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ORIGINAL RESEARCH

Assessing the Knowledge and Prescription Practice of Gastroenterologists and Pharmacists Toward Probiotics in Saudi Arabia: An Electronic Survey-Based Study

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Background: Probiotics are live microorganisms that provide many benefits to the human body when supplemented with a diet. In Saudi Arabia, there are limited studies on the use of probiotic supplements for some gastrointestinal inflammatory and infectious conditions. Many health professionals who provide health care for patients with gastrointestinal conditions may recommend probiotics at different degrees based on their knowledge and experience. This study aimed to explore the knowledge and practice of gastroenterologists and pharmacists in Saudi Arabia regarding probiotics.

Methods: We measured the practice of recommending, prescribing, and using probiotics by analyzing the responses of the healthcare specialists (gastroenterologists and pharmacists) using an anonymous online survey. The survey was constructed to explore the knowledge, use, and manner of prescribing probiotics by healthcare practitioners in the Saudi community to discuss health benefits with patients with gastrointestinal conditions.

Results: Most gastroenterologists (61.5%) partially disagreed that probiotics could benefit the treatment of digestive symptoms. However, a third of the pharmacists agreed that probiotic products could relieve digestive symptoms. The attitude toward and practice of prescribing probiotics depend on many factors, including professionals' beliefs in the benefits of probiotics, insufficient evidence from previous studies and clinical trials about the beneficial use of probiotics, cost, and manufacturing brands.

Conclusion: Gastroenterologists' and pharmacists' knowledge of probiotics was up to date as evident by their ability to identify specific digestive disorders for which probiotics may be beneficial, as well as their rejection of the notion that probiotics are universally effective in all gastrointestinal disorders, which is a commonly held belief in the community. The cost of probiotics as supplements to dairy products or as brands alone may also affect the prescription of probiotics by health professionals, as shown in the current study.

Keywords: perception, probiotics, gastroenterologist, pharmacist, practice

Introduction

Probiotics are a mixture of live microorganisms that provide a healthy balance to the host.[1] Increasing evidence supports the notion that probiotics consumed with fermented milk or supplements can maintain and restore normal gut microbial balance.[2] Probiotics support the immunological equilibrium in the gut[3] and maintain the integrity of the intestinal epithelium.[4] Modern lifestyle, diet, and antibiotic use can alter the gut microbial balance.[5] Recent studies have associated changes in gut microbiota with the body's health and immune system.[6] The mechanism of action of probiotics is very sophisticated and varies depending on the microorganism's species.[2]

Increasing evidence supports the health benefits of probiotics in several conditions, such as diarrheal diseases, allergic reactions, alcohol-induced liver disease, coronary heart disease, and even cancer.[7] However, the effect of probiotics on various gastrointestinal diseases has received great attention in recent years.[2] These studies have shown that probiotics

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can decrease the duration of acute infectious diarrhea and reduce the risk associated with it.[8] In a meta-analysis of ulcerative colitis patients, probiotics induce the remission rate significantly and maintain the remission for pouchitis.[9] Moreover, probiotics effectively improved bloating, flatulence, and quality of life in adults and children with irritable bowel syndrome (IBS), as reported previously.[10] Most importantly, probiotics can decrease the mortality rate and the risk of necrotizing enterocolitis in infants.[11] Probiotics are also effective in improving different gastrointestinal conditions, including treatment of irritable bowel syndrome (IBS),[12] treatment of *H. pylori* infection,[13] decrease the occurrence of hepatic encephalopathy,[14] and resolving nonalcoholic steatohepatitis.[15]

Different studies have investigated the knowledge and use of probiotics among healthcare providers and the general community. However, despite the high incidence of gastrointestinal disorders and malignancies in Saudi Arabia,[16–20] there are no studies on the knowledge, use, and prescription pattern of probiotics by gastrointestinal specialists and pharmacists, since they have a major contribution in the prescription to the targeted patients. Therefore, this study aimed to investigate the knowledge, use, and prescription pattern of probiotic-containing products among gastroenterologists and pharmacists in Saudi Arabia.

Materials and Methods

Subjects

An anonymous electronic survey was conducted on healthcare providers (gastroenterologists who were members of the Saudi Gastroenterology Association and the Saudi Society of Pediatric Gastroenterology, Hepatology and Nutrition, and pharmacists who were members of the Saudi Pharmaceutical Society). The study was conducted between May and July 2020. The recipients were informed before proceeding to the question section of the online survey, which required filling out the questionnaire and a writing section expressing their consent to participate in this study.

Inclusion Criteria

Gastroenterologists and registered pharmacists working in Saudi Arabia were included in the study.

Exclusion Criteria

Students and healthcare providers who were not yet gastroenterologists, registered pharmacists, and those who did not practice in Saudi Arabia were excluded.

Study Design

This cross-sectional study conducted in Saudi Arabia targeted pediatric gastroenterologists and adult gastroenterologists working in private and public clinics and pharmacists working in public hospitals, private pharmacies, and self-employed. According to the Saudi Commission for Health Specialties (SCFHS) accessed on June 14, 2021, members of The Saudi Society of Pediatric Gastroenterology, Hepatology, and Nutrition included 52 gastroenterologists and members of the Saudi Gastroenterology Association were 306 gastroenterologists. For the group of pharmacists, 4414 pharmacists affiliated with the Saudi Pharmaceutical Society, according to the Saudi Commission for Health Specialties. The random sample obtained included 118 gastroenterologists and 382 pharmacists.

