ORIGINAL ARTICLE

Assessment of Knowledge and Practice Regarding the Use of Probiotics among Periodontists in Andhra Pradesh, a Cross-Sectional Study

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Abstract

Background: Elimination of subgingival microflora, thereby attaining the health of the supporting structures of the tooth, remains the goal of periodontal therapy. This goal cannot be attained by mechanical therapy alone, hence paving the way for many adjunctive treatment strategies. Probiotics are one such modality that can aid in the reduction of the progression of periodontal diseases. A clear understanding of the mechanism by which probiotics alleviate periodontal conditions is fundamental.

Objectives: To know about the knowledge related to probiotics and the use of probiotics in the treatment of periodontal diseases, among periodontists who are working as academicians, private practitioners, and both.

Methods: This cross-sectional study was conducted among 102 periodontists in Andhra Pradesh over a 3-month period (December 2024 to February 2025). A questionnaire was structured, consisting of relevant questions under demographic data, knowledge, and practice regarding probiotics. A Google form was used to circulate and collect the data.

Results: A total of 102 responses were analyzed, out of which 32.4% were academicians, 44.1% were private practitioners, and 23.5% had a profession of both academicians and private practitioners. Knowledge regarding probiotics was high across all groups, with 100% familiarity and over 90% awareness of their benefits for oral health. 100% of the study participants prescribed probiotics to their patients in any form. Statistically significant differences were observed in practice patterns; private practitioners were more likely to prescribe probiotics daily (p=0.047) and after non-surgical periodontal therapy (p=0.010).

Conclusion: Private practitioners demonstrated a better understanding of probiotics. The 21-30 years of age group exhibited better practice of probiotics, and females have shown superior knowledge and practice of the use of probiotics for their periodontitis patients.

Keywords: *Probiotics, periodontitis, knowledge, oral microflora, practitioners, dentistry, periodontology.*

INTRODUCTION

Periodontal disease is one among the contributing oral diseases to the global burden of chronic disease, with a prevalence of about 51% in India [1]. Inflammation within the gingival tissues is directly related to the subsequent development of periodontitis, which eventually causes progressive attachment loss around teeth [2].

The oral cavity harbors a complex community of bacteria, organized into protective biofilms. These biofilms encase bacterial communities in an extracellular matrix, providing resistance against external threats [3]. As oral bacteria colonize, they co-evolve with the host, establishing a dynamic interplay that maintains oral homeostasis. However, an imbalance (dysbiosis) in this relationship can lead to oral diseases like periodontitis and dental caries. Factors such as the host's immune response, salivary composition, diet, and oral hygiene practices influence the oral microbiome's composition and stability, impacting the delicate balance between health and disease [3, 4].

The primary objective of periodontal therapy is to eliminate subgingival microflora and restore the health of tooth-supporting structures. Traditionally, non-surgical periodontal therapy (NSPT) has been the preferred approach [4]. While scaling and root planing (SRP) are considered the gold standard for treating chronic periodontitis, research suggests that SRP alone may not yield significant improvements, particularly in areas with deeper probing pocket depths. Furthermore, systemic diseases such as diabetes mellitus, obesity, and cardiovascular disease can exacerbate periodontal deterioration, highlighting the need for a comprehensive treatment approach [5-7].

Mechanical therapy alone is insufficient to achieve optimal periodontal health, necessitating adjunctive treatment strategies. Probiotics have emerged as a promising modality to combat periodontal disease progression. According to the World Health Organization (WHO), probiotics are defined as 'live microorganism cultures that confer health benefits when administered in adequate amounts.' Probiotics can be administered systemically or locally, offering a safer alternative to antibiotics, without their associated disadvantages [8]. While systemic antibiotics have shown additional benefits as an adjunctive therapy for periodontal infections, their use is compromised by side effects, patient misuse, and the risk of promoting antibiotic-resistant bacterial strains. In contrast, probiotics provide a more favorable risk-benefit profile, making them an attractive adjunctive

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Received: February 26, 2025; Revised: June 06, 2025; Accepted: July 31, 2025
DOI: https://doi.org/10.37184/lnjpc.2707-3521.7.80

treatment option for periodontal disease management [9].

