

An Institution Based Systematic evaluation on the perception of dental nutritional knowledge among dental undergraduate students in Pune (A Cross-sectional Questionnaire Study)

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Aim: To Systematically evaluate the perception of dental nutritional knowledge among dental undergraduate students in Pune

Materials and Methods: A questionnaire-based study was conducted in the department to assess dental nutritional knowledge among dental interns during their subsequent visit to dental clinics. Hundred registered dental interns participated in this study. They were then provided with pretested questionnaire consisting of fifteen questions with multiple options. The responses marked were then obtained systematically and analyzed accordingly.

Results: The obtained figures definitely suggests that a majority of dental interns were aware of the basic knowledge about nourishment and diet, however their resultant values suggest that the dental interns required more advancements and were willing to uptake more educational awareness programs on importance of diet and nutrition and its influence on dental health.

Conclusion: The dental graduates have to be provided with more impactful programs which would provide awareness on dental nutritional knowledge

Keywords: Dental nutritional knowledge, Dental interns, Diet, nutrition, Dental caries

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Introduction

In today's global scenario, dental diseases are estimated to contribute to an enormous percentage of rapidly progressing pandemic among the general population. Individual's dental health status is regulated by the active involvement of legions of causative elements which guides its impact on the general health and well being of the individual.^{1,2} Unattended dental scenarios will ultimately result in hampering the individual's routine activities thereby leading to an unprecedented effect on the person's psychological, physical and interactive social living. However, out of the defined environmental factors diet instigates to have an impeded influence on the progressive nature of dental diseases.³ The estimated surveys published by the World Health Organization undeniably furnishes the fact that nearly about 70- 80% of vast majority of pertaining dental diseases is solely accredited to the prevailing incorrect dietary and lifestyle practices. Irrespective of age and gender an adequate diet is defined to cavort the critical health of population.^{4,5} Nutrition is defined as the planned and analytical measurement of nourishing supplies to the healthy viable being and the mechanisms by which these nourishments are involved in enrichment of body's vitality and healthy functional mechanism.^{6,7} An adequate and well balanced diet is considered to be highly unavoidable for robust and thriving life. The unrequited definition that diet rich in nutritious and fibrous foods have considerable impact on reduction of dental caries and other dental diseases have been proven through a vast majority of experimental observations.⁸

The current need of the hour is that all health care professionals including dental practitioners should be able to devise and provide factorial checks on modulation towards healthy diet and identification of probable risks involved in non-monitored

nourishment intake on a routine basis.^{9,10} In order to carry out these devised regulations and practices it is highly essential that dental professionals have sufficient knowledge about nutrition in their extremes.¹¹ This coincides with the popular perspective that oral cavity explicits to be the reflective evidence of the individual's health; thereby proclaiming the fact that dental health and nutrition have an existing causal and interdependent relationship of the same.^{12,13,14} It is henceforth determined that a transcendent dietary pattern is required for ideal growth, calcification and development of both primary and permanent dentition.¹⁵ Hence this establishes the fact that lack of proper awareness of balanced nutrition or inadequate nutrition will obviously have altering effects on oral structures thereby leading to increased incidence of dental caries, periodontal lesions and other oral conditions.^{16,17}

Ideally the dental professionals has the unique opportunity of examining healthy oral tissues during their routine dental checkup which is usually a contrary attitude seen among other health care providers who generally attend patients once inflicted by the onset of symptoms of any particular illness.^{18,19} However it is highly recommended that obtaining a highly ordained diet chart and nourishment status of the patient will henceforth enable the dental professional to get a bird's eye view of the existing eating pattern of the individual. This diet history will also detail the quantity of nutritious food required for that individual which would be beneficial in identifying the mandatory consumables to prevent the advancement and obviation of any particularly manifested oral diseases.^{20,21} Hence in general regards dental professionals take into consideration this nutrition factor and claim to provide advocative suggestions of including highly fibrous, proteinaceous and less sweet and sticky food varieties for

obtaining and maintaining a healthy oral environment.^{22,23} However considering the nutrition aspect it is mandatory that all dental students during their course of study in their professional curriculum should be trained effectively on the importance of adequate diet and nutrition in determining the overall well being of the patients.^{24,25} The number of experimental and inferential studies are comparatively less when in comparison to the current topic of concern, hence this clinical study will help us in assessing the dental nutrition knowledge among the newly qualified dental interns in Pune.

