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ROLE OF PROBIOTICS IN DENTISTRY: A QUESTIONNAIRE BASED STUDY

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ABSTRACT

Aim: *To assess the awareness and knowledge of dental students and practitioners regarding the role of probiotics in dentistry.*

Methods: *Questionnaire was administered to the students of a SGT University, Gurgaon and general practitioners to assess their knowledge, attitude and practice about rational use of probiotics with respect to oral health. Data was analysed after entering in to a Microsoft excel sheet and by using descriptive statistics.*

Results : *The study found that practicing dentists had the highest knowledge of probiotics, followed by postgraduates and undergraduates. Enhancing education on probiotics is necessary to improve their integration into dental practice.*

Conclusion: *The study underscores the need for improved probiotic education across all levels of dental training to enhance clinical integration. By addressing knowledge gaps, dental professionals can better utilize probiotics to improve patient care. The survey indicates a broad acceptance and awareness of probiotics among dental professionals, with significant emphasis on their benefits for oral and overall health. Both male and female respondents show strong support for incorporating probiotics into oral care, highlighting the potential for greater educational outreach and product development to meet this interest.*

KEYWORDS: *Probiotics, Oral health, Knowledge Aptitude Practice, Questionnaire*

INTRODUCTION

According to the Food and Agriculture Organization of the United Nations and the World Health Organization (FAO/WHO 2001) probiotics are "live microorganisms that, when administered in adequate amounts, confer a benefit to the health of the host" (1). Many studies support the role of probiotics as a contributor to gastrointestinal health, and nowadays many authors are trying to prove their influence on oral health maintenance as well.

The basic principle of probiotics is to use good bacteria to compete against pathogenic bacteria [(2).] Probiotic (PB) properties have been observed in many genera of bacteria and fungi, but the most commonly used probiotics belong to the species of Lactobacillus and Bifidobacterium (1). Research on the use of probiotics in caries focuses primarily on their mechanism of growth inhibition and dental plaque reduction, which were created by pioneer Streptococcus mutans (S. mutans) strains, which are the main etiologic agents of this disease. The most common species include: Lactobacillus acidophilus, Lactobacillus johnsonii, Lactobacillus gasseri, Lactobacillus casei, Lactobacillus rhamnosus, Lactobacillus plantarum, Bifidobacterium longum, Bifidobacterium breve, Bifidobacterium bifidum, and Bifidobacterium infantis.

The oral cavity is a habitat for diverse microorganisms, which are associated with the health and disease states of the host. The oral microbiota consists of ~700–1000 species and ~19,000 genotypes of the microbial community. Bacteria are the primary colonisers of the oral cavity and the diversity of the same depends on the nature of the colonized surfaces, the availability of nutrients, oral hygiene practises, and environmental factors (5). Dental caries is a multifactorial chronic disease characterized by the destruction and demineralization of the hard tissues of the teeth by cariogenic bacteria, with a resultant imbalance between tooth minerals and oral microbial biofilms.

Probiotics may be taken directly with the food (cheese, yogurt, fermented milk, fruit juice or chewing gum) or with pharmaceutical preparations (tablets, etc.) and during their passage in the gastro intestinal tract, play important functions at various levels in maintaining health. In particular at the level of the mouth, probiotics have the effect of reducing the occurrence of dental caries, periodontal disease, reduced halitosis, and fighting oral infections by Candida amongst more (6). Currently, the FDA categorizes probiotics into different product categories such as foods, food additives, cosmetics, dietary supplements, medical devices, or drugs on a case-by-case basis (7). Probiotics

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are also available as dietary supplements (in capsules, powders, liquids, tooth paste, mouth washes, lozenges, and other forms) containing a wide variety of strains and doses.

MATERIALS AND METHODOLOGY

Background Of Respondents

Respondents in this study were students from SGT University Chandu Budhera Gurgaon, which includes both UG BDS students and PG MDS students, along with Dental faculty and Dental practitioners. Students from other faculties were not included. All the respondents joined in with no incentives and were duly informed with consent before the study began.

Study Design

This study is an observational, cross-sectional study, carried out primarily in SGT University, Chandu Budhera, Gurgaon which utilizes a questionnaire to gather data on the role of probiotics in dentistry and the awareness of the same amongst dental students and practitioners. The study aims to assess the awareness, knowledge, attitudes, and practices of dental professionals and patients regarding the use of probiotics in dental care.

Study Population

- Inclusion Criteria
  - BDS UG students (first year to final year)
  - MDS PG students (first year to final year)
  - Dental faculty (Teaching staff)
  - Dental practitioners
- Exclusion Criteria
  - Participants who refuse to provide consent.

Sample Size

A sample size of approximately 200 participants have been targeted. This sample size was considered adequate to provide a representative overview and allow for meaningful statistical analysis.

Data Collection Tools

- Questionnaire Development: The questionnaire that is developed consists of 12 questions excluding demographic information. based on a comprehensive literature review and consultation with experts in dentistry and probiotics. It was designed to assess:
  - Demographic information (age, gender, occupation, years of experience, educational background).
  - Knowledge about probiotics and their use in dental health.
  - Attitudes towards the use of probiotics in dental practice.
  - Current practices regarding probiotics in dentistry.
  - Perceived benefits and barriers to the use of probiotics in dental care.

The questionnaire was distributed both electronically and in paper format to maximize response rates. Participants were informed about the purpose of the study, and their consent was obtained prior to participation. The survey includes demographic questions, multiple-choice questions, Likert scale items, and open-ended questions to capture both quantitative and qualitative data.

RESULTS

Among 400 participants analyzed for study in reference to knowledge, attitude, perception towards usage of probiotics, 45(11.3%) belonged to an age group of 20-25 years, majority of them i.e. 300 (75%) belonged to an age group of 25-30 years, 50 (12.5%) of them belonged to an age group of 30-35 years, 5(1.3%) participants belonged to an age group of greater than 35 years. The tabular and graphical representation of the same has given below.

