower-calorie consumption, and generally being more-health-conscious (Qahwaji, 2023; Chanpura and Kumar, 2023; Alghamdi et al., 2023).

In 2022, the effects of probiotics on the gut microbiome of young individuals with anorexia nervosa were investigated. The results justify that probiotic therapy can normalize the composition of microbiome, reduce inflammation and gastrointestinal pain, and improve body weight; it could be included in the multimodal treatment of anorexia nervosa (Gröbner et al., 2022). According to a 2019 review article, probiotics reportedly have an impact on the gastrointestinal tract and other systems. Regular consumption of probiotics restores the intestinal microbiota balance and may benefit the cardiovascular system, at least in part, due to their ability to reduce oxides (Vasquez et al., 2019).

Probiotics are currently considered viable therapeutic options. It is essential for doctors to have a comprehensive understanding of probiotics to provide patients with accurate information on its functions and possible uses as alternative medicines. Therefore, it is crucial to evaluate healthcare professionals' probiotic knowledge, attitudes-and-practices. Thus, to this end, we aimed to assess the knowledge-attitudes-and-practices of probiotic use among healthcare professionals in the Kingdom of Saudi Arabia.

2. MATERIALS AND METHODS

Male and female physicians who agreed to participate in the study and completed the questionnaire were included in a cross-sectional study conducted between 1 October 2022 and 30 January 2023. A social media-distributed online survey, obtained from previous studies, was used to collect data and was related to knowledge, practices, and attitudes toward probiotics.

The questionnaire was composed of five sections. The first section was the introduction, which explained the nature of the research and confidentiality of participants' information. Socio-demographic details of the participants, such as age, sex, marital status, level of education, and years of experience, were included in the second section. The third section assessed the physician's knowledge by rating their probiotic knowledge, choice of correct definition, response to multiple-choice questions regarding probiotic-containing microbial species, and five true-and-false statements. The fourth section assessed the physician's attitudes toward probiotic via grading of ten statements on a 5-point Likert scale. The last section assessed their practices using "Yes" or "No" questions.

The study was approval by the Ethical Research Committee of Taif University (No: 44-034; |26-9-2022|). The National Council for Bioethics accredited the group (No: HAO-02-T-105). SPSS for Windows (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.) was used to gather, tabulate, and analyze all data. Absolute and relative frequencies were used to express qualitative data (percentages). Relative and absolute frequencies were used to express the qualitative data (percentage). Categorical variables were compared using either the chi-squared or Fisher's exact test. Statistical significance was set at $P < 0.05$.

3. RESULTS

We included 237 healthcare professionals in the study, of whom 57.8% were females and 42.2% were males. Approximately 73% of the participants were aged 25–35 years, while 16% were aged 36–45 years. Among the participants included, 49.8% were physicians, 35.4% pharmacists, and 14.8% surgeons (Table 1).

Table 1 Socio-demographic characteristics of participants (n=237)

Parameter		No.	%
Residence	Jeddah	46	19.4
	Makkah	73	30.8
	Medina	44	18.6
	Taif	66	27.8
	Yanbu	8	3.4
Age	25-35	173	73.0
	36-45	38	16.0
	46-55	21	8.9
	>55	5	2.1
Gender	Male	100	42.2
	Female	137	57.8
Marital status	Married	103	43.5
	Single	134	56.5
Professional position	Pharmacist	84	35.4
	Physician	118	49.8
	Surgeon	35	14.8
Total number of years in practice	0-5 years	151	63.7
	6-15	61	25.7
	>15	25	10.5

Approximately 14.3% of the participants had good knowledge, 3% had very good knowledge, 45.1% had little knowledge, 26.2% had moderate knowledge, and 11.4% had no knowledge. Lactobacillus acidophilus was identified by 65% of the participants as a probiotic strain, and 12.7% of the health professionals incorrectly chose Mycobacterium avium as a probiotic bacterium (Figure 1).