Materials and methods

Ethical approval

Ethical approval for this study was obtained from the Patil Institutional Scientific Review Board.

Questionnaire

The assessment of dental nutritional knowledge among dental interns were done using a predetermined questionnaire which was instituted by Labban L which was seemingly modified on basis of our requirements.²⁵ The sampled content of the predetermined questionnaire was validated by a group of well affluent experts from the field and the resultant modifications were accepted.

The resultant questionnaire was systematically disseminated among a pilot population of twenty dental interns to determine its validity and reliability. The final inconvertible questionnaire consisted of 15 questions which included questions on (a) Knowledge (b)attitude and (c)awareness of dental nutritional knowledge among dental interns.

Study population

The study population included all dental interns registered in the institution

there by totalling the sample size to 100 in number. A detailed participant information sheet was provided to all the participating interns along with informed consent stating the willingness of participants to enrol in the present study. A participant information sheet was given and informed consent was obtained from the willing participants. The total time frame of the study was for a period of six months.

Data collection

The pretested questionnaire was systematically distributed among the participating dental interns after proficiently detailing the various aspects and the ultimate need of conducting the study. The estimated duration taken by each of the dental intern to mark their responses were approximated to be around 15 minutes duration. The marked responses were tabulated and transferred into Microsoft Excel sheet and were directed undergo statistical analysis.

Statistical analysis

The sample size for the experimental study was determined using census sampling which determined it to be totaled to 100 in number. The obtained responses for each specific question from the dental interns were then tabulated into Microsoft Excel sheet and directed to undergo statistical analysis. The statistical analysis was performed using Statistical Package for Social Sciences software version 26(version 26, IBM Corporation, Texas, USA). Descriptive statistics and Chi-square tests were utilized to assess and compare the resultant responses marked by the dental interns. P value of <0.001 was considered to be statistically significant

Results

Results of the questionnaire are demonstrated in table 1

Table 1: Aggregate responses to the questions

Questions	Responses	Positive Responses	Negative Responses	Chi-Square	P-value
1. Do you think that maintaining adequate diet and nutrition is essential for good oral health?	a. Yes b. No c. Don't Know	100%	nil		0.001
2. Do you advise your patients regarding the importance of diet and nutrition for maintaining good oral health?	a. Yes b. No c. Not Always	92%	8%	13.601a	0.001
3. According to you which among the following is the most cariogenic sugar?	a. Sucrose b. Lactose c. Maltose	96%	4%	6.517a	0.038
4. Which among the following sugar substitutes reduces incidence of dental caries predominantly?	a. Xylitol b. Aspartame c. Saccharine	95%	5%	8.232a	0.016
5. According to you which among the following is anticariogenic?	a. Milk b. Cheese c. Nuts	66%	34%	80.575a	<0.001
6. Which among the following food prevents dental caries occurrence?	a. Fibrous food b. Sticky food c. Liquid food	91%	9%	15.469a	<0.001
7. Which among the following elements is highly cariostatic?	a. Fluoride b. Calcium c. Iodine	72%	28%	60.826a	<0.001
8. Which among the following provides maximum calories irrespective of being same amount by weight?	a. Sugar b. Fiber c. Fat	91%	9%	54.955a	<0.001
9. Which among of the following deficiencies manifest as oral symptoms?	a. Vitamin C and B12 deficiency b. Iron deficiency c. Both	79%	21%	41.577a	<0.001
10. With which of the following genetic error would an individual have practically no tooth decay?	a. Hereditary glucose intolerance b. Hereditary lactose intolerance c. Hereditary fructose intolerance	32%	68%	38.503a	<0.001
11. Which of the following psychological disorders affect nutritional and oral health of an individual?	a. Bulimia b. Schizophrenia c. Bipolar and anxiety disorders	52%	48%	88.636a	<0.001
12. How many servings of fruits and vegetables should you include in a day's diet?	a. 3 b. 4 c. 5 and more	49%	51%	78.610a	<0.001
13. Do you feel that diet and nutrition was given sufficient importance during your dental education curriculum?	a. YES b. NO c. Can't Say	60%	40%	96.528a	<0.001
14. Are you aware of My Plate categories?	a. YES b. NO	83%	17%	32.036a	<0.001
15. Do you think more awareness programmes on importance of diet and nutrition on oral health have to be organized on timely manner?	a. YES b. NO	84%	16%	29.792a	<0.001