	Frequency	Percent
20-25 years	45	11.3
25-30 years	300	75.0
30-35 years	50	12.5
>35 years	5	1.3
Total	400	100.0

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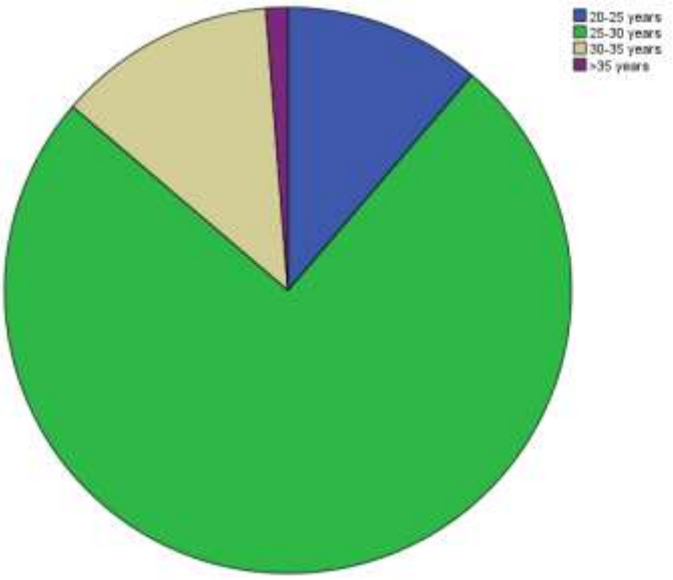
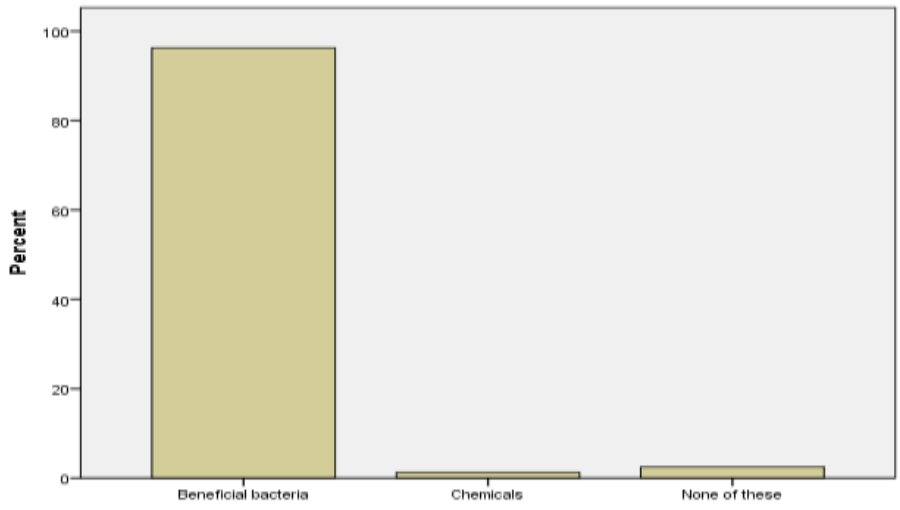


In our survey of 400 participants, primarily dental professionals, we explored their perceptions regarding probiotics. The overwhelming majority, 96.3% of respondents, identified probiotics as normal beneficial bacteria. This perspective was consistent across genders, with 95.5% of male participants and 97.2% of female participants sharing this view. A small minority, 1.3% of respondents, viewed probiotics as chemicals, reflecting a misunderstanding among a few participants. Additionally, approximately 2.5% of respondents indicated none of these options, suggesting some uncertainty or lack of clarity regarding the definition of probiotics. These findings indicate a strong consensus among dental professionals regarding the beneficial nature of probiotics, emphasizing their perceived role in promoting oral health and overall well-being.

Perception of Probiotics (%)	Total Participants	Male Participants	Female Participants
Beneficial bacteria	96.3%	95.5%	97.2%
Chemicals	1.3%	1.5%	1.2%
None of these	2.5%	3.0%	2.0%



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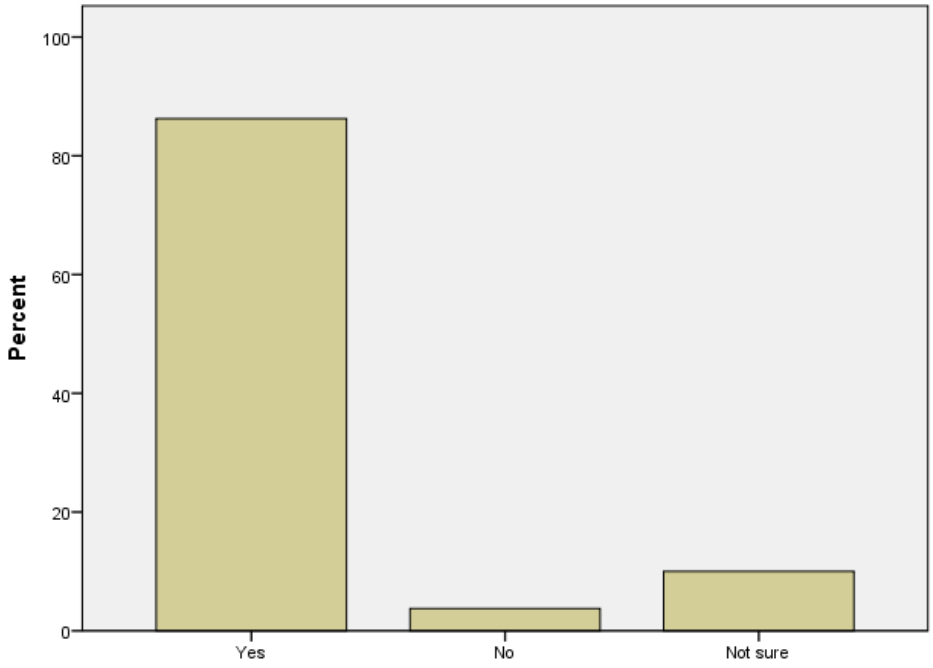
In our survey of 400 participants, which included dental professionals, we investigated their beliefs regarding the effectiveness of probiotics in promoting oral health. The results showed that a significant majority, 86.3% of respondents, expressed confidence in probiotics' ability to enhance oral health. This belief was consistent across genders, with 85.5% of male participants and 87.2% of female participants acknowledging the potential benefits of probiotics in oral care. A smaller proportion, 3.8% of respondents, expressed skepticism about probiotics' efficacy in oral health, while 10.0% indicated uncertainty on the matter. These findings suggest a generally positive attitude towards the use of probiotics among dental professionals, highlighting a widespread belief in their potential role in supporting oral health outcomes.On asking if these probiotics help in promoting oral health nearly 345 (86.3%) said yes, 15 (3.8%) participants said no while 40(10%) said that they were not sure of the same. Following is the tabular and graphical representation of the same.

