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HEALTHCARE PROFESSIONALS' KNOWLEDGE AND EXPERIENCE OF PROBIOTICS USE IN GASTROINTESTINAL DISEASES IN IRAQ

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Abstract – *Objective:* Probiotics are currently classified as part of complementary and alternative medicine and are believed to be effective in treating various gastrointestinal and other conditions. The aim of the study was to explore the available types of probiotics and the knowledge and experience of physicians regarding probiotics as therapeutic options in managing gastrointestinal diseases in Iraq, as well as the barriers that may prevent the prescription of probiotics.

Materials and Methods: A cross-sectional study was conducted between October 2023 to November 2023 in Karbala and Babel provinces, Iraq. The data about probiotics was collected from different sources. A questionnaire was provided to a convenient sample of physicians to assess their knowledge and experience.

Results: Eighty-eight physicians were involved in the study. Of these, sixty-three physicians (71.60%) preferred to prescribe probiotics, which prefer tablet dosage form, mainly for irritable bowel syndrome (IBS), for three to six months, with a majority for young adults. The factors associated with prescribing probiotics are IBS [adjusted odds ratio (OR) 0.082, 95% CI 0.008-0.855, p=0.036] and functional diarrhea (OR 0.053, 95% CI 0.003-0.818, p=0.035). The main barrier to prescribing probiotics was the lack of knowledge about their clinical indications.

Conclusions: While most physicians in Iraq prefer prescribing probiotics, particularly for conditions like IBS and functional diarrhea, the main barrier to broader use is a lack of knowledge regarding their clinical indications. This highlights the need for improved education and training for healthcare professionals to enhance the effective use of probiotics in treating gastrointestinal diseases.

Keywords: Probiotics, Gastrointestinal diseases, Healthcare professionals.

INTRODUCTION

Probiotics, which are currently classified as part of complementary and alternative medicine, are believed to be effective in treating various gastrointestinal conditions and promoting a healthy balance of intestinal microorganisms. The Food and Agriculture Organization of the United Nations and the World Health Organization define probiotics as "live microorganisms that, when administered in sufficient quantities, may provide a health benefit to the host"[1,2]. Research has shown that probiotics support gastrointestinal health by combating potential pathogens, out-competing them, boosting mucosal immune function, and improving digestion[3-5].

Probiotics can be categorized into three main groups: *Lactobacilli*, *Bifidobacteria*, and others. Many commonly used probiotics belong to the *Lactobacillus* genus, which is versatile and provides benefits ranging from extending food shelf life (such as in the production of yogurt or cheese from milk) to promoting health when consumed through probiotic foods and supplements[6,7]. *Bifidobacterium spp.* is a crucial group of probiotics for humans, as it can proliferate and metabolize in the middle and distal sections of the small intestine and large intestine. It also secretes bifidogenic factors with probiotic effects that help regulate intestinal health and support adaptation to the anaerobic environment of the gut[8,9].

Several mechanisms have been identified to explain how probiotics work against diseases. Probiotics can transiently colonize the human gut in unique patterns, depending on factors such as the individual's microbiota, the specific probiotic strain(s), and the region of the gastrointestinal (GI) tract. These mechanisms play a role in enhancing the epithelial barrier, increasing adhesion to the intestinal mucosa, producing antibacterial substances, competitively excluding pathogens, inhibiting bacterial adhesion, and modulating the immune system simultaneously[10-12].

Probiotics have been shown to significantly improve the health of the intestinal microbiota by fostering a favorable gut environment. As a result, probiotics are effective in managing, treating, and preventing various gastrointestinal conditions, including *Clostridium difficile* infection, *Helicobacter pylori* infection, irritable bowel syndrome, ulcerative colitis, antibiotic-associated diarrhea, and acute diarrhea[13-18]. In addition, probiotics have demonstrated efficacy in managing and treating health conditions such as atopic dermatitis, common acute respiratory infections, obesity, and oral candidiasis[19-21].