The table displays aggregation of the required responses to the systematically displayed questions and the resultant correlation with the awareness and knowledge among dental interns regarding dental nutrition. It is evidently proven that all the dental interns

(100%) confirmed that maintaining a highly sustainable diet and nutrition is essential more stabilizing a good and efficient dental health (P-0.001).

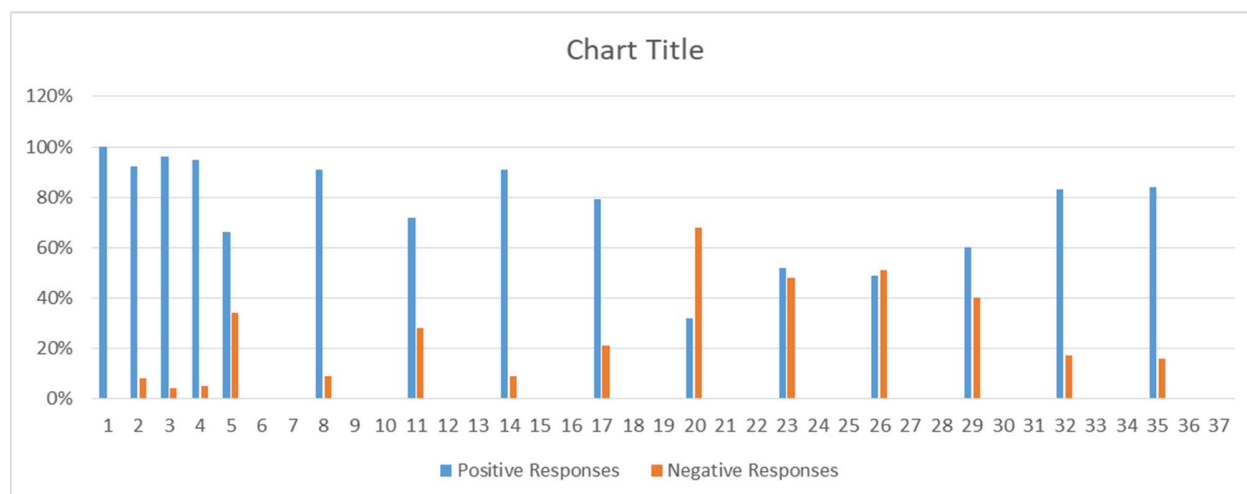


Figure 1: Type of Responses received for all the given questions

Out of the registered dental interns they displayed a preponderance of (96%) confirmed to the correct answer of sucrose being highly cariogenic among the following options (P=0.38) about 95% of the dental interns identified xylitol as the ideal sugar substitute which has a major role in reduction of dental caries (P=0.016). Milk was chosen as the required option in contrast to cheese by 66% of dental interns as the most anticariogenic food item available whereas only 34% of them chose cheese as their ideal food alternative. Nearly 91% of the posted dental interns were definitive about the fact that fibrous food has to be included in daily diet as it prevents caries occurrence and strengthens periodontium (P<0.001). Nearly 76% of dental interns solemnly confirmed that the element Fluoride exhibits an inherently evident highly demandable cariostatic activity when compared to other available elements (P<0.001). 91% of dental interns were determined with the fact that intake of sugar contributed more amount of calories when compared to fats and fibers (P<0.001). 91.7% of dental interns firmly confirmed to the fact that their undergraduate education provided them with sufficient