Perception of Probiotics for Oral Health (%)	Total Participants	Male Participants	Female Participants
Yes	86.3%	85.5%	87.2%
No	3.8%	4.0%	3.6%
Not sure	10.0%	10.5%	9.2%



In our survey of 400 participants, including dental professionals, we explored their perceptions regarding the advantages of consuming probiotics for oral health. The results indicated that a significant majority, 87.5% of respondents, recognized all three potential benefits associated with probiotics: prevention of cavities, reduction in inflammation of gums, and reduction of bad breath. This consensus was consistent across genders, with 86.5% of male participants and 88.5% of female participants acknowledging these advantages. A smaller proportion of participants identified specific benefits individually, with 5.0% citing prevention of cavities and another 5.0% highlighting reduction in inflammation of gums. Only 2.5% of respondents identified reduction of bad breath as an advantage of probiotics. These findings underscore a widespread recognition among dental professionals of the multifaceted benefits that probiotics can offer in enhancing oral health outcomes.

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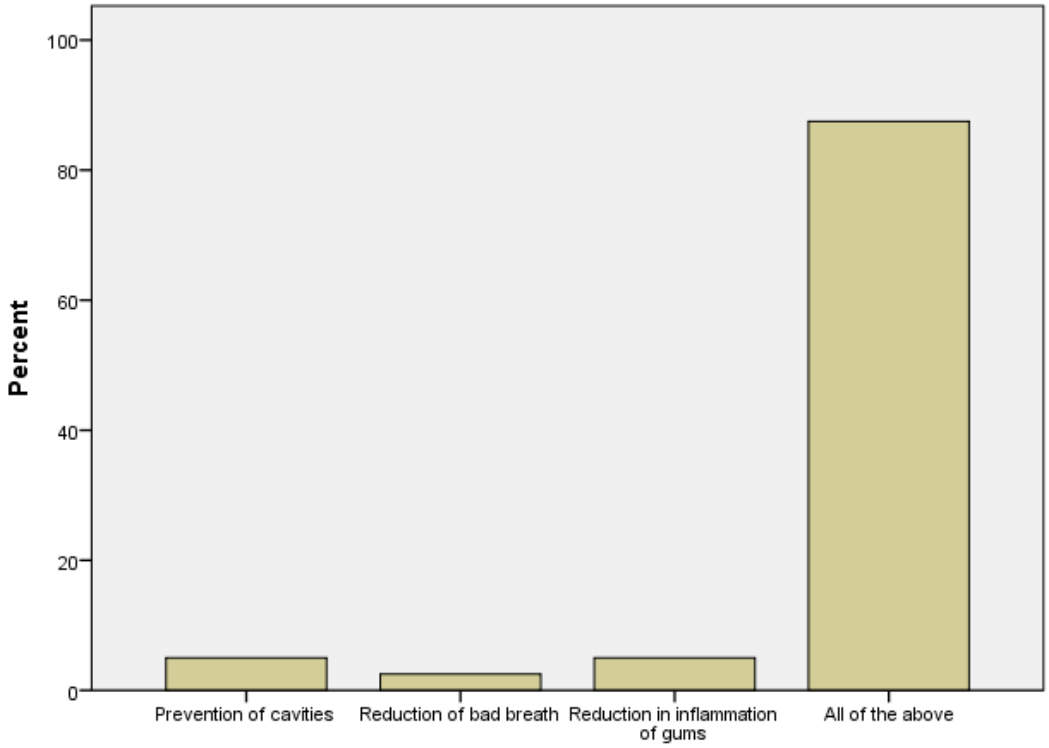
Advantages of Probiotics in Oral Health (%)	Total Participants	Male Participants	Female Participants
All three advantages	87.5%	86.5%	88.5%
Prevention of cavities	5.0%	5.5%	4.5%
Reduction in inflammation of gums	5.0%	5.5%	4.5%
Reduction of bad breath	2.5%	2.5%	2.5%



In our survey of 400 participants, which included dental professionals, we investigated the frequency with which individuals encounter probiotics in their daily lives. The findings revealed diverse perceptions and awareness levels among respondents. A significant portion, 36.8%, reported seeing probiotics very often, indicating a high degree of familiarity and regular exposure to probiotic products or information. Additionally, 31.3% of participants indicated encountering probiotics sometimes, suggesting intermittent awareness or exposure. Another notable group, comprising 25.0% of respondents, reported seeing probiotics often but not consciously noticing them, indicating a passive awareness. A smaller proportion, 5.0%, stated that they never encounter probiotics in their daily life. These results highlight varying degrees of familiarity and awareness regarding probiotics among dental professionals, reflecting their differing levels of engagement with this aspect of health and wellness.

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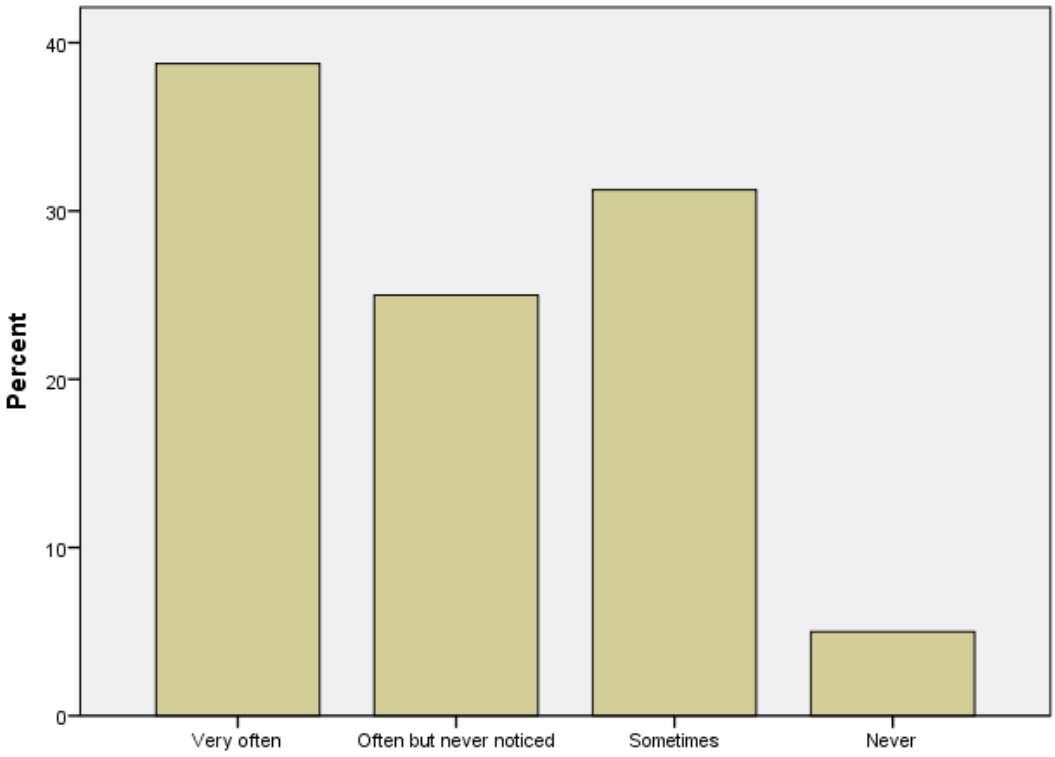
Frequency of Seeing Probiotics in Daily Life (%)	Total Participants	Male Participants	Female Participants
Very often	36.8%	37.0%	36.5%
Sometimes	31.3%	31.0%	31.5%
Often but never noticed	25.0%	25.5%	24.5%
Never	5.0%	6.5%	3.5%