In recent years, probiotics have gained widespread use among the general public, with usage rates significantly higher in specialized populations, such as gastroenterology patients. However, selecting the most appropriate probiotic for patients remains a moving target, as ongoing research and clinical trials continue to expand our understanding[22]. Data suggest that the first consideration should be the intended purpose – whether for therapy, prevention, or treatment – since different probiotics may better suit each goal. Healthcare providers would be better equipped to determine if the specific probiotic strain(s) and dosage are appropriate for their patients' conditions and to incorporate probiotic use into their treatment plans accordingly[23]. In light of this, the current study aimed to explore the available types of probiotics and the knowledge and experience of physicians regarding probiotics as therapeutic options for managing gastrointestinal diseases in Iraq, as well as the barriers that may prevent the prescription or recommendation of probiotics.

MATERIALS AND METHODS

A cross-sectional study was conducted between October 2023 and November 2023 in Karbala and Babel provinces, Iraq. Firstly, data was collected from ninety locations, including eighty-two community pharmacies, seven large stores, and one nutrition shop, regarding the probiotics they contained, the species of probiotics available, the type of dosage form, and the mode of selling, considering the common types of probiotics.

Secondly, a questionnaire was created based on previously published studies[24,25], which included six questions about the type of probiotic dosage they prefer, the main indications for prescribing probiotics, how long the physician has been prescribing probiotics, the approximate duration of probiotic treatment, the age category of their patients receiving probiotics, and the main clinical specialty of the physician. The questionnaire was examined for content validity with a small group of physicians, and all responses were collected anonymously. In addition, the physicians were asked about barriers that may influence their decision to prescribe or recommend probiotics.

The questionnaire was completed based on the knowledge and practices of a convenient sample of physicians, supported by a designated brochure. The brochure contains information about probiotics, including the definition of probiotics, their importance, the relationship between gut microbiota and health, natural sources (such as yogurt), and common types of probiotic species based on data collected from various sources mentioned above.

Statistical Analysis

Descriptive statistics, including frequencies and percentages, were used to summarize the data of this study using Microsoft Excel. The Chi-square test was employed for comparisons between groups. Multinomial logistic regression was utilized to determine the factors associated with prescribing or recommending probiotics. A p-value of < 0.05 was considered statistically significant. All analyses were conducted using the IBM SPSS software (Statistical Package for the Social Sciences), version 25. The study adhered to the principles described in the Declaration of Helsinki and received approval from the scientific and ethical committee of the College of Pharmacy, University of Kerbala (Project No: 2024HU16).

RESULTS

After screening eighty-two pharmacies, seven big stores, and one nutritional shop, the results show that one hundred and forty-eight probiotics products were available. The most common dosage forms available for probiotics were (38.5%) sachets, (32%) in the form of capsules, and (11.2%) in the form of tablets (Figure 1).

The mode of sales of these products was (56.76%) prescription-only medicine (POM), (37.16%) over-the-counter (OTC), and (6.08%) other types of sales. The probiotics products found during screening were 47.6% mono-species products and 52.4% multi-species products.

Eighty-eight physicians were involved in the study. Of these, sixty-three physicians (71.60%) preferred to prescribe probiotics, and 25 (28.40%) did not choose to prescribe them. Comparing to those who do not prefer to prescribe probiotics, physicians who prefer to prescribe probiotics, prefer tablet dosage form (33.33%), mostly prescribe probiotics for IBS (41.27%), mostly for duration of three to six months (46.03%), with majority for young adults (47.62%), and majority of them with general medicine specialty (33.33%) (Table I).

In multinomial logistic regression analysis, the factors associated with prescribing probiotics are IBS (OR 0.082, 95%CI 0.008-0.855, p=0.036) and functional diarrhea (OR 0.053, 95%CI 0.003-0.818, p=0.035) (Table II).

In addition, the most common barrier to not recommending probiotics was a lack of knowledge about their clinical indications (34%), followed by the cost of probiotics (32%) (Figure 2).