knowledge regarding the importance of diet in maintaining ideal dental health (P<0.001). About 79% dental interns believed the established fact that Vitamin C and B12 deficiency have well demarcated oral manifestations which can be predominantly identified (P<0.001). 32% of the dental interns were conformably aware that Hereditary fructose intolerance did not contribute to any incidence of dental caries. When the dental interns were instructed to identify the psychological diseases which had incoherent oral manifestations only 52% of dental interns defined that Bulimia had considerable effects on the individuals general nutritional and oral health status (P<0.001). Considering the daily fruit intake 49% of participating dental interns believed the fact that daily about 4 servings of fruits have to be included for a healthy diet. Only 83% dental interns confirmed that they were aware of My Plate system which is one of the most rapidly and fast paced diet table that is being adapted for practicing healthy eating among population (P<0.001). 84% of Dental interns defined the particular need for more awareness program which would highlight the importance of diet and its

correlation to oral health both among the health care professionals and the general population ($P < 0.001$).

Positive attitude was found in among 84% of the participating interns with remarkable association of the fact that the participating dental interns had an overall and generalized awareness that nutrition had and continues to be one of the significantly associative factors in determining the dental health of population which is evident in the findings obtained in the present study.

Discussion

Inadequate nourishment has an undesirable governance on the individual's immune system thereby coherently exposing the individual to numerous dental diseases. Inclusion of diet and nutrition in the existing dental curriculum mainly is to reciprocate the fact of appropriate care, forestalling illness and its treatment conductance. Hence an inclusion of absolute tutoring with respect to diet and nutrition awareness have to be made compulsory for dental students in their academic curriculum and clinical practice strategies. The present questionnaire based study thus confirms the fact that procuring various aspects of dental nutritional knowledge will evidently be an added adjunct in dental education.

Zero D. T et al in his study explains the finding that sucrose is proven to possess maximum cariogenic potential when in comparison to lactose and fructose.²⁶ Cury J.A et al also supported this finding with the addition to the existing fact that the cariogenic nature of dental plaque formed in presence of sucrose is more potent than any other secondary sugars.²⁷ In addition to this Nobre et al stated that incidence of dental caries is found to rise considerably in primary dentition in the presence of highly potent cariogenic sucrose.²⁸ Sivakumar et al. in his study conducted among dental interns have stated that 64% of them considered sucrose as

the sugar with most potent cariogenic potential.²⁹ These findings correlates with our present study in which 96% of dental interns confirmed sucrose to be highly cariogenic in nature.

Xylitol has been indicated to rapidly promote progressive process of mineralization when consumed in a systematically followed diet. Xylitol has the exponential property of being the unique sugar which is practically non fermentable by bacteria present in the oral cavity. Mohammad Z et.al in his study conducted among dental practitioners regarding the cariogenic effect of xylitol established his findings that 63.6% of dental practitioners believed that xylitol is the most efficient sugar substitute which reduces the incidence of dental caries. Our study also approves the fact that 95% of dental interns coincided that xylitol reduces dental caries to a greater extent.³¹

Telgi et al in his study have profoundly stated that cheese is one of the highly accepted dairy source which has inbuilt capacity of being anticariogenic in nature. Salivary secretion is found to have a spike on consumption of cheese in our diet.³² Rugg-Gunn et al. in his study has explained the fact that inspite of the beneficial effects of cheese only 15.4% of dental students believed that it possessed anticariogenic effect.³³ However our study is a strict contrast to this findings which estimated that 66% of dental interns substantiated anticariogenic potential of cheese rather than commonly available milk.