The questionnaire was adopted from a previous study[21] with some modifications related to the brand names of probiotics to account for the products available in the Saudi market that are accessible to the population. The survey was constructed using the electronic tool "Google Forms." English language questionnaires were shared using emails and other online communication channels. The questionnaire was divided into two sections. The first section included demographic data, namely age, sex, professional activity, education, and the type of clinical practice. The second section included data on probiotics, such as the knowledge, frequency of prescription, recommendation of probiotics, characteristics influencing prescription, and questions on personal consumption of probiotics and safety considerations regarding probiotic use.

Statistical Analysis

The frequencies and percentages of the sample were calculated according to the following variables: sex, age, graduation year, clinical practice type, postgraduate degree, and type of patients. For statistical analysis of the data, chi-square ($\chi 2$) was calculated, and statistical significance was set at p-value <0.05.

Results

Demographic Characteristics of the Participants

The research sample was divided into various categories, as shown in Table 1. Regarding sex, 41% were males, and 59% were females. Of the gastroenterologists, 75% were males, and 68.6% of the pharmacists were females. The participants (gastroenterologists and pharmacists) were divided into five age groups; the 26–35-years group had the highest percentage (36%), and the 18–25-years group had the lowest percentage (3%). Most gastroenterologists (40.2%) were 46–55 years old, whereas most of the pharmacists (41.7%) were 26–35 years old.

Table 1 Demographic Data and Sample Categories

Variable		Gastroenterologists		Pharmacists		Total	
		Frequency	(%)	Frequency	(%)	Frequency	(%)
Gender	**Male**	84	75.0%	119	31.4%	203	41%
	Female	28	25.0%	260	68.6%	288	59%
Age	**18–25 years**	0	0%	16	4.2%	16	3%
	26–35 years	18	16.1%	158	41.7%	176	36%
	36–45 years	8	7.1%	156	41.2%	164	33%
	46–55 years	45	40.2%	36	9.5%	81	16%
	56 or older	41	36.6%	13	3.4%	54	11%
Graduation year	**1970–1979**	7	6.3%	2	0.5%	9	2%
	1980–1989	33	29.5%	12	3.2%	45	9%
	1990–1999	31	27.7%	43	11.3%	74	15%
	2000–2009	15	13.4%	166	43.8%	181	37%
	2010–2020	26	23.2%	156	41.2%	182	37%
Clinical practice type	**Public**	77	68.8%	246	64.9%	323	66%
	Private	7	6.3%	82	21.6%	89	18%
	Both	28	25.0%	51	13.5%	79	16%
Total		112	100%	379	100%	491	100%
Postgraduate degree	**Clinical Specialty**	91	81.25%			91	81.25%
	Doctorate **Post doctorate**	8 13	7.14% 11.61%			8 13	7.14% 11.61%
Type of patients	**Children**	21	18.8%			21	18.8%
	Adults	91	81.3%			91	81.3%
Total		112	100%			112	100%

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Regarding the graduation year, 37% of the participants graduated between 2000 and 2020. Fifteen percent of participants graduated in 1990–1999, 9% graduated in 1980–1989, and only 2% graduated between 1970 and 1979. Most of the gastroenterologists who responded to this questionnaire graduated in the period from 1980 to 1989 (29.5%), while 43.8% of the pharmacists graduated in the period between 2000 and 2009.

Participants who exclusively worked in public clinics/pharmacies constituted 66% of all the participants, while 18% worked in private clinics/pharmacies, and 16% worked in both sectors. Overall, 68.8% of the gastroenterologists worked in public clinics, and 64.9% of the pharmacists worked in public pharmacies.

Most of the gastroenterologists (91%) had a postgraduate degree (clinical specialty) and most of them (81%) treat adult patients in their clinics, while the rest (18%) were focused on pediatric patients.

Awareness of Probiotics Definition, Health Benefits, and Safety

As indicated in Table 2, most gastroenterologists (56.3%) were well aware of the published definition of probiotics by the International Scientific Association, and 84.1% were male respondents ($p < 0.05$); 39.1% of the pharmacists defined probiotics correctly as live microorganisms that confer a health benefit, and 79.7% were females ($p > 0.05$). Based on the age groups (Table 3), the gastroenterologists who responded to the correct definition of probiotics were mainly among the age groups 46–55 and 56 or older (36.5% and 42.8%, respectively), with no significant difference among age groups. Young pharmacists of the age group 26–35 years defined probiotics correctly, with a significant difference ($p < 0.05$) compared with the other age groups of participating pharmacists.

When asked about their view on the statement "probiotics improve digestive symptoms", about 40% of all participants partially agreed that probiotics improve digestive symptoms, whereas 35% totally agreed on the health benefits of probiotics for digestive symptoms. Some participants (18%) reported that they "partially disagree" with this statement, and only (2%) selected "strongly disagree". Lastly, 2% of the participants had no knowledge of probiotics' health benefits.

Most gastroenterologists (62.5%) partially disagreed that probiotics improve digestive symptoms, and these were mostly within the age group 46–55 years ($p<0.05$) who see adult patients ($p<0.05$). However, only 10.7% of pediatric gastroenterologists shared this opinion (Figure 1). On the other hand, gastroenterologists who partially agreed that probiotics improve digestive symptoms were only about 16%.

Additionally, 44.9% of the pharmacists selected "totally agree" in response to whether probiotics improve digestive symptoms, and most were females ($p < 0.05$). One-third of these pharmacists (30.3%) partially agreed that probiotics improve digestive symptoms ($p > 0.05$), while the lowest percentage (0.2%) strongly disagreed that there were benefits from the probiotics in improving digestive symptoms ($p > 0.05$).

There were 19.8% of the gastroenterologists and 27.5% of the pharmacists who agreed that scientific evidence supports the use of probiotics for patients with IBS (Figure 2). In total, 25% of the participants recognized that scientific evidence supports the use of probiotics for IBS, followed by diarrhea associated with antibiotics (17%). Thirteen percent selected acute diarrhea, and the lowest percentage was for *C. difficile* (11%).