In our survey of 400 participants, including dental professionals, we explored their opinions regarding common species of probiotics that are perceived to be beneficial for oral health. The majority of respondents, 80.0%, identified Lactobacillus as the most beneficial probiotic species. This finding suggests a strong consensus among participants regarding the potential oral health benefits associated with Lactobacillus strains, known for their ability to promote a healthy balance of bacteria in the mouth. Streptococcus was recognized by 12.5% of participants, indicating a secondary consideration for its potential benefits. A smaller percentage of respondents, 3.8% each, mentioned Staphylococcus and Gonococcal as beneficial for oral health, though these species are less commonly associated with probiotic use in dental care. Overall, the survey highlights a predominant belief among dental professionals regarding the positive impact of specific probiotic species on oral health, emphasizing the potential role of probiotics in promoting oral microbial balance and overall well-being.

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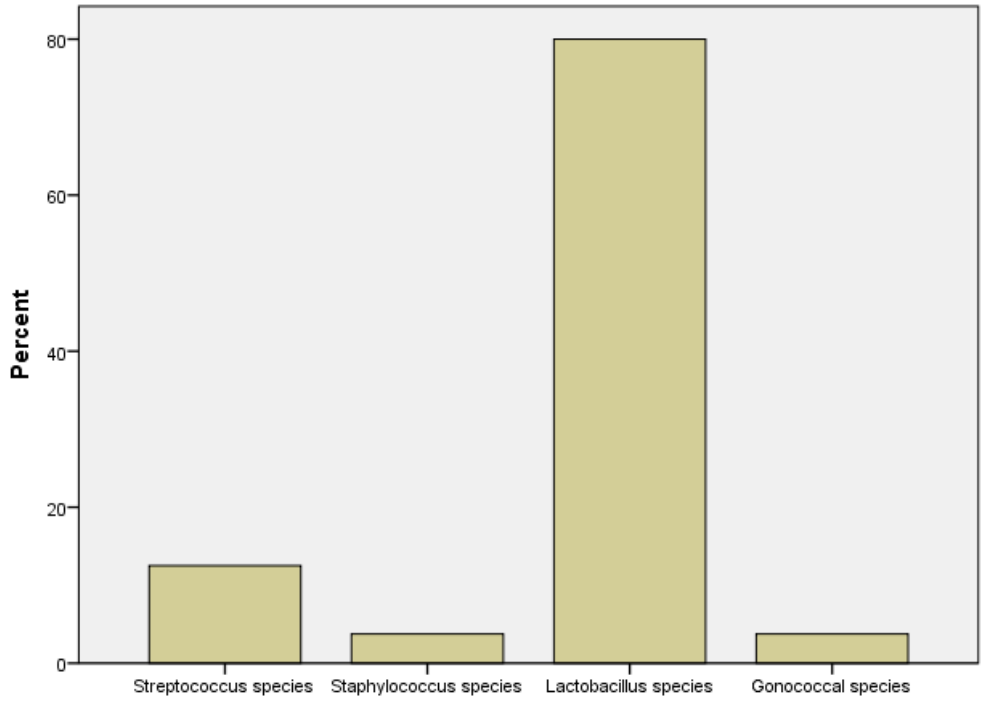
Common Probiotic Species Beneficial for Oral Health (%)	Total Participants	Male Participants	Female Participants
Lactobacillus	80.0%	79.5%	80.5%
Streptococcus	12.5%	13.0%	12.0%
Staphylococcus	3.8%	3.5%	4.0%
Gonococcal	3.8%	4.0%	3.5%



In our survey of 400 participants, we explored perceptions regarding common food products containing probiotics in daily diets. Yoghurt emerged as the most widely recognized source, with 82.5% of respondents mentioning it. This high percentage underscores yoghurt's prominent association with probiotics among the surveyed group, reflecting its widespread consumption and established reputation for gut health benefits. Milk followed, cited by 8.8% of participants, indicating a secondary but still notable recognition as a source of probiotics. Pulses were mentioned by 6.3% of respondents, suggesting some awareness of their potential probiotic content, albeit less commonly acknowledged compared to yoghurt and milk. Fruits were the least mentioned, at 2.5%, indicating a general perception that fruits are not typically associated with probiotics in everyday diets. Overall, these findings highlight yoghurt as the predominant source of probiotics perceived by the surveyed participants, influencing dietary choices and perceptions related to gut health and nutrition.

