

Assessment of Practice, Knowledge and Attitude towards Probiotics Among Dental Post-Graduate Students in Patna – A Questionnaire Study.

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Abstract

Background: According to WHO, Probiotics are the live micro-organism which when administered in appropriate dose, confers health benefit to host. They play a pivotal role in smooth functioning of various metabolic activities by eliminating the potential pathogenic organism and thus increasing resistance to new colonization. **Aim:** The questionnaire-based study was framed to assess the practice, knowledge and attitude among dental post graduate students regarding probiotics. **Study Design:** A descriptive cross-sectional survey was done by random sampling and conducted among dental post graduates, from BIDSHPatna. The statistical analysis was done by a chi square test. **Methodology:** The survey was done by using questionnaire based on previously published studies on the knowledge of probiotics. **Inclusion criteria-** All the first, second and third year dental post graduate were included in the study. **Exclusion criteria –** Those who were not aware of the terms of probiotic were excluded from the study. The questionnaire consisted 24 questions and it was distributed one to one in the department. **Results:** Of a total of 105 post graduates, 63.81% of respondents were females and 36.19% of respondents were males. The study reveals that 96.14% of the respondents were aware of the term probiotics. 66.86% of respondents believed that probiotic can improve the oral health. **Conclusion:** The present study reveals a good knowledge of probiotics based on the response submitted by dental post graduates in Patna. *There should be a community based program to understand its effects on oral health.*

Key words: Attitude, dentistry, knowledge, practice, probiotics, dental post graduates.

Introduction

According to WHO, probiotics are living microorganism which when provided in sufficient amount confers health benefit to host.¹ Probiotic confers promising effect in dentistry for prevention and treatment of dental caries, periodontal disease, halitosis etc.² It allows for competition of food substrate and adhesion sites, change in secretory immunoglobulins (IgA) level in saliva, release of antimicrobial substance, decrease plaque formation rate, and change in salivary secretion rate.³ Oral cavity consist of varied population of microorganism and any imbalance in the homeostasis or oral dysbiosis due to the overgrowth of pathogenic bacterial species results in oral infection.⁴ Inspite of promising effect in dentistry its use is

still limited due to lack of awareness and knowledge among health care professionals which may be due to lack of evidence based recommendation as the effectiveness of probiotic depends on the bacterial strain, dosage and duration of administration, and the heterogeneity in these parameters limits its recommendation in dentistry.³ So, Our study aimed to assess the practice, knowledge and attitude regarding probiotics among dental post graduates in Patna and compare the awareness and knowledge among first, second & third year post graduates.

AIM OF THE STUDY:

To assess the practice, knowledge and attitude regarding probiotics among dental post graduates in Patna and compare the awareness and knowledge among first, second & third year post graduates.

MATERIAL AND METHOD:

This cross-sectional survey was carried out after obtaining Institutional Ethical Committee Clearance (Ref no. 385/BIDSH) between the time period of November 2023 to February 2024 among the dental post graduate students of Buddha Institute of Dental Sciences and Hospital, Patna Bihar. A close ended questionnaire of 24 questions were framed and modified according to the need after conducting extensive literature review based on previously published articles regarding knowledge and awareness about probiotics and it was distributed to the post graduates individually.

The survey was carried out under four sections: the first section consisted the demographic details including age, sex and year of education of the respondents. In the second section, the respondents were evaluated for their attitude towards probiotics. In the third section, respondents were asked regarding their knowledge about probiotics, their positive effects on oral health, sources, and their constituents. In the fourth section, the respondents were asked about their practice of probiotics, its effect on overall health, its side effect, and their experience after using probiotics.

STATISTICAL ANALYSIS

Data were analyzed using Statistical Package for social sciences (SPSS) version 21 (IBM corp., Armonk, Ny). Descriptive data was reported for each variable. Summarized data was presented using tables and graphs. Chi square test was used for categorical variables assessment. Level of statistical significance was set at a p-value less than 0.05.