The microbial strains commonly used in the preparation of probiotics are *Lactobacillus* and *Bifidobacterium* strains, as they are proven to be beneficial for dental health [10]. Probiotics exhibit generalized mucosal immunity [11], pro and anti-inflammatory cytokine regulation, antibacterial effect, reduction of volatile sulphur compounds (VSCs), T helper cell regulation, tumor cell apoptosis, immune modulatory effect, *etc.* [12]. The null hypothesis of the study suggests that there will be no significant difference in the knowledge and practice regarding the use of probiotics among periodontists in Andhra Pradesh. This study was conducted to know about the knowledge related to probiotics and the usage of probiotics in the treatment of periodontal diseases, among academicians as well as practitioners.

METHODOLOGY

This is a cross-sectional study done within a span of three months (Dec 2024 to Feb 2025). Ethical approval for the study was granted by the Institutional Ethics Committee (protocol no: PR.461/IEC/SIBAR/2024) of Sibar Institute of Dental Sciences, Guntur. The protocol complied with ethical guidelines with consideration of the Declaration of Helsinki, Indian GCP, and ICMR guidelines. The inclusion criteria consisted of periodontists within the region of Andhra Pradesh. The exclusion criteria included periodontists practicing outside the state of Andhra Pradesh, non-periodontists, postgraduate students, and undergraduate students.

The survey was anonymous and voluntary. Online informed consent was obtained from the participants before starting the survey. The prepared questionnaire was circulated *via* Google Forms through known WhatsApp groups, email, and social media platforms using snowball sampling and was open for 4 months.

Initially, a pilot study was conducted among 20 subjects. The questions were modelled based on those used in previously published studies on the knowledge of probiotics. Some questions were modified based on the expert's opinion. Three experts have reviewed the questionnaire, and the responses were recorded in an Excel sheet; questionnaire validity and reliability were assessed. For validity, a content validation Test and for Reliability, a re-test was done. For validity, the Content validity ratio is 0.1, and for reliability test, a re-test was done after 1 week, and the coefficient value is 0.71; the Crohnbach alpha value obtained was 0.75.

The sample size calculation is as follows. Sample size calculated using G* power software version 3.1.9.2, Considering Effect size = 0.4; α-error = 0.05; Power of the study = 95%. The sample size obtained for the study was 102.

The present study questionnaire is provided as a supplementary file. The online survey was divided into five sections. Under Section I, the title was mentioned. Section II comprises an individual's demographic data under Name, Age, Gender: male/ female, and their present working field. Section III was prepared to determine whether the participant is aware of the term probiotics. This section was separated from others to determine if the individual is eligible to continue the further questionnaire; otherwise, they will be excluded from the study. In sections IV and V, the respondents were asked about the knowledge and practice of probiotics, respectively.

Data entries were done in Microsoft Office Excel, and analyses of results were done using Statistical Product and Service Solution (SPSS) version 21 software developed by IBM Corp., Armonk, New York, USA. Descriptive statistics such as frequencies and percentages/proportions were calculated. Pearson Chi-square test was used to find out the difference between responses of study subjects. P-value ≤0.05 was considered significant.

RESULTS

A total of 102 participants have responded to the study. 32.3% were males and 67.6% were females. Distribution of overall participants according to the study groups is depicted in Table **1**.

Table 1: Socio-demographic data based on type of profession.

Variables	Profession		
	Academician	Private Practitioner	Both Academician and Private Practitioner
Males, n(%)	6(18.7)	16(34.8)	11(45.8)
Females, n(%)	26(81.3)	30(65.2)	13(54.2)
Mean age, mean ± standard deviation	26.2±5	31.2±5.13	33.7±7.33

Fig. **(1)** displays the frequency distribution of knowledge-related questions. Table **2** shows the percentage of respondents from each profession (Group A is Academicians, Group B is Private Practitioners, Group C is Both) regarding knowledge of various aspects of probiotics. All 102 respondents were aware of probiotics,

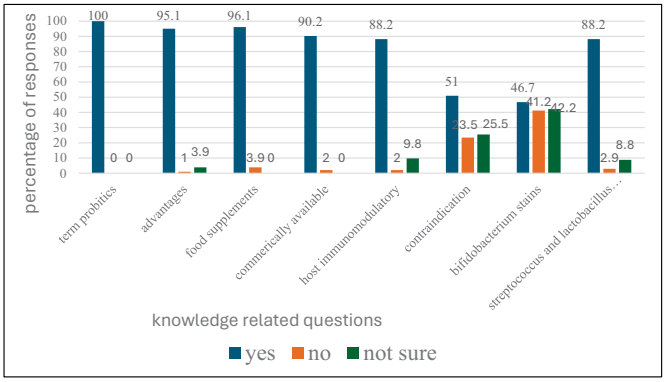

Fig. (1): Frequency distribution of responses to knowledge-based questions among study participants.

