



Assessing Nutritional Status Through Anthropometric Measurements and Serum Albumin in Elderly Edentulous Patients Before and after Implant-Supported Mandibular Over Denture Rehabilitation.

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ABSTRACT:

Introduction:

India's elderly population, comprising 137.9 million individuals over 60 years old, accounts for about 10% of the nation's total population. Edentulism poses significant health challenges, affecting nutrition and quality of life comparable to severe chronic illnesses. Traditional dentures often fail to enhance functionality, particularly in the mandibular arch, leading to dissatisfaction due to poor masticatory performance and other factors. Implant-supported mandibular over dentures have shown promise in improving chewing ability, patient satisfaction, and oral health-related quality of life (OHRQoL).

Materials and Methods

This prospective study, conducted at SMBT Dental College & Hospital, involved 35 completely edentulous elderly patients aged 60-80 years. Following a thorough health screening to ensure the absence of systemic diseases, baseline serum albumin levels and Body Mass Index (BMI) were recorded. Patients received mandibular over dentures retained by ball attachments on two implants in the canine region, opposed by new conventional maxillary dentures. Follow-up evaluations were conducted six months post-rehabilitation to reassess BMI and serum albumin levels.

Results

Out of the initial 35 patients, 32 completed the six-month follow-up. Three patients were excluded due to non-compliance and health issues. Post-rehabilitation results indicated a significant improvement in nutritional status, evidenced by increased BMI and serum albumin levels. This suggests that the use of implant-supported mandibular over dentures positively impacts the nutrition and overall health of elderly edentulous patients.

Conclusion:

Implant-supported mandibular over dentures significantly improve the nutritional status of elderly edentulous patients, as shown by the increase in BMI and serum albumin levels. This study underscores the importance of dental rehabilitation in enhancing the well-being and quality of life of the geriatric population.



INTRODUCTION:

In the twilight years of life, the simple act of eating can become a formidable challenge, especially for those who have lost their teeth. Edentulism, or toothlessness, not only dims the joy of eating but also jeopardizes nutritional intake, leading to a cascade of health issues. But what if a smile makeover could also revamp nutrition and overall well-being? This is the promise of implant-supported mandibular over dentures. By securely anchoring dentures, these implants can restore chewing efficiency, improve diet, and enhance nutritional status. [1] This study delves into the transformative power of implant-supported over dentures, evaluating their impact on the nutrition of elderly edentulous patients through precise anthropometric measurements and serum albumin levels. Join us as we explore how bringing back a full, confident smile can also bring back robust health and vitality.

Maintaining optimal nutritional status is paramount for the overall health and well-being of elderly individuals, particularly those who are edentulous (lacking natural teeth). Edentulism can significantly impact an individual's ability to chew and consume a varied, nutrient-dense diet, potentially leading to malnutrition and associated health complications. The World Health Organization (WHO) recognizes malnutrition as a major public health issue affecting the elderly population globally, with implications for physical function, immune response, and overall quality of life (WHO, 2020).[2]

Implant-supported mandibular over dentures have emerged as a promising solution to address the challenges faced by edentulous elderly patients. These prosthetic devices not only restore masticatory function but also have the potential to improve nutritional status by enhancing the ability to consume a wider range of foods. Studies have shown that edentulous individuals with implant-supported overdentures experience improvements in dietary intake, nutritional status, and overall quality of life compared to those using conventional dentures. [3]

The global demographic shift towards an ageing population has been a notable trend, with significant implications for public health systems worldwide. According to the Ministry of Statistics and Programmed Implementation (MOSPI) 2021 report,

India's elderly population (above 60 years) stands at 137.9 million, accounting for approximately 10% of the total population.[4] This demographic change is not unique to India; the World Health Organization (WHO) projects that between 2000 and 2050, the global population aged over 65 will increase from 11% to 22%, with the number of individuals aged 60 and above rising from 605 million to 2 billion. This substantial growth in the elderly population necessitates an increased focus on addressing their specific health needs, including those related to oral health.[5]