Table 2 Distribution of Awareness of Probiotics Definition According to Sex Among Gastroenterologists and Pharmacists

What is a Probiotic?	Gastroenterologists				Pharmacists				Total
	Male	Female	Total	%	Male	Female	Total	%	%
It is the bacilli of fermented dairy products that confer a health benefit	24	11	35	31.3*	32	68	100	26.4*	27
Fermentable ingredients that promote the growth of the intestinal microbiota	7	7	14	12.5*	14	55	69	18.2*	17
Live microorganisms that confer a health benefit	53	10	63	56.3*	54	94	148	39.1*	43
They are medicines or food supplements that promote health	0	0	0	0.0	19	43	62	16.4*	13

Note: *(*P*-value <0.05).

Table 3 The Distribution of Awareness of Probiotics Definition According to Age Among Gastroenterologists and Pharmacists

What are Probiotics?	Gastroenterologist						Pharmacists					
	18–25 Years	26–35 Years	36–45 Years	46–55 Years	56 or Older	Total	18–25 Years	26–35 Years	36–45 Years	46–55 Years	56 or Older	Total
It is the bacilli of fermented dairy products that confer a health benefit	0	8	2	15	10	35*	2	35	47	11	5	100*
Fermentable ingredients that promote the growth of the intestinal microbiota	0	3	0	7	4	14*	1	37	27	2	2	69*
Live microorganisms that confer a health benefit	0	7	6	23	27	63*	13	64	59	11	1	148*
They are medicines or food supplements that promote health	0	18	8	45	41	112*	0	22	23	12	5	62*

Note: *(*P*-value <0.05).

Recommendation to Prescribe Probiotics

Overall, 44.40% of participants chose "Sometimes" for the recommendation of the use of probiotics; 24.3% selected "Frequently", 15.27% selected "Rarely", 8.35% selected "Never", and only 7.94% selected "Constantly" for recommending the use of probiotics.

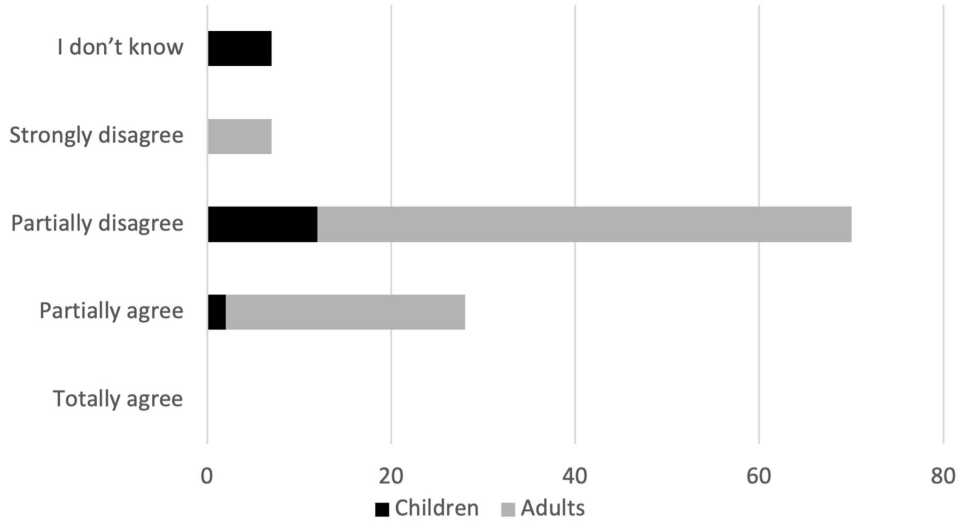

Figure 1 The distribution of the opinion about probiotics' benefits among gastroenterologists, according to the type of practice.

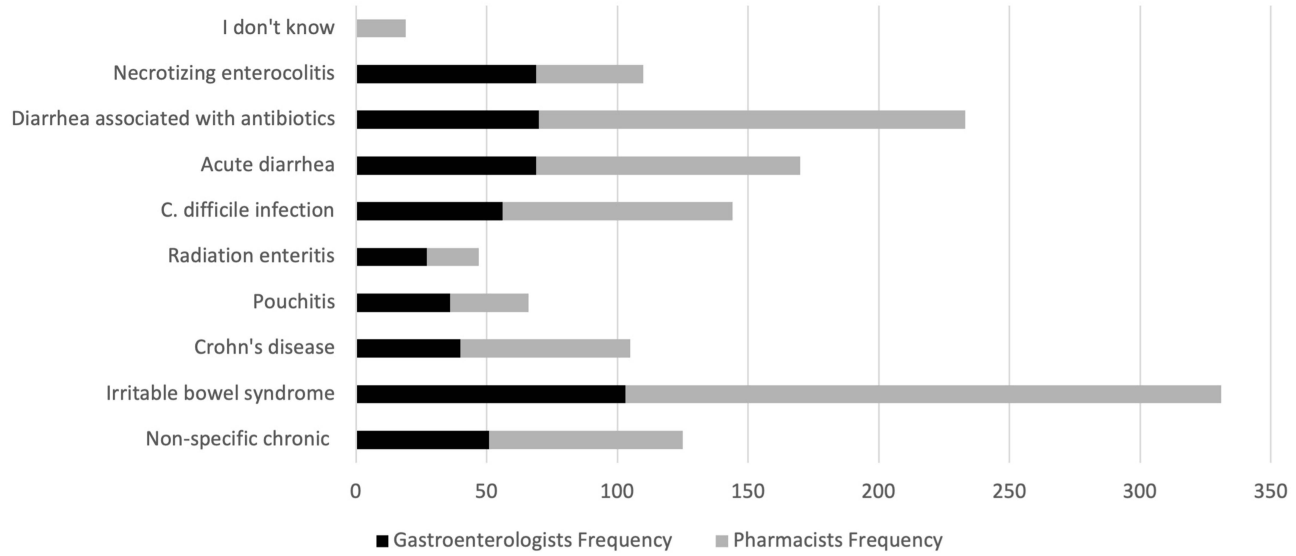

Figure 2 The participants' insights on how much scientific evidence supports the use of probiotics for the listed pathological and inflammatory cases.

