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# Knowledge, Attitude and Practice of Jordanian Pediatricians Toward Probiotics

**Eyad Altamimi[1]*, Bayan Ahmad[2] and Anastasia Ensminger[3]**

*[1]Pediatric Department, Faculty of Medicine, Jordan University of Science and Technology, Irbid, Jordan*

*[2]Pediatric Emergency Department, Ibn Alnafees Hospital, Manama, Bahrain*

*[3]Registered Dietician, Danville Public School, Danville, Virginia*

***Corresponding Author:** Eyad Altamimi, Professor, Pediatric Gastroenterologist, Hepatologist, Pediatric and Neonatology Department, Faculty of Medicine, Jordan University of Science and Technology, Irbid, Jordan.

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## Abstract

**Background:** The indications for probiotics are expanding, and numerous formulations are now available. This study aimed to explore the knowledge, attitude, and prescribing practices of Jordanian pediatricians regarding probiotics, and to identify any knowledge gaps or restrictions to probiotics prescription in North Jordan.

**Methods:** A cross-sectional survey was conducted among 120 pediatricians working in different health sectors in North Jordan. The survey included questions on demographic characteristics, knowledge, attitudes, prescribing practices, and barriers to prescribing probiotics.

**Results:** Approximately 44% of surveyed physicians reported knowing the constituents of probiotics, and 50% expressed a desire to learn more about probiotics. Antibiotic-associated diarrhea was the most common indication for prescribing probiotics, followed by irritable bowel syndrome and constipation. Knowledge, efficacy evidence, and safety concerns were identified as key determinants of probiotics prescription. The lack of information was considered a barrier to prescribing probiotics by 77.9% of respondents.

**Conclusion:** Our findings suggest that there is a knowledge gap among Jordanian pediatricians regarding probiotics. The study highlights the need for an educational program to provide updated information and recommendations for prescribing probiotics in North Jordan. Additionally, marketing efforts should be directed towards physicians to improve their awareness and knowledge of probiotics.

***Keywords:*** *Knowledge; Attitude; Practice; Jordanian Pediatricians; Probiotics*

## Introduction

Probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit on the host, as defined by the International Scientific Association for Probiotics and Prebiotics (ISAPP) [1]. Most probiotic microorganisms belong to the genera *Lactobacillus* and *Bifidobacterium* [1]. Probiotics help the immune system fight against pathogenic bacteria and balance the microflora composition [2]. These effects are exerted through competing with enteropathogens and producing metabolic products like bacteriocin and butyric acid [2].

A significant body of clinical data has proven the efficacy of probiotics in multiple gastrointestinal disorders, including infectious diarrheas [3], infantile colic [4], irritable bowel syndrome, and abdominal pain [5]. If administered prophylactically to premature newborns, probiotics reduce the chance of necrotizing enterocolitis development [6]. The beneficial effect of probiotics extends beyond

the gut to include a long list of systems, such as respiratory and urinary tracts infections, allergy, osteoporosis, metabolic syndromes, neuropsychiatric illnesses, hepatic encephalopathy, and autoimmune diseases [7].

The fast-growing list of indications and the widely available products mandate prescribing physicians to be familiar with this subject. An international study was conducted about the knowledge of healthcare workers concerning probiotics, with 1066 health professionals from 30 countries worldwide recruited. Only 8.9% responded with an excellent knowledge, while 36.2% considered themselves as having a good knowledge about these drugs [8].

Pediatric healthcare providers from across Europe were asked about their knowledge and usage of probiotics in their practice. The majority agreed that probiotics have significant clinical benefits and are likely to recommend a probiotic to their patients. However, respondents were concerned with prescribing probiotics to immunodeficient hosts, and some were skeptical of the evidence of the efficacy of probiotics [9].

## Aim of the Study

This study aims to measure the knowledge of Jordanian pediatricians about probiotics, identify any knowledge gaps, understand their beliefs and attitudes toward probiotics, identify what limits the prescription of probiotics, and determine how many professionals are willing to prescribe them to their patients.

## Methods

### Participants

All pediatricians and pediatric residents practicing/doing their training in North Jordan, regardless of the working discipline (University Hospital, Ministry of Health, Military Hospital, and Private Practice), are members of the North Jordan Pediatric Club (NJPC). 120 active members (10 retired) participated in the club. An introductory note was posted on the WhatsApp page and Facebook page of the NJPC, explaining the aim of the study and asking members to participate in the study. The link for the survey was then posted on both pages and made available for participation between December 2019 and February 2020. Reminders for participation were sent fortnightly throughout the study period.