Table 2: Association between knowledge-based questions to profession among study participants.

Knowledge Based Question	Groups	Profession			p-value
		Academician n(%)	Private Practitioner n(%)	Both n(%)	
Are you familiar with the term probiotics?	Yes	31 (100)	46 (100)	25 (100)	
Do you know about the advantages of using probiotics for oral health?	Yes	30 (96.8)	44 (95.7)	23 (92)	0.529
	No	0 (0)	0 (0)	1 (4)	
	Not sure	1 (3.2)	2 (4.3)	1 (4)	
Do you think some food supplements are also a source of probiotics?	Yes	29 (93.5)	45 (97.5)	24 (96)	0.638
	No	2 (6.5)	1 (2.2)	1 (4)	
Do you know that probiotics are commercially available in various forms for periodontal patients?	Yes	28 (90.3)	41 (89.1)	23 (92)	0.927
	No	3 (9.7)	5 (10.9)	2 (8)	
Do you think probiotics have host immunomodulatory effect and anti- oxidant property?	Yes	28 (90.3)	39 (84.8)	23 (92)	0.356
	No	1 (3.2)	0 (0)	1 (4)	
	Not sure	2 (6.5)	7 (15.2)	1 (4)	
Do you know about the contraindications of using probiotics?	Yes	16 (51.6)	23 (50)	13 (52)	0.983
	No	8 (25.8)	11 (23.9)	5 (20)	
	Not sure	7 (22.6)	12 (26.1)	7 (28)	
Are *Bifidobacterium* strains commonly contraindicated in preparation of probiotics?	Yes	6 (19.4)	8 (17.4)	3 (12)	0.777
	No	12 (38.7)	21 (45.7)	9 (36)	
	Not sure	13 (41.9)	17 (37)	13 (52)	
Do you think *Streptococcus* and *Lactobacillus* strains, when used as probiotics are beneficial to oral health?	Yes	28 (90.3)	39 (84.8)	23 (92)	0.674
	No	0 (0)	2 (4.3)	1 (4)	
	Not sure	3 (9.7)	5 (10.9)	1 (4)	

Table 3: Association between practice based questions to profession among study participants.

Practice Based Question	Groups	Profession			p-value
		Academician n(%)	Private Practitioner n(%)	Both n(%)	
Do you prescribe probiotics in any form as a daily oral hygiene practice for any of your patients?	Always	0 (0)	7 (15.2)	1 (4)	*0.047
	Never	6 (19.4)	12 (26.1)	3 (12)	
	Occasionally	25 (80.6)	27 (58.7)	21(84)	
Do you prescribe probiotics for halitosis patients?	Always	1 (3.2)	8 (17.4)	1 (4)	0.240
	Never	13 (41.9)	17 (37)	11 (44)	
	Occasionally	17 (54.8)	21 (45.7)	13 (52)	
Have you ever prescribed probiotics alone (as monotherapy) without any periodontal treatment?	Always	0 (0)	1 (2.2)	0 (0)	0.824
	Never	25 (80.6)	38 (82.6)	20 (80)	
	Occasionally	6 (19.4)	7 (15.2)	5 (20)	
Do you prescribe probiotics after Non-surgical Periodontal therapy (NSPT)?	Always	0 (0)	4 (8.7)	3 (12)	0.910
	Never	7 (22.6)	16 (34.8)	11 (44)	
	Occasionally	24 (77.4)	26 (56.5)	11 (44)	
Do you prescribe probiotics after any surgical cases?	Always	0 (0)	4 (8.7)	2 (8)	0.527
	Never	12 (38.7)	19 (41.3)	9 (36)	
	Occasionally	19 (61.3)	23 (50)	14 (56)	
Do you prescribe probiotics as an alternative to Antibiotics?	Always	0 (0)	1 (2.2)	0 (0)	0.335
	Never	19 (61.3)	35 (76.1)	20 (80)	
	Occasionally	12 (38.7)	10 (21.7)	5 (20)	
If prescribed, does any of your patient's exhibited improvement in periodontal parameters after using probiotics?	Yes	10 (32.3)	17 (37)	8 (32)	0.452
	No	6 (19.4)	5 (10.9)	1 (4)	
	Not aware	15 (48.4)	15 (48.4)	16 (64)	
Apart from conditions such as gingivitis and periodontitis, have you suggested the use of probiotics to other conditions such as caries, *etc.*?	Yes	8 (25.8)	21 (45.7)	6 (24)	0.091
	No	23 (74.2)	25 (54.3)	19 (76)	