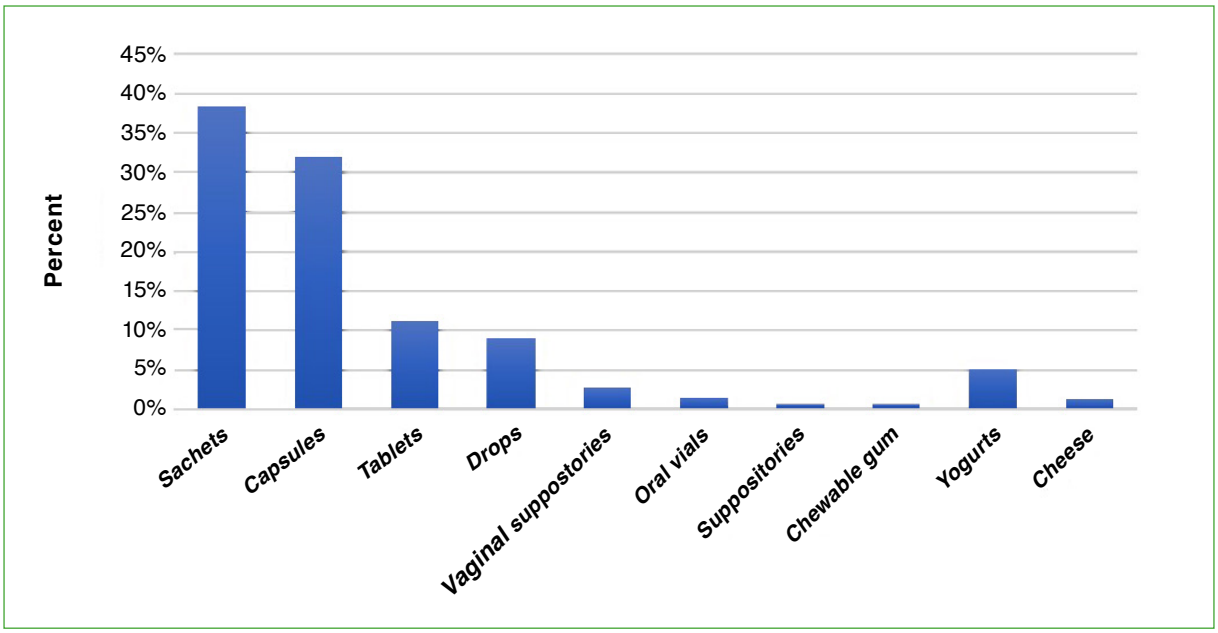

Figure 1. Various dosage forms of probiotics.

TABLE 1. COMPARISON BETWEEN PHYSICIANS WHO PREFER AND DO NOT PREFER TO PRESCRIBE PROBIOTICS.

	Physicians prefer to prescribe probiotics (n=63)	Physicians do not prefer to prescribe probiotics (n=25)	*p*-value
Types of probiotics			*p*=0.529
Sachet	10 (15.87)	3 (12)	
Capsules	14 (22.22)	5 (2)	
Tablets	21 (33.33)	7 (28)	
Drops	2 (3.17)	2 (8)	
Powder	7 (11.11)	1 (1)	
Liquid	9 (14.29)	7 (28)	
Indication for probiotics			*p*=0.727
IBS*	26 (41.27)	13 (52)	
Functional diarrhea	11 (17.46)	6 (24)	
Crohn's disease	5 (7.94)	2 (8)	
Neonatal colic	3 (4.76)	1 (4)	
GI upset*	6 (9.52)	1 (4)	
H. pylori	1 (1.59)	1 (4)	
Others	11 (17.46)	1 (4)	
Time for being prescribed or recommending probiotic supplements			*p*=0.708
< 6 months	30 (47.62)	12 (48)	
6-12 months	13 (20.63)	5 (20)	
1-5 years	12 (19.05)	3 (12)	
> 5 years	8 (12.70)	5 (20)	
Duration of probiotics treatment			*p*=0.082
< 3 months	25 (39.68)	13 (52)	
3-6 months	29 (46.03)	8 (32)	
6-12 months	9 (14.29)	4 (16)	
Age category of the patients receiving probiotics			*p*=0.808
Pediatrics (≤ 17 years)	18 (28.57)	8 (32)	
Young adults (18-64 years)	30 (47.62)	10 (40)	
Older adults (≥ 65 years)	15 (23.81)	7 (28)	
Clinical specialty			*p*=0.569
General medicine	21 (33.33)	7 (28)	
Gastroenterology	12 (19.05)	3 (12)	
Surgery	14 (22.22)	5 (20)	
Other specialities	16 (25.40)	10 (40)	

GI: gastrointestinal, IBS: irritable bowel syndrome.