### The questionnaire

A validated questionnaire in English [10] (prepared and validated previously by the third author) was administered as a Google form. The questionnaire consisted of six sections in addition to the consent statements. The first part covered demographics and practice (age, gender, practicing role, practicing sector, and years of practice). The next section consisted of questions about the pediatricians' knowledge of probiotics. The third section entailed questions about the physician's attitudes and beliefs The next section was about the practice of the physicians regarding prescribing or non-prescribing probiotics. The following section inquired about the source of information about probiotics the physicians use in their practice. And finally, what are the physicians' reasons for not prescribing the probiotics to their patients.

### Study setting

A cross-sectional survey on knowledge, beliefs toward probiotics and prescribing practices was administered to all members of the NJPC.

### Exclusion criteria:

- Those who didn`t give their consent.
- Non-practicing (retired physicians).
- Non-pediatricians.

### Statistics

Data collected through google form was exported into the Excel spread sheet. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS release 20.0.0, SPSS Inc, Chicago, IL). Data were presented as frequency distributions for categorical variables and mean ± standard error of the mean (SE) for continuous variables. Data was tested at a significance level of 0.05%. Pearson $\chi^2$ test was used to investigate the significance of association between categorical variables, while student's t-test and ANOVA were applied to examine the significance level for continuous normally distributed variables. A p-value < 0.05 was considered statistically significant.

## Ethical consideration

The study was approved by the Institutional Review Board at the Deanship of Faculty of Medicine and the Research Committee at Jordan University of Science and Technology (Approval Number 30-2018).

## Results

### Physicians knowledge and beliefs

26 (44.1%) of the surveyed physicians reported that they know the constituents of probiotics, while 30 (50.1%) stated that they are familiar with mode of action of probiotics. 43 (72%) believe that probiotics have a beneficial clinical effect. 35 (59.3%) believe the effect is strain specific. On the other hand, 38 (64.4%) believe that probiotics are safe and there is a minimal risk associated with probiotics usage (Table 2). Most of the surveyed physicians believed that lack of insurance coverage and scarcity of information regarding available probiotic supplements limit their prescription of probiotics. On the other hand, 70% of the surveyed physicians agree that they would benefit from education/training related to the use of probiotics in their clinical practice**.** There was no significant difference in reported knowledge between physicians from different sectors.

### Physicians` practice

32 (54%) of the surveyed physicians admitted that they never prescribed probiotics. The most common cause for not to advise probiotics was "the cost and non-availability of the product", followed by lack of experience and lack of knowledge (67%, 55.9% and 55.9% respectively) (Table 3).

| | Number | Percent (%) |
|---|---|---|
| | Mean ± SE | |
| **Gender** | | |
| Male | 30 | 50.8 |
| Female | 29 | 49.2 |
| **Age (y)** | 34.22 ± 1.371 | |
| **Role in Medicine** | | |
| Resident | 30 | 50.8 |
| Specialist | 12 | 20.3 |
| Sub-specialist | 17 | 28.8 |
| Total | 59 | |
| **Years Practicing** | 7.185 ± 1.1751 | |
| **Sector of practice** | | |
| Public | 11 | 25.6 |
| University | 23 | 53.5 |
| Private | 9 | 20.9 |
| Total | 43 | |
| **Life style description** | | |
| Healthy | 10 | 16.9 |
| Somehow healthy | 33 | 55.9 |
| Non healthy | 16 | 27.1 |

***Table 1:*** *Demographics of participants.*

The most common indications for using probiotics in our cohort were: antibiotic associated diarrhea (72.9%), irritable bowel syndrome (50.8%) and constipation (40.7%) (Figure 1).

