



Assessing the knowledge of the pediatrician and general physician about the probiotics in the treatment of the infant diarrhea

Samiyah Tasleem¹ and Kamran Afzal²

¹Department of Microbiology, University of Karachi, FUUAST-Karachi, **Pakistan**

²Department of Physiology, Bhawalpur Medical And Dental College, **Pakistan**

*Correspondence: samiyahtasleem2005@yahoo.com Received 15-02-2022, Revised: 02-06-2022, Accepted: 03-06-2022 e-Published: 05-06-2022

Uses of probiotics worldwide among healthcare providers against diarrhea have increased. Many healthcare organizations, nutritional and pharmaceutical companies encourage health professionals to promote the use of the probiotic in infant's diarrheal treatment. The current study aimed to assess the knowledge of the general physicians and Pediatricians about the clinical use of probiotics. A cross-sectional online survey using a brief questionnaire consisting of three segments in multiple languages was distributed via emails and social platforms by snowball sampling technique. A total of 1020 respondents participated, of which 456 were general physicians, and the remaining 564 were Pediatricians. The majority of the participants were 40-50 years old with 30 years of job practice. The ratio of the female respondents was higher as compared to any other gender. Besides this, pediatricians were more knowledgeable and were sure of using probiotics as a part of treatment. Among these, 90.42% choose the correct definition of the probiotics while in general physician 48.24% choose the correct option. A total of 46.96% respondent rated their knowledge as medium. Among strains, *Lactobacillus acidophilus*, *Bifidobacterium bifidum*, and *Escherichia coli* were most frequently selected, especially pediatricians. The majority of the respondents agreed that infants after 6 months are more likely to suffer from diarrhea and that probiotics should be living microorganisms. Respondents from Canada, Europe, Africa, and China were more familiar with the term probiotics, and most of them are involved in using probiotics in the form of yogurt. From the current findings, it was concluded that Pediatricians were better informed about the use of probiotics than general physicians. Further, it is very important to educate the medical staff regarding the effectiveness and usefulness of probiotics in infants.

Keywords: Use of probiotics, Infants diarrhea, Probiotic strains, Pediatrician, General physician

INTRODUCTION

Probiotic is derived from the Greek word *pro*, meaning "for," and *biotic*, which means "life." Probiotics can be defined as "live microorganisms when ingested provide the beneficial effects to the host by improving its intestinal microbial balance" (FAO/WHO, 2001). Later in 2014, ISAPP suggested a new definition that is accepted worldwide "live microorganisms that, when administered in adequate amounts, confer a health benefit on the host." Previously, some particular strains were considered probiotic strains (Hill, C.et al. 2014), but now, several other strains are also considered probiotic strains (Fijan, S 2014). Probiotics can be used against several clinical conditions like diarrhea, mental illnesses, immune booster, slow gut transit, irritable bowel syndrome, abdominal pain and bloating, and ulcerative colitis (Hill, C.et al. 2014, Goldenberg, J.Z.et al. 2017, Agamennone, et al. 2018

and Peng, et al.2019).

Although probiotics are available and accessible, their use as medicine among health care providers is still confusing due to conflicting messages and a wide range of information about probiotics. Besides this regulation no 1924/2006 of the European Union on nutrition and health forbids the use of probiotics term on food items, leading to massive confusion across the world. The current study was designed to evaluate the knowledge of healthcare professionals about probiotic use.

MATERIALS AND METHODS

Survey and Questionnaire:

The structure of the questionnaire used was based on the previously published research (Johnson, N et al. 2016, Soni, R. et al. 2018). Using the snowball sampling technique, a questioner was distributed through the

internet via emails and other social platforms (Facebook, Twitter, and LinkedIn). This online survey was carried out for four months, from February to May 2019. English version of the questionnaire was translated into four other languages (Chinese, German, Italian, franc), and every respondent was free to answer in any of these languages.

The questionnaire was divided into three sections; each of the sections is explained below

First section: this section contains questions about demographics, general practice experience, specialization, and country. The second section of the questionnaire was to evaluate the general knowledge of the Physician about probiotics. Knowledge was assessed on a 5-point Likert scale that is 1: no knowledge at all, 2: little knowledge, 3: medium knowledge, 4: good knowledge 5: expert of the field. After this question on the basic knowledge and facts was asked like the definition of probiotics, beneficial effect of the probiotics, any side effects and strains that may contain the strain of probiotics, etc., specific age of infants that are most prone to diarrheal infection; namely 1) before 6th month 2) after 6th months. In the last portion (3rd section) of the questionnaire, Physicians were asked about their experience in probiotics administration and results. This survey was completed in approximately 7 minutes. Though the survey was voluntary and anonymous, still the

respondents were given the opportunity to mention their email addresses if they wish to receive a result copy.

