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ORIGINAL ARTICLE

PHYTOTHERAPY IN DENTISTRY: ASSESSMENT OF KNOWLEDGE, AWARENESS AND THE APPLICATIONS OF PHYTOTHERAPY AMONG UNDERGRADUATE DENTAL STUDENTS – A CROSS SECTIONAL SURVEY

Fitoterapia en odontología: evaluación de conocimientos, concienciación y aplicaciones de la fitoterapia entre estudiantes de odontología de pregrado: una encuesta transversal

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ABSTRACT

Background: The integration of phytotherapy into healthcare practices has gained substantial attention in recent years. In the realm of dentistry, the exploration of herbal products and their potential applications has become a subject of growing interest. Herbal remedies have been traditionally used for oral care in various cultures, and their potential benefits are increasingly acknowledged in contemporary dental care. **Aim:** This survey aims to assess dental students' knowledge and awareness of phytotherapy in dentistry, an area of increasing interest due to the traditional use and potential benefits of herbal remedies for oral health.

Material and Methods: A survey using a 15-question questionnaire was conducted to assess students' experience, information sources, awareness of herbal toothpaste, opinions on curriculum inclusion, and interest in prescribing herbal products.

Results: A total of 260 students participated in the survey (20.38% male, 79.61% female) 94.23% were aware of herbal products in dentistry and 62.7% had used them, primarily learning about them through media and elders. While 72.1% had observed family members using herbal products, only 10.85% reported side effects. A significant number were interested in learning more about herbal products (90.1%) and favoured their inclusion in the curriculum (94.42%). Statistically significant differences ($p<0.05$) were found regarding observed side effects, interest in prescribing, and opinions on curriculum inclusion.

Conclusions: This survey reveals that while most dental students are aware of and have used herbal products, their knowledge is primarily sourced from media and family, highlighting a need for more formal education. Therefore, the dental curriculum should incorporate comprehensive, evidence-based information on herbal products to equip future dentists with the knowledge to critically evaluate and appropriately integrate herbal remedies into their practice.

Keywords: *Dental students; Phytotherapy; Oral health; Plants, medicinal; Health Knowledge, attitudes, practice; Curriculum*

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RESUMEN

Antecedentes: La integración de la fitoterapia en las prácticas sanitarias ha cobrado gran importancia en los últimos años. En el ámbito de la odontología, la exploración de productos herbales y sus posibles aplicaciones se ha convertido en un tema de creciente interés. Los remedios herbales se han utilizado tradicionalmente para el cuidado bucal en diversas culturas, y sus posibles beneficios son cada vez más reconocidos en la odontología contemporánea. **Objetivo:** Esta encuesta busca evaluar el conocimiento y la concienciación de los estudiantes de odontología sobre la fitoterapia en odontología, un área de creciente interés debido al uso tradicional y los posibles beneficios de los remedios herbales para la salud bucal.

Materiales y métodos: Se realizó una encuesta mediante un cuestionario de 15 preguntas para evaluar la experiencia de los estudiantes, las fuentes de información, el conocimiento de las pastas dentales herbales, las opiniones sobre su inclusión en el currículo y el interés en la prescripción de productos herbales.

Resultados: Participaron en la encuesta 260 estudiantes (20,38 % hombres, 79,61 % mujeres). El 94,23 % conocía los productos herbales en odontología y el 62,7 % los había utilizado, principalmente a través de los medios de comunicación y de personas mayores. Si bien el 72,1% había observado a familiares utilizando productos herbales, solo el 10,85% reportó efectos secundarios. Un número significativo mostró interés en aprender más sobre los productos herbales (90,1%) y favoreció su inclusión en el currículo (94,42%). Se encontraron diferencias estadísticamente significativas ($p<0,05$) en cuanto a los efectos secundarios observados, el interés en la prescripción y las opiniones sobre su inclusión en el currículo.

Conclusiones: Esta encuesta revela que, si bien la mayoría de los estudiantes de odontología conocen y han utilizado productos herbales, su conocimiento proviene principalmente de los medios de comunicación y de la familia, lo que resalta la necesidad de una educación más formal. Por lo tanto, el currículo de odontología debe incorporar información completa y basada en la evidencia sobre los productos herbales para dotar a los futuros odontólogos de los conocimientos necesarios para evaluar críticamente e integrar adecuadamente los remedios herbales en su práctica.