DISCUSSION

The prevalence of various dosage forms, such as sachets, capsules, tablets, drops, and suppositories, reflects the diversity of products available in pharmacies, nutritional shops, and supermarkets. This indicates a wide range of patient options, potentially catering to different preferences and needs. This may be due to the probiotics market being one of the fastest-growing segments of the food industry, as there is growing scientific evidence of the positive health effects of probiotics on consumers. Currently, there are various forms of probiotic products, and they can be categorized according to dosage form and the site of action[26].

The majority of probiotic products being prescription-only medicines (POM) found in the study suggests that many of these dosage forms are intended for specific medical conditions and require professional guidance for use. The study by Kim et al[27] found that physicians prescribe probiotics more frequently in patients who complain of abdominal pain and increased stool frequency in both Ulcerative colitis (UC) and Crohn's disease, as well as in UC patients experienc-

TABLE 2. FACTORS ASSOCIATED WITH PRESCRIBING PROBIOTICS.

Variable	Adjusted OR*	95% confidence interval	*p*-value
Dosage form			
Sachet	3.406	0.309-37.581	*p*=0.317
Capsules	6.379	0.811-50.165	*p*=0.078
Tablets	2.864	0.536-15.293	*p*=0.218
Drops	1.594	0.041-62.299	*p*=0.803
Powder	6.699	0.487-92.205	*p*=0.155
Indications for probiotics			
IBS*	0.082	0.008-0.855	*p*=0.036
Functional diarrhea	0.053	0.003-0.818	*p*=0.035
Crohn's disease	0.282	0.015-5.147	*p*=0.393
Neonatal colic	0.426	0.006-28.787	*p*=0.691
GI upset*	0.711	0.026-19.349	*p*=0.840
H. pylori	0.061	0.001-3.247	*p*=0.168
Being prescribed or recommending probiotic			
< 6 months	0.964	0.149-6.252	*p*=0.969
6-12 months	0.725	0.063-8.293	*p*=0.796
> 5 years	3.507	0.504-24.421	*p*=0.205
Duration of probiotics treatment			
< 3 months	1.017	0.148-7.011	*p*=0.986
3-6 months	2.204	0.343-14.167	*p*=0.405
Age category of the patients receiving probiotics			
Pediatrics	1.019	0.155-6.704	*p*=0.986
Young adults	0.914	0.209-3.995	*p*=0.905
Clinical speciality			
General medicine	3.294	0.590-18.385	*p*=0.174
Gastroenterology	6.493	0.205-54.922	*p*=0.086
Surgery	3.797	0.592-24.343	*p*=0.159

GI: gastrointestinal, IBS: irritable bowel syndrome.

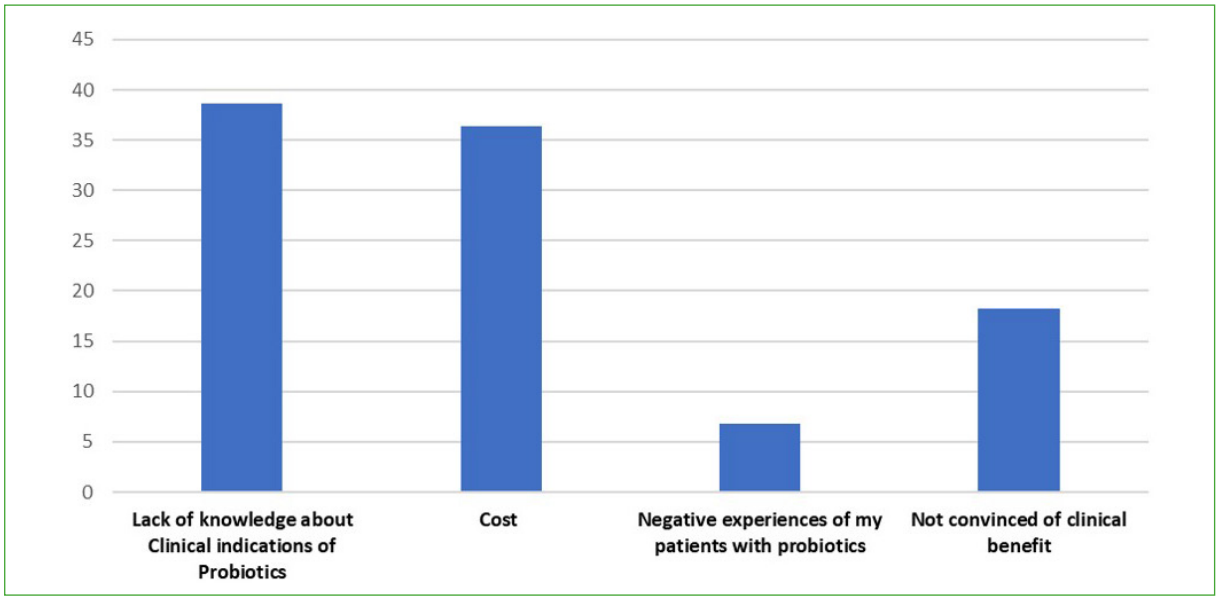

Figure 2. Barriers for not prescribing or recommending probiotics.