Statistical analysis

The findings of the research work were statistically analyzed by using the chi-square test and ANOVA the SPSS version and Microsoft Excel. For categorical variables, percentages and proportions were calculated. All the data in current research work is represented as means and standard deviation.

RESULTS

1st segment of the questionnaire

The first part of the questionnaire about their profession revealed that respondents in current survey were from 11 different countries (total n=2014) and the countries and respondent quantity participated in the survey is highlighted in the map below. The pediatrician and general physician were grouped separately, and other health professionals were excluded from the study, like nurses, pharmacists, or any other type of health practitioner. In selected health professionals (general Physician and pediatrician) ratio of the female participant were higher. And age group was of 40-50 years old. Further details of different groups of the respondent are illustrated in Figure 2.

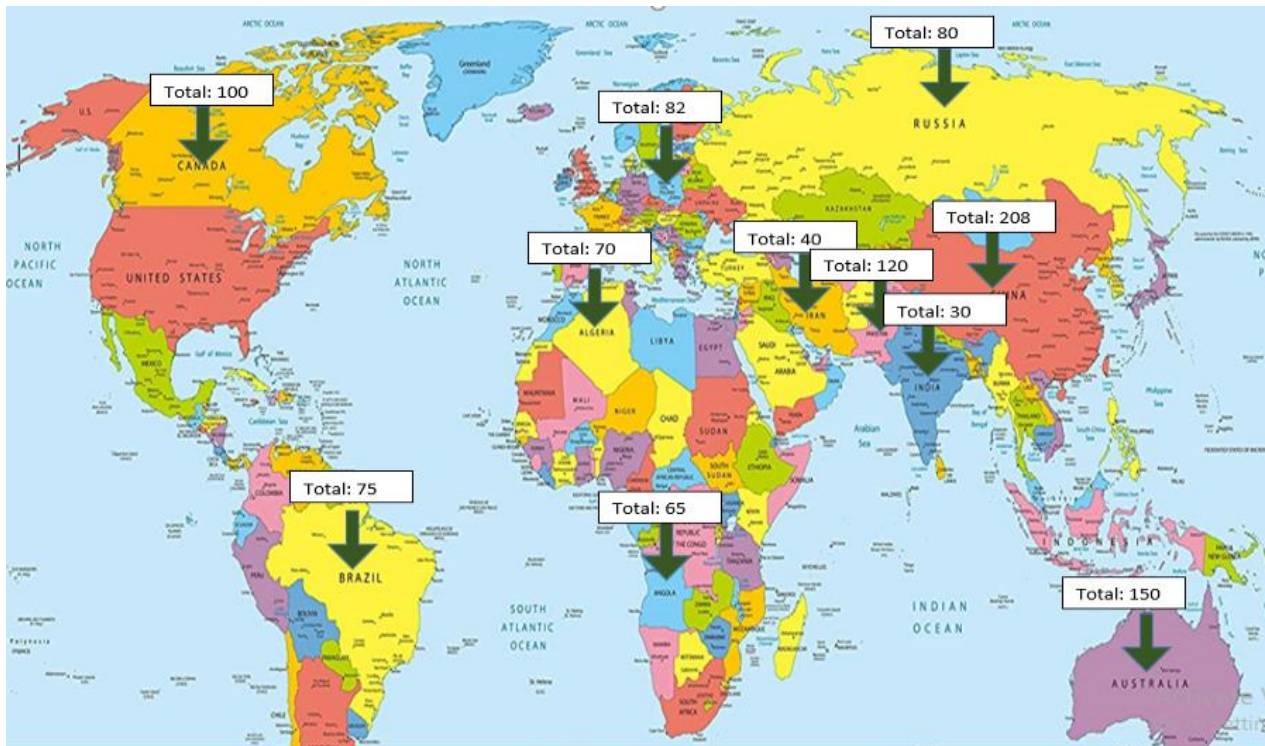


Figure 1: World map showing respondents of countries

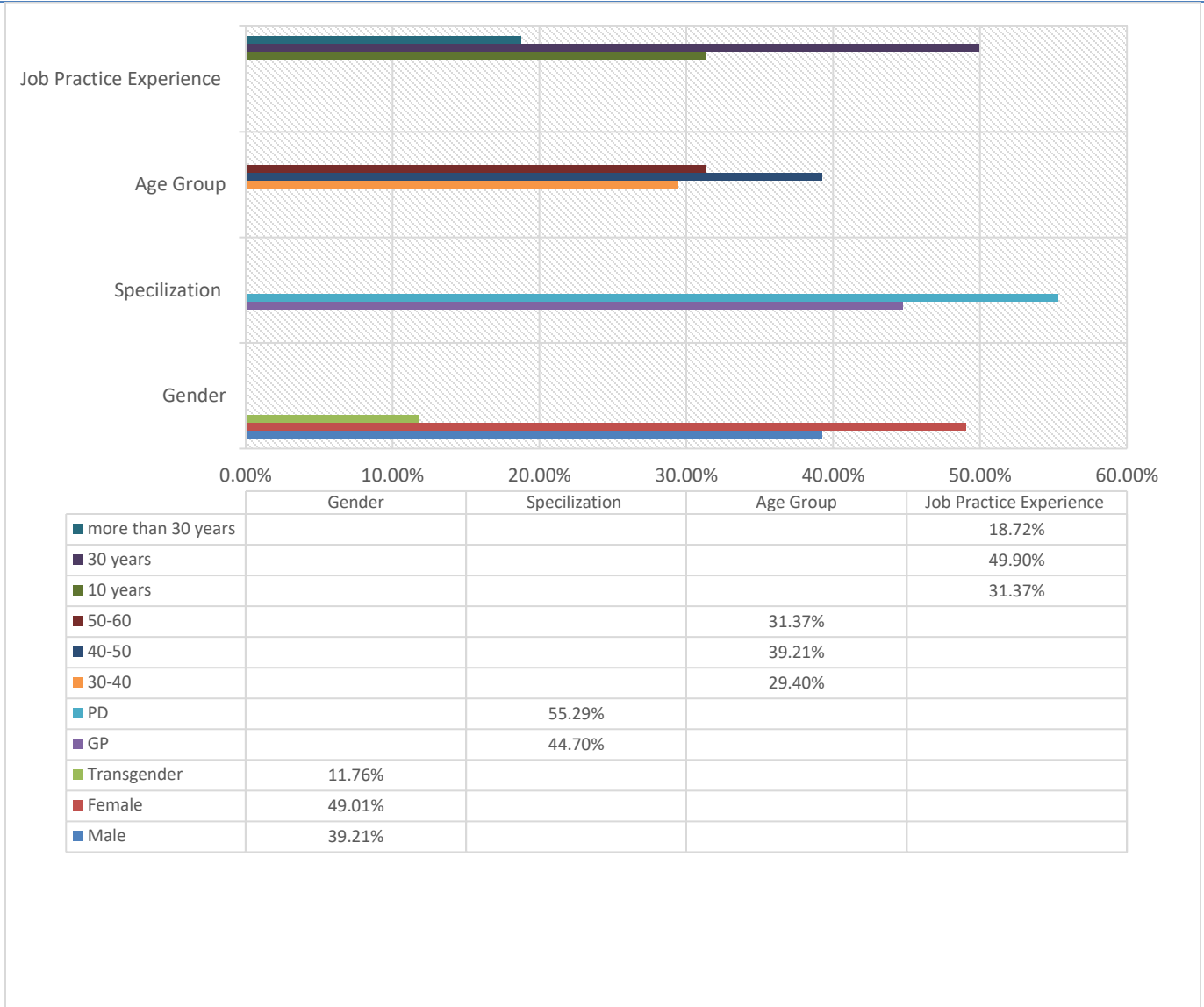


Figure 2: Distribution of different respondent groups

2nd segment of the questionnaire

Self-knowledge assessment result revealed that (5-point Likert scale) that the majority of the respondent rated their knowledge as medium or good n= 479 (46.96%) (Pds: 39.00%, GP: 56.79%). In comparison, some of them rated as an expert of the field n=189 (18.52%) (Pds:30.14%, GP: 4.16%), and few of them have no knowledge at all or poor knowledge. And Pediatrician has a significantly higher knowledge of the probiotics used as compared to the general physician. Besides this, among pediatrician majority check the correct definition box while in general, physicians 48.24 % select the correct definition and remaining 51.15% wrong. Detail result is depicted in the following table 1 below.