Palabras clave: *Estudiantes de odontología; Fitoterapia; Salud bucal; Plantas medicinales; Conocimientos, actitudes y práctica en salud; Curriculum.*

INTRODUCTION

In recent years, there has been a notable surge in the global interest and exploration of herbal remedies within various domains of healthcare.[1] The field of dentistry, traditionally rooted in conventional approaches, has witnessed an emerging curiosity and consideration for the integration of herbal products.[2,3] The amalgamation of age-old herbal practices with modern dental care presents a promising frontier, offering potential benefits in oral health maintenance and treatment.[4]

Herbal products used in dentistry encompass a diverse range of natural remedies derived from plants, herbs, and botanical sources.[5] These products are gaining recognition for their potential therapeutic benefits in promoting oral health and addressing various dental concerns.[6]

Specific phytotherapeutic agents such as Neem (*Azadirachta indica*), Tea Tree Oil (*Melaleuca alternifolia*), Aloe Vera (*Aloe barbadensis var*), Cloves (*Syzygium aromaticum*), Chamomile (*Matricaria chamomilla*), Turmeric (*Curcuma longa*), Green Tea (*Camellia sinensis*), Propolis, Myrrh (*Commiphora species*), Eucalyptus Oil, are frequently employed in dentistry for their therapeutic effects.[7,8]

These are commonly incorporated into tooth pastes, mouth washes, gum paints and topical gels.[9] Studies indicate that these plant derivatives can play a significant role in addressing periodontal and endodontic infections, as well as caries and oral candidiasis.[10-12] Herbal remedies are used due to their widespread availability, low toxicity, and cost-effectiveness.

The application of phytotherapy in dentistry spans from managing pain and inflammation to combating infections with antibacterial and antifungal properties. Additionally, phytomedicine is used in endodontics as intracanal medicaments, irrigants, and retreatment agents.[13] Dental students, as the future custodians of oral healthcare, play a pivotal role in shaping the trajectory of dental practices. Understanding their knowledge and awareness regarding herbal products and their applications in dentistry is imperative for comprehending the potential adoption of these alternative approaches within the dental community.[14]

While studies have explored the general use of herbal medicine among adults and students, research focusing specifically on dental students remains limited.[15,16] Hence, this study seeks to assess the depth of dental students' understanding of herbal products, shedding light on their familiarity, experiences, and perceptions.

This study aims to bridge the existing gap in literature by providing insights into the level of knowledge dental students possess regarding herbal products, their sources of information, practical experiences, and their opinions on the incorporation of herbal practices into the dental curriculum. By exploring the herbal frontier in dentistry, this study aspires to contribute valuable data to the evolving discourse on oral healthcare.

MATERIALS AND METHODS

Study Design & Participants

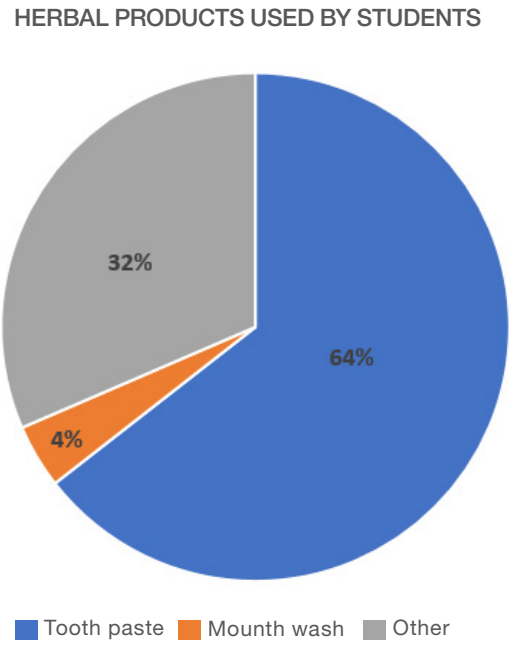
This cross-sectional survey included 260 undergraduate dental students from various dental institutions in Tamil Nadu, India. The study adhered to the principles outlined in the Declaration of Helsinki, and ethical approval was obtained from the Institutional Ethical Committee of Chettinad Academy of Rese-arch and Education (Ref. No: IHEC-II/0085/21). Participation in the study was voluntary, ensuring the confidentiality of student's identities, and data collection was conducted online using *Google Forms* (*https://forms.gle/1Hgu6wdVpyMm7g1Z8*). The electronic questionnaire, consisting of 15 closed-ended questions with 2 to 4 response options, was structured to assess students' awareness of herbal product usage.

