



## Medical Students' Knowledge of Probiotics and their Health Usage in Jordan

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### ABSTRACT

**Objective:** The clinical uses of probiotics are increasing. As medical students are our future physicians, their knowledge and attitude towards probiotics will dictate the extent to which probiotics are prescribed in the future. We investigated medical students' knowledge and attitudes towards probiotics during their clinical years (4-6 years) at the Jordan University of Science and Technology, Irbid, Jordan. **Methods:** This is a cross-sectional cohort study using online/printed questionnaire collecting personal and socio-demographic data in addition to students' knowledge and attitude towards probiotics, the clinical usage, and availability of probiotics, and students' source of information on probiotics and whether probiotics are covered in their curriculum. We presented their responses as averages and compared these by gender and lifestyle. **Results:** Total 272 (15%) students completed the questionnaires (144 females, 22.93 ± 1.13 years old), 140 (51.5%) of which claimed to have a healthy lifestyle. More than half the students could correctly define probiotics, knew the sources and could identify at least 2 usages; such knowledge did not differ by gender. Most students 225 (82.3%) recognized the mechanisms of action of probiotics, but only 115 (42.2%) knew that probiotics' effects are strain-specific. Most students (244 (89.7%)) had a positive attitude towards probiotics and were interested in learning more about probiotics (252 (92.6%)). Their attitudes did not differ by lifestyle ( $p=0.196$ ). **Conclusion:** Medical students in Jordan had an acceptable level of knowledge about probiotics and their health effects. Covering probiotics in medical school curricula may boost students' knowledge, thereby enhancing future prescription of probiotics.

**Keywords:** Probiotics, Medical students, Attitude, Curriculum, Physicians

### INTRODUCTION

Probiotic is derived from the Latin pro "for" and the Greek bios "life", making it direct contrast to the word antibiotic (anti "against" and bios) [1]. The word probiotics have been given a number of different definitions over the years, with the current definition being "live micro-organisms which when administered in adequate amounts confer a health benefit on the host."

Probiotics are useful in managing a number of medical conditions, most notably helping to maintain the immunologic composure of the gastrointestinal tract. This is considered to be the result of direct interaction between the probiotics and immune cells in that system of the body. However, their effectiveness to this end is dependent on numerous variables that must be specified in the treatment regimen [2-4].

The beneficence of probiotics is not limited to the gastrointestinal tract: they may be of use in cancer prevention and treatment, allergy control and prevention, obesity treatment, and many other fields currently being investigated [5-9]. Among these fields, strain type is one factor that has been consistently found to influence probiotic performance, although this might be overshadowed by other host-dependent factors such as diet and microbiota; this would explain why some strains share common benefits and others possess unique properties [10].

The ESPGHAN recommendations on using probiotics in adjunct to hydration therapy in cases of acute gastroenteritis represent an example of strain specificity; where they recommend using *S. boulardi* and *Lactobacillus rhamnosus* but recommended against *E. faecium* [11].

The health effects of probiotics are not generalizable to all types, with certain types showing greater health benefits than others. In fact, probiotics can even have adverse effects at different timelines, with some presenting in the short-term and others in the long-term [12]. Thus, each type has a different safety profile, which can lead to problems of varying severity depending on the predisposition of the individual and the setting [13].

Healthcare professionals knowledge directly influences the selection and the outcomes of the treatment used. As future health care providers, medical students' knowledge of probiotics and the health effects of functional food will shape their ability to provide accurate and practical dietary advice for their patients and may dictate their prescription practices [14-16]. The knowledge of clinicians on probiotics availabilities and clinical effects reflect at least partially their exposure during studying years. It is reasonable to believe that the knowledge gap is a reflection of the deficient medical school curriculum. In 2 studies from Nigeria and Iran, conducted to assess the knowledge and perception of probiotics among medical science students; medical students represent 33% and 50.4% of the study samples [16,17]. Their knowledge ranged between poor and acceptable [16,17]. Both studies concluded that students might benefit from teaching materials and sources on probiotics.

A previous study from Jordan involved college students found that their knowledge on probiotics and their health effects was poor. Although students of health sciences did better than non-health sciences, the study did not specify the program. Health science students represent a minority in their cohort.

Up to our knowledge, no studies targeted medical students specifically. This study targeted medical students only. In the present study, we examined the knowledge and attitude towards probiotics of medical students in their clinical years at Jordan University of Science and Technology, Irbid, Jordan.

## MATERIALS AND METHODS

### Design and Participants

We conducted a cross-sectional observational study using online and paper-and-pencil versions of a self-administered questionnaire. We asked all medical students at the study university who were participating in clinical training (4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> years) to participate in the study.

### Measures

We developed the questionnaire using a thorough review of the relevant literature [15-19]. The questionnaire contains 4 parts; the first part covered socio-demographic data including age, gender, studying year, Jordanian, Non-Jordanian, residence, smoking, self-reporting of lifestyle (healthy-not healthy). The second part consists of 7 questions explored the knowledge of students of probiotics (definition, clinical effects, availability, safety profile, side-effects and specific features of probiotics).