About 91% of participating interns were aware that high fiber foods promoted increased mineralization and decreased incidence of dental caries occurrence. Chalmuri et al in his study determined that post graduate students confirmed that vegetables and fibrous foods decreased the incidence of occurrence of dental caries which corresponds to similar findings to that

in our study.³⁴ Alcântara PC et al in his study detailed the fact that Fluoride prevents dental decay by increasing remineralization. This finding corresponds to our study which stated that 72% of dental interns considered Fluoride as the most cariostatic element in comparison to any other available elements.³⁵ Several studies entail the fact that sugar is upheld with an increased definition of calories when compared to other consumable products of fibers and fats. Moynihan P et al in his review has explained the fact that intake of free sugars has to be reduced in both children and adults as it totals to an increased disease prevalence and hampers health however 91% of dental interns also estimated similar findings that sugar continues to remain as undeniable threat in progression of dental caries and other diseases.³⁶ Nourishment plays a highly significant criterion in stabilizing the coherence of dental tissues which plays a major role in maintaining the integrity of oral tissues, hence any reduced nourishment or improper nutrition can therefore result in onset of numerous lesions and subsidiary other oral lesions. Studies conducted by Eman A abdallah et al also claims the fact that inadequate dental nutrition could pave a pathway resulting in considerable reduction in immune response henceforth leading to oral lesions like oral lichen planus in such individuals over a period of time.³⁷ Nireeksha et al in their review have well orderly detailed that vitamin deficiencies especially Vitamin C, Vitamin B12 and Vitamin D can result in significant oral manifestation which corresponds to findings in our study which states that 79% of dental interns reviewed the response that vitamins definitely causes undesirable oral manifestations which often go unnoticed when not looked into detail in absolute manner.³⁸ In addition to this another fairly significant oral finding which is highly evident in vast majority of individuals inflicted with improper dental nutritional

knowledge would be the recurrence of oral ulcers. This was well detailed in the study conducted by Sara Ali Abdel-Raouf et.al in which she explained that oral results can be a subsequent complication of prolonged lack of adequate nutrition which would elevate severe side effects over the course of duration.³⁹

Newbrun et al in his study has clearly that subjects with Hereditary fructose intolerance have a reduction of dental caries of more than 10% when compared to patients without the hereditary condition.⁴⁰ However only 32% of dental interns confirmed to the findings that HFI does not cause any significance dental caries. Kisely et al had studied and arrived at conclusions stating that patients with severe bulimia and anorexic conditions display definitive symptoms of these nutritional and dietary deficiencies evidently in the oral tissues.⁴¹ AbdelRazek RH et al and Hussien AA et al in his study detailing the consistent impact of anxiety on dental visits of children have undoubtedly stated that parental nutritional knowledge and dental encounters subsidly plays an important role in determining the child's nutrition and response in the dental setting.^{42,43} 52% of dental interns were able to identify that these have significant influence on surrounding oral structures which clarifies the need of correlating and updating the knowledge on diet and nutrition among dental interns. Apart from this as per the questionnaire survey conducted by Eissa et al , the need of inclusion of oral hygiene practices with supplemented fluoride levels will also significantly reduce caries incidences.⁴⁴ Another aspect of concern which could also assume to be a considerable part in determining the dental nutritional knowledge in inclusion of habits like tobacco chewing, alcohol consumption which would considerably affect the normal nutritional consumption of the individual thereby increasing the incidences of precancerous

lesions to a greater extent. This was validated by findings in the questionnaire study conducted by Alshami M et al and Mohamed MR et al who clarified that constant consumption or addiction to these habits will have a subsequent effect on general health of the individual including dental nutrition thereby resulting in intangible precancerous lesions.^{45,46} Another important inclusion whereby studies conducted by Denewer S et al have proclaimed that caffeine can possibly have safer effects on cell cycles including fibroblasts which would be an added note on safe consumption of caffeine and its beneficiary effects.⁴⁷ Shreeja et al in her questionnaire based survey had defined that regular consumption of regular 4-5 servings of fruits and vegetables gradually had a positive impact of general health along with oral tissue integrity which also corresponds to the findings of present study stating that nearly 49% of dental interns corresponds with the findings of Shreeja et al.⁴⁸