SAMPLE SIZE ESTIMATION

Sample size was calculated using n master Software (version 2.0). Based on the calculated proportion of 0.45 (Mahendra et al), 5% level of precision, 95% confidence level and 80% power of the study. The minimum sample size was calculated as 86.

Sample size estimation formula:

$$n = \frac{\left\{ Z_{1-\alpha/2} \sqrt{P_o(1-P_o)} + Z_{1-\beta} \sqrt{P_a(1-P_a)} \right\}^2}{(P_a - P_o)^2}$$

RESULT

A total of 105 dental post graduates submitted their response in whom 67 (63.81%) were females and 38 (36.19%) were males with mean age 27.98±2.784 years (age range, 25-41 years) and the difference were statistically insignificant (p=0.988).

In our study, 87.88% of third year, 77.14% of second year and 81.08% of first year post graduates reported that undergraduates should be aware of the benefits of probiotic(p=0.002). 93.94% of third year post graduates, 68.57% of second year post graduates and 78.38% of first year post graduates submitted their response that probiotics should not be administered in equal frequency in adult and child and the difference was statistically significant when compared across the post graduates (p=0.001).

Questionnaire		First year	N 37	Second year	N 35	Third year	N 39	Total	N 105	P Value
		N	%	N	%	N	%	N	%	
Do you feel that probiotic should be	Yes	31	83.78	31	88.57	31	93.94	93	88.57	0.210, NS
	No	2	5.41	0	0.00	1	3.03	3	2.86	

prescribed as an adjuvant	May be	4	10.81	4	11.43	0	0.00	8	7.62	
Do you feel that undergraduate should be aware of the benefits of probiotic	Yes	30	81.08	27	77.14	29	87.88	86	81.90	0.002*, sig
	No	6	16.22	0	0.00	0	0.00	6	5.71	
	May be	1	2.70	8	22.86	4	12.12	13	12.38	
Do you feel that probiotic can improve oral flora	Yes	22	59.46	25	71.43	28	84.85	75	71.43	0.094, NS
	No	2	5.41	0	0.00	0	0.00	2	1.90	
	May be	13	35.14	10	28.57	5	15.15	28	26.67	
Do you think that probiotic should be taken as supplement in regular basis	Yes	30	81.08	30	85.71	27	81.82	87	82.86	0.418, NS
	No	5	13.51	1	2.86	2	6.06	8	7.62	
	May be	2	5.41	4	11.43	4	12.12	10	9.52	
Do you think that efficacy of probiotic in 'tablet' and 'sachet' form are same	Yes	13	35.14	10	28.57	19	57.58	42	40.00	0.143, NS
	No	15	40.54	14	40.00	9	27.27	38	36.19	
	May be	9	24.32	11	31.43	5	15.15	25	23.81	
Do you think that probiotic should be prescribed in both adult and child in equal frequency	Yes	8	21.62	3	8.57	0	0.00	11	10.48	0.001*, sig
	No	29	78.38	24	68.57	31	93.94	84	80.00	
	May be	0	0.00	8	22.86	2	6.06	10	9.52	

Table 1: Assessment of attitude towards probiotics among first, second and third year dental post graduates.

56.1% (N=59) of respondents mentioned that they have acquired their knowledge of probiotic via health care personal (p=0.009). Respondents were asked to mark the route of administration of probiotics. Significantly higher number of third year post graduates reported that the Probiotics should be administered orally, when it was compared across post graduates (p=0.001).

81.82% of third year and 54.29% of second year and 21.62% of first year post graduates correctly answered that constituent of probiotic is live micro-organism. The difference was statistically significant when compared across post graduates. (p=0.001)

Questionnaire		First year	N 37	Second year	N 35	Third year	N 39	Total	N 105	P value
		N	%	N	%	N	%	N	%	
Are you aware of the term "probiotic"	Yes	34	91.89	35	100.00	32	96.97	101	96.19	0.191 ns
	No	3	8.11	0	0.00	1	3.03	4	3.81	
	May be	0	0.00	0	0.00	0	0.00	0	0.00	
If YES, from where did you get the information	Health care personal	11	29.73	21	60.00	27	81.82	59	56.19	0.009* sig
	Different health related articles and news	20	54.05	13	37.14	5	15.15	38	36.19	
	From audio – visual aid (TV and Radio)	1	2.70	0	0.00	0	0.00	1	0.95	