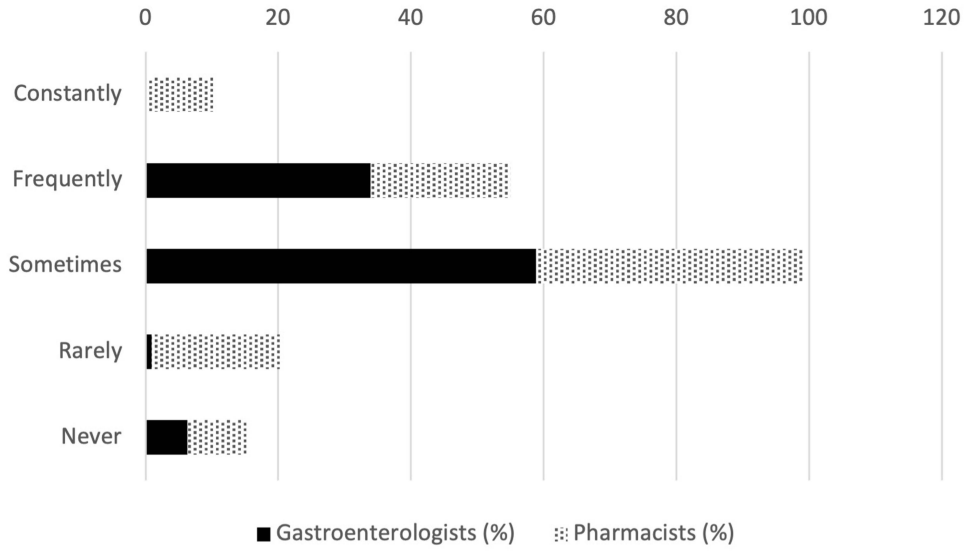

Figure 3 Responses from the participants regarding how frequently they recommend the use of probiotics.

Figure 3 shows that 58.9% of gastroenterologists sometimes recommended the use of probiotics ($p < 0.05$), and 40.1% of pharmacists sometimes recommended the use of probiotics to patients ($p > 0.05$).

As illustrated in Figure 4, 34.01% of the participants from both specialties stated that they recommend the use of probiotics because "they are necessary to maintain good health", 27.70% indicated that they recommend the use of probiotics because "they are effective in the treatment of some", 22.20% declared that they do not recommend the use of probiotics, 12.02% stated that they recommend the use of probiotics because "they are useful for disease prevention", and 4.07% considered recommendation because of "all of above reasons".

While 44.6% of the gastroenterologists indicated that they "do not recommend the use of probiotics" ($p < 0.05$), 36.9% of the pharmacists stated that they recommend the use of probiotics because "they are necessary to maintain good health" ($p > 0.05$).

Figure 5 shows that 43.79% of the participants from both specialties partially agreed that probiotics are safe and do not confer health risks; 41.55% were totally agree, 18% of them strongly disagreed, 5.5% partially disagreed, and 1.63% of them selected the "Don't know" option.

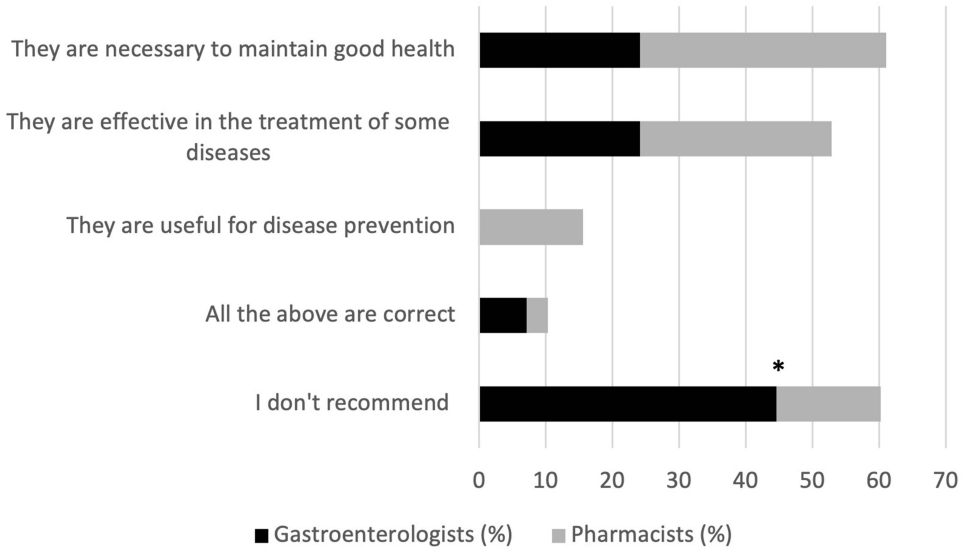

Figure 4 The frequency of the statements on the recommendation of the use of probiotics.
Note: **p-value* <0.05.