The questionnaire aimed to collect information on participants' gender, academic year, knowledge and awareness of herbal products such as toothpaste, sources of information, personal and familial experiences with herbal product usage, observed side effects, interest in recommending herbal products, and views on the integration of herbal content in the dental curriculum.

Measures in the Questionnaire

The questionnaire incorporates various measures to systematically gather information on dental students' knowledge and awareness of

Figure 1
Distribution of herbal products used by undergraduate dental students



herbal products in dentistry. The measures are designed to explore different aspects, including awareness, personal experiences, sources of information, familial usage, perceived effectiveness, and professional engagement.

Statistical Analysis

Statistical significance of associations was determined with Chi square test using SPSS version 13.0 (IBM Corp. Released 2008), and statistical significance was defined as $p<0.05$.

RESULTS

The *Google Form* was emailed to 300 undergraduate dental students and 260 responses were obtained (79.61% response rate). The respondents included 65 students from each of the second, third, and fourth years, as well as interns, with a demographic distribution of 207 female (79.61%) and 53 male (20.38%) students.

Figure 2
Sources of information about herbal products among dental undergraduate students

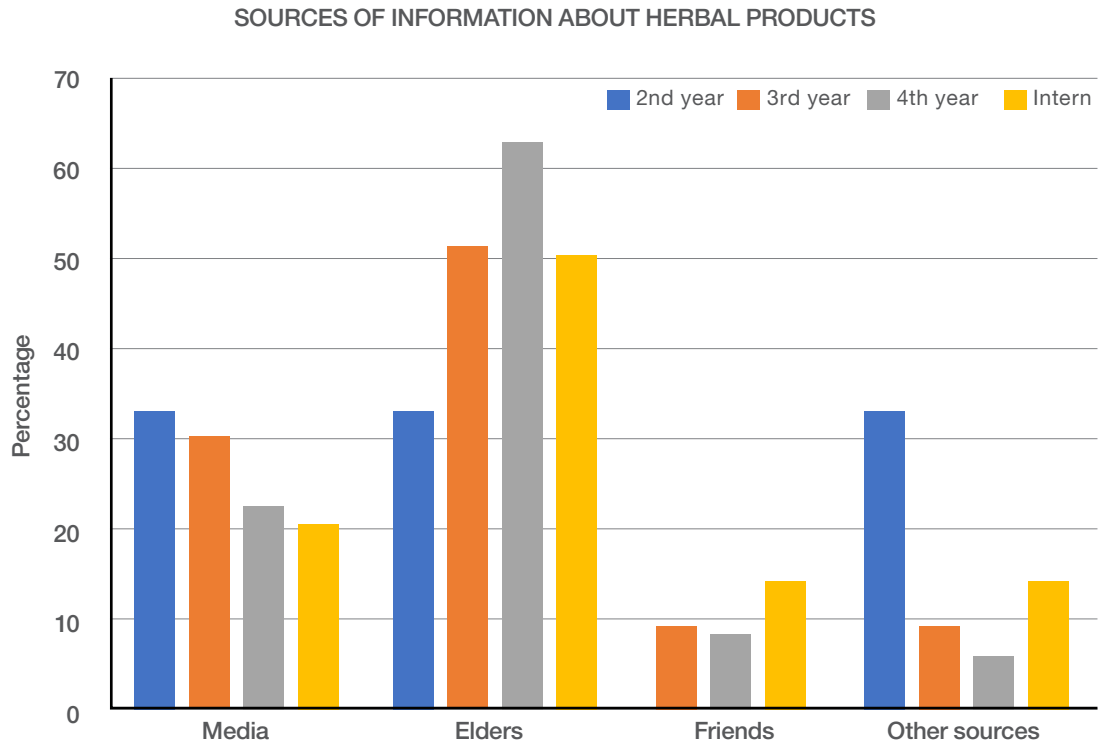


Table 1

Awareness of herbal products among undergraduate dental students

Awareness of herbal products in dentistry	2nd Year (%)*	3rd Year (%)*	4th Year (%)*	Intern (%)*	Chi square test value	*p*-value
Yes	66.7	95.4	94	93.7	4.57	0.33
No	33.3	4.6	6	6.3		

*: Students pursuing second, third and fourth year of dental school.

Table 2

Experience of using herbal products among dental undergraduate students

Awareness of herbal products in dentistry	2nd Year (%)*	3rd Year (%)*	4th Year (%)*	Intern (%)*	Chi square test value	*p*-value
Yes	66.7	69.7	58.3	57.1	5.517	0.238
No	33.35	30.3	41.7	42.9		

*: Students pursuing second, third and fourth year of dental school.

Awareness of Usage of Herbal Products in Dentistry

Table 1 presents a comprehensive overview of the results obtained from the survey, highlighting the responses of dental students on various aspects related to their awareness and usage of herbal products in dentistry. High awareness of herbal products in dentistry was prevalent across all academic years, increasing from 66.7% in the 2nd year to over 93% in the 3rd and 4th years and among interns.

Awareness was also consistently high for both males (92.5%) and females (94.7%). The chi-square value of 4.57 with a *p*-value of 0.33 indicates no statistically significant gender-based difference in awareness.

Experience of Using Herbal Products