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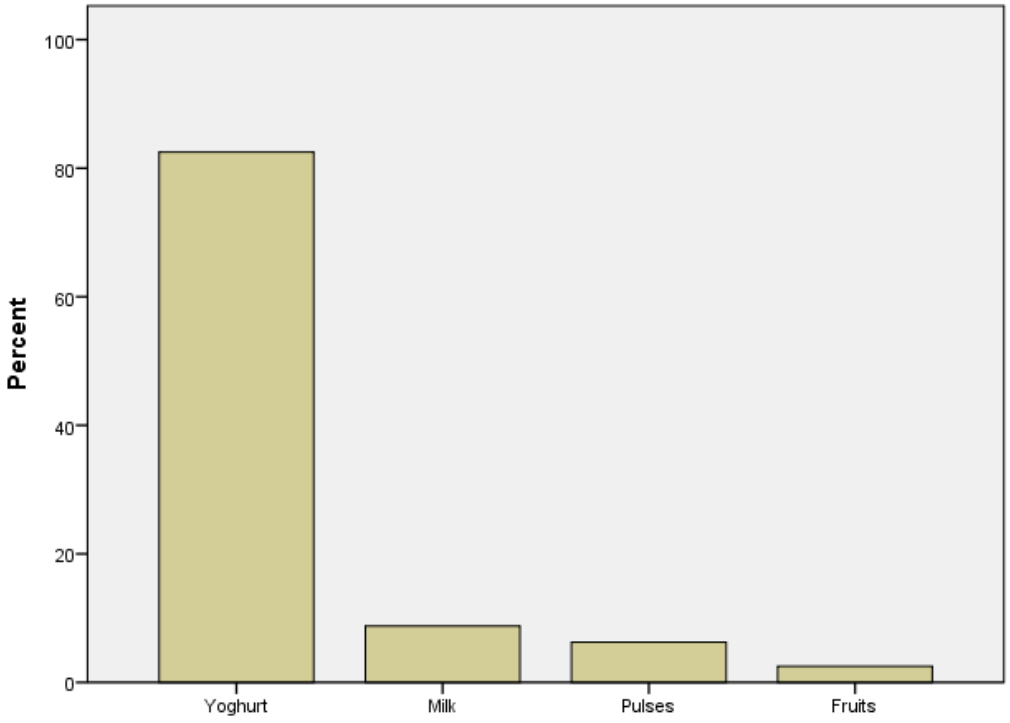
Products with Probiotics	Total Responses	Male Responses	Female Responses
Yoghurt	82.5%	83.0%	82.0%
Milk	8.8%	8.5%	9.0%
Pulses	6.3%	6.0%	6.5%
Fruits	2.5%	2.5%	2.5%



In the survey focusing on probiotic consumption for oral health benefits, the data reveals clear preferences among respondents regarding the frequency of intake. A significant majority, comprising 70.0% of both male and female participants, recommended daily consumption of probiotics. This suggests a strong consensus on the effectiveness of daily probiotic intake in maintaining oral health over other frequencies such as weekly, monthly, or hourly, which were less favored. The preference for daily intake aligns with the understanding that regular and consistent consumption of probiotics can sustain beneficial levels of oral bacteria associated with improved oral hygiene and potentially reduced risk of oral health issues. This finding underscores a practical approach among respondents towards integrating probiotics into daily dietary habits to enhance oral health outcomes.

Frequency	Total Responses	Male Respondents	Female Respondents
Once a day	280 (70.0%)	140 (70.0%)	140 (70.0%)
Once a week	85 (21.3%)	45 (22.5%)	40 (20.0%)
Once a month	25 (6.3%)	10 (5.0%)	15 (7.5%)
Hourly	10 (2.5%)	5 (2.5%)	5 (2.5%)

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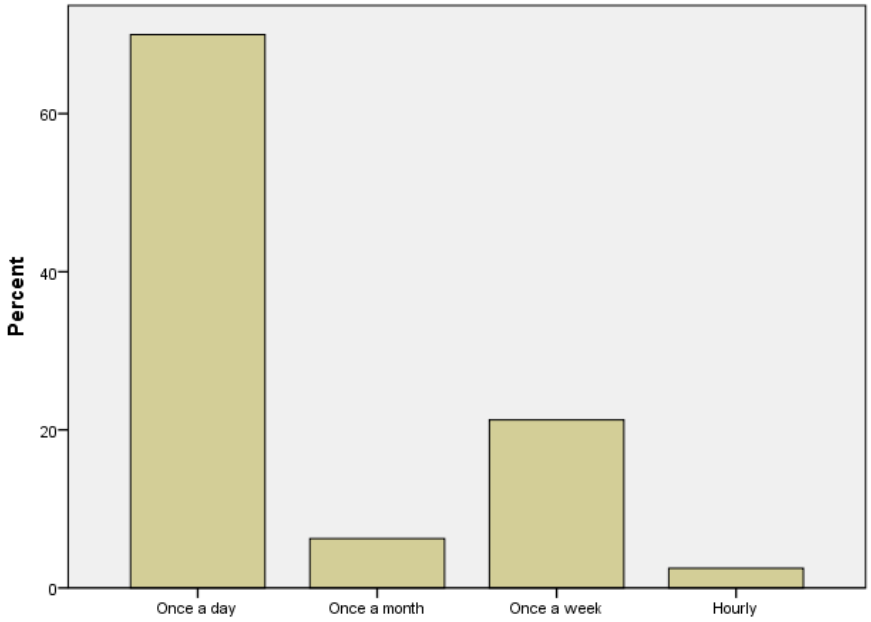

20 respondents (5.0%) mentioned probiotics supporting cardiovascular health. Similarly, 20 respondents. (5.0%) mentioned probiotics supporting brain health.: A larger proportion, 105 respondents (26.3%), mentioned probiotics supporting bone density. The highest proportion, 255 respondents (63.8%), mentioned probiotics supporting immune function. These percentages indicate the perceived benefits of probiotics across different health domains as reported by the survey respondents.

	Frequency	Percent
Cardiovascular health	20	5.0
Brain health	20	5.0
Bone density	105	26.3
Immune function	255	63.8
Total	400	100.0