*Significant at p<0.05

but reflected with different levels of knowledge and use in their practice.

All participants (100%) across all professions reported being familiar with the term "probiotics," indicating a foundational awareness. A majority recognized the benefits of probiotics in oral health: Academicians: 96.8%, Private practitioners: 95.7%, Both: 92%. This response shows uniformly high awareness, with only a few participants expressing uncertainty. (p=0.529) High

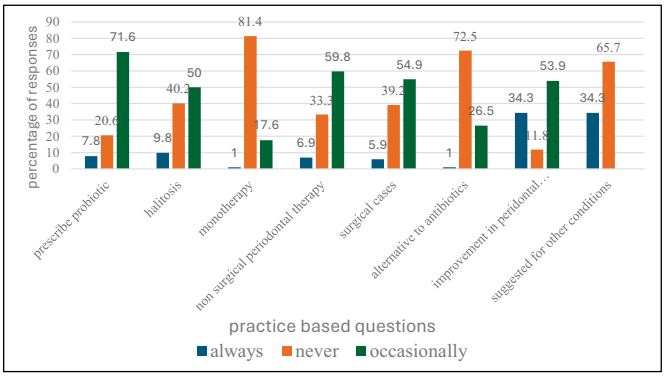

Fig. (2): Frequency distribution of responses to practice based questions among study participants.

percentages (over 93%) in all groups believed that food supplements could be sources of probiotics, indicating awareness beyond pharmaceutical preparations. (p=0.638). About 89-92% of respondents across all groups were aware that probiotics are available in various commercial forms intended for periodontal therapy (p=0.927). Knowledge was again high, especially among those with dual roles (92%), followed by academicians (90.3%) and private practitioners (84.8%). A small percentage remained unsure (p=0.356). Approximately half of the participants in each group knew about contraindications. Academicians: 51.6%, Private practitioners: 50%, Both: 52%. Around 22-28% were unsure, reflecting a potential knowledge gap in this area. (p=0.983). A significant proportion across all groups were "not sure" whether *Bifidobacterium* strains were contraindicated: Not sure: 41.9% (Academicians), 37% (Private Practitioners), 52% (Both). Most participants (84.8%-92%) agreed that these strains were beneficial for oral health. Only a few expressed doubts or were unsure (p=0.674). None of the knowledge-based questions showed a statistically significant difference across professions.

Practice-Based Application of Probiotics, while knowledge was high, variation was seen in the actual clinical use of probiotics, depending on professional category. Table **3** and Fig. **(2)** show the percentage of respondents from each profession (Group A is Academicians, Group B is Private Practitioners, Group C is Both) regarding the practice of probiotics. (p=0.529). Daily Prescription as Part of Oral Hygiene: "Always" prescribing probiotics was most common among private practitioners (15.2%), and much less common in other groups. Academicians mostly prescribed them "occasionally" (80.6%) and never prescribed in 19.4% cases. The difference was statistically significant (p = 0.047), indicating that private practitioners are more proactive in daily use. Occasional use was the most common across all groups, with private practitioners again showing slightly higher "always" use (17.4%). However, the association was not statistically significant (p=0.240). The majority across all groups reported never prescribing probiotics alone (approx. 80%). This question had no significant differences among groups (p = 0.824), implying cautious or adjunctive use only. Most respondents prescribed probiotics occasionally after NSPT Private Practitioners: 56.5%, Academicians: 77.4%, Both: 44%. The association was statistically significant (p=0.910). "Occasional" prescription was most common, ranging from 50% to 61%. The differences were not significant (p=0.527). Most professionals did not prescribe probiotics as antibiotic alternatives. Only a very small percentage (≤2.2%) reported "always" doing so. The practice was not significantly different across groups (p=0.335). Many participants were "not aware" of patient improvements, Academicians: 48.4%, Private Practitioners: 48.4%, Both: 64%. Only a minority reported positive patient response, and the difference among groups was not significant (p=0.452). Private practitioners were more likely to recommend probiotics for other conditions (45.7%) compared to others. However, this trend did not reach statistical significance (p=0.091).