Further, participants were asked to choose the correct strains of the probiotics strain of the species in which

Lactobacillus acidophilus, *Bifidobacterium bifidum*, *Mycobacterium avium*, *Escherichia coli*, *Lactobacillus rhamnosus*, *Bacillus subtilis*, *Enterococcus faecium*, and *Saccharomyces boulardii* were enlisted. All mentioned species except for *Mycobacterium avium* contain different probiotic strains. Knowledge about the probiotic strain was significantly different between the two groups of health professionals. The pediatrician had to select the most frequent strains of the *Lactobacillus acidophilus*, *Bifidobacterium bifidum*, and *Escherichia coli*. While few of the individuals selected species of *Mycobacterium avium*, which contain no probiotic strain. Detail of this question is illustrated in the following figure 3.

Table 1: Evaluation of the self-knowledge assessment

		Rating of the knowledge					Total	Correct definition	False definition
		Expert	Good Knowledge	Medium knowledge	Poor Knowledge	No Knowledge at all			
specialty	Pediatrician	170 (30.14%)	150 (26.59%)	220 (39.00%)	20 (3.54%)	4 (0.70%)	564	510 (90.42%)	54 (9.57%)
	General Physician	19 (4.16%)	42 (9.21%)	259 (56.79%)	36 (7.89%)	100 (21.92%)	456	220 (48.24%)	236 (51.75%)
Total		189 (18.52%)	192(18.82%)	479(46.96%)	56 (5.49%)	104 (10.19%)	1020		

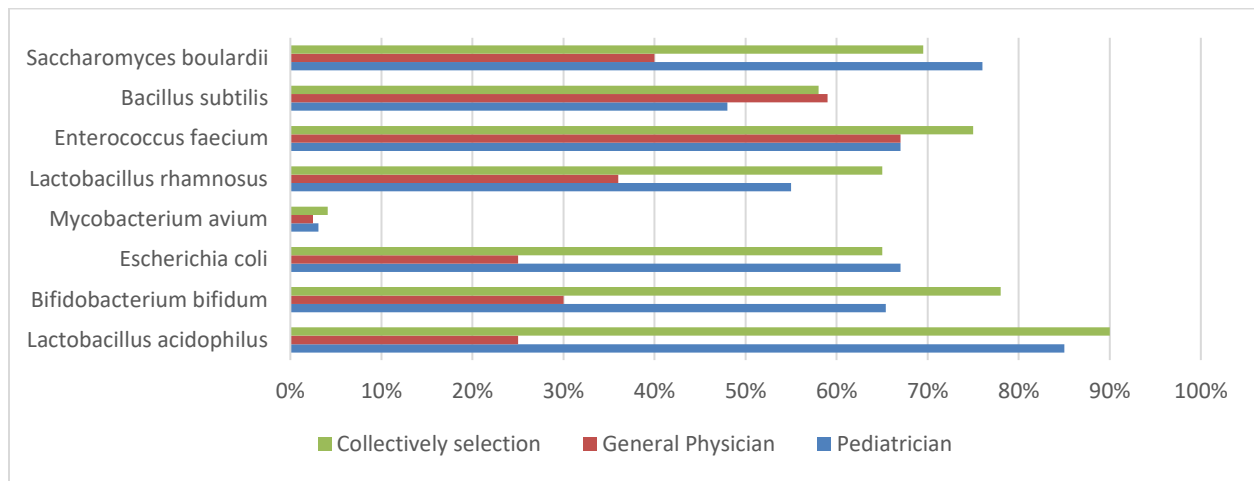


Figure 3: Knowledge of the respondent about the probiotics strains

The next question was about the form of the probiotic in which they were asked to tick true or false for the following question. Probiotics work better in the form of tablets, capsules, or powder. 2) Probiotics should be living organism 3) it is important to take probiotics for a longer duration for their satisfactory result. 4) Probiotics should be taken after the meal. Few of the respondents responded wrongly that probiotic is effective in tablet, powered, or capsule. In contrast, the majority of the respondents respond correctly that it is a living microorganism. Most of the pediatricians agreed that probiotic species should be taken for a long time orally as they may disappear from the gut while few of the general physician agreed on this statement on the other hands most of the patrician suggest that it should not take after meal and few agreed with our statement. The general physicians suggest that it should take after the meal. In comparison, a minority of them suggest that it should be taken before the meal. Information about when to take the probiotic strains vary significantly different between these two groups. ($\chi^2 = 29.365$; $p < 0.001$). The last question was about diarrhea at the age of 1) pre-sixth month 2) Post-Sixth month. Collectively more than half of the participants selected the second option of the post-sixth month. While very few select pre-sixth month.