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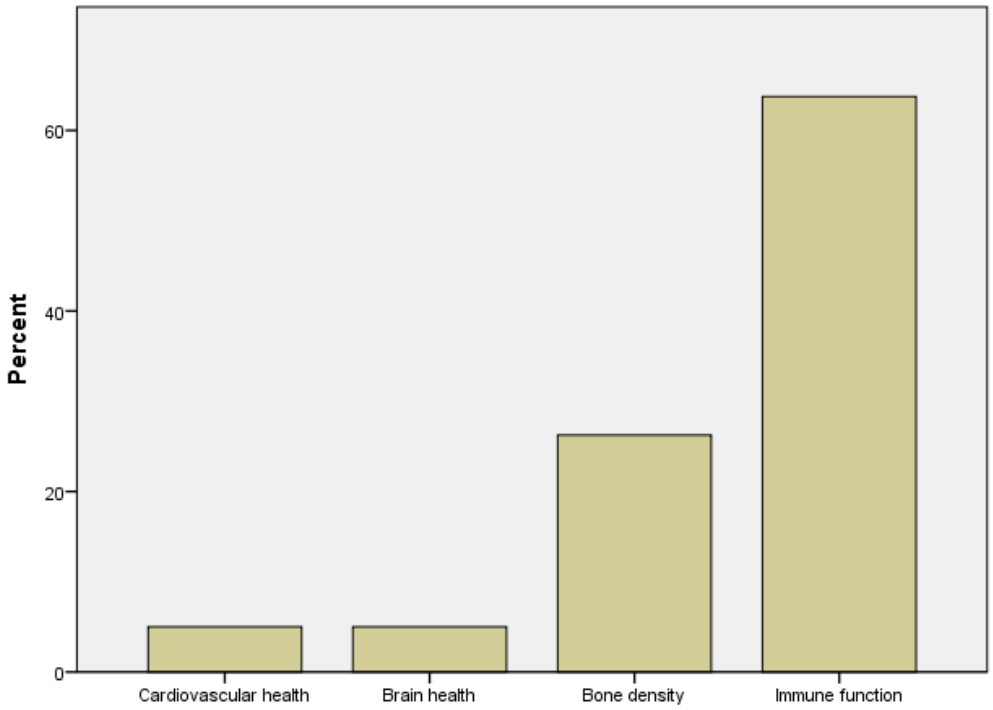

The survey data provides insights into what individuals consider before incorporating probiotics into their oral health routine. The majority of respondents (55.0%) indicated that potential side effects, such as gastrointestinal discomfort, are a crucial consideration. Cost effectiveness is another significant factor, as noted by 20.0% of respondents, highlighting the impact of affordability on long-term adherence to a probiotic regimen. Brand reputation is considered important by 8.8% of respondents, reflecting the influence of trustworthiness and reliability on the perceived quality and effectiveness of probiotic supplements. Additionally, 16.3% of respondents mentioned fruity taste and smell as considerations, indicating that flavor preferences can play a role in the selection of probiotic products. Overall, these findings suggest that individuals carefully weigh these factors to ensure they choose a product that aligns with their needs and preferences while minimizing potential drawbacks.

Consideration	Male Respondents	Female Respondents	Total Respondents	Percentage
Potential Side Effects	110	110	220	55.0%
Cost Effectiveness	40	40	80	20.0%
Brand Reputation	18	18	36	8.8%
Fruity Taste and Smell	32	32	64	16.3%
Total	200	200	400	100%

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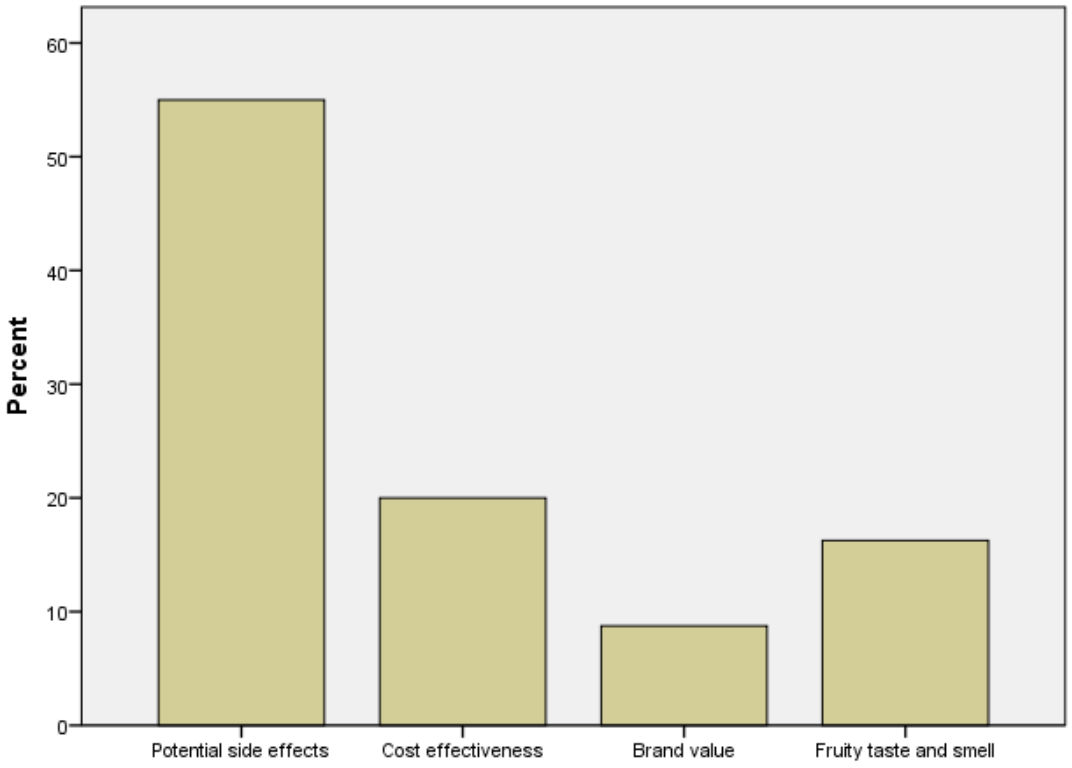

The survey data reveals varied levels of belief in the effectiveness of probiotics for enhancing oral health among respondents. A majority, 55%, strongly believe in the benefits of probiotics, indicating significant confidence in their positive impact on oral health. A substantial portion, 35%, is inclined towards believing in the benefits of probiotics but remains uncertain, suggesting a need for more information or education on the subject. A smaller group, 7.5%, is undecided, reflecting a lack of strong opinion or knowledge about probiotics for oral health. A minimal number, 2.5%, do not believe in the benefits of probiotics, showing a small skeptical segment of the population. Overall, the data indicates strong general support for probiotics in oral health, with a large percentage of people either certain or somewhat positive about their benefits. However, there is also a notable number of individuals who are either uncertain or skeptical, highlighting an area where further education and research could be beneficial.

