



“A Coalition Between Nutritional and Dental Health Status Amongst the Geriatric Population in Uttarakhand State”

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KEYWORDS

Dental health,
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ABSTRACT

Background: Impaired oral health has been suggested to affect the food selection, hence making people susceptible to malnutrition.

Objectives: The current study was done to assess the correlation of dental health and nutritional status in the elderly population of Uttarakhand.

Material and Method: In the Indian state of Uttarakhand, a community-based cross-sectional survey was carried out in 2022–2024. Using a population proportionate to size sampling technique, 200 senior citizens from several Uttarakhand cities were enlisted. Anthropometric measures and sociodemographic profile data were gathered. To evaluate nutritional status, the Mini Nutritional Assessment scale (MNA) and body mass index (BMI) were computed. Through a physical examination, a qualified specialist evaluated the state of oral health. Data on dietary intake was gathered using the 24-hour dietary recall technique.

Results: The underweight (as calculated by BMI) and malnutrition (as measured by MNA) rate was greater in subjects who were totally edentulous, had difficulty in chewing, and did not use dentures. In comparison with subjects who did not use dentures, the malnutrition rate was significantly lower than subjects wearing dentures.

Conclusion: Among older adults in Uttarakhand, poor dietary condition was substantially correlated with dental health status. In order to improve the nutritional state of the senior population, restorative dental healthcare services should be improved.



1. Introduction

Population aging has emerged as one of the most significant public health challenges of the 21st century, with profound implications for health systems worldwide.¹ In India, the demographic transition is especially pronounced, and regions such as Uttarakhand are witnessing a rapid increase in the geriatric population—a trend that demands targeted research into the determinants of healthy aging. Among the various factors that influence the quality of life in older adults, nutritional status and dental health stand out as critical, interrelated domains that significantly impact overall well-being.² Nutrition, defined as the provision and assimilation of food necessary for growth, maintenance, and repair of the body, plays a vital role in sustaining physiological functions and preventing chronic diseases.³ Equally important is oral health, which encompasses the integrity of the teeth, gums, and entire oral mucosa, and is essential not only for effective mastication and clear speech but also for maintaining social interactions and self-esteem.⁴

In the geriatric population, the interplay between nutrition and dental health is particularly complex. Compromised dentition and poor oral conditions can impede the ability to chew effectively, thereby limiting the intake of nutrient-rich foods, while inadequate nutrition can weaken the immune response and impair the repair mechanisms of oral tissues, ultimately leading to dental pathologies.⁵ This bidirectional relationship creates a vicious cycle in which declining dental health exacerbates nutritional deficiencies, and these deficiencies, in turn, further deteriorate oral health—ultimately affecting the overall health and quality of life of older individuals.⁶

Uttarakhand, a state characterized by its diverse topography and predominantly rural demographics, presents a unique setting in which this coalition between nutritional and dental health can be critically examined.⁷ The region's rugged terrain, coupled with limited access to comprehensive healthcare services including specialized dental care, leaves many older adults vulnerable to both nutritional deficits and untreated dental conditions.⁸ Traditional dietary practices—shaped by local culture, seasonal food availability, and longstanding culinary customs—often result in diets that are high in carbohydrates yet

deficient in proteins, vitamins, and minerals. Such nutritional imbalances not only predispose the elderly to malnutrition but also adversely affect oral health by failing to provide the necessary components required for maintaining dental tissue integrity.⁹ In support of this, evidence has shown that an adequate intake of nutrients such as vitamin D, calcium, and antioxidants is crucial for preserving bone density and preventing periodontal diseases.¹⁰ Conversely, dental issues such as tooth loss, periodontal infections, and conditions like xerostomia (dry mouth) further impair the ability to consume a balanced diet, thereby perpetuating nutritional deficiencies. This reciprocal interaction underscores the urgent need for integrated health strategies that address both nutritional and dental issues concurrently.

The aim of the present study is to a coalition between nutritional and dental health status amongst the geriatric population in Uttarakhand state.

The objective of the study is to assess the dental health status amongst the geriatric population, to assess the nutritional health status amongst the geriatric population and to assess the coalition between dental health status and nutritional health status.