The third part consisted of 4 questions which enquired whether the students ever tried probiotics if tried why, how they feel towards future prescribing probiotics and any barriers they think of towards using or prescribing probiotics. The last part consists of 3 questions which tried to explore the source of information the students depend on, and whether they are willing to learn more about probiotics and whether probiotics are covered in the medical school curriculum or not.

### Data Collection

Between March 1, 2018, and June 30, 2018, we posted an announcement of the study on the class Facebook groups for students in their clinical training years asking these students to participate; all students in these classes had joined the Facebook groups. The questionnaire was posted online along with an access link. The questionnaires were completely anonymous. Students could complete the questionnaire only once; however, it was possible to save progress and continue at a later time. Reminder messages were posted regularly in the facebook groups. A letter from the investigators was posted along with the questionnaire explaining the purpose of the study and asking the students to complete the questionnaire accurately.

We also made printed copies of the questionnaires available for students in their lecture halls. They were asked to complete the questionnaire and return them at their convenience. Students were asked to complete the questionnaire only once.

### Statistical Analysis

The means, standard deviations, and percentages were calculated for participants' responses to the questionnaire. We then conducted an independent t-test to compare knowledge and attitude between males and females and between students who reported having a healthy lifestyle and those who reported an unhealthy lifestyle. The results were considered significant at  $p < 0.05$ .

### Ethical Approval

This study was approved by the institutional review board of the Jordan University of Science and Technology/King Abdullah University Hospital (15/112/2018) and the University Research Committee.

## RESULTS

Table 1 shows the participants' characteristics. Ultimately, 272 students with a mean  $\pm$  SD age of  $22.9 \pm 1.33$  (range 21-27 years) completed the questionnaire. Of these, about 53% were female. Just over half 40 (51.5%) of the students described their lifestyle as healthy.

**Table 1 Participants characteristics**

Characteristic	%
<b>Age</b>	
22.9 $\pm$ 1.33	
<b>Gender</b>	
Male (N=128)	47.1%
Female (N=144)	52.9%
<b>Nationality</b>	
Jordanian (N=191)	70.2%
Non-Jordanian (N=81)	29.8%
<b>Smoking</b>	
Yes (N=45)	16.5%
No (N=227)	83.5%
<b>Lifestyle (student's own description)</b>	
Healthy (N=140)	51.5%
Non-healthy (N=132)	48.5%

Over half, the students could correctly define probiotics and could name its sources and at least two usages. None of these knowledge items showed a significant gender difference ( $p=0.728$ ,  $0.180$ , and  $0.158$ , respectively). On the other hand, females showed better knowledge than males regarding the availability of probiotics pharmaceutical products and probiotics strain specificity but it did not reach statistical significance ( $p=0.054$ ). Regarding attitude towards probiotics, no gender difference was observed in our cohort.

Furthermore, while most students 225 (82.3%) recognized the mechanisms of action of probiotics, only 115 (42.2%) knew that the effects of probiotics are strain-specific (Table 2).

**Table 2 Students' responses compared according to gender**

Item	Females N (%) N=144	Males N (%) N=128	p-value
Definition of probiotics	79 (54.9%)	73 (57.0%)	0.728
Natural sources of probiotics	87 (60.4%)	67 (52.3%)	0.180
Clinical usage (at least two indications)	81 (56.2%)	61 (47.6%)	0.158
Pharmaceutical availability	112 (77.8%)	95 (74.2%)	0.054
Safety	96 (66.7%)	90 (70.3%)	0.118
Strain specific benefits	53 (36.8%)	62 (48.4%)	0.054
Mechanism of action	124 (86.1%)	101 (78.9%)	0.118

Ever used probiotics	39 (27.0%)	23 (17.9%)	0.075
Positive attitude	130 (90.2%)	114 (89.0%)	0.746
I would like to learn more about probiotics	137 (95.1%)	115 (89.8%)	0.097

Interestingly, students who described their lifestyle as healthy were more knowledgeable than were students who reported unhealthy healthy lifestyle, specifically for the items concerning sources of probiotics, pharmaceutical availability, safety profile, and mechanisms of action. These differences were significant ( $p=0.044$ ,  $0.036$ ,  $0.005$ , and  $0.000$ , respectively) (Table 3).