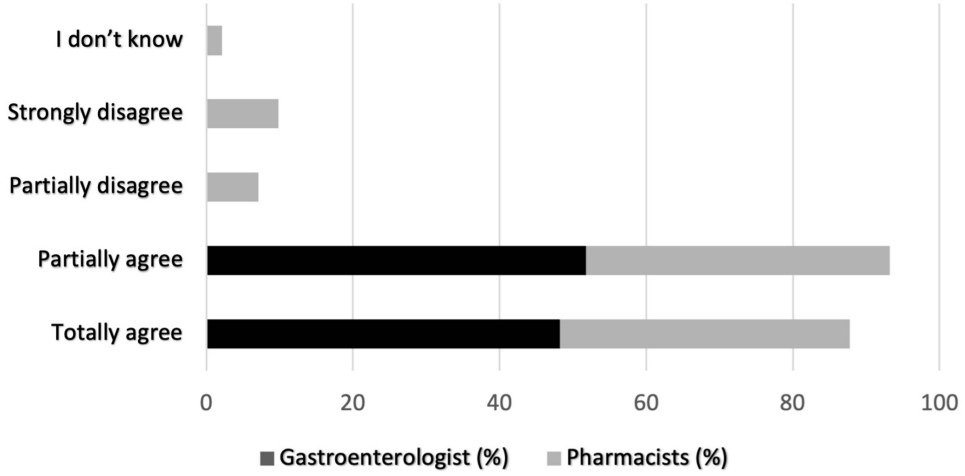

Figure 5 The frequency of the statements on the safety of probiotics.

Figure 6 shows that 24.64% of the participants indicated that they would not recommend the use of probiotics because the evidence is insufficient for the use of probiotics in clinical practice; 21.59% of them stated that they would not recommend the use of probiotics because they are unaware of the evidence for probiotics in the treatment of digestive diseases, 18.94% stated that they would not recommend the use of probiotics because of the cost, and 14.26% declared that they would not recommend the use of probiotics because they consider probiotics to be less effective or offer no additional benefits to specific treatments ($p > 0.05$).

The results also showed that only 24.1% of the gastroenterologists would not recommend the use of probiotics because they consider probiotics to be less effective or offer no additional benefits to specific treatments, while 25.6% of the pharmacists would not recommend the use of probiotics because the evidence is insufficient for the use of probiotics in clinical practice (Figure 6).

There were 29.23% of the participants (Figure 7) who found that the most important factor for the recommendation or prescription of probiotics was "Availability at the local market", followed by 16.59% for the factor "Contains a specific strain tested in the clinical study for the specific symptom or disease", 16.01% for the factor "Contains a higher variety of strains and number of living microorganisms", and 15.78% for the factor "Product's cost and presentation".

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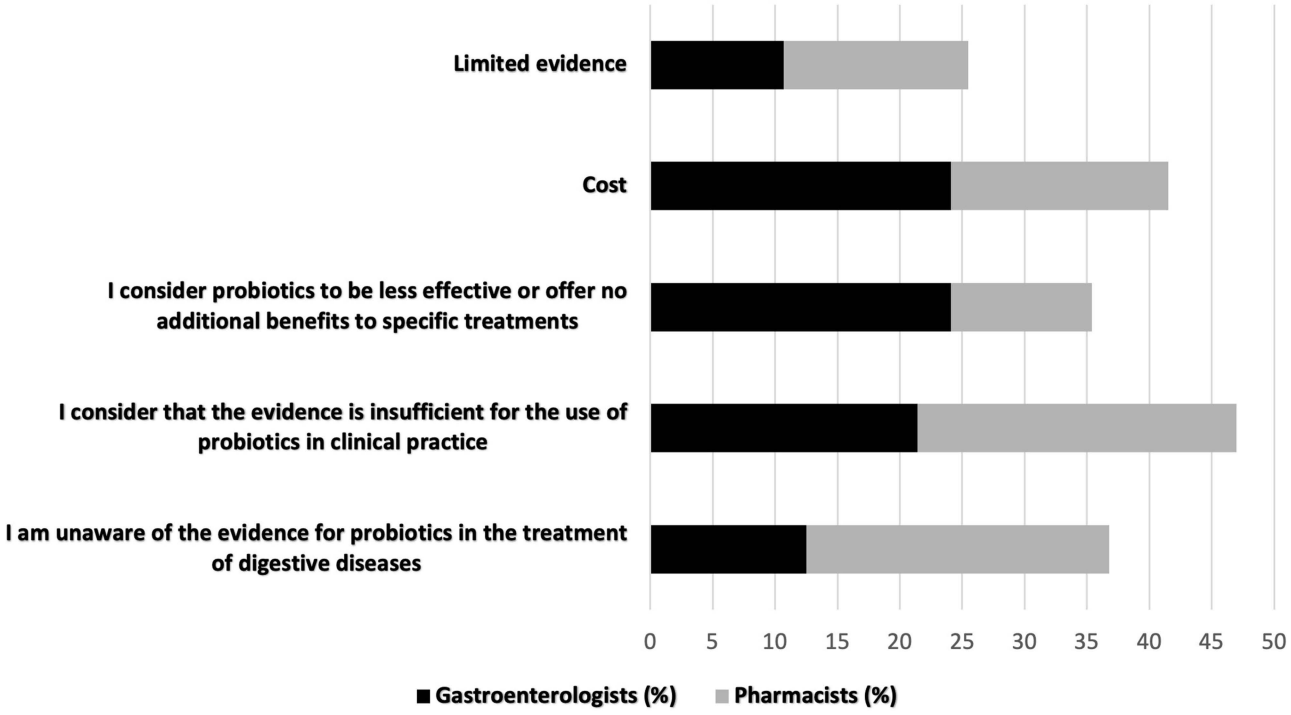

Figure 6 The frequency of the participants that chose the reasons why they would not recommend the use of probiotics.