3rd segment of the questionnaire

The last segment of the questionnaire's first question was about their personal use of probiotics. The majority of the physician already used this probiotic in the form of probiotic yogurt (Pd: 41.66%, GP: 91.66%), probiotic drinks (Pd:16.66% GP: 4.16%), probiotic medicines (Pd: 31.25%, GP: 3.20%), probiotic food supplements available in specialized shops, supermarkets, pharmacy or online (Pd: 8.33%, 0.96%), and other probiotic products (Pd: 2.08%, GP: 0.96%). The difference between the two groups of physicians was significant ($\chi^2 = 6.319$; $p < 0.004$).

The next question of this segment was about the reason for the use of probiotics. Respondents were provided with the options like probiotic should use for 1) diarrhea 2) constipation 3) traveling aboard 4) with antibiotic treatment 5) reduce bloating 6) release tension/stress. In response to these options, the majority of them selected the use of probiotics for the treatment of diarrhea with antibiotic treatment reduce bloating while few suggest that it can also be used to reduce bloating or traveling abroad. At the same time, information about the prescription of probiotics to their patient varied significantly.

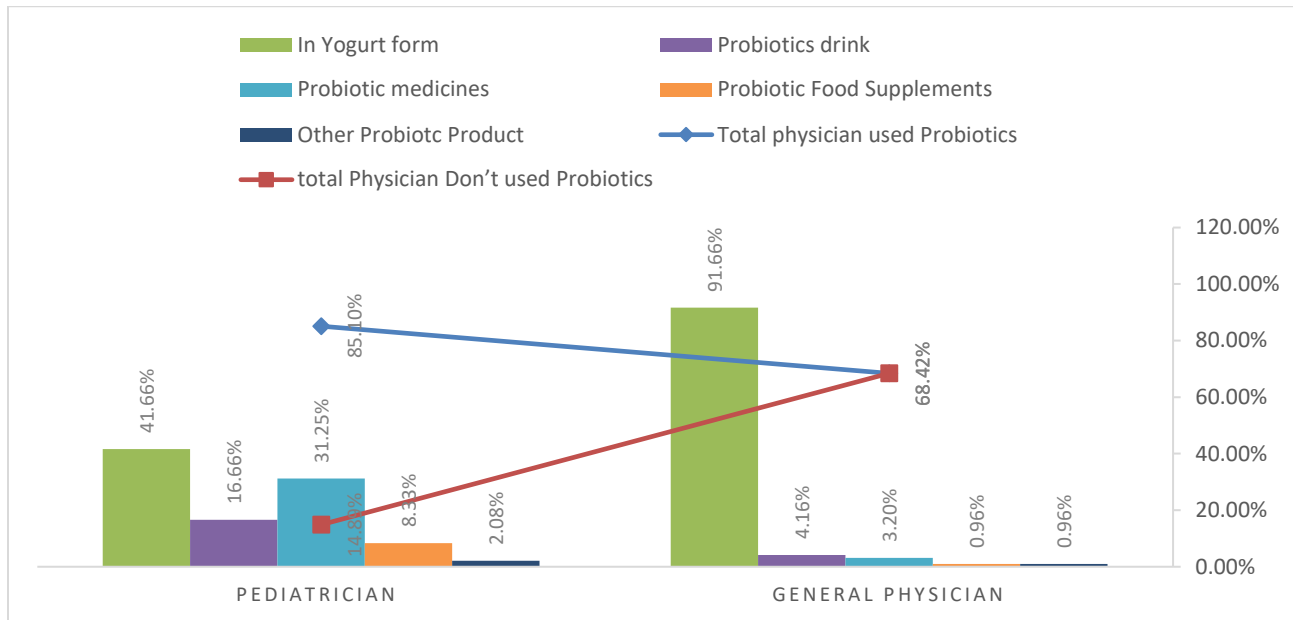


Figure 4: Probiotics used by Pediatrician and General Physician

Some of them were sure to use probiotics, while many of them are not sure. The majority of the pediatricians were prescribing probiotics for infants, especially in diarrhea control. The majority of physicians from China and Canada (North America) prescribed probiotics, followed by Brazil, Russia, Australia, and Africa, while physicians from Pakistan, Iran, and India were not sure of prescribing probiotics. The rest of the few countries don't prescribe Antibiotics. Further, they were asked about the result of the probiotics used in infants 1) perfect 2) satisfactory 3) poor 4) don't know. In response to this question, those physicians who used probiotics in their prescription concluded that the result of probiotic use is satisfactory, and very few (10.19%) said the results were poor.

DISCUSSION

This research work was a cross-sectional survey to assess the knowledge and beliefs of the pediatrician and general physician regarding the use of the probiotic and to identify the critical age of diarrhea, its pathogenesis, and to assess the level of confidence to use probiotics in infants across the world through an online survey. There were few limitations of the current study, including the quantity of the respondent that is no of clicks were quite higher than the actual number of the participant (2014) that filled the questionnaire. The possible reasons behind high click verse limited respondent could be that some might have felt they had not enough knowledge to answer or some might not agree with the type of questions that has been raised. Secondly, we had a high female to male ratio of around 3:1. Due to these limitations, our samples could not statistically be validated.