The distribution of responses related to the experience of using herbal products among dental students across different academic years is detailed in table 2. A substantial proportion of dental students reported experience using herbal products, ranging from 57.1% (interns) to 69.7% (3rd year students), with a slightly higher prevalence among females (64.3%) compared to males (56.6%). The distribution of experiences with herbal products varies across academic years, with the highest reported experiences in the 3rd Year. The chi-square test value of 5.517 with a *p*-value of 0.238 suggests that the difference is not statistically significant.

Family Members Using Herbal Products

The responses regarding family members using herbal products were higher among the 4th year students (75%). A similar number of positive responses were obtained from the 3rd years and Interns (73%), with 2nd years reporting only 66.7% positive responses. There were no significant gender-based differences (chi-square test= 0.652, *p*=0.722). Both males and females reported similar patterns of family members using herbal products.

Effectiveness of Herbal Treatment

Comparable responses were obtained from the students among different years of study regarding the effectiveness of herbal products. While there is a higher percentage of males (71.7%) reporting the effectiveness of herbal treatment compared to females (68.1%), the chi-square test value of 1.371 with a *p*-value of 0.504 suggests no statistically significant difference. There were no statistically significant differences among the different years of students regarding the responses for effectiveness of herbal treatment.

Observation of Side Effects

A notable gender-based difference is observed in the observation of side effects. Females (65.2%) reported a higher frequency of side effects compared to males (43.4%), and the chi-square test (X^2) value of 11.507 with a *p*-value of 0.003 indicates statistical significance.

The Interns reported majority of positive responses (17.5%) on observation of side effects, with the main side effect being staining of teeth following long term use of herbal toothpastes.

Herbal products used by students for oral hygiene maintenance

Although 66.7% of students in their second year, 69% of students in their fourth year, and 50.8% of interns reported using herbal toothpaste, third-year students reported using it more frequently (71.6%).

The 4th year students had the most (6%) favourable response for herbal mouthwashes, with the lowest positive responses overall for herbal products. A total of 31.5% of respondents reported usage of various herbal products, such as chewing gum, topical gels, and gum paints.

Knowledge of Herbal Toothpaste

A collective 66.7% of second-year students, 99.1% of third-year students, and 97.6% of 4th year students acknowledged their awareness of the existence of herbal toothpaste. Likewise, 96.7% of interns demonstrated awareness. In both genders, more than 94% of participants confirmed their familiarity with herbal toothpaste.