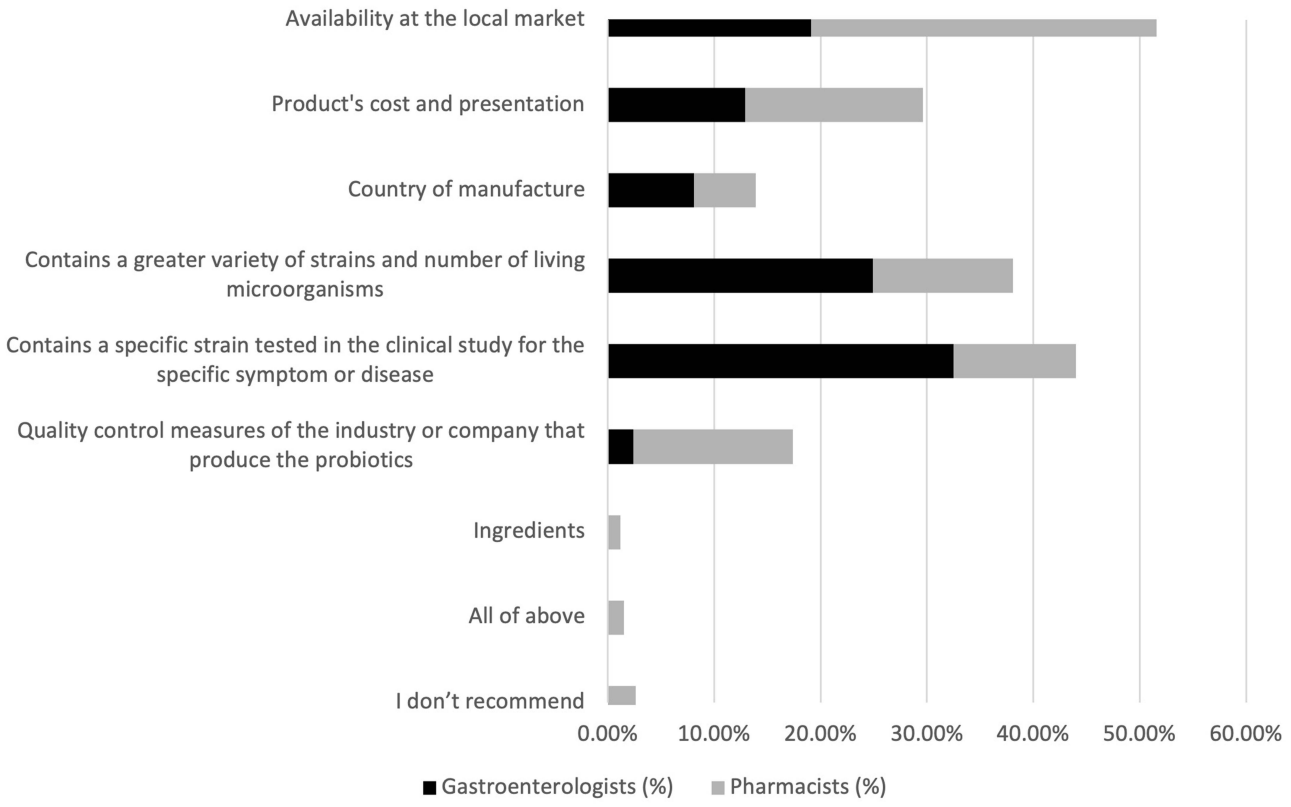

Figure 7 The most important factors for recommendation or prescription of probiotics.

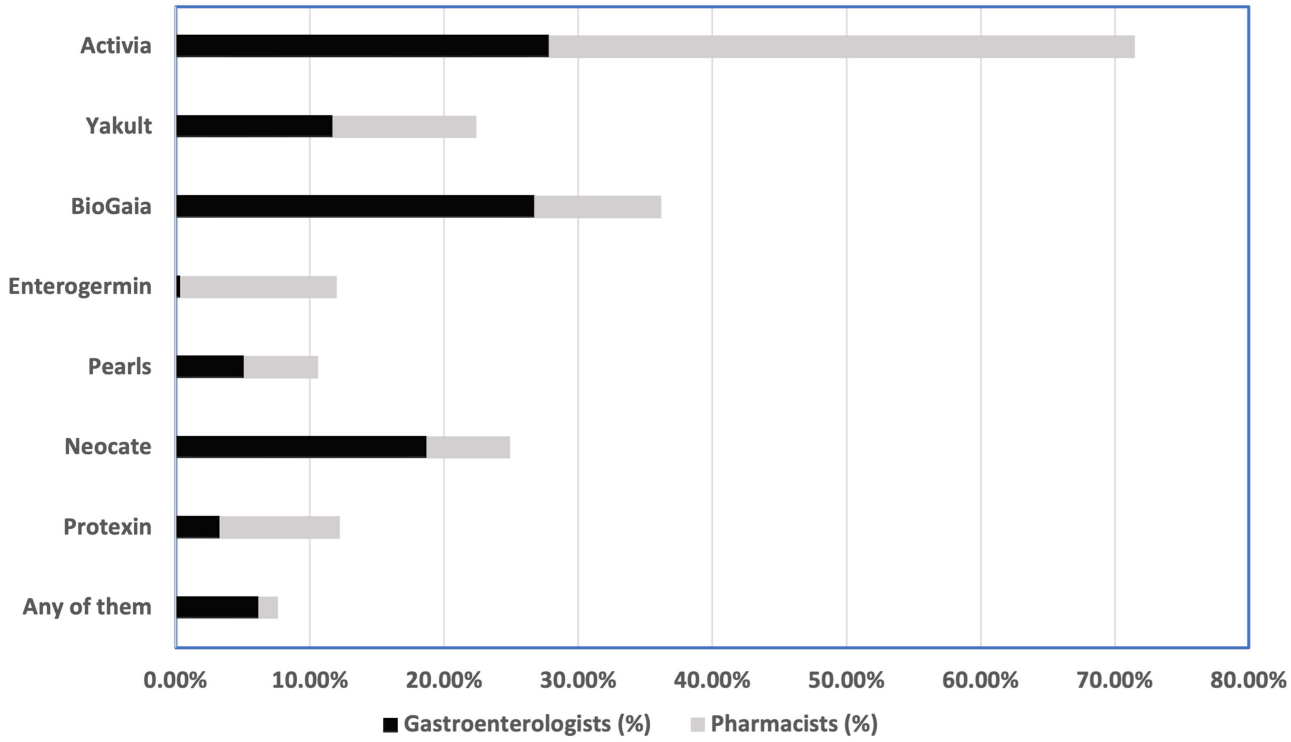

Figure 8 The percentage of brand names of probiotics available in the market prescribed or recommended by the participants.