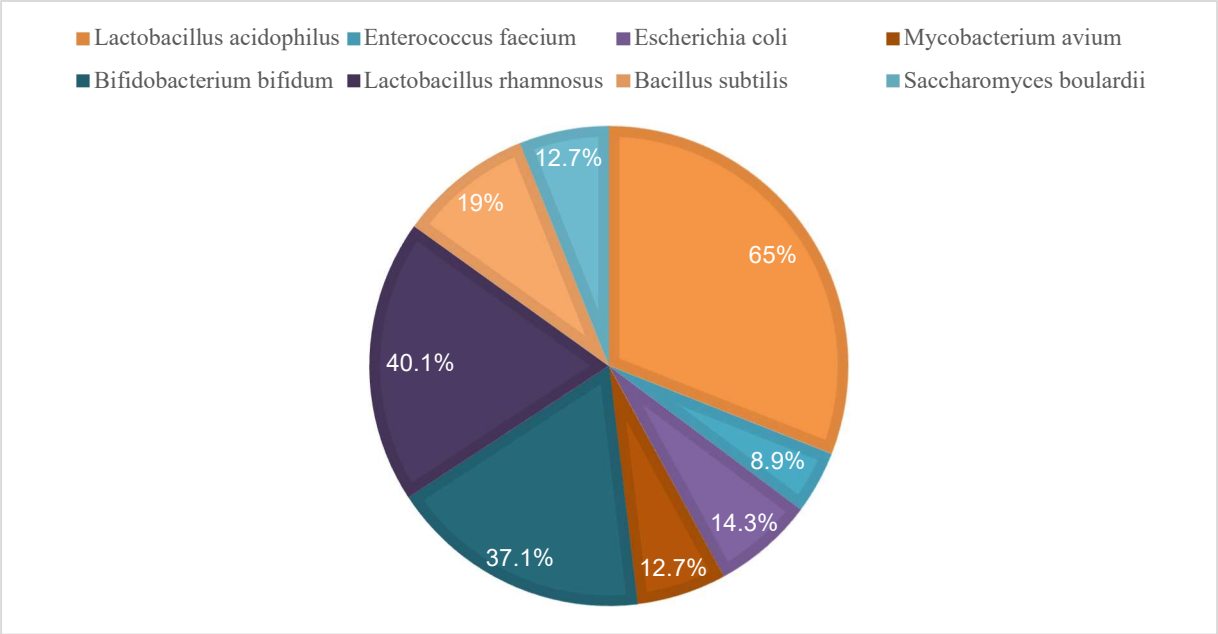

Figure 1 Microbial species contain probiotic strains

As in Table 2, a total of 77.2% of the participants reported that tablet, powder, or capsule forms of probiotics were effective. Additionally, approximately 53.2% of participants believed that probiotics must be consumed for a long time to produce a positive effect, as they disappear from the gut after two weeks. A total of 65.4% participants reported that the bacteria in probiotics must be alive, and 67.9% reported that probiotics should be taken before a meal. The sources of information-on-probiotics were books or expert magazines (10.5%), pharmacies (8.9%), radio or television (3.8%), the internet (51.1%) and from working as a healthcare professional (25.7%). Approximately 21.9% of the participants strongly agreed that consuming probiotics was beneficial to their health.

Table 2 Participants' attitude of probiotics (n=237)

Parameter	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Consuming probiotics is beneficial to one's health	52 21.9%	95 40.1%	82 34.6%	2 .8%	6 2.5%
Probiotics can have an impact on the outcome of therapy	42 17.7%	102 43.0%	77 32.5%	12 5.1%	4 1.7%
Probiotics may be an alternative option for preventing digestive system complaints	41 17.3%	106 44.7%	70 29.5%	18 7.6%	2 .8%
Probiotics may reduce antibiotic side effects	34 14.3%	105 44.3%	63 26.6%	28 11.8%	7 3.0%
Some mental health conditions are improved by taking probiotic supplements	31 13.1%	83 35.0%	86 36.3%	26 11.0%	11 4.6%
Some Probiotic Strains May Promote Heart Health	39 16.5%	83 35.0%	86 36.3%	24 10.1%	5 2.1%
Probiotics Have the Potential to Reduce the Severity of Certain Allergies and Eczema	36 15.2%	80 33.8%	83 35.0%	30 12.7%	8 3.4%
Probiotics Could Aid in Immune System Boosting	49 20.7%	81 34.2%	81 34.2%	18 7.6%	8 3.4%
Probiotics Could Aid with Weight Loss	35 14.8%	73 30.8%	86 36.3%	33 13.9%	10 4.2%

As in Figure 2, participants' attitude of probiotics related to Probiotics may be an alternative treatment for digestive system complaints 36.7% agree and only 5.5% strongly disagree.