The statistically significant outcomes, indicating a potential elevation in knowledge among the students, are highlighted by the chi-square test value of 13.97, with a *p*-value of 0.007, suggesting a discernible trend.

Usage of Herbal Toothpaste

As reported by 2nd year students, 33.3% of them had experimented with using herbal toothpastes for a duration of six months to two years. Of the third-year students, 56% reported using herbal toothpaste; of these, 8.3% reported using it for two to five years, 13.9% reported using it for six months to two years, and the other students reported using it for less than six months.

The 4th year students provided comparable responses. Of the interns, 41.3% reported using herbal toothpaste; most students stopped using it within six months because it stained their teeth. The usage of herbal toothpaste showed no statistically significant differences among the students (chi-square test = 5.453, *p*=0.24). Both males and females reported similar patterns of trying herbal toothpaste.

Efficacy of Herbal *versus* Conventional Toothpaste

Table 3 reveals statistically significant differences (*p*=0.016) in perceived efficacy of herbal *versus* conventional toothpaste across academic years.

Perceptions of efficacy were highest in the 3rd Year (51.4%) but notably lower among Interns (23.8%). Perceived am-ong dental undergraduate students

Interest in Herbal Products

A statistically significant gender-based difference is observed in the interest in herbal products. More males (84.9%) express interest compared to females (95.2%), with a chi-square test value of 6.898 and a *p* -value of 0.009. Almost 90% of the dental undergraduate students reported interest in seeking knowledge about herbal products and their use in dentistry.

Sources of Information on Herbal products: Information-seeking behaviours regarding herbal products were dynamic across dental students in different academic years (Figure 2). Elders were an increasingly important source in the third (51.4%) and fourth years (63.1%), while media, friends (9.2% in the third year), and other sources played varying roles. Interns demonstrate a further diversification, with elders, friends and other sources continuing to play a role.

The varying reliance on these sources throughout academic progression suggests the dynamic nature of information seeking behaviours among dental students, incorporating familial, peer, and miscellaneous sources in their quest for knowledge on herbal products.

Herbal Products Inclusion in Curriculum

The inclusion of herbal products in the curriculum shows a statistically significant gender-based difference, with more males (88.7%) favouring inclusion compared to females (94.6%). The chi-square test value of 4.604 and a *p*-value of 0.032 indicates statistical significance.

In summary, while both male and female dental students exhibit high awareness and similar patterns of perceptions in various aspects related to herbal products, significant gender-based differences emerge in the observation of side effects, interest in herbal products, and the preference for including herbal products in the curriculum.

These findings provide valuable insights for educators and policymakers in developing targeted educational interventions and curriculum enhancements to address the varying perspectives and preferences among male and female dental students.

DISCUSSION

The findings of our study provide valuable insights into the knowledge and awareness of herbal products and their application in dentistry among dental students. The results shed light on various aspects, including awareness levels, experiences, sources of information, perceived effectiveness, and potential side effects associated with herbal products.

Herbal products are promoted widely these days due in part to the surge in popularity and usage of herbal medications in recent years and people's increased interest in herbal formulations.[17]

The high awareness level (94.23%) among dental students regarding the potential use of herbal products in dentistry aligns with the global trend of increased interest in natural and alternative remedies. Furthermore, a substantial percentage (62.7%) of students reported personal experiences with herbal products, indicating a practical familiarity within the student community.

These results are supported by a 2013 study by Sekhri *et al.*,[18] in India in which 60.77% of dental students reported using herbal

medications; and by Shinshai *et al.*,[19] where 39.6% of dentists used herbal medicine and 32.1% prescribed phytotherapy to their patients.

However, our findings contrast with those of Ege *et al.*,[20] in 2021, who assessed 242 dental students and found that while a majority of dental students 94% used herbal products, about half were not well-informed about phytotherapy.

The study highlights the influential role of media and elderly family members as the primary sources of information for dental students regarding herbal products. The statistically significant difference observed in the reliance on these sources highlight the need for tailored educational strategies to address diverse influences on students' awareness of herbal practices in dentistry.