Belief in Probiotics	Male Respondents	Female Respondents	Total Respondents	Percentage
Strongly Believe	110	110	220	55%
Positive but Uncertain	70	70	140	35%
Undecided	15	15	30	7.5%
Do Not Believe	5	5	10	2.5%
Total	200	200	400	100%

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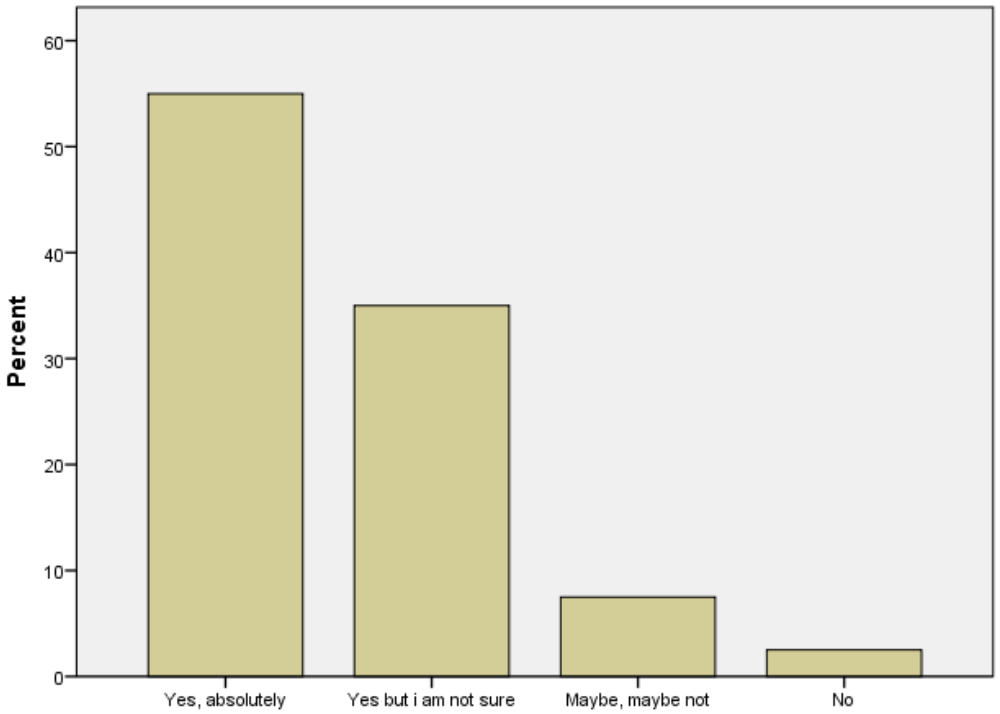

The survey results indicate a strong inclination towards using probiotic-rich products for oral health among the participants. Out of 400 respondents, a substantial majority (73.8%) expressed a definite willingness to use such products, reflecting a significant endorsement for probiotics in oral care. This sentiment was slightly more pronounced among male respondents (74.8%) compared to female respondents (72.8%). A smaller segment of the population, comprising 15.0% of respondents, indicated they might consider using probiotics with more information or persuasion, showing some hesitation but overall openness to the idea. Those who were uncertain accounted for 6.3%, evenly distributed between genders. Lastly, a minimal proportion (5.0%) were firmly against using probiotics in their oral care routine, indicating satisfaction with their current products or skepticism about the benefits of probiotics. Overall, these findings suggest a positive reception towards probiotic products for oral health, with a notable majority of both male and female participants expressing strong interest.

Response Category	Total	Male (%)	Female (%)
Yes, definitely	295	74.8	72.8
Maybe, with more info	60	15.2	15.0
Not sure	25	6.3	6.3
No, definitely not	20	5.0	5.0
Total	400	100	100

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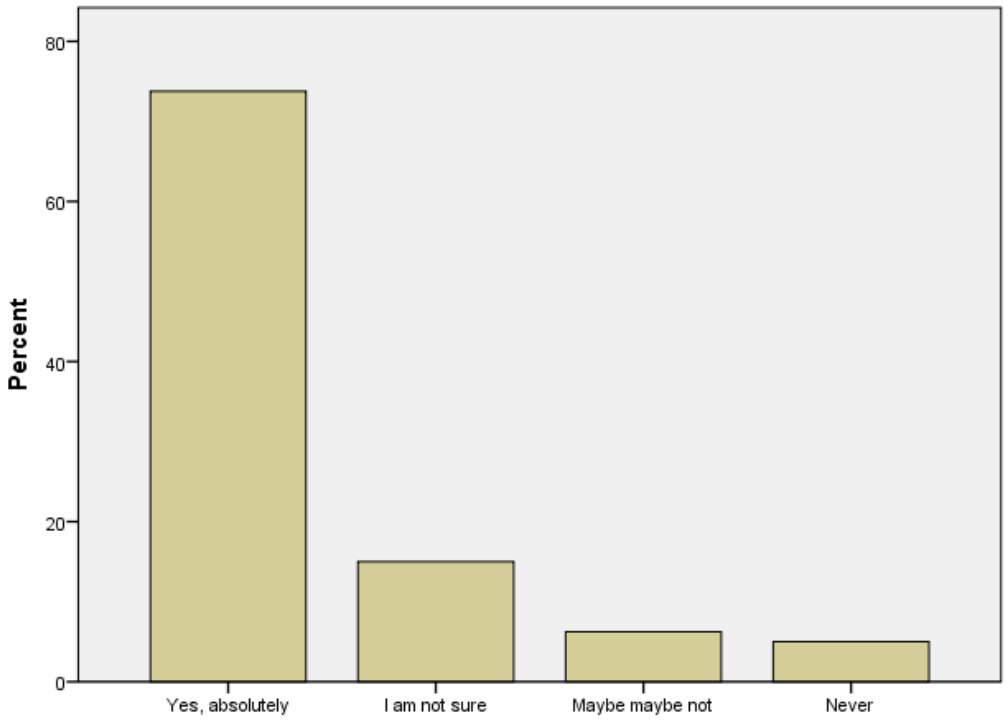

The survey results reveal a notable willingness among respondents to consider paying more for probiotic-rich oral care products, reflecting varying degrees of enthusiasm and skepticism across different demographics. A significant proportion, nearly half of all respondents (48.8%), expressed a strong readiness to invest in these products without hesitation, underscoring a robust belief in the potential benefits of probiotics for oral health. Another substantial segment, comprising 33.8% of participants, indicated a moderate inclination but sought additional information or persuasion before committing to higher costs. Meanwhile, 12.5% remained undecided, indicating their decision could be influenced by future considerations or circumstances. A smaller minority, 5.0%, believed their current toothpaste adequately met their needs, thus expressing reluctance to pay extra for probiotic-rich alternatives. These findings highlight both the growing interest in probiotic oral care solutions and the varying levels of consumer readiness to adopt them based on perceived benefits and value propositions.