In our research work, we found that most pediatricians were sure about their knowledge and were prescribing it to their patients. On the other hand, the general physician had a limited understanding of using probiotics. Besides this, most pediatricians selected the correct definition of probiotics as compared to the general physicians. A lot of the research has been conducted to evaluate the benefit of probiotics, and most of these studies supported their use. But a wide range of probiotics strains and a variety of available products make it very difficult for the physician to choose the right strain with the correct dose. (Jordan, D, et al. 2015). The score of the current study was not the highest. Some of the previously published research studies have assessed the awareness and perception of probiotics in Nigeria, which concluded that health professionals of Nigeria were not that familiar with the term of the probiotic. On the contrary, health professionals of Europe, Asia, and the USA were mostly familiar with probiotics. (Oliver, L. et al. 2014, Payahoo, L. et al. 2012). The same result was concluded in current studies that physicians from the USA, Europe, and China had a high degree of familiarity. Besides this, health professionals of Africa were aware of probiotics, and they were also involved in prescribing probiotics; this result is contrary to some previously published research. (Anukam, K.C, et al. 2006, Stanton, C. et al. 2001)

The current study also concluded that infants aged six months and older suffer from severe diarrhea more frequently than infants less than six months. This could be explained on fact that older infants are fed with semi-solid food which increase their exposure to the gut pathogens. Many health care providers use probiotics for the treatment of diarrhea. It has been indicated from the

different studies carried out in world conclude its safety and efficacy in treating the acute diarrheal infection. (Wilkins T. et al. 2017, Thomas DW. et al. 2010, Indrio F. et al. 2009, Vlieger A M. et al. 2009, Arine M. et al. 2009 Chouraqui JP. et al. 2008, Wilkins T et al. 2017)

However, limited information to the healthcare providers about the use of probiotics made it impossible to use probiotics. Several previous studies indicated that health professionals need more information and knowledge about the rational use and dosage of probiotics. (Chukwu, O.A. et al. 2016, Ensminger, A. et al. 2011) Probiotic knowledge should be disseminated to the nursing staff because they have a critical role in supporting the use of probiotics. They are involved in routine care of the patients, and high interaction with the attendants facilitates the education of stakeholders about the use of probiotics and their beneficial properties. (Johnson, N. et al. 2016)

Stains suggested in the current studies were *Lactobacillus acidophilus*, *Bifidobacterium bifidum*, *Mycobacterium avium*, *Escherichia coli*, *Lactobacillus rhamnosus*, *Bacillus subtilis*, *Enterococcus faecium*, and *Saccharomyces boulardii*. Among these strains, genera of *Lactobacillus* and *Bifidobacterium* are more commonly used as probiotic bacteria by many health professionals (Hill, C. et al. 2014, Fijan, S 2014, Pandey, K.R et al. 2015) In the current study, most of the participants chose *Enterococcus faecium* and *Escherichia coli* as the probiotic source because these strains are the normal microbiota of the gastrointestinal tract and have probiotic activities. But both of the microbes also have serious pathogenic potential as well, like *Enterococcus faecium* or enteropathogenic, enterohemorrhagic, and enterotoxigenic *Escherichia coli*. Most of these species show a high level of resistance to vancomycin and β -lactamases. (Rund, S.A. et al. 2013, Say Coskun 2019, Franz, E. et al. 2015)