This may also stem from the false belief that herbal treatments are entirely risk-free and devoid of adverse effects, given that the internet and other forms of mass media marketing are the main sources of information on herbal medications. The internet was favoured by 55.59% of students in a 2017 survey by Boparai *et al.*,[21] as their source of reliable scientific knowledge about herbal products. The study revealed a positive trend in students' awareness of potential side effects associated with herbal drugs, with 60.8% acknowledging that herbal products could lead to side effects similar to allopathic medicines.

This contrasts with study conducted in 2017 by Boparai *et al.*,[21] where 46.85% of students believed that herbal medications posed no risks and had a poor degree of awareness of herbdrug interactions.In a 2013 study conducted by Sekhri *et al.*,[18] 82.5% of participants believed herbal medications to be natural, risk-free, and side effect-free. The observed shift in perception emphasizes the importance of promoting a nuanced understanding of herbal product safety among dental students.

Although a considerable proportion of stundents expressed interest in herbal products, it is noteworthy that only a small percentage (13%) reported having prescribed herbal products for patients. This suggests a potential gap between awareness and practical application, warranting further exploration. Additionally, the overwhelming interest (94.6%) among students to study herbal drugs as part of their curriculum underscores the need for educational institutions to integrate herbal pharmacopeia into dental education.[22]

The study highlights challenges associated with the acceptance of herbal products, specifically the lack of standardization and quality control. The absence of standards and a quality control profile is one of the barriers to the adoption of phytotherapy, despite their growing popularity worldwide. This difficulty is increased by the fact that traditional practices involve the use of combinations of herbal medicines. Similar to the negative consequences of allopathy, phytochemical interactions can also occur and are frequently overlooked.[23,24]

This challenge, stemming from the complex nature and inherent variability of plant-based drugs, emphasizes the need for stringent quality control parameters. As herbal products gain popularity globally, addressing these challenges becomes imperative to ensure their safety and efficacy. It's important to note that while herbal products in dentistry are gaining popularity, scientific evidence supporting their efficacy can vary.[25,26] Individuals considering the use of

herbal products should consult with dental professionals to ensure compatibility with their oral health needs.

Although this study provides valuable insights, it is important to acknowledge certain limitations. The study focused on dental institutions in a particular region, limiting the generalizability of the findings. A potential limitation of this study is the lack of data on the training and experience of the instructors who taught the participating students. Since phytotherapy is not a part of the dental curriculum in India, we did not consider instructor bias. Future research could adopt a broader approach, encompassing diverse dental schools and geographical locations.

Additionally, the study's cross-sectional design provides an overview of knowledge and awareness at a specific point in time; longitudinal studies could offer a more comprehensive understanding of evolving perceptions.

CONCLUSIONS

This study provides insights into the knowledge, awareness, and experiences of dental students in Tamil Nadu, India regarding the use of phytotherapy in dentistry. This study reveals a high level of awareness among dental students regarding the potential use of herbal products in dentistry, however perceptions regarding their efficacy and appropriate use vary significantly across academic years and gender. The findings highlight the need for integrating evidence-based information on herbal medicine into the dental curriculum to equip future dental professionals with the knowledge and skills necessary for the safe and effective application of these products.

As the dental landscape continues to evolve, acknowledging and incorporating diverse perspectives on phytotherapy is crucial for fostering well-informed and culturally sensitive dental professionals. More comprehensive research, utilizing longitudinal study methods, is recommended in future to better understand dentists' perceptions of phytotherapy in dentistry.

CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

ETHICS APPROVAL

Ethical approval was obtained from the Institutional Human Ethical Committee of Chettinad Academy of Research and Education (Ref. No: IHEC-II/0085/21). Participation was voluntary, participants signed an informed consent before participation.

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AUTHORS' CONTRIBUTIONS

Cynthia Leslie: Data curation; Formal analysis; Writing – original draft.
Agila Elumalai: Conceptualization; Investigation.
Ashwath Balachandran: Validation; Writing – review & editing.
Anitha Vijayarangan: Validation; Writing – review & editing.
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