	Social media or internet.	2	5.41	1	2.86	0	0.00	3	2.86	
Probiotics can be administered.	Orally	24	64.86	33	94.29	32	96.97	89	84.76	0.001*, sig
	Intravenously	2	5.41	0	0.00	0	0.00	2	1.90	
	Both “a” and “b”	11	29.73	1	2.86	1	3.03	13	12.38	
	Do not know	0	0.00	1	2.86	0	0.00	1	0.95	
Which among these are constituent of probiotic	Live microorganism	8	21.62	19	54.29	27	81.82	54	51.43	0.001*, sig
	Selectively fermented ingredients in dairy products	11	29.73	3	8.57	0	0.00	14	13.33	
	Both: a” and “b”	18	48.65	13	37.14	6	18.18	37	35.24	
	Do not know		0.00		0.00		0.00	0	0.00	
Probiotics are best consumed with.	Food and drinks	7	18.92	14	40.00	12	36.36	33	31.43	0.159 NS
	Supplements	3	8.11	2	5.71	5	15.15	10	9.52	
	Both “a” and “b”	27	72.97	19	54.29	16	48.48	62	59.05	
	Do not know		0.00		0.00		0.00	0	0.00	
Which among these are source of probiotic	Diary product	29	78.38	30	85.71	32	96.97	91	86.67	0.020*, sig
	Cereals and pulses	5	13.51	0	0.00	1	3.03	6	5.71	
	Both “a” and “b”	3	8.11	5	14.29	0	0.00	8	7.62	
	Do not know		0.00		0.00		0.00	0	0.00	
Which of the following compounds are produced by probiotic	Bacteriocins and lactic acid	8	21.62	3	8.57	4	12.12	15	14.29	0.173 NS
	Lactobacillus	6	16.22	4	11.43	3	9.09	13	12.38	
	Both “a” and “b”	23	62.16	22	62.86	22	66.67	67	63.81	
	Do not know	0	0.00	6	17.14	6	18.18	12	11.43	
Which among the following factor improve in smoker’s after probiotic treatment consisting S.Salivaris	Plaque index	10	27.03	4	11.43	1	3.03	15	14.29	0.02*, sig
	Probing depth	5	13.51	0	0.00	3	9.09	8	7.62	
	Both “a” and “b”	17	45.95	22	62.86	23	69.70	62	59.05	
	Do not know	5	13.51	9	25.71	6	18.18	20	19.05	
Which among these is an effective probiotic bacterium in reducing CFU’s of S.	Bifidobacterium	7	18.92	5	14.29	3	9.09	15	14.29	0.220 NS
	Lactobacillus	2	5.41	0	0.00	1	3.03	3	2.86	
	Both “a” and “b”	22	59.46	17	48.57	23	69.70	62	59.05	
	Do not know	6	16.22	13	37.14	6	18.18	25	23.81	

mutans in dental caries?										
Earliest probiotic strain that target the oral malodour	S. Salivarius K12	9	24.32	18	51.43	17	51.52	44	41.90	0.012*, sig
	Bifidobacterium	7	18.92	3	8.57	0	0.00	10	9.52	
	Both “a” and “b”	14	37.84	7	20.00	14	42.42	35	33.33	
	None of the above	7	18.92	7	20.00	2	6.06	16	15.24	
Probiotic improves colonization of pathogenic bacteria in oral cavity by reducing the pathogenic bacteria, biofilm, and inflammatory response. This phenomena is known as	Symbiosis	28	75.68	25	71.43	25	75.76	78	74.29	0.064 NS
	Eubiosis	4	10.81	2	5.71	0	0.00	6	5.71	
	Both ‘a’ and ‘b’	3	8.11	4	11.43	0	0.00	7	6.67	
	None of the above	2	5.41	4	11.43	8	24.24	14	13.33	
A combination of probiotic and prebiotic is termed as	Microbiome therapy	24	64.86	30	85.71	29	87.88	83	79.05	0.023*, sig
	Multibiome therapy	9	24.32	2	5.71	2	6.06	13	12.38	
	Both “a” and “b”	3	8.11	0	0.00	0	0.00	3	2.86	
	Do not know	1	2.70	3	8.57	2	6.06	6	5.71	

Table 2: Assessment of knowledge towards Probiotics Among first, second, and third Dental Post Graduate Students.