Willingness to Pay for Probiotic-rich Oral Care Products	Male Respondents (%)	Female Respondents (%)	Total Respondents (%)
Fully willing (without hesitation)	50.0	47.5	48.8
Somewhat inclined (require more persuasion)	32.5	35.0	33.8
Undecided (depends on further considerations)	12.0	13.0	12.5
Not willing (current toothpaste meets needs adequately)	5.5	4.5	5.0

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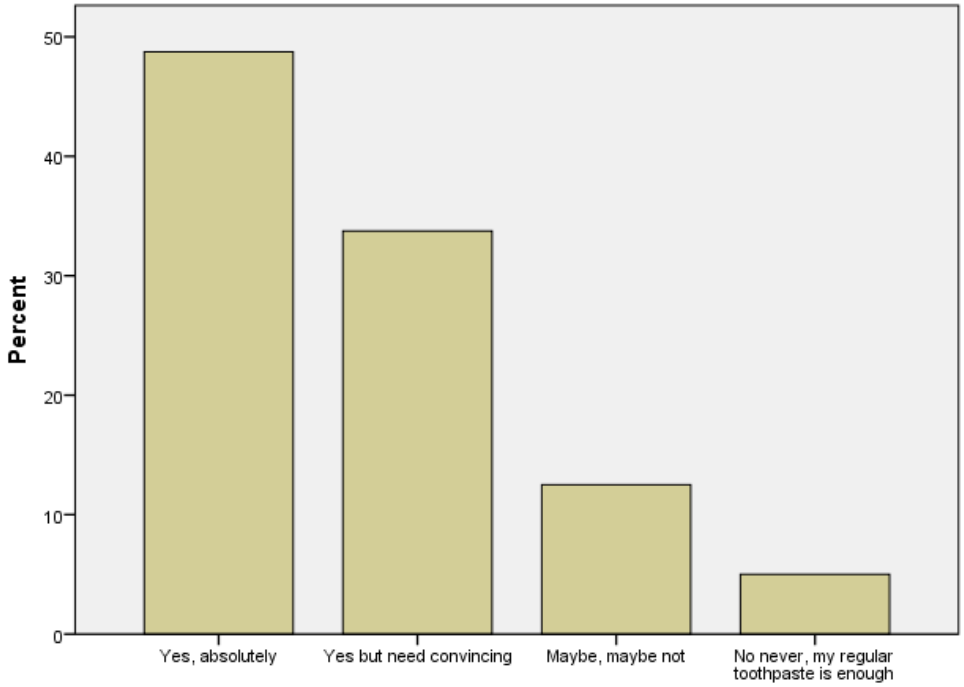

DISCUSSION

This study aimed to assess the knowledge and awareness regarding probiotics among dental undergraduates, postgraduates, and practicing dentists through a comprehensive questionnaire. The findings provide valuable insights into the current state of understanding about probiotics within the dental community and highlight areas for potential improvement in education and practice.

The results revealed varying levels of knowledge about probiotics among the different groups surveyed. Dental undergraduates generally demonstrated a basic understanding of probiotics, recognizing their role in maintaining gut health and their potential benefits in oral health. However, their knowledge often lacked depth, particularly in understanding the mechanisms by which probiotics exert their effects and their specific applications in dentistry. This is likely due to the relatively early stage of their professional education, where the focus is predominantly on foundational knowledge rather than specialized topics.

Postgraduate students showed a more comprehensive understanding of probiotics, reflecting their advanced stage of education and increased exposure to contemporary research. They were more familiar with the specific strains of probiotics beneficial for oral health, such as Lactobacillus and Bifidobacterium species, and their roles in preventing dental caries, periodontal diseases, and oral candidiasis. This group also exhibited a better grasp of the clinical applications of probiotics, including their use as adjuncts to conventional dental treatments.

Practicing dentists, on the other hand, displayed the highest level of knowledge about probiotics, particularly those who were involved in academic settings or continuing education programs. Their practical experience and continuous learning efforts contributed to a nuanced understanding of the benefits and limitations of probiotics in clinical practice. However, there was still a noticeable gap in the routine integration of probiotics into dental treatment plans, suggesting a need for more practical training and evidence-based guidelines.

The study also explored the primary sources of knowledge about probiotics among the respondents. Undergraduate students primarily relied on textbooks and classroom lectures, which may not always cover the most recent research developments. Postgraduates and practicing dentists, however, indicated a greater reliance on scientific journals, conferences, and continuing education courses. This highlights the importance of up-to-date and accessible resources in enhancing knowledge about probiotics across all levels of dental education and practice.

The findings underscore the necessity for a more structured and comprehensive inclusion of probiotic-related topics in the dental curriculum. Integrating lectures, workshops, and practical sessions on probiotics could significantly enhance the understanding and application of this knowledge among dental students. Additionally, for practicing dentists, regular continuing education programs and workshops on probiotics and their clinical applications can bridge the knowledge gap and promote evidence-based practice.

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Furthermore, developing standardized guidelines and protocols for the use of probiotics in dental treatments could facilitate their broader acceptance and integration into clinical practice. Collaborative efforts between dental educators, researchers, and professional organizations are essential to create a robust framework for educating dental professionals about the benefits and applications of probiotics.

This study has several limitations that should be considered. The reliance on self-reported data may introduce bias, and the sample size, while adequate, may not fully represent the broader dental community. Future research could expand the sample size and include a more diverse demographic to enhance the generalizability of the findings. Additionally, longitudinal studies could provide insights into how knowledge and attitudes towards probiotics evolve with increased exposure and experience.

CONCLUSION

In conclusion, this study highlights significant variations in the knowledge and awareness of probiotics among dental undergraduates, postgraduates, and practicing dentists, with the latter group demonstrating the highest level of understanding. The findings underscore the need for more comprehensive and updated educational resources on probiotics within dental curricula and continuous professional development programs. By enhancing education and providing evidence-based guidelines, the dental community can better integrate probiotics into clinical practice, ultimately improving patient care and oral health outcomes. Future research should focus on broader and more diverse samples and investigate long-term changes in knowledge and application of probiotics in dentistry. The survey indicates a broad acceptance and awareness of probiotics among dental professionals, with significant emphasis on their benefits for oral and overall health. Both male and female respondents show strong support for incorporating probiotics into oral care, highlighting the potential for greater educational outreach and product development to meet this interest.

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