**Table 3 Students responses according to life-style description**

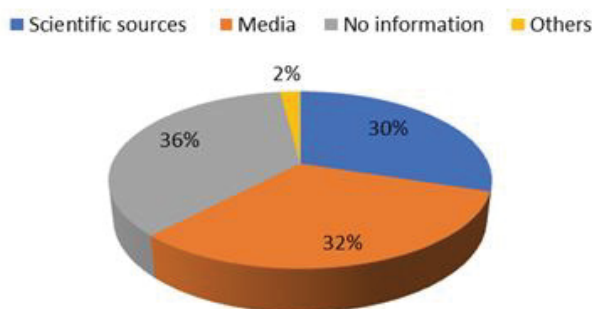
Item	Healthy N (%) N=140	Not- Healthy N (%) N=132	p-value
Definition	76 (54.3%)	71 (53.8%)	0.934
Sources	86 (61.40)	65 (49.2%)	0.044*
Clinical usage	93 (66.4%)	86 (65.2%)	0.835
Pharmaceutical availability	109 (77.4%)	90 (68.2%)	0.036*
Safety	104 (74.3%)	77 (58.3%)	0.005*
Strain specific	59 (42.1%)	51 (38.6%)	0.557
Mechanism of action	124 (88.6%)	93 (70.5%)	0.000*
Ever used probiotics	41 (29.3%)	19 (14.4%)	0.003*
Positive attitude	90 (64.3%)	74 (56.1%)	0.168
I would like to learn more	132 (94.3%)	120 (90.1%)	0.196

As for attitude, the majority of students 244 (89.7%) exhibited a positive attitude towards probiotic use. More students who reported a healthy lifestyle actually used probiotics than did those without a healthy lifestyle (41

(29.3%) vs. 19 (14.4%)), and this difference was statistically significant ( $p=0.003$ ). Most of the students 252 (92.6%) showed an interest in learning more about the features of probiotics and its clinical benefits; however, this item did not differ by lifestyle ( $p=0.196$ ).

Less than 20% of the students reported that probiotics were covered in their medical school curriculum. Furthermore, only 30% of the students depended on scientific resources to learn about probiotics (Figure 1).

### Reported sources of information on Probiotics:



**Figure 1 Reported sources of information on probiotics**

### DISCUSSION

We have a wealth of evidence on the health effects of probiotics, and there is a growing need to prepare future healthcare providers to utilize these substances, in both natural sources and available pharmaceutical products. Assessing medical students current knowledge and attitude towards probiotics will help teachers and curriculum developers in medical schools to incorporate this subject into their teaching. To our knowledge, this is the first study in Jordan to examine medical students' knowledge and attitude towards probiotics.

More than half the students could define probiotics and know of its natural sources and at least 2 clinical usages of

probiotics. These rates align with those found in a study by Payahoo, et al., on medical sciences students, wherein half the studied group had an acceptable knowledge level [16]. By contrast, a previous study revealed very low rates of probiotics knowledge among Jordanian college students in general (11.7%); the discrepancy between this study and our own likely originates from pooling of the results of students from a variety of disciplines (e.g., health sciences, basic sciences, engineering) [18]. That study, in fact, found that students pursuing health sciences degrees showed greater knowledge than did students in other disciplines [19].

In this study, women showed greater knowledge for most items than did men; however, the difference was only slightly significant for knowledge on the availability of probiotic pharmaceutical products. This is consistent with an Irish study showing that female consumers tend to be significantly more aware than do their male counterparts (73% versus 57%) [20]. The previous study on Jordanian college students also showed that female students were significantly more knowledgeable of probiotics than were male students [18], as did a study in India [21]. Another study examined general consumers rather than medical students but found that women appear more knowledgeable in general about nutrition and food than do men and are more likely to be concerned about their health and physical appearance [22]. This was reflected in female students' attitude toward probiotics, as well as female students had higher rates of using probiotics and were willing to learn more about it (although the differences were not statistically significant). Previous studies have illustrated that women tend to be more interested in using probiotic food products [23], and implied that women consumed more health foods than men and had a more positive attitude towards health foods [24].

Functional foods are defined as healthy foods with health-promoting and/or disease-preventing properties beyond the traditional and basic nutrients such as vitamins and minerals [25]. One would expect that individuals who are more interested in pursuing a healthy lifestyle are more knowledgeable and have a more positive attitude towards health promoting products such as probiotics. In fact, we found this with those who described their lifestyle as healthy were more knowledgeable and had a more positive attitude towards probiotics.

Most of the students mentioned that probiotics were not covered in their curriculum. Furthermore, most of their knowledge derived from media sources than trustworthy scientific sources. A previous study on physicians in the Netherlands showed that the mass media is still the greatest source of knowledge on probiotics in a physician who does not advise the use of probiotics in their practice [26]. Incorporating probiotics into the curricula of upcoming healthcare professionals is likely to improve their knowledge and awareness, and will consolidate their skills with trusted information.

## CONCLUSION

This study provides insight into medical students' knowledge and attitude towards probiotics. Nevertheless, it has some limitations, as well. In particular, the sample was small and the response ratio was low, thus limiting the generalizability of the results. Furthermore, our dependence on the self-reporting of lifestyle might have influenced the precision of the conclusions for that variable. Moreover, given that the students were allowed to complete the questionnaires in multiple sessions or at home, the percentage of accurately answered questions might be overinflated.

## DECLARATIONS

### Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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