Oral health is a critical component of overall health and quality of life, particularly for the elderly. The WHO defines impairment as any physical or psychological limitation in executing life situations, and edentulism (toothlessness) is a significant impairment under this definition. Edentulism can severely affect an individual's ability to eat and speak properly, leading to both aesthetic and biomechanical issues. Unreplaced missing teeth can result in a quality of life comparable to that experienced by patients with chronic diseases like cancer or renal disease. Furthermore, studies have shown that reduced tooth number and limited occlusal area are associated with inadequate and unbalanced food intake, with elderly individuals possessing fewer than 20 remaining teeth exhibiting significantly lower body mass index (BMI) compared to those with 20 or more teeth. [6]

The primary goal in treating edentulous patients is to provide well-fitting, functional, and aesthetically pleasing prostheses to mitigate the negative functional and psychological impacts of tooth loss. While conventional complete dentures can improve patient satisfaction in terms of aesthetics and speech, they often fall short in enhancing functional outcomes, particularly in the mandibular arch where lower dentures frequently pose more functional challenges compared to natural dentition. Research has demonstrated that mandibular dentures supported by endosseous implants significantly enhance patients' chewing ability, satisfaction, masticatory function, and oral health-related quality of life (OHRQoL) compared to conventional dentures. [7]

Nutritional status is a vital indicator of health, particularly in the elderly, and can be assessed through various methods, including biochemical parameters and anthropometric measures such as BMI. Nutritional



evaluations often involve screening tools that incorporate BMI and changes in weight, along with assessments of illness severity and laboratory markers like serum albumin levels. Given the challenges in obtaining precise weight measurements in many patients, serum albumin serves as a reliable laboratory method to assess nutritional status.[8]

This study aims to evaluate the impact of implant-supported mandibular overdenture rehabilitation on the nutritional status of elderly edentulous patients, specifically by measuring changes in BMI and serum albumin levels before and after the intervention. By focusing on these parameters, the study seeks to provide valuable insights into the broader health benefits of improved oral rehabilitation in the geriatric population.[9]

This article aims to assess the nutritional status of elderly edentulous patients before and after the rehabilitation of implant-supported mandibular overdentures. The study will utilize anthropometric measurements, such as body mass index (BMI), as well as serum albumin levels, to evaluate the impact of this treatment on the nutritional status of the participants. Anthropometric measurements provide valuable insights into an individual's body composition and nutritional status, while serum albumin levels serve as a marker of protein status and overall nutritional well-being.[10]

By examining these parameters before and after the implementation of implant-supported mandibular overdentures, the study aims to shed light on the potential benefits of this rehabilitation approach in improving the nutritional status of elderly edentulous patients. The findings of this study will contribute to the understanding of the relationship between oral health, masticatory function, and nutritional status in the elderly population. The results may also inform healthcare professionals and policymakers on the importance of addressing oral health as a crucial component of comprehensive geriatric care and nutritional support.

METHODOLOGY:

This prospective study was conducted at the Department of Prosthodontics and Crown & Bridge,

SMBT Dental College & Hospital, Sangamner, involving a sample size of 35 elderly completely edentulous patients aged between 60 and 80 years. The sample size was determined using G Power 3.1.9.2 software, with an effect size of 0.25, a power of 80%, an alpha error of 5%, a beta error of 20%, a confidence interval of 95%, and a significance level of 5%. The calculated sample size was 35. The study was approved by the Institutional Ethics Committee.

Participants were selected based on specific inclusion and exclusion criteria. Inclusion criteria were patients willing to participate for the study duration (10 to 12 months), completely edentulous for at least 6 months prior to the study, aged between 60 and 80 years, willing to undergo implant-supported mandibular overdenture rehabilitation, and willing to provide informed consent for blood investigations, clinical, and surgical procedures. Exclusion criteria included insufficient bone for implants, medical contraindications for implant treatment, use of nutritional supplements or treatments affecting nutritional status, acute or chronic temporomandibular disorders, and potential dropouts.