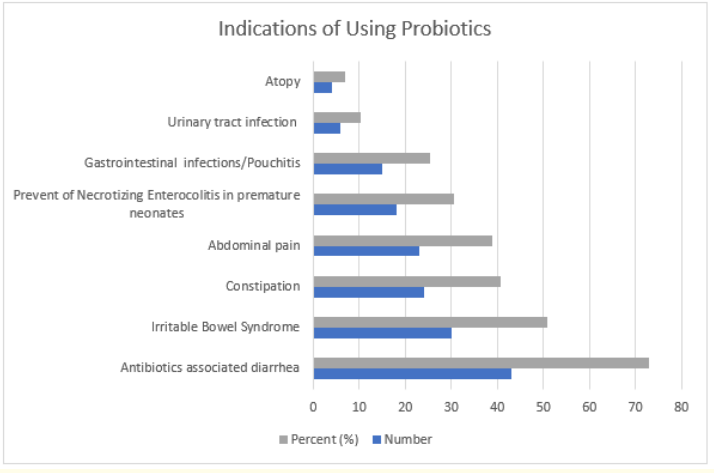


***Figure 1:*** *Indications` distribution of using probiotics by the pediatricians in North Jordan.*

## Prescribers vs. non-prescribers

Neither the sector of practice nor the role of the physician were significant regarding the prescribing practice. Male pediatricians prescribe probiotics more than females (p-value 0.026). Physicians who prescribe probiotic reported significantly better knowledge of the mode of action of probiotics, believe that probiotics are safe, and depend on scientific resources for education on probiotics compared to non-prescribing physicians (p-value 0.025, 0.001 and 0.007 respectively) (Table 4 and 5).

| | **How often do you advise probiotics** | | |
|---|---|---|---|
| **Pre- and post-operative Variables** | **Never prescribe** | **Prescriber** | **P-value** |
| **Sex** | | | 0.026 |
| Male | 12 (37.5) | 18 (66.7) | |
| Female | 20 (62.5) | 9 (33.3) | |
| **Role in Medicine** | | | NS |
| Resident | 19 (59.4) | 11 (40.7) | |
| Specialist | 5 (15.6) | 7 (25.9) | |
| Sub-specialist | 8 (25) | 9 (33.3) | |
| **Sector of Practice** | | | NS |
| Ministry of health | 5 (25.0) | 6 (26.1) | |
| University | 13 (65.0) | 10 (43.5) | |
| Private | 2 (10.0) | 7 (30.4) | |
| Non healthy | 9 (28.1) | 7 (25.9) | |
| **Do you know what constitutes a probiotic?** | | | NS |
| Yes | 10 (31.3) | 16 (59.3) | |
| No | 2 (6.3) | 2 (7.4) | |
| I would like to know more about it | 20 (62.5) | 9 (33.3) | |

| | | | |
|---|---|---|---|
| **Are you familiar with mode of action of probiotics?** | | | 0.007 |
| Yes | 11 (34.4) | 19 (70.4) | |
| No | 4 (12.5) | 4 (14.8) | |
| I would like to know more about it | 17 (53.1) | 4 (14.8) | |
| **Probiotics have beneficial effects** | | | 0.025 |
| Strongly disagree | 0 | 5 (18.5) | |
| Neutral | 9 (28.1) | 2 (7.4) | |
| Agree | 18 (56.3) | 15 (55.6) | |
| Strongly agree | 5 (15.6) | 5 (18.5) | |
| **There are minimal risk for probiotics** | | | 0.001 |
| Strongly disagree | 0 | 3 (11.1) | |
| Disagree | 1 (3.1) | 3 (11.1) | |
| Neutral | 12 (37.5) | 2 (7.4) | |
| Agree | 19 (59.4) | 13 (46.1) | |
| Strongly agree | 0 | 6 (22.2) | |
| **Physiological effect vary with strain** | | | NS |
| Strongly disagree | 1 (3.1) | 4 (14.8) | |
| Disagree | 0 | 2 (7.4) | |
| Neutral | 12 (37.5) | 5 (18.5) | |
| Agree | 18 (56.3) | 13 (48.1) | |
| Strongly agree | 1 (3.1) | 3 (11.1) | |
| **Matching the most beneficial barrier** | | | NS |
| Strongly disagree | 2 (6.3) | 2 (7.4) | |
| Disagree | 4 (12.5) | 2 (7.4) | |
| Neutral | 12 (37.5) | 4 (14.8) | |
| Agree | 12 (37.5) | 16 (59.3) | |
| Strongly agree | 2 (6.3) | 3 (11.1) | |
| **Lack information barrier** | | | NS |
| Strongly disagree | 1 (3.1) | 2 (7.4) | |
| Disagree | 3 (9.4) | 2 (7.4) | |
| Neutral | 1 (3.7) | 1 (3.7) | |
| Agree | 15 (55.6) | 15 (55.6) | |
| Strongly agree | 8 (25.0) | 7 (25.9) | |
| **Lack of insurance coverage limit my prescription** | | | 0.046 |
| Strongly disagree | 0 | 3 (11.1) | |
| Disagree | 1 (3.1) | 2 (7.4) | |
| Neutral | 11 (34.4) | 3 (11.1) | |
| Agree | 15 (46.9) | 10 (37.0) | |
| Strongly agree | 5 (15.6) | 9 (33.3) | |