According to 17.7% of those who strongly agreed, probiotics may affect the results of therapy. Approximately 17.3% and 13.5% of the participants strongly agreed that probiotics may be an alternative option for preventing and treating digestive system complaints, respectively. Among the participants, 14.3% strongly agreed that probiotics may reduce the side effects of antibiotics. Furthermore, 13.1% and 16.5% of the participants strongly agreed that probiotic supplements can help with mental health issues and promote heart health, respectively. Approximately 14.8% of participants strongly agreed that probiotics could aid with weight loss. Among the participants, 48.9% had previously consumed a probiotic product. Furthermore, 51.1% of the participants had recommend probiotics to patients/family/close relatives, for gut issues and GI health. Approximately 65% of the participants had looked for additional information on probiotics from various sources. The participant's knowledge of probiotics was significantly associated with their residential region, sex, marital status, and professional position ($P< 0.05$) (Table 3).

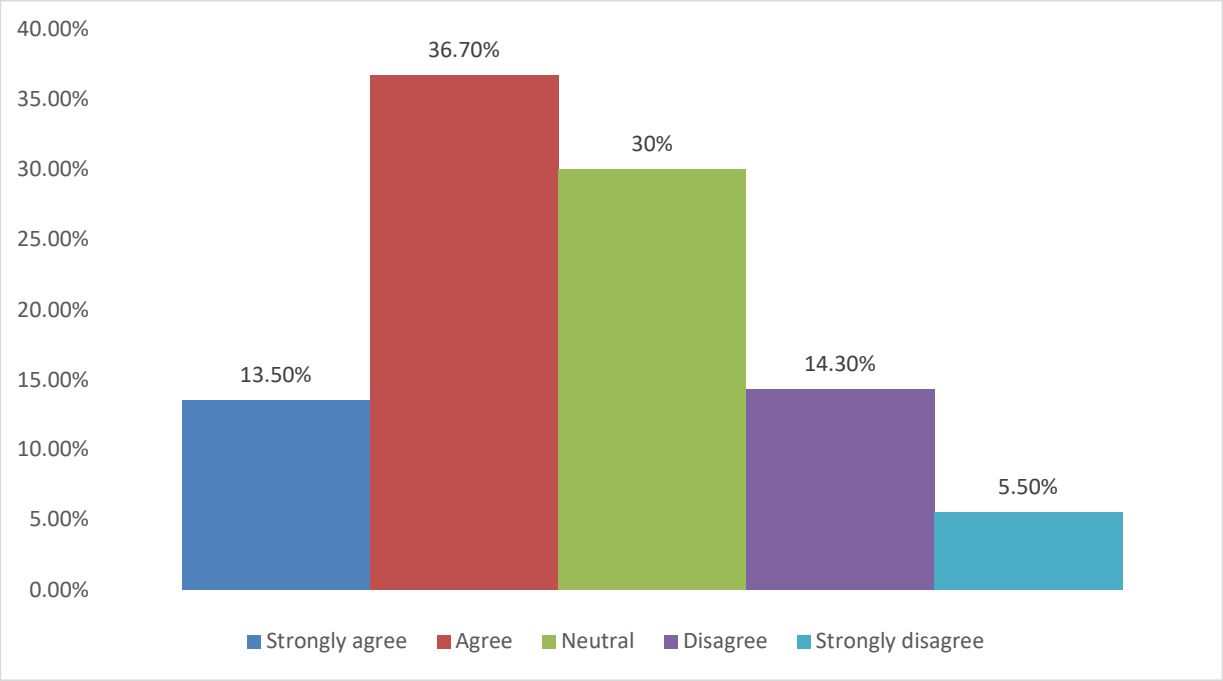

Figure 2 Participants' attitude of probiotics related to Probiotics may be an alternative treatment for digestive system complaints