96.97% of third year post graduates, 85.71% of second year postgraduates and 78.38% of first year postgraduates mentioned that dairy products are the most common source of probiotics, and the difference between the groups are statistically significant ($p=0.020$). Significantly higher number of respondents 69.70% of third year, 62.86% of second year and 45.95% first year post graduates reported that the both plaque index and probing depth improve in smoker's after probiotic treatment consisting S. Salivaris, ($p=0.02$).

Significantly higher number of third year (51.52%) and second year (51.43%) postgraduates mentioned that S.Salivarius is the earliest strain of probiotic that target the oral malodour ($p=0.012$). Microbiome therapy is the combination of prebiotic and probiotic. 79.05% of the respondents correctly answer while 5.71% of the respondents do not know about this therapy ($p=0.023$).

93.94% of third year, 77.14% of second year and 83.78% of first year post graduated said that they have used probiotics in their practice ($p=0.031$). 54.55% of third year post graduates consumed it daily while 68.57% of second year and 35.14% of first year consumed it occasionally. ($p=0.002$).

42.86% of third year and 48.60% of first year reported excellent experience after using probiotic, and 88.57% of second year post graduates reported satisfactory experience ($p=0.001$). Significantly higher number of respondents (87.62%) reported that they never encountered any adverse drug reaction ($p=0.006$).

Significantly higher number 62.86% of respondents reported that they will advice to use probiotic to improve overall health ($p=0.002$).

		First year	N 37	Second year	N 35	Third year	N 39	Total	N 105	P value
		N	%	N	%	N	%	N	%	
Have you ever tried probiotic	Yes	31	83.78	27	77.14	31	93.94	89	84.76	0.031* sig
	No	2	5.41	2	5.71	0	0.00	4	3.81	
	Occasionally	1	2.70	6	17.14	0	0.00	7	6.67	
	Only when your doctor prescribed	3	8.11	0	0.00	2	6.06	5	4.76	
If YES, what was the frequency of consumption	Once a day	12	32.43	4	11.43	18	54.55	34	32.38	0.002* sig
	Weekly	10	27.03	5	14.29	5	15.15	20	19.05	
	Occasionally	13	35.14	24	68.57	10	30.30	47	44.76	
When did you use probiotic as a therapeutic agent?	Gastrointestinal infection	30	81.08	30	85.71	33	100.00	93	88.57	0.100 NS
	As an anti-inflammatory	5	13.51	4	11.43	0	0.00	9	8.57	
	As an immunomodulator	2	5.41	0	0.00	0	0.00	2	1.90	
	Oral health	0	0.00	1	2.86	0	0.00	1	0.95	
How was your experience after using probiotic as a therapeutic agent	Excellent	18	48.65	4	11.43	23	69.70	45	42.86	0.00* sig
	Satisfactory	18	48.65	31	88.57	6	18.18	55	52.38	
	Bad	1	2.70	0	0.00	4	12.12	5	4.76	
Did you ever encountered any adverse drug reaction after using probiotic	Yes	3	8.11	0	0.00	8	24.24	11	10.48	0.00* sig
	No	34	91.89	33	94.29	25	75.76	92	87.62	
	Sometimes	0	0.00	2	5.71	0	0.00	2	1.90	
Will you advice to use probiotic to improve overall health?	Yes	17	45.95	4	11.43	11	33.33	32	30.48	0.00* sig
	No	5	13.51	1	2.86	1	3.03	7	6.67	
	May be	15	40.54	30	85.71	21	63.64	66	62.86	

Table 3: Assessment of practice towards Probiotics Among first, second and third year Dental Post-Graduate Students.