Since the use of the antibiotics is widespread and popular in treating multiple infections including diarrhea worldwide but the use of the probiotics along with the antibiotic could be more beneficial and effective. (Stuart B L et al. 2012, Sharp R R, et al. 2009)

CONCLUSION

Widespread use of antibiotics has resulted in the emergence of antibiotic-resistant strains. Also, due to a high number of side effects, consumers' demand for an alternative has increased several folds. The effectiveness of the probiotic against many infections has caught the attention of many healthcare providers. Consumers interested in the use of probiotics face a lot of difficulties due to a lack of knowledge, and consequently, they have to seek advice from health professionals about probiotics. Hence health care providers should have sufficient scientific knowledge about the right strain, dosage, and frequency of probiotics use. And they are the ones who are responsible for the preparation of the guidelines based

on research. The current study may help to aimed learning programs which may in turn improve use of the probiotics.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

ACKNOWLEDGEMENT

Department of Microbiology, University of Karachi, FUUAST-Karachi, Pakistan and "Department of Physiology, Bahawalpur Medical and Dental College, Pakistan for technical expertise.

AUTHOR CONTRIBUTIONS

ST designed and performed the experiments and also wrote the manuscript and data analysis. KA reviewed the manuscript. All authors read and approved the final version.

Copyrights: © 2022@ author (s).

This is an open access article distributed under the terms of the [Creative Commons Attribution License \(CC BY 4.0\)](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and source are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

REFERENCES

- Agamennone, V.; Krul, C.A.M.; Rijkers, G.; Kort, R. A 2018. Practical guide for probiotics applied to the case of antibiotic-associated diarrhea in The Netherlands. *BMC Gastroenterol.* 18, 103
- Anukam, K.C.; Osazuwa, E.O.; Reid, G. 2006 Knowledge of probiotics by Nigerian clinicians. *Int. J. Probiotics Prebiotics.* 1, 57–62.
- Arine M. Vlieger, Afke Robroch, Stef van Buuren, Jeroen Kiers, Ger Rijkers, Marc A. Benninga, Rob te Biesebeke 2009. Tolerance and safety of *Lactobacillus paracasei* ssp. *paracasei* in combination with *Bifidobacterium animalis* ssp. *lactis* in a prebiotic-containing infant formula: a randomised controlled trial, 102(6): 869-875.
- Chouraqui JP et al 2008. Assessment of the safety, tolerance and protective effect against diarrhea of infant formulas containing mixtures of probiotics or probiotics and prebiotics in a randomised controlled trial. *Am J Clin Nutr.* 87: 1365 – 73.
- Chukwu, O.A. 2016 Assessing the Awareness and Knowledge on the Use of Probiotics by Healthcare Professionals in Nigeria. *J. Young Pharm.*, 8, 53–55.
- Ensminger, A.; Haque, R.S. 2011. Clinical Use of Probiotics: A Survey of Physicians' Beliefs and Practice Patterns. *J. Am. Diet. Assoc.*, 111, A41.
- Fijan, S. 2014 Microorganisms with claimed probiotic properties: An overview of recent literature. *Int. J.*