MATERIALS AND METHOD

The study was designed as a cross-sectional survey, which was employed to evaluate the interrelationship between nutritional and dental health status among the geriatric population in Uttarakhand. A standardized questionnaire and clinical examination were used to collect data on both nutritional intake and oral health conditions. The design was chosen because it allowed us to capture a snapshot of the current status and assess associations between the variables of interest.

Participants eligible for inclusion in the study will be those who are willing to respond to the questionnaire proforma, fulfil the research criteria, and are ready to provide informed consent. Only individuals aged above 65 years will be considered. Additionally, participants must be physically capable of undergoing the clinical examination required as part of the study.

Conversely, individuals receiving artificial feeding or experiencing malabsorption issues will be excluded. The study will also exclude participants who are uncooperative



during the clinical examination or those unwilling to provide consent for participation

An informed written consent was obtained from each subject after explaining the objectives and procedure of data collection for the study. The study was approved by the ethical committee of Seema Dental College and Hospital, Rishikesh.

The data were collected on the following parameters:

(1) Sociodemographic profile

The participants' identifying information and sociodemographic profile, which included age, gender, educational background, current occupation, family monthly income, and financial dependency, were gathered orally through a questionnaire. The Kuppuswamy classification (2014) was used to calculate socioeconomic status (SES).⁹

(2) Dental health status

Information on complete loss of teeth, chewing problems, and usage of dentures was assessed through physical examination. The dental health status of each participant was assessed on an individual basis. The actions listed below were taken:

Inspection: A thorough intra oral examination was conducted. Teeth loss was tallied. In the both upper and lower jaws, the edentulous status was evaluated and chewing issues was documented.

Palpation: Additionally, lymph node and TMJ was palpated.

(3) Mini Nutritional assessment

The study participants' risk of malnutrition was evaluated using the Mini Nutritional Assessment (MNA) scale. 10. Anthropometric measurements, general assessments, nutritional assessments, and subjective assessments were all the subjects of data collection. The following three criteria were used by the MNA scoring to classify nutritional status: (i) normally nourished (>23.5), (ii) at risk of malnutrition ($17-23.5$), and (iii) malnourished (<17).

(4) Body mass index

Standard protocols were used to measure the older subjects' weight and height. The following formula was used to determine the body mass index (BMI): Weight (kg) divided by height (m²) is the BMI (kg/m²). The World Health Organisation (WHO) classed BMI (kg/m²) as follows: <18.5 (underweight), $18.5-24.9$ (normal), $25-29.9$ (overweight and preobese), and ≥ 30 (obesity).

(5) Dietary assessment

The following measures were taken to record the dietary assessment:

(i) Data related the meal pattern and the baked and raw foods consumed by the subject was recorded. (ii) Raw materials used for preparation of each cooked food item consumed was recorded for each cooked food item consumed. (iii) Equivalent weights of raw materials used for preparation of each food item were measured on a SECA kitchen scale and recorded. (iv) Total capacity of each cooked food material was recorded by measuring in standard cups. (v) The quantity of each food type consumed by the indexed respondent was quantified in units of standard cups/spoons/chapati models. Cups were used to help the respondent FOR estimating the quantity consumed by the individual respondent. (vi) The quantity of raw ingredients used in grams used by each food category by the indexed subject was calculated. (vii) Nutritive value of raw foods taken was estimated by employing Food Composition Table of Nutritive value of Indian foods.¹² Dietary intake of food-cooking staff of the subjects was interviewed to ascertain dietary intake of the indexed subjects. Dietary intake of macronutrients and micronutrients and trace elements by elderly subjects were compared with RDA for Indians published by ICMR.¹³

SAMPLE SIZE

The sample size was determined by using a formula that accounted for the estimated prevalence of malnutrition and dental health issues in the elderly. Previous studies and local health records were referenced to estimate the



prevalence, and a confidence level of 95% with a margin of error of 5% was used in the calculations.¹⁴ A sample size of 200 participants was determined to be adequate to ensure statistical power and to detect meaningful differences in the variables under study. The calculation also considered an anticipated non-response rate of 10%, and therefore, additional participants were recruited to offset potential losses. The final sample size was confirmed after a review of the pilot data, and the process was overseen by a statistician to ensure that the number was both statistically and practically sufficient to achieve the study objectives.

$$\text{Sample Size (SS)} = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where: c^2

SS = sample size

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage of population

This was found to be 70% for the present study which was expressed as 0.7.

c = confidence level

So, sample size was = $(1.96)^2 \times 0.7 \times 0.3$

$$(0.05)^2$$

RESULTS

The results of the study pertaining to assess a coalition between Nutritional and Dental health status amongst the Geriatric population in Uttarakhand State in a sample of 200 subjects surveyed from Uttarakhand are given below after the statistical analysis.