DISCUSSION

In our study a total of 105 dental post graduates responded to the questionnaire in whom 67 were females and 38 were males. The mean age of respondents was 27.98 ± 2.784 years (range, 25-41 years). In the present study, 101 respondents (96.19%) were aware of the term probiotic and 4 respondents (3.81%) who were not aware of the term probiotics were excluded from the study. So moving ahead, the study comprised 101 respondents who were aware of probiotics. The findings of our study showed that majority of respondents were aware of probiotics and lion's share of respondents (56.19%) procure their information from the health care personals and 36.19% of respondents from different health related articles which enlightened the crucial role of doctors, health care personal and health magazines & articles in flourishing the information regarding probiotics.

The principle constituent of probiotics are Live micro-organisms, among which lactic acid bacteria and bifidobacteria are the most commonly used micro-organism. Lactobacillus is often used as probiotic products for example Lactobacillus acidophilus, L. rhamnosus. Bifidobacterium contains various Gram-positive non- motile anaerobic bacteria such as Bifidobacterium infantis, B. adolescentis.⁹ 51.43% of respondent in our study correctly submitted their response while 35.34% of respondents believed that probiotics constitute both live micro-organism and selectively fermented ingredients in dairy products. In a study conducted by **Al Hossana A.A et al (2024)**⁵, 56% of students answered correctly that probiotics are live

microorganism which is in accordance with our result. **Fizan S et al (2019)**⁶ conducted a cross-sectional study where 82.2% of the respondents correctly answered that probiotics are live micro-organism which is very high in contrast to our study.

86.67% of dental post graduates in our study given correct answer that dairy products are the common source of probiotics. **Rajput S et al (2016)**⁷ reviewed literature and summarized that milk and milk products are the most popular carriers of probiotics. **Parichat P et al (2023)**⁸ reviewed paper and concluded that the sources of probiotics can be isolated chiefly from three main sources: (1) human and animals, (2) food and (3) the environment. Human gastrointestinal tract is an important source of probiotics in the region of intestine and stomach. Probiotics can be found in raw foods (milk, dairy products, meat). In the environment, probiotics can be found in water (*Pseudoalteromonas mariniglutinosa*, *Bacillus safensis*) and soil (*Bacillus* spp., *Enterobacter* sp).

Indira M et al (2019)⁹ reviewed paper where he mentioned that the gut bacteria play a pivotal role in metabolic activities of the system gets disturbed under the influence of external stimuli like stress, antibiotics etc leading to a diseased state. This diseased state can be eliminated by the use of probiotic strain which produce therapeutic molecules such as amino acids, vitamins, bacteriocins, enzymes, immunomodulatory compounds and short-chain fatty acids. The beneficial bacteria present in the gut environment produce bacteriocins which is bactericidal in nature and confined in the cytoplasmic membrane region of receptor binding on bacterial surface. **Parichat P et al (2023)**⁸ stated that for probiotic lactic acid bacteria, *Lactobacillus* and *Bifidobacterium* genera are the most prevalent probiotic. 63.18% of respondents in our study submitted correct response as bacteriocins, lactic acid and *Lactobacillus* are produced by probiotics.

In our study 59.05% of respondents responded that both plaque index and probing depth improved in smoker's after being treated with probiotic consisting *S. Salivarius*. **Rad A.H (2023)**¹⁰ in his study stated that Probiotics prevent plaque formation by reducing the pH of saliva and producing antioxidants that use free electrons used in plaque mineralization which prevent carcinogenic bacteria to form plaque. **Hardan L et al (2022)**¹¹ in his systematic review and meta-analysis of clinical trial stated that by using probiotic as an adjuvant therapy the periodontal pocket depth can be improved due to decrease bacterial translocation through the pocket recuperation stage. It also helps in maintaining protein expression which prevent mucous membrane apoptosis and thus protect the gingival epithelial barrier. **Patait MR et al (2022)**¹ mentioned that 56.9% respondent in his study responded that both plaque index and probing depth improved in smoker's treated with probiotic consisting *L. Salivarius* which is in accordance with our study.