- Environ. Res. Public Health, 11, 4745–4767.
- Food and Agriculture Organization of the United Nations 2001. World Health Organization. Guidelines for the evaluation of probiotics in food: joint FAO/WHO Working Group report on drafting guidelines for the evaluation of probiotics in food. Available at www.fao.org/3/a-a0512e.pdf
- Franz, E.; Veenman, C.; Van Hoek, AHAM; De, A.; Husman, R.; Blaak, H. 2015. Pathogenic *Escherichia coli* producing Extended-Spectrum β -Lactamases isolated from surface water and wastewater. *Sci. Rep.*, 5, 14372.
- Goldenberg, J.Z.; Yap, C.; Lytvyn, L.; Lo, C.K.F.; Beardsley, J.; Mertz, D.; Johnston, B.C. 2017. Probiotics for the prevention of *Clostridium difficile*-associated diarrhea in adults and children: A systemic review and meta-analysis. *Cochrane Database Syst. Rev.*, 12, CD006095.
- Hill, C.; Guarner, F.; Reid, G.; Gibson, G.R.; Merenstein, D.J.; Pot, B.; Morelli, L.; Canani, R.B.; Flint, H.J.; Salminen, S.; et al. 2014. The International Scientific Association for Probiotics and Prebiotics consensus statement on the scope and appropriate use of the term probiotic. *Nat. Rev. Gastroenterol. Hepatol.*, 11, 506–514.
- Indrio F, Francavilla R, Raimondi F, Bisceglia M, Delvecchio M, Cecinati V, Cavillo L, Riezzo G 2009. Probiotic improves regurgitation and gastric emptying in infancy. Poster session, *Gastroenterology/Hepatology/Nutrition*.
- Johnson, N.; Thomas, L.; Jordan, D. 2016. Probiotics: Assessing health professionals' knowledge and understanding. *Gastrointest. Nurs.*, 14, 26–33.
- Jordan, D.; Johnson, N.; Thomas, L. 2015. Probiotics in primary care: A survey of health professionals. *Pract. Nurs.*, 26, 550–554.
- Oliver, L.; Rasmussen, H.; Gregoire, M.B.; Chen, Y 2014. Health Care Provider's Knowledge, Perceptions, and Use of Probiotics and Prebiotics. *Top. Clin. Nutr.*, 29, 139–149.
- Pandey, K.R.; Naik, S.R.; Vakil, B.V. 2015. Probiotics, prebiotics and synbiotics—A review. *J. Food Sci. Technol.*, 52, 7577–7587
- Payahoo, L.; Nikniaz, Z.; Mahdavi, R.; Asghari Jafar Abadi, M. 2012 Perceptions of medical sciences students towards probiotics. *Health Promot. Perspect.*, 2, 96–102
- Peng, L.; Zhong, Y.; Wu, A.; Jiang, Z. 2019 Probiotics combined with aminosalicilic acid *inhibits* remission of ulcerative colitis: A meta-analysis of randomized controlled trial. *Biosci. Rep.*, 39, BSR20180943
- Rund, S.A.; Rohde, H.; Sonnenborn, U.; Oelschlaeger, T.A. 2013. Antagonistic effects of probiotic *Escherichia coli* Nissle 1917 on EHEC strains of serotype O104:H4 and O157:H7. *Int. J. Med. Microbiol.*, 303, 1–8.
- Say Coskun, 2019 US Investigation of the relationship between virulence factors and antibiotic resistance of Enterococci isolates. *Cell. Mol. Biol. (Noisy le Grand)*, 65, 14–17
- Sharp R R, Achkar J P, Brinich M A and Farrel R M. 2009. Helping patients make informed choices about probiotics: A need for research. *The American journal of gastroenterology*, 104: 809-813.
- Soni, R.; Tank, K.; Jain, N. 2018. Knowledge, attitude and practice of health professionals about probiotic use in Ahmedabad, India. *Nutr. Food Sci.*, 48, 125–135
- Stanton, C.; Gardiner, G.; Meehan, H.; Collins, K.; Fitzgerald, G.; Lynch, P.B.; Ross, R.P. 2001. Market potential for probiotics. *Am. J. Clin. Nutr.*, 73, 476s–483s.
- Stuart B L, Bonnie M and Naik P. 2012. Focus: Probiotics for prevention and adjunctive therapy. *The APUA Newsletter*, 30(2): 1-32.
- Thomas DW, Greer FR 2010. American Academy of Pediatrics Committee on Nutrition, American Academy of Pediatrics Section on Gastroenterology, Hepatology, and Nutrition. Probiotics and prebiotics in pediatrics. *Pediatrics*, 126(6): 1217-1231
- Vlieger A M et al 2009 Tolerance and safety of *Lactobacillus paracasei* ssp *paracasei* in Combination with *Bifidobacterium animalis* ssp *lactis* in a prebiotic containing infant formula; a randomized controlled trial. *Br J Nutr.* [e-pub].
- Wilkins T, Sequoia J2. 2017. Probiotics for Gastrointestinal Conditions *Am Fam Physician*, Aug 1; 96(3): 170-178.
- Wilkins T, Sequoia J2. Probiotics for Gastrointestinal Conditions (2017). *Am Fam Physician*, Aug 1; 96(3): 170-178.