Health Status – Prevalence of Dental Conditions

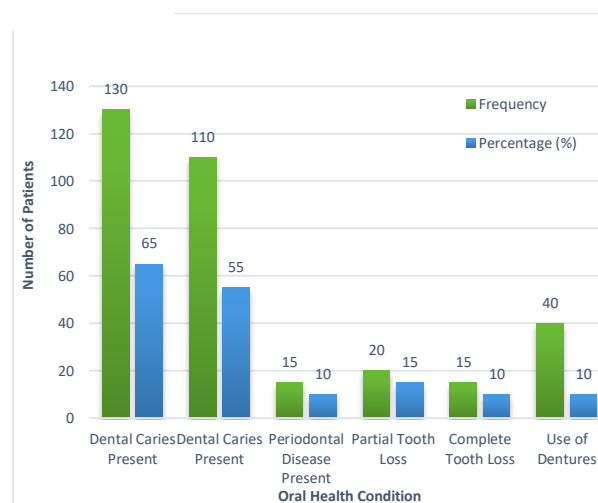
The analysis of oral health conditions among participants reveals a high prevalence of dental issues. Sixty-five percent of the elderly were diagnosed with dental caries, while half exhibited periodontal disease. Additionally, 15% experienced partial tooth loss and 10% complete tooth loss. Only 10% of the participants reported using dentures. These findings indicated that a

significant proportion of the geriatric sample suffers from oral health problems (as shown in table 1 and plotted in graph 1) that could impact chewing efficiency and overall nutrition. The prevalence of these conditions underscores the necessity for regular dental care and timely prosthodontic interventions to maintain quality of life.

Table 1: Oral Health Status – Prevalence of Dental Conditions of study population

Oral Health Condition	Frequency	Percentage (%)
Dental Caries Present	110	55.0
Periodontal Disease Present	15	10.0
Partial Tooth Loss	20	15.0
Complete Tooth Loss	15	10.0
Use of Dentures	40	10.0

Graph 1: Oral Health Status – Prevalence of Dental study population



Nutritional Status Based on BMI

The nutritional assessment using Body Mass Index (BMI) shows that 50% of the participants have a normal BMI. However, 20% of the elderly are classified

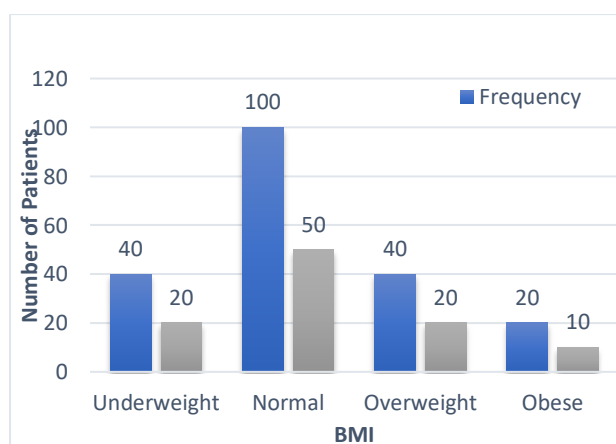


as underweight, 20% as overweight, and 10% as obese. This distribution reflects a mixed nutritional status within the geriatric population. While half maintain a healthy weight, a significant portion shows potential nutritional imbalances that could be exacerbated by dental problems affecting mastication (as shown in table 2 and plotted in graph 2). These findings underscore the need for integrated nutritional and dental care, as both extremes of BMI may have implications for overall health, impacting immunity, physical function, and quality of life.