| | | | |
|---|---|---|---|
| **I would benefit from more education on probiotics** | | | NS |
| Strongly disagree | 2 (6.3) | 2 (7.4) | |
| Disagree | 1 (3.1) | 1 (3.7) | |
| Neutral | 1 (3.1) | 1 (3.7) | |
| Agree | 14 (43.8) | 13 (48.1) | |
| Strongly agree | 14 (43.8) | 10 (37.0) | |
| **More evidence needed** | | | NS |
| Strongly disagree | 2 (6.3) | 1 (3.7) | |
| Disagree | 2 (6.3) | 4 (14.8) | |
| Neutral | 4 (12.5) | 4 (14.8) | |
| Agree | 16 (50.0) | 14 (51.9) | |
| Strongly agree | 8 (25.0) | 4 (14.8) | |
| **Reasons not to advice probiotics** | | | |
| **Lack of evidence** | | | 0.039 |
| No | 18 (56.3) | 22 (81.5) | |
| Yes | 14 (43.8) | 5 (18.5) | |
| **Lack of knowledge/awareness** | | | 0.007 |
| No | 9 (28.1) | 17 (63.0) | |
| Yes | 23 (71.9) | 10 (37.0) | |
| **Not part of protocol** | | | NS |
| No | 19 (59.4) | 16 (59.3) | |
| Yes | 13 (40.6) | 11 (40.7) | |
| **No indication/No need** | | | NS |
| No | 27 (84.4) | 26 (96.3) | |
| Yes | 5 (15.6) | 1 (3.7) | |
| **Industry bias** | | | NS |
| No | 27 (84.4) | 25 (92.6) | |
| Yes | 5 (15.6) | 2 (7.4) | |
| **Lack of experience** | | | 0.001 |
| No | 8 (25.0) | 18 (66.7) | |
| Yes | 24 (75.0) | 9 (33.3) | |
| **Costs/Products not available** | | | NS |
| No | 15 (46.9) | 7 (25.9) | |
| Yes | 17 (53.1) | 20 (74.1) | |
| **Safety concerns** | | | 0.010 |
| No | 25 (78.1) | 27 (100) | |
| Yes | 7 (21.9) | 0 | |

***Table 4:*** *Comparison of demographics, knowledge, attitude and practice between probiotics-prescribers and non-prescribers.*

| Source of information | 32 | 27 |
|---|---|---|
| Media | 5 (15.6) | 5 (18.5) |
| Scientific sources | 9 (28.1) | 15 (55.6) |
| Education, training | 16 (50.0) | 17 (63.0) |
| Conferences/symposia | 14 (43.8) | 14 (51.9) |
| Medical association | 3 (9.4) | 11(40.7) |
| Industry | 0 | 1 (3.7) |
| No info received | 4 (12.5) | 0 |

***Table 5:*** *Sources of information pediatricians depend on.*

Out of the suggested causes for not to advise probiotics, non-prescribing physicians reported lack of efficacy evidence, lack of knowledge, lack of experience and safety concerns more than prescribing physicians, which was statistically significant (p-value 0.039, 0.007, 0.001, and 0.01) (Table 4).

## Knowledge gap

One fourth of the responders stated that they rely on non-scientific media for information on probiotics or even didn`t receive any information at all. Almost 50% of the surveyed physicians expressed their interest in more knowledge about probiotics. The most requested information physicians want to know about probiotics were: safety and side effects, efficacy, evidence-based indications, and dosing (84.7%, 84.7%, 79.7% and 78% respectively) (Table 6).