Table 3 Association between participants knowledge of probiotics with their socio-demographic characters

		Knowledge of probiotics					Total (N=237)	P value
		Good knowledge	Little knowledge	Medium knowledge	No knowledge	Very good knowledge		
Residence region	Jeddah	8	27	5	3	3	46	0.044
		23.5%	25.2%	8.1%	11.1%	42.9%	19.4%	
	Makkah	6	33	27	6	1	73	
		17.6%	30.8%	43.5%	22.2%	14.3%	30.8%	
	Medina	7	15	15	6	1	44	
		20.6%	14.0%	24.2%	22.2%	14.3%	18.6%	
	Taif	12	28	15	9	2	66	
		35.3%	26.2%	24.2%	33.3%	28.6%	27.8%	
	Yanbu	1	4	0	3	0	8	
		2.9%	3.7%	0.0%	11.1%	0.0%	3.4%	
Age	25-35	21	84	42	19	7	173	0.544
		61.8%	78.5%	67.7%	70.4%	100.0%	73.0%	
	36-45	8	15	11	4	0	38	
		23.5%	14.0%	17.7%	14.8%	0.0%	16.0%	
	46-55	3	7	8	3	0	21	
		8.8%	6.5%	12.9%	11.1%	0.0%	8.9%	
	>55	2	1	1	1	0	5	
		5.9%	0.9%	1.6%	3.7%	0.0%	2.1%	
Gender	Male	14	43	20	18	5	100	0.019
		41.2%	40.2%	32.3%	66.7%	71.4%	42.2%	
	Female	20	64	42	9	2	137	
		58.8%	59.8%	67.7%	33.3%	28.6%	57.8%	
Marital status	Married	17	36	36	12	2	103	0.029
		50.0%	33.6%	58.1%	44.4%	28.6%	43.5%	
	Single	17	71	26	15	5	134	

		50.0%	66.4%	41.9%	55.6%	71.4%	56.5%	
Professional position	Pharmacist	18	32	20	7	7	84	0.005
		52.9%	29.9%	32.3%	25.9%	100.0%	35.4%	
	Physician	11	58	35	14	0	118	
		32.4%	54.2%	56.5%	51.9%	0.0%	49.8%	
	Surgeon	5	17	7	6	0	35	
		14.7%	15.9%	11.3%	22.2%	0.0%	14.8%	
Total number of years in practice	0-5 years	19	75	36	16	5	151	0.656
		55.9%	70.1%	58.1%	59.3%	71.4%	63.7%	
	6-15	10	24	17	9	1	61	
		29.4%	22.4%	27.4%	33.3%	14.3%	25.7%	
	>15	5	8	9	2	1	25	
		14.7%	7.5%	14.5%	7.4%	14.3%	10.5%	

4. DISCUSSION

Numerous clinical issues, including acute, antibiotic-associated, or travellers' diarrhea, inflammatory bowel disease, irritable bowel syndrome, ulcerative colitis, and Clostridium difficile infection, may result from changes in the human gut microbiota (Cai et al., 2018; Asto et al., 2019). Probiotics can be used to treat and prevent such complications. Additionally, probiotics are helpful in the treatment of diseases other than those of the gut, such as allergies, obesity, stress, cardiovascular illnesses, and urinary and respiratory tract infections (Wang et al., 2019; Rondanelli et al., 2017).

We aimed to evaluate the health-care-professionals' knowledge-attitudes-and-practices regarding probiotics. We found that only a small proportion of healthcare professionals had good or very good knowledge of probiotic use. A 2021 study involving pediatricians in Saudi Arabia revealed that pediatric gastroenterologists had high probiotic knowledge (42.9%), whereas pediatric consultants had low probiotic knowledge (47.7%) (Hasosah et al., 2021). This could be related to the use-of-probiotics in their practice, thus encouraging them to understand probiotics better than other health professionals. Most studies have focused on the benefits of probiotics in gastrointestinal diseases.