Table 2: Nutritional Status Based on BMI Among Participants

BMI Category	Frequency	Percentage (%)
Underweight	40	20.0
Normal	100	50.0
Overweight	40	20.0
Obese	20	10.0
Total	200	100.0

Graph 2: Nutritional Status Based on BMI Among Participants



Multivariate Logistic Regression Analysis for Factors Associated with Nutritional Deficiency

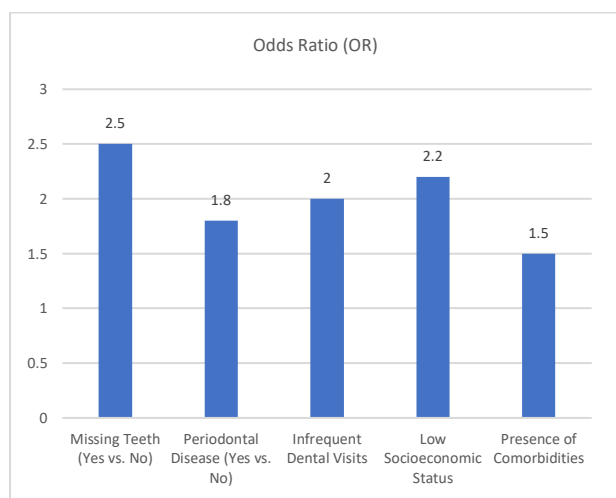
The multivariate logistic regression analysis identifies key risk factors associated with nutritional deficiency among the elderly. Missing teeth significantly increased the odds of nutritional deficiency by 2.5 times (OR = 2.5, 95% CI: 1.3–4.8, p = 0.005). Periodontal disease (OR = 1.8, 95% CI: 1.0–3.2, p = 0.045) and infrequent dental visits (OR = 2.0, 95% CI: 1.1–3.7, p = 0.021) also contributed significantly. Additionally, low socioeconomic status raised the risk (OR = 2.2, 95% CI: 1.2–4.1, p = 0.010). Although comorbidities showed an increased risk (OR = 1.5), this factor was not statistically significant (p = 0.150). These results pinpoint critical areas for targeted intervention to improve nutritional outcomes.

Table 3: Multivariate Logistic Regression Analysis for Factors Associated with Nutritional Deficiency

Variable	Odds Ratio (OR)	95% Confidence Interval	p-value
Missing Teeth (Yes vs. No)	2.5	1.3 – 4.8	0.005
Periodontal Disease (Yes vs. No)	1.8	1.0 – 3.2	0.045
Infrequent Dental Visits	2.0	1.1 – 3.7	0.021
Low Socioeconomic Status	2.2	1.2 – 4.1	0.010
Presence of Comorbidities	1.5	0.8 – 2.8	0.150



Graph 3: Multivariate Logistic Regression Analysis for Factors Associated with Nutritional Deficiency



DISCUSSION

This study examined the relationship between nutritional status and dental health among the geriatric population in Uttarakhand, India. It highlights how poor dental health can impair chewing ability, leading to nutritional deficiencies, while malnutrition can, in turn, weaken oral health. Given the unique geographical and healthcare challenges in Uttarakhand, elderly individuals face significant barriers in maintaining both proper nutrition and oral hygiene. The research aims to assess the dental and nutritional health status of older adults and evaluate their interrelationship through a survey-based approach.

A cross-sectional survey was conducted among 200 participants aged 65 years and above, selected through systematic random sampling from urban and rural areas. Data collection included dietary assessments, oral health examinations, BMI measurements, and socioeconomic status evaluation.

The findings of present study revealed that 55% of participants had dental caries, 10% had periodontal disease, and 15% had partial tooth loss, yet only 10% used dentures despite 10% having complete tooth loss. In terms of nutrition, 20% of the elderly were underweight, 50% had normal BMI, 20% were overweight, and 10% were obese. While 60% consumed fruits and 70% included vegetables in their diet, 30%

had a high intake of processed foods, potentially exacerbating their health issues.

The study also identified less dental care, with 50% of participants not visiting a dentist in the past year and 10% never brushing their teeth. Additionally, 40% had hypertension, 30% had diabetes, and 20% had both conditions, highlighting the presence of chronic diseases that further complicate nutritional and oral health. Low socioeconomic status (40% of participants) was another major factor influencing access to healthcare and quality nutrition.

Statistical analysis confirmed that missing teeth significantly increased the risk of being underweight, while poor periodontal health, infrequent dental visits, and financial constraints were major contributors to malnutrition.