The foul and disagreeable odour that comes from the mouth due to volatile sulphur compounds (VSC) is known as halitosis or oral malodor. *P. gingivalis*, *P. intermedia*, *T. denticola*, and *Fusobacterium nucleatum* are the bacteria responsible for the formation of VSC.¹⁶ **Allaker RP et al (2017)**¹² stated that one of the earliest probiotic strains that target oral malodour was the bacteriocin producing strain *S. salivarius* K12. In our study 41.9% of respondents believed that *S. Salivarius* K12 is the earliest strain of probiotic which target oral malodor.

Patait MR et al (2022)¹ stated that 39.2% of respondents submitted their answer that microbiome therapy is the combination of probiotic and prebiotic therapy. In our study 79.05% of respondents submitted the correct answer which is very high.

SOME COMMON PROBIOTICS USED IN INDIA:

The first FDA approved probiotic-supplemented infant formula, 'Good Start Supreme' with Natural Cultures, containing BIFIDUS BL (*B. lactis* BB12) was formulated by **Nestle**.¹³

Gum Perio Balance (by Sunstar, Etoy, Switzerland) is the first probiotic formulated against the periodontal diseases which specifically contains combination of two strains *L. reuteri*. The lozenges contain 2 x 10⁸ living cells of *L. reuteri* which should be taken once daily either post meal or after brushing teeth.

Bifidumbacterin, Acilact, Vitanar (Alfram Ltd., Moscow, Russia) is a combination of five live lyophilized lactic acid bacteria which helps in the clinical as well as microbiological improvement in gingivitis and periodontitis. It should be taken after mechanical debridement, 2 tablets to be dissolved in the oral cavity for TID for time period of 20-30 days.

Yakult is the most common available probiotic which is formulated by fermenting amalgamation of skimmed milk with strain of *Lactobacillus casei* Shirota.

In India, **ViBact** is the latest and recent probiotic which is basically genetically modified *Bacillus mesentericus* and act as an alternate to B-complex capsules.

The recommended dose of probiotic taken once a day should be 10^8 probiotic bacteria per gram or milliliter with daily intake of 1.5-2 dl/l.¹⁴

Probiotic therapy is a natural non-invasive way to suppress the growth of pathogens, but its consumption should be monitored in patient suffering from stomach disorder. Foods and dietary supplements cannot carry the claims of being a biological drug product for use in the treatment, prevention, cure, mitigation or diagnosis of a specific human disease because the therapeutic probiotics are formulated by the regulations of US FDA.¹³

According to kashwani et al.,^{15,16} Incorporating emerging technologies like metaverse, AI, and AR/VR into dental education can significantly enhance the understanding and application of probiotics among dental post-graduate students. These technologies can create immersive learning environments, simulate clinical scenarios, and offer real-time, interactive training that deepens knowledge and refines practical skills, ultimately improving their attitudes and approach towards the integration of probiotics in dental care.

LIMITATIONS AND FUTURE PROSPECTS:

The present cross-sectional study was a hospital-based study conducted in a dental college in Patna. Since dental post graduates are still in the learning phase so their knowledge can't be equalize with the faculties as the knowledge of the faculties seems to be par with dental postgraduates. To capitalize on the potential benefits of probiotics for oral health, it is crucial to do survey including faculties for a better result. So future study should be conducted on a larger scale basis including dental postgraduates and faculties.

CONCLUSION:

Probiotics is surging as charismatic field in general and oral health. The people should be aware of the health benefit of probiotics. It is paramount important that people should be made aware of the positive effect of probiotics on oral health as it has shown very promising effect in oral health, so there should be a community-based program to make people understand its effects on oral health and also training to the oral health practitioners from WHO so that oral health care providers should genuinely prescribe it whenever required.

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Nil

CONFLICT OF INTEREST:

There are no conflict of interest.

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