Considering the gastroenterologists' responses, 32.5% of them considered the most important factor for recommendation or prescription to be "Contains a specific strain tested in the clinical study for the specific symptom or disease", while 32.5% of the pharmacists considered the most important factor for recommendation or prescription to be "Availability at the local market" ($p > 0.05$). Regarding the product's manufacturing company, 39.36% of the participants recommended the product (Activia), followed by 14.26% for BioGaia, 10.94% for Yakult, and 9.64% for Neocate. About 27.8% of the gastroenterologists and 43.7% of the pharmacists recommended Activia, as shown in Figure 8.

Discussion

This study evaluated gastroenterologists' and pharmacists' perceptions and practices regarding the role of probiotics in digestive symptoms by investigating their knowledge, use and prescription patterns. The study demonstrated that gastroenterologists and pharmacists have adequate knowledge of probiotics and the available evidence of their effect. Moreover, gastroenterologists are more specialized in the management of gastrointestinal diseases and products affecting digestive functions, while pharmacists have a broader knowledge of the probiotic products available in the market.

There is an increasing attention toward probiotics and their effect on digestion and digestive disorders; however, limited data are available on the attitude to prescribing or recommending these products among health practitioners in Saudi Arabia. With the availability of over the counter (OTC) products containing probiotics, there are different clinical practice beliefs toward probiotics in Saudi Arabia.[21,22] Healthcare providers working in different sectors (public or private) and treating different age categories have different mindsets based on their knowledge, educational background, and practice attitude. The availability of information, the validity of resources, and the intention of healthcare providers to update their information and their open attitude allows them to reach the ultimate level of healthcare services. On one hand, international guidelines and consensus documents are available worldwide on the use of probiotics.[23] On the other hand, there is a lack of information on professional advice regarding the consumption of probiotic products in the Saudi community.[22] This vagueness of probiotics prescription may be due to uncertain knowledge about their benefits or the limited number of health professional recommendations, especially for patients who have digestive problems or

developed digestive diseases. Therefore, the current study evaluated gastroenterologists' and pharmacists' perceptions and practices regarding the role of probiotics in these digestive symptoms.

This study indicated that gastroenterologists are aware of probiotics, and most of them correctly defined probiotics. A recent study investigating the knowledge and practice patterns of probiotics among Saudi pediatricians showed a significant difference in the knowledge and use of probiotics.[22] There were 57.7% of the respondents from different categories of pediatricians aware of the correct definition of probiotics.[22] Expectedly, the gastroenterologist pediatricians showed excellent knowledge regarding probiotics,[22,24] similar to the findings of the present study. In the current study, compared with gastroenterologists, most pharmacists who defined probiotics correctly recently graduated or belonged to the young age group. This might be due to the fact gastroenterologists are more specialized in digestive disorders; thus, they are more aware of the OTC products related to the management of gastrointestinal diseases and products affecting digestive functions. A recent study conducted on the population of Muscat, Oman demonstrated that pharmacists showed good (64.5%) and very good (25.6%) knowledge of probiotics, according to their scale of knowledge.[25] On the other hand, another study demonstrated that pharmacists from the Middle East showed to have more knowledge about probiotic but with the lowest percentage of using probiotics (24.4%) and for the prescription to patient (43.1%).[26] However, a recent systematic review study found that pharmacists were the most knowledgeable about probiotics than nurses.[24] Similarly, the current study showed that the pharmacists had a broader knowledge of these products available in the market than the gastroenterologists.

The pharmacists completely agreed that probiotics improve digestive disorders, while experienced gastroenterologists (46 and older) partially disagreed that probiotics can improve digestive functions. Pediatric gastroenterologists especially showed that they believe that probiotics have no role in improving digestive functions. This perception might be due to the fact that the clinical benefits of probiotics are only evident in cases of infectious gastroenteritis and antibiotic-associated diarrhea.[27,28] Moreover, most studies on the potential benefits of probiotics in children were heterogenous in terms of probiotic strains, doses, and treatment regimens. This indicates the need for more well-structured strain-specific studies.[28,29] A systematic review recently suggested strain-specific effects of probiotics specifically for acute infectious diarrhea.[30] On the contrary, few trials have assessed the protective effect of probiotics on diarrhea in hospitalized children, showing conflicting findings. Most importantly, studies that recommended probiotics for preventing diarrhea provided weak evidence of probiotics' effect.[31] Another reason that might have affected the gastroenterologists' perception of probiotics for children is their gastrointestinal disorders that are related to hereditary factors rather than the dietary lifestyle.[32]

Although pharmacists showed total agreement on the probiotics' benefits in the current study, there is a trend for most pharmacists to not consume probiotics themselves. On the contrary, a study from Western countries that surveyed health practitioners showed another behavior in consuming probiotics; 92.1% of the pharmacists who participated in the study have used probiotics.[33] An observational finding found by Valdovinos-Garcìa et al (2019) study showed that gastroenterologists consume probiotics more than three times a week. This result is similar to a study that surveyed a different population of gastroenterologists, which demonstrated that more than half of their participants used probiotics.[21]