The preferred educational sources for the surveyed physicians to know about probiotics were: scientific journals, symposia, conferences and e-learning (62.7%,52.5% and 44.1%) (Table 6).

| Preferred sources for further information | |
|---|---|
| Scientific journals | 37 (62.7%) |
| Symposia/conferences | 31 (52.5%) |
| E- learning | 26 (44.1%) |
| Emails/Newsletters | 14 (23.7%) |
| Popular journals | 11 (18.6%) |
| No more information | 1 (1.7%) |
| **Type of future information pediatrician interested in** | |
| Safety/side effects | 50 (84.7%) |
| Efficacy | 50 (84.7%) |
| Indications | 47 (79.7%) |
| Dose | 46 (78.0%) |
| Mode of action | 36 (61.0%) |
| Colleagues experience | 29 (49.2%) |

***Table 6:*** *Type of information pediatricians interested in and the preferred source of communication.*

## Discussion

The indications for probiotics are expanding, while the available formulations are growing exponentially. The knowledge of prescribing physicians needs to keep pace with the rapidly growing science. This study explored the reported knowledge, attitudes, and prescribing practices of Jordanian pediatricians working in different health sectors in North Jordan. The aim was to describe the pediatricians' practice and identify any knowledge gaps and restrictions to probiotic prescription in North Jordan. Such data is expected to help generate an educational program and local recommendations that can be used.

There has been exponential growth in the knowledge on probiotics over the last decade. Edmunds L. surveyed 100 family physicians on using probiotics to prevent antibiotic-associated diarrhea, and only 18% of family physicians were aware of probiotic research [11]. A recent study on the understanding and use of probiotics by different pediatric healthcare professionals working in Europe reported that pediatricians had the highest knowledge and positive attitude toward prescribing probiotics [9]. A more recent study from Saudi Arabia [12] found that 57.7% of pediatricians were aware of the definition of probiotics. In our cohort, only 44% of surveyed physicians reported that they knew the constituents of probiotics, and almost 50% stated that they were aware of the mechanism of action. The encouraging fact was that 50% of the surveyed pediatricians expressed their willingness to know more about probiotics.

Our respondents used probiotics mainly for gastrointestinal indications. The most common indications reported by our surveyors were antibiotic-associated diarrhea, followed by irritable bowel syndrome and constipation [13]. Draper., *et al*. studied the probiotic-prescribing practices among healthcare providers (HCPs) at a tertiary medical center and compared these practices to clinical guidelines. The most common indication for probiotics was the prevention and treatment of antibiotic-associated diarrhea (79% and 66%, respectively). Another study [14] on gastroenterologists and surgeons reported irritable bowel syndrome followed by pouchitis as the most common indications.

Physician prescription behavior is affected by multiple factors [15]. In a review by Davari and colleagues, they listed physicians' personal attributes, cost of the medicine, and pharmaceutical industries' marketing and promotion strategies as the most commonly mentioned factors for prescribing decision. With regard to probiotic prescription, a previous study involving Indonesian pediatricians concluded that their knowledge, the presence of scientific evidence, and ethical point of view were key factors influencing their probiotic prescription decision [16]. In our cohort, the same determinants were believed to influence the decision: knowledge, efficacy evidence, and safety concerns. Consequently, in our cohort, almost half of our respondents would like to learn more about probiotics, and 86.5% agreed that they would benefit from learning about them. 77.9% of them agreed that the lack of information was considered a barrier. This means that the marketing efforts of probiotic supplement manufacturers are not directed towards the physicians who might require them.

Medical knowledge is expanding exponentially, creating unmet gaps that need to be addressed. [17] found that the main information sources for physicians are consulting with colleagues and available electronic sources, while the most important barriers are the lack of search skills and time limitations. In our cohort, most physicians preferred reading scientific journals and attending symposia and conferences as sources of educating themselves on probiotics. This might reflect the fact that more physicians are working in academic centers.

## Conclusion

44% of the surveyed pediatricians reported knowing the constituents of probiotics, while almost 50% stated that they were aware of the mechanism of action. The most common indications for prescribing probiotics were antibiotic-associated diarrhea, irritable bowel syndrome, and constipation. Factors that influenced the prescription decision included knowledge, efficacy evidence, and safety concerns. The lack of information was considered a barrier to probiotics prescription. Most physicians preferred reading scientific journals and

attending symposia and conferences as sources of educating themselves on probiotics. The study highlights the need for continuous education and local recommendations on probiotics prescription.

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