The age distribution of participants showed that 40.0% were aged 65–69 years, 30.0% were aged 70–74 years, 20.0% were aged 75–79 years, and 10.0% were aged 80 years or above. Gender distribution indicated that 55.0% were male and 45.0% were female. In terms of oral health status, 65.0% exhibited dental caries, 50.0% had periodontal disease, 45.0% experienced partial tooth loss, 15.0% had complete tooth loss, and 20.0% used dentures. Regarding the severity of dental caries, 35.0% had no caries, 30.0% had mild caries, 25.0% had moderate caries, and 10.0% suffered from severe caries. Periodontal status showed that 50.0% of participants were periodontally healthy, 20.0% had gingivitis, 15.0% had mild periodontitis, 10.0% had moderate periodontitis, and 5.0% had severe periodontitis. Tooth loss distribution revealed that 55.0% reported no tooth loss, 25.0% had 1–3 missing teeth, 12.5% had 4–6 missing teeth, and 7.5% had more than 6 missing teeth. Denture use analysis indicated that 80.0% did not use dentures, 15.0% used partial dentures, and 5.0% used complete dentures. In terms of nutritional status based on BMI, 20.0% were underweight, 50.0% had a normal BMI, 20.0% were overweight, and 10.0% were obese.

Dietary habits assessment showed that 20.0% consumed fruits daily, 50.0% consumed vegetables daily, 10.0% maintained regular protein intake, and 20.0% had a high intake of processed foods.



Regarding the frequency of dental visits, 50.0% had no dental visits in the past year, 25.0% visited once, 15.0% visited twice, and 10.0% visited more than twice. The association between missing teeth and nutritional status revealed that among participants with no tooth loss, 9.1% were underweight, whereas among those with any tooth loss, 33.3% were underweight ($\chi^2 = 12.5$, $p = 0.0004$).

Oral hygiene practices showed that 40.0% brushed once daily, 35.0% brushed twice daily, 15.0% brushed occasionally, and 10.0% never brushed their teeth. Socioeconomic status distribution indicated that 40.0% belonged to low SES, 45.0% to middle SES, and 15.0% to high SES.

The prevalence of medical comorbidities was 30.0% for diabetes mellitus, 40.0% for hypertension, 20.0% for both conditions, and 10.0% had no comorbidities. Finally, multivariate logistic regression analysis showed that missing teeth increased the odds of nutritional deficiency by 2.5 (OR = 2.5), periodontal disease by 1.8 (OR = 1.8), infrequent dental visits by 2.0 (OR = 2.0), and low socioeconomic status by 2.2 (OR = 2.2), while comorbidities were not statistically significant (OR = 1.5, $p = 0.150$).

The study highlights that there is a strong link between dental health and nutritional status among the elderly, with poor oral health leading to nutritional deficiencies and overall health deterioration. Socioeconomic factors further aggravate these issues by limiting access to both dental care and quality food. The findings underscore the need for integrated healthcare interventions, including dental rehabilitation, nutritional counselling, and community-based support programs to improve the well-being of elderly individuals in Uttarakhand. Addressing these issues holistically could significantly enhance the quality of life and functional independence of the aging population.

CONCLUSION

The following conclusions have been drawn from this study:

Among dental health 55% of geriatric population had dental caries while 10% suffered from periodontal disease, 15 % had partial tooth loss, 10% had complete

tooth loss and 10% were used denture which impacts their ability to eat and maintain proper nutrition.

Among Nutritional health 20% of geriatric population were underweight, indicating malnutrition, 50% had a normal BMI, while 20% were overweight and 10 % obese which indicate nutritional deficiencies are prevalent among the elderly, often exacerbated by dental health issues.

The finding of this study clearly indicated the Coalition between Dental and Nutritional Health in geriatric population: A strong correlation exists between poor oral health and inadequate nutrition, highlighting the need for combined dental and dietary care strategies.

ETHICS OF HUMAN SUBJECT PARTICIPATION

This study was conducted according to the guidelines and all procedures involving human subjects/patients were approved by the ethics committee of the Seema Dental College and Hospital, Rishikesh.

FINANCIAL SUPPORT AND SPONSORSHIP

This study was self-funded.

Conflicts of interest

There are no conflicts of interest.

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