ing hematochezia. Some medications, such as methotrexate and iron supplements, and a history of inflammatory bowel disease (IBD)-related surgeries were also associated with more probiotic prescriptions in patients with Crohn's disease[27].

The high percentage of physicians prescribing or recommending probiotics underscores the growing recognition of probiotics' benefits in clinical practice. The preference for probiotics in tablet and capsule forms could be due to their convenience and ease of administration. A study by Valdovinos-García et al[28] found that participating gastroenterologists and nutritionists understand the concept of probiotics, recommend them frequently, and consider them safe. The gastroenterologists prescribed probiotics as therapeutic agents, and the nutritionists to maintain health[28].

The common indication for prescribing probiotics is irritable bowel syndrome (IBS), aligning with existing research highlighting the role of probiotics in gastrointestinal health. These results are in agreement with a previously published systematic review by Hungin et al[29] showed that specified probiotics can provide benefits in IBS and antibiotic-associated diarrhea; relatively few studies in other indications suggested benefits warranting further research[29].

The varying duration of probiotics treatment prescribed by physicians indicates a range of approaches, from short-term interventions to longer-term maintenance therapies. Probiotics play an important role in the maintenance of immunologic equilibrium in the gastrointestinal tract through direct interaction with immune cells. Probiotic effectiveness can be species, dose, and disease-specific, and the duration of therapy depends on the clinical indication[30,31].

The distribution of prescribing physicians across different specialities, including general medicine, gastroenterology, and surgery, suggests a multidisciplinary approach to probiotics use, reflecting their relevance in various medical contexts. This can help in the Identification of gaps in knowledge and practice between physicians from different specialties and may be helpful to policymakers who are in charge of developing educational materials for those physicians about providing knowledge on probiotics[32].

The study shows that being diagnosed with IBS or functional diarrhoea is are factors that influence the prescribing of probiotics. A systematic review by Sun et al[16] found that probiotics with high doses or different strains are effective and safe for these indications through improving symptoms, as well as abdominal pain and quality of life[16].

In addition, the study found that the primary barrier to prescribing or recommending probiotics is a lack of knowledge about their clinical indications. This finding aligns with previous studies published in Pakistan[33], India[34], and Jordan[35]. Awareness about understanding probiotics through more training and education of healthcare providers, and more often with probiotics marketing responsible parties, is required. Furthermore, the cost of probiotics also impacted the decision to prescribe probiotics. This finding was revealed by previously published studies[36,37], in which probiotics were not shown to be a cost-effective option despite their clinical benefit.

The current study provides insights into physicians' knowledge and experience as well as barriers to prescribing probiotics. However, the study design, as well as using convenient sampling, may limit the generalizability of the findings. In addition, the focus of the study was only on physicians and excluded other healthcare professionals who may be associated with social desirability.

CONCLUSIONS

Several types of probiotics are available from different sources based on field screening. The study also indicates that physicians prefer tablet dosage forms for prescribing probiotics, mainly for IBS and functional diarrhoea, with a duration between three to six months for treatment, mainly for young adults, as well as the knowledge of clinical indications for probiotics, mainly the barrier to prescribing probiotics.

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Conflict of Interest

The authors declare no conflict of interest.

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Authors' Contributions

L.M. contributed to the design and implementation, analysis of the results, and writing of the manuscript. H.J. contributed to the review & editing and supervised the study. S.K. and A.I. supported data collection, provided critical feedback, and helped shape the research, analysis, and manuscript.

Ethical Approval

AI technology was not employed in this study. scientific and ethical committee of the College of Pharmacy, University of Kerbala (Project No: 2024HU16).

Data Availability Statement

All data supporting the findings of this study are included within the article.

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