Since most probiotics can be accessed without a prescription, this study shows very limited recommendations for probiotics by gastroenterologists. This low percentage of recommendations might be because there is limited scientific evidence of the benefits of probiotics and the mechanism of probiotic action on the human body is still not fully understood.[34–36] However, our data showed that a higher percentage of pediatric gastroenterologists agree that probiotics can improve digestive functions compared to another study conducted on pediatricians' knowledge and attitude regarding probiotics in different regions in Saudi Arabia.[22]

In terms of specific digestive conditions, 25% of the participants believed that probiotics are beneficial in treating IBS, which is low compared to another finding from a study in Mexico among gastroenterologists showing that more than 90% of the respondents believed that probiotics are useful in the treatment of IBS.[21] The role of probiotics in IBS has been found to be beneficial in seven clinical trials. The effects were indicated in the trials that used multi-strain probiotic supplements of intervention of 8 weeks or more.[37,38] Some recent systematic reviews outlined that using probiotics reduces the symptoms of IBS patients, such as abdominal pain.[37–40]

Another important feature that our participants indicated as the benefit of probiotics is the prevention and treatment of diarrhea associated with antibiotics (DAA). In this regard, there is sufficient evidence that probiotics reduce DAA.[27]

Even with some heterogeneity of the clinical trials conducted on probiotics in the treatment and prevention of the DAA, a significant association was observed between probiotic consumption and the reduction in DAA.[25,27,41] The lowest percentage of the conditions that the participants indicated was for radiation enteritis. Although previous studies showed the beneficial effect of probiotics in radiation enteritis,[42,43] a recent meta-analysis reviewing randomized controlled trials of probiotic preventive effects on radiation-associated diarrhea showed that probiotics are not beneficial in these cases.[44]

All the gastroenterologists in the current study agreed that probiotics are safe for patients with digestive problems, while most pharmacists (80%) agreed on the safety of the probiotics. The safety of the probiotics was indicated and supported by many clinical trials that reported an improvement in the symptoms of some conditions, such as IBS.[38] More than 97% of gastroenterologists surveyed in a study from Mexico completely or partially agreed that probiotics are safe.[21] Most of the practitioners in general tend to prescribe probiotics for minor health conditions rather than life-threatening ones.[24]

Different guidelines and consensus have been published on the use of probiotics in gastroenterology. However, various reasons could prevent gastroenterologists and pharmacists from recommending or prescribing probiotics for individuals. One reason for this uncertainty in continuously recommending probiotics is the insufficient evidence about the recent scientific reports on probiotic benefits and inconsistent reports of the safety outcomes of probiotics in clinical trials.[45,46] The current study showed that 24.6% of the participants considered the evidence in the scientific literature insufficient regarding the use of probiotics in clinical practice. The second reason is that 21.6% of the participants are unaware of the evidence on whether probiotics aid in treating digestive problems in clinical practice. The cost of the probiotic products was the third frequent reason why the participants hesitated in prescribing probiotics.

The gastroenterologists recommended probiotics according to the number of strains in the products. As shown in the results, 32% of the recommendations were for products with three or more strains, which are expected to be beneficial for many digestive disorders, such as IBS.[37] This percentage is higher among gastroenterologists than among pharmacists, and we suppose that is because of the specialty-based knowledge of these products. Many studies have shown that knowledge of the type and number of strains in probiotic products vary among healthcare providers, such as physicians and pharmacists.[33,47,48] A study conducted on the clinical use and prescribing pattern of probiotics by gastroenterologists and specialists in clinical nutrition in Mexico found that most do not know the strains in commercial probiotics.[21] However, the lack of this knowledge did not affect the prescription and the frequency of recommendations of probiotics among gastroenterologists and nutritionists.

One of the objectives of the present study was to investigate which probiotic products are the most prescribed or recommended by gastroenterologists and pharmacists. Figure 8 shows a list of probiotic products available in Saudi Arabia and illustrates the percentage of each product recommended by the participants in our study. These products have various strain components and pharmaceutical products formulation. For example, Activia© is available as a supplemented dairy product that supports the gut with *Lactobacillus* and is considered a natural way of implementing probiotics in an individual's diet. This product has the highest percentage of recommendations (39.3%) by gastroenterologists and pharmacists. BioGaia© is the second most-recommended product by gastroenterologists for improving digestive function. The product is a dietary supplement containing the strain *Lactobacillus reutri*, which helps the gut microbiome in natural balance. This product is available in different forms, such as drops for children and tablets for adults. All the gastroenterologists who see children in our study particularly recommended BioGaia©. It was different in the pharmacist responses as Enterogermina© was the second most-recommended product.

Conclusion

The gastroenterologists and pharmacists who participated in our study had adequate knowledge of probiotics and the available evidence of their effect. However, both groups had the same perspective regarding prescribing probiotics; the variability in prescribing probiotics depends on many factors, such as insufficient evidence published in the guidelines and clinical trials, the uncertainty of the usefulness of probiotics to treat digestive disorders, and the cost of probiotics. This study also highlights the importance of updating healthcare practitioners on the recent evidence of the role and benefit of probiotics in digestive problems. Continuous educational programs and integration of the clinical guidelines regarding probiotics and supplemented products are recommended to improve the knowledge about probiotics in healthcare professionals, especially gastroenterologists and pharmacists.

Data Sharing Statement

Detailed data are available upon request from the corresponding author naobaid@uqu.edu.sa.

Ethics Approval and Consent to Participate

This project was approved by the Biomedical Ethics Committee at Umm Al-Qura University (approval number: HAPO-02-K-012-2020-07-422). A written consent was obtained from each participant before answering the survey.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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