DISCUSSION

Following any periodontal therapy, periodontists commonly prescribe medications that include antibiotics, analgesics, *etc.* Probiotics are specific genera of microorganisms that play a vital role in preventing, modifying, or slowing the progression of periodontal diseases. Probiotics act by inhibiting other micro-organisms that compete for the same ecology and/or substrates by disrupting their metabolism or altering their living conditions. This can be achieved by creating a shift in local pH or the concentration of reactive oxygen or nitrogen species, which occurs through the production of metabolites such as organic acids, peroxide, or nitric oxide (NO) [13, 14]. Additionally, bacteriocins, specific peptides capable of selectively eliminating competitive bacteria or altering their metabolic pathways, contribute to this process [15-17]. Probiotics can influence various pro-inflammatory mediators, such as matrix metalloproteinase (MMP-8) and interleukins (IL-6), thereby regulating gingival and periodontal inflammation [18]. Additionally, certain probiotics can effectively disrupt biofilm formation by competing microorganisms through various mechanisms, including the inhibition of their quorum sensing.

In our study, 100% of the study population were aware of the term probiotics. This is in contrast with a study done by Sinha *et al.* [19] and Pranavi *et al.* [20], where in their study, 96.14% and 86.5% of the participants are only aware of the term probiotics. More than 90% are aware of its advantages and its properties.

When asked about the *Bifidobacterium* strains in the preparation of probiotics, only 46.7% answered correctly. Regarding knowledge of *Streptococcus* and *Lactobacillus* strains, 88.2% of respondents in our study correctly submitted their response. *Lactobacillus*, *Bifidobacterium*, and *Streptococcus* strains are commonly used as probiotic bacteria that have more health benefits.

Fijan *et al.* and Gul *et al.* reported that *Bifidobacterium* and *Lactobacillus* were the most identifiable bacterial genera in probiotic strains. *Lactobacillus acidophilus*, *Bifidobacterium bifidum*, and *Lactobacillus rhamnosus* are some of the most commonly used bacterial genera in probiotics [21, 22]. The other groups include *Bacillus*, *Streptococcus*, *Enterococcus*, and *Saccharomyces* [23]. Allaker *et al.* and Fujiwara *et al.* in 2017 stated that one of the earliest probiotic strains that targets oral malodor was the bacteriocin-producing strain *S. salivarius* K12 [24, 25].

In our study, although many are aware of probiotics, prescribing them to their patients in their practice was very low. Only 8% have responded that they prescribe them as a daily oral hygiene regimen, and 71.6% occasionally prescribe them. Private practitioners in Andhra Pradesh have shown better knowledge and practice of probiotics than group A and C. Though very few have shown to prescribe them after NSPT and Surgical therapy, only one has responded to using probiotics as a monotherapy. Mani *et al.* conducted a study about the effect of probiotic lozenge after scaling and root planing SRP and concluded that oral supplementation of probiotics as a daily practice could be a useful adjunct to SRP among chronic periodontitis patients [26]. Li *et al.* [27] in their results of meta-analysis suggested that clinical outcomes of the patient can be improved by the combined administration of probiotics with scaling and root planing (SRP). This also reduces the levels of periodontal pathogens. However, further extensive studies are required to standardize the probiotics and maximize their therapy. Hardan *et al.* [28] in 2022, in their systematic review and meta-analysis, stated that by using probiotics as an adjuvant therapy, the periodontal pocket depth can be improved due to a decrease in bacterial translocation through the pocket recuperation stage. It also helps in maintaining protein expression, which prevents mucous membrane apoptosis and thus protects the gingival epithelial barrier.

Beyond reducing periodontal pathogens, probiotics have been shown to decrease inflammatory markers like IL-1β, IL-17, and TNF-α in gingival crevice fluid. By modulating the immune system, gut-based probiotics may offer a protective effect against periodontitis. This makes them a promising alternative to antibiotics, helping mitigate antibiotic resistance. Meta-analyses support probiotic consumption for periodontitis management. However, before recommending probiotics for treating periodontitis and gingivitis, factors like treatment duration and prevention of pathogenic microbiota recurrence must be carefully considered [29-32].