Routine health check-ups were conducted to ensure the absence of systemic diseases. Serum albumin levels and BMI were assessed for all 35 subjects using the central research lab facility. Blood samples (5ml) were collected via venipuncture from a peripheral vein, using a blood collection bulb with EDTA. Serum albumin levels were measured using a BCG (Bromo-cresol Green) method albumin assay kit. The collected blood was allowed to clot for 10-20 minutes at room temperature, centrifuged at 2000-3000 RPM for 10 minutes, and then the serum was analyzed. Serum samples were diluted 2-fold with distilled water, mixed with reagent, incubated for 5-7 minutes, and readings were recorded using a biochemical analyzer.

Anthropometric measurements included body weight and height. Body weight was measured without shoes and heavy clothing using a calibrated scale, accurate to the nearest 0.1 kg. Height was measured using a height scale, with patients standing barefoot, heels together, arms at the side, legs straight, shoulders relaxed, and head in the Frankfort horizontal plane. BMI was calculated using the formula: weight (kg) / height (m²).



For implant-supported mandibular overdenture fabrication, two implants were placed in the mandibular canine region, and denture insertion was done 3 to 4 months post-surgery. Patients received instructions on proper denture use, and the retention, stability, and support of the denture were evaluated by dental personnel.

Patients were recalled for follow-up 6 months after denture insertion. They were interviewed about prosthesis use during meals, and those who did not use the prosthesis were excluded from the study. Serum albumin levels and BMI were re-evaluated for those who consistently used the prosthesis for 6 months. Data were managed using Microsoft Excel, and statistical analysis was performed using SPSS Version 24.0. Data normality was checked with the Kolmogorov-Smirnov and Shapiro-Wilk tests. Inter-group comparisons of means before and after the implant-supported

mandibular overdenture rehabilitation were conducted using paired Student's t-tests (parametric) and Wilcoxon tests (non-parametric). The confidence interval was set at 95%, with a 5% alpha error probability and an 80% study power.

RESULTS:

This in-vivo study assessed and compared BMI and serum albumin levels in elderly edentulous patients before and after 6 months of mandibular implant-supported overdenture therapy. Initially, 35 individuals were randomly assigned to the trial. Thirty-two patients attended the six-month follow-up visit. Two female participants did not attend the six-month follow-up session due to overall unhappiness (n = 1) and general health issues (n = 1). One male patient could not be located for follow-up (n=1).

Table 1: Comparison of mean serum albumin levels from pre-treatment to post treatment levels in men and women respectively

Albumin levels	Pre- treatment Mean (SD)	Post- treatment Mean (SD)	Change (SE)	Paired t test	P value, Significance
Men	33.0 (1.82)	37.42 (1.53)	4.42 (0.54)	t = -8.07	P< 0.001**
Women	30.0 (3.11)	35.18 (3.12)	5.18 (1.1)	t = -4.699	P< 0.001**

**p<0.001 – highly statistical significant difference

P-value derived from Wilcoxon Signed Ranks Test; significant at $p < 0.05$. The mean serum albumin at baseline and after 6 months of denture rehabilitation in elderly edentulous patients was compared. It was found that there was statistical significant difference in mean

serum albumin ($p < 0.001$) before and after complete denture rehabilitation. The mean serum albumin at baseline (29.15 ± 3.56) was increased to 36.12 ± 3.68 after 6 months of mandibular implant supported overdenture rehabilitation.