However, it is an undeniable fact that exists considerable need on implication of more awareness and practicality in detailing the importance of diet and addition of nutrition in to the existing Dental curriculum. This ideology is consistent with the findings of our present study which describes that only nearly 83% of dental interns were consistently aware of My Plate system and that a vast majority were opinionated that there existed a considerable need for creating awareness and imparting higher educational standards on basis of dental nutritional knowledge among undergraduates and dental interns which unreliably corresponds to findings processed by Sivakumar et al in which he explained that nutrition was considered as a vital component which has to be further incultivated among dental interns at an utmost level of significance. The effect of adequate dental nutritional knowledge among the dental interns would aid in maintaining an ideal and healthy oral

environment which will promote the formation of highly active and viable human cells, thereby preventing active caries lesions.^{49,50}

Conclusion

The present questionnaire study firmly adheres the fact that dental nutritional knowledge and awareness is considered as a meagerly enriched area of concern which has to be instilled well among the new graduates. Our findings establishes the fact that all dental graduates have basic knowledge regarding nutrition which definitely has to be engrossed so that they get a bird's eye view with respect to the need of its importance on oral health. This also explains the fact of including more dental education programmes and modules signifying the importance of dental nutrition in dental curriculum.

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Data availability

The data that support the findings of the present study are available from the corresponding author upon reasonable request.

Author statement

All authors have read and approved the final version of the manuscript. Dr.Lakshmi Thribhuvan had full access to all the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

Ethics approval and consent to participate

The study proposal was approved by the ethical committee of the faculty of Dentistry, Department of Pediatric and Preventive Dentistry, Dr.D.Y.Patil Vidyapeeth, Dr. D.Y.Patil Dental College

and Hospital, (Local ethical committee, No: DYPDCH/IR No.145/2023). CONSORT guidelines for clinical trials were followed. All patients signed written consent.

Competing interests

The authors declare no competing interests.

Author Contributions

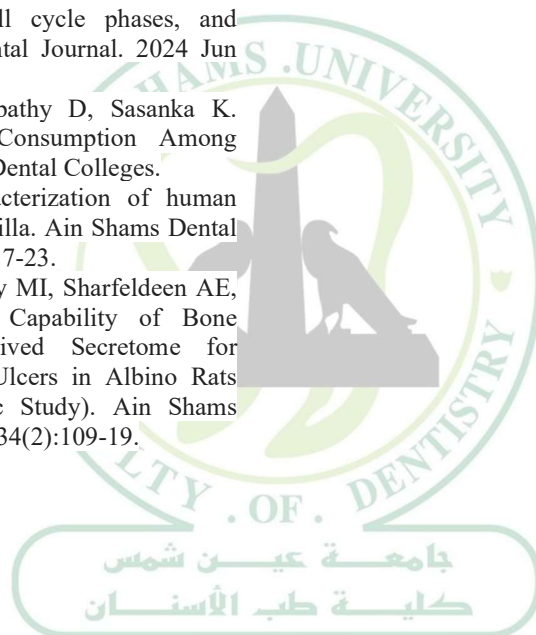
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Methodology and data curation: Dr. Lakshmi Thribhuvan, Dr. Aditi Mathur, Dr. M.S. Saravanakumar. **Resources:** Dr. Lakshmi Thribhuvan, Saumya Shrivastava, **Formal analysis:** Dr. Aditi Mathur, Dr. M.S. Saravanakumar **Writing: original draft:** Dr. Lakshmi Thribhuvan, **Writing – review: and editing:** Dr. Lakshmi Thribhuvan, Saumya Shrivastava **Visualization and supervision:** Dr. Aditi Mathur, Dr. M.S. Saravanakumar.

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