Another study in Pakistan revealed that only 15.1% of healthcare practitioners had good knowledge of probiotics, and 89.1 precent had a positive-opinion of probiotics (Arshad et al., 2021). The findings of our study were similar to those of this study. An international survey revealed that healthcare professionals whose knowledge were assessed as good (36.2%) or moderate (36.4%) were more likely to be females (Fijan et al., 2019).

The majority of healthcare practitioners had a positive outlook about probiotic use, with two-thirds of the participants looking for additional information from various sources. Half of the participants had suggested the-use of probiotics-to their patients, family members, or close relatives, and approximately half of them had previously consumed probiotics. These findings are consistent with those of other studies-conducted in (Jordan-Nigeria-India), and Indonesia (Ababneh et al., 2020; Anukam et al.,2006; Soni et al., 2018; Basrowi et al., 2019).

Lacto-bacillus acido-philus was the most widespread probiotic that participants in the current study were aware of and used. However, Draper et al., (2017) determined that Lactobacillus rhamnosus GG is frequently recommended for improving gut health. In another study, majority of the surveyed doctors commonly recommended Bifidobacterium infantis and probiotic mixture (VSL-3) for antibiotic-induced diarrhea and irritable bowel syndrome (Williams et al., 2010). The most widely used probiotic strains belong to the genera-Lactobacillus and Bi-fidobacterium (Fijan, 2014; Pandey et al., 2015).

Recent studies have shown that the therapeutic benefits of probiotic products are strain and disease-specific. When selecting a suitable probiotic, it is crucial to match the strains to the particular health issue and consider the preparation method, dosage, and source (Sniffen et al., 2018). Thus, healthcare professionals should only recommend probiotics that are proven to be effective in treating the specific health problem. Additionally, they should limit their recommendations to high-quality products that adhere to the external labelling. According to Aldawsari et al., (2020) only 1 of the 22 reviewed products were confirmed to contain bacterial strains via a genotypic-method; the other 21 had different phenotypes. More than 1/2 of the reviewed-products lacked the strain name on the external label (Aldawsari et al., 2020).

The participants' knowledge of probiotics in our paper was significantly associated with their residential region, sex, marital status, and professional position. Professionals in Jeddah and Taif exhibited higher knowledge rates than those in Yanbu, which may be attributed to the fact that we did not receive sufficient responses from healthcare professionals in Yanbu. The female sex

exhibited significantly better knowledge than the male sex did. Pharmacists seemed to have excellent knowledge compared to physicians and surgeons. An international study showed similar results that medical doctors and nurses had lower knowledge scores than pharmacists, allied healthcare professionals, and other healthcare professionals did (Fijan et al., 2019).

5. CONCLUSION

Our study offers insights into the probiotic knowledge and practices of Saudi Arabian healthcare providers. Healthcare providers in various regions of Saudi Arabia have distinct knowledge gaps and practice patterns regarding the definition-knowledge-and use of-probiotics. Individuals responsible for creating probiotic-related training material for pediatricians may find it useful to identify this knowledge and practice gaps. Although the participants exhibited favorable attitudes toward the use of probiotics, professional health organizations should initiate targeted training programs to change healthcare providers' attitudes toward their profession and raise awareness about probiotic usage.

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Author Contributions

The authors confirm contribution to the paper as follows: Data collection: Analysis, interpretation of results: Ghaliah Alnefaie, Renad Alammari, Aseel Alzahrani, Rana Althobaiti. Draft manuscript preparation: Faten Althomali, Nada Alsherbi, Eman Ali Khalifa. Ghaliah Obaid Alnefaie, Renad Mirzam Alammari, Aseel Ahmad Alzahrani, Rana Mohammed Althobaiti, Faten Abdullah Althomali, Nada Abdullah Alsherbi, Eman Ali Khalifa. All authors reviewed the results and approved the final version of the manuscript.

Ethical Approval

Ethical approval was obtained from the Research Ethical Committee at faculty of Medicine at Taif University, Saudi Arabia (Ethical approval number: No: 44-034; 26-9-2022). Participants were informed that their participation is voluntary and filling the questionnaire indicates their consent to participate.

Informed consent

Written consent was obtained from all individual participants included in the study

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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