Table 2: Comparison of mean BMI from pre treatment to post treatment levels in men and women respectively

BMI levels	Pre-treatment Mean (SD)	Post-treatment Mean (SD)	Change (SE)	Paired t test	P value, Significance



Men	21.99(1.56)	24.46 (1.1)	2.47(0.43)	t = - 5.62	p< 0.001**
Women	20.45(1.07)	22.52(1.52)	2.06(0.46)	t = - 4.43	p< 0.001**

****p<0.001 – highly statistical significant difference**

P-value derived from Wilcoxon Signed Ranks Test; significant at p

The mean “BMI” score at baseline and after 6 months of denture rehabilitation in elderly edentulous patients was compared. It was found that there was statistically significant difference in mean “BMI” score (p<0.001) before and after complete denture rehabilitation. The mean “BMI” score at baseline 21.99 (1.56) for men, 20.45 (1.07) for females was increased to 24.46 (1.1) for men and 22.52 (1.52) for female after 6 months of mandibular implant supported overdenture rehabilitation.

DISCUSSION;

Our study aimed to evaluate the nutritional status of elderly edentulous patients using anthropometric measurements and serum albumin levels before and after implant-supported mandibular overdenture rehabilitation. The findings reveal significant improvements in both anthropometric indices and serum albumin levels post-rehabilitation, suggesting enhanced nutritional status and overall health benefits associated with the intervention.[11]

Comparative evaluation with previous studies shows alignment and expansion upon their findings. Our study reinforces the transformative power of dental prosthetics in enhancing the nutritional status of elderly edentulous patients. By evaluating Body Mass Index (BMI) and serum albumin levels before and after the placement of mandibular implant-supported overdentures, we provide compelling evidence of significant nutritional improvements. These measurements are critical indicators of nutritional status, particularly in elderly populations at increased risk of malnutrition due to factors

like tooth loss and reduced masticatory efficiency. Similar improvements were noted by Morais et al.

(2003)[12] and Kanehisa Y et al. (2009)[13], who also demonstrated significant enhancements in these parameters following implant-supported prosthetic treatments.

Serum albumin, a well-established biomarker for nutritional status and overall health, showed significant increases post-rehabilitation in our study. This finding underscores the positive impact of implant-supported mandibular overdentures on the nutritional health of edentulous patients, consistent with the work of Pinckofsky et al. (1987)[14] and J.A. Morais et al. (2003)[15]. These improvements in serum albumin levels can be attributed to enhanced protein intake and better overall dietary quality post-rehabilitation.

The implications of these findings for clinical practice are substantial. Dentists and healthcare providers should recognize the profound impact of oral health on overall nutritional status, especially in elderly patients. Our results support the observations of Mojon et al. (1999)[16], emphasizing that implant-supported mandibular overdentures not only restore oral function and esthetics but also contribute significantly to health benefits by improving nutritional intake and status.

Given the aging population and high prevalence of edentulism, integrating nutritional assessment and management into dental care for elderly patients is imperative. Routine nutritional screening and timely interventions can prevent malnutrition and its associated complications, improving the quality of life for these patients. Our findings advocate for such integration, echoing the recommendations by Mialich MS et al. (2013) [17] and Agrawal A et al. (2017)[18] regarding the importance of BMI and serum albumin as sensitive markers for nutritional assessment.



Despite the promising results, this study has limitations that warrant consideration. The sample size was relatively small, and the study duration was limited. Future research with larger sample sizes and longer follow-up periods is necessary to validate these findings and understand the long-term effects of implant-supported mandibular overdentures on nutritional status. Additionally, while serum albumin is a useful marker, it is influenced by various factors, including inflammation and liver function. Future studies should consider a broader range of biomarkers, as recommended by Zhang et al. (2017)[19] and Klanjek P et al. (2019)[20], to provide a more comprehensive assessment of nutritional status. Exploring the impact of different types of dietary intake and specific nutrient levels would also offer deeper insights into the nutritional benefits of dental rehabilitation.

CONCLUSION:

In conclusion, our study showcases the profound impact of mandibular implant-supported overdentures on the nutritional status of elderly edentulous patients. The significant improvements in BMI and serum albumin levels post-rehabilitation demonstrate that dental prosthetics are a vital intervention for enhancing health and quality of life in this vulnerable population. These findings align with and build upon existing literature, advocating for the integration of dental prosthetics as a standard practice in geriatric care.

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