None of the academicians have prescribed probiotics as a daily oral hygiene regimen, monotherapy, after NSPT and surgical therapy. All three 3 groups have occasionally prescribed probiotics as an alternative to antibiotics, but neither group A nor C has prescribed them in their continuous practice. A study by Boyeena *et al.* [33] in 2019 performed a study using tetracycline fibers, local delivery of a combination of probiotics, and SRP. Their results showed a significant improvement in the levels of bleeding on probing (BOP) and probing pocket depth (PPD) in the probiotic group compared to the SRP with tetracycline fiber alone. Significant reductions in PPD and BOP were observed from baseline to 45 days when compared to the tetracycline fibers group alone. The study concluded that the combination of probiotics and tetracycline fibers was more effective in reducing the microbial load than either probiotics or tetracycline alone ($p < 0.001$). Though improvements in the periodontal condition with probiotics were better noticed by private practitioners, many of them are not aware of the positive changes during their patient recalls.

The reason for including a separate Group C comprising periodontists working both as academicians and in private practice is to explore whether their dual role provides them with better knowledge, given their more frequent and consistent exposure to periodontitis patients. Contrary to initial expectations, this study did not find a significant correlation between institutional affiliation and knowledge or practice regarding probiotics. Instead, private practitioners demonstrated superior awareness and application of probiotics in periodontal care. These findings highlight a potential gap in academic or institutional exposure to emerging adjunctive therapies and suggest the need for enhanced continuing education in such settings.

In light of these results, future research should explore the integration of probiotic supplementation with other novel adjunctive periodontal treatments, such as ozone therapy [34, 35], photo bio-modulation [36, 37], *etc.* Under healthy conditions, there is a balance between the microbiota and host tissues in both periodontal and peri-implant areas [38]. This microbiota plays a key role in the development of periodontal and peri-implant diseases. In disease states, the microbiota becomes imbalanced or dysbiotic, as shown in various animal and human studies. Therefore, probiotics have been proposed as a possible way to help restore this balance and reduce dysbiosis [39, 40].

LIMITATIONS

Investigating the combined effects of these therapies could provide a more comprehensive understanding of their synergistic potential in improving periodontal and overall oral health outcomes. A major limitation of the present study is a limited sample size and is confined to the region of Andhra Pradesh. The mean age in all three groups ranges from 26 to 34 years. The study should aim to include older age periodontists also. Involving only younger periodontists can be a limitation of the study. Large-scale studies and educating the periodontists regarding the advancements and alternative treatment strategies should be carried out to achieve a successful treatment outcome.

CONCLUSION

In conclusion, despite the rapid increase in research on pathogen-host interactions, knowledge about beneficial bacteria and their role in preventing the emergence of pathogenic species in oral health remains limited. From our study, periodontists within the region of Andhra Pradesh are aware of probiotics, but lack thorough knowledge, and the incorporation of them into the routine treatment regimen is still to be enhanced. Not solely antibiotics, but the recommendation of probiotics in appropriate dosages also shows as a promising alternative in the field of periodontics.

ETHICS APPROVAL

This study was approved by the Institutional Ethics Committee of the Sibar Institute of Dental Sciences (protocol no: PR.461/IEC/SIBAR/2024). All procedures performed in studies involving human participants were following the ethical standards of the institutional and/ or national research committee and the Helsinki Declaration.

CONSENT FOR PUBLICATION

Informed consent was obtained from all individual participants included in the study.

AVAILABILITY OF DATA

The data is available upon a considerable request made to the corresponding author.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

Declared none.

AUTHORS' CONTRIBUTION

Dr. V. Jaswitha was responsible for conceptualization, methodology, and data collection; Dr. Boyapati Ramanarayana contributed to data collection, analysis, and supervision; Dr. Lakshmikanth Kolaparthy provided supervision and editing; Dr. Ravindranath Dhulipalla was involved in supervision and data collection; and Dr. Yamuna Marella contributed to data collection and analysis.

SUPPLEMENTARY MATERIAL

Supplementary material is available on the publisher's website.

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