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An observational study evaluating the impact of dentures and dietary recommendations on the nutritional status of completely edentulous patients using MNA®-SF

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Abstract
This study uses the micro nutritional assessment-short form (MNA®-SF) to investigate the impact of dentures and dietary recommendations on the nutritional status of individuals who are completely edentulous. This study's goals are to measure patients' nutrition using MNA®-SF prior to denture insertion and nutritional advice, to measure patients' nutrition using MNA®-SF following denture insertion and nutritional advice at one month and three months, and to measure and compare nutritional differences before and after insertion using MNA®-SF. Using the MNA®-SF questionnaire, 60 patients who were totally edentulous participated in an observational research. In order to evaluate their nutritional health using the MNA®-SF, they were asked the same questions both at baseline and after receiving full dentures. They were then contacted back after one and three months. It was simple to comprehend and answer the questions because they were all in the original tongue. Significant changes in the patient's nutritional condition were discovered, indicating that the patient's nutritional status was impacted by the dietary recommendations and full denture. The effectiveness and use of MNA®-SF in patients who are fully edentulous were evaluated by this study. In order to promote healthy eating practices, we gave patients in this research full denture prosthesis along with nutritional advice.
Keywords: *Completely edentulous, Teeth, Nutritional status, Dietary advice*

I. Introduction

Throughout history, humanity has strived for perfect health. Although sustaining dental health is challenging and varies depending on one's stage of life, it is not distinct from general health (Krishnan et al., 2017). Aging brings about a number of changes, including physiological, psychological, functional, pharmacological, and oral aspects that can influence and be influenced by diet (Palmer, 2003; Deogade et al., 2020). Each person experiences these changes in a very different way.

According to Ikebe et al. (2012) and Kimura et al. (2013), the major function of teeth is mastication. If teeth are removed, the effectiveness of mastication would be compromised, resulting in changes in eating habits and an increased risk of developing systemic illnesses. Patients either adjust to this or begin eating gritty particles that may create digestive issues due to tooth loss that will hinder mastication (Prakash et al., 2012). Apart from chewing difficulties, other variables include changes in taste and smell (Toffanello et al., 2004), gastrointestinal deterioration (Parker and Chapman, 2004), and sadness (Cabrera et al., 2007).

Anorexia in older persons may be linked to reduced consumption of certain nutrients, such as protein, calcium, iron, vitamins B1, B6, and C, retinol, and betacarotene (Fulgoni, 2008; Shrestha et al., 2020). Their diet is therefore lacking in vitamins, proteins, and fiber that may be found in fresh fruits. Both health and chewing skills are enhanced by the full denture prosthesis. Therefore, it is crucial to periodically assess their nutritional condition. One non-invasive examination technique prior to denture implantation is the mini nutritional assessment-short form (MNA®-SF).

II. Materials And Methods

Study setting and design
The total edentulous patients at the Department of Prosthodontics, Kothiwal Dental College, Moradabad, Uttar Pradesh, India, participated in an observational research.

Study population
The research comprised sixty individuals who were either fully edentulous or required total dentures. The patients were first-time denture patients who were removed from OPD. The following are the requirements for inclusion:
1. Individuals who require upper and lower dentures.

2. Patients who understood the directions and explanations provided by the doctor.
3. Patients who could understand the questionnaire and answer it.
4. Individuals who could adhere to the dietary guidelines.

The following are the exclusion criteria:

1. A communicable illness.
2. An orofacial motor impairment.
3. Any unique dietary needs or limitations.

Data collection

MNA®-SF was used to assess the patients' nutritional status. The MNA®-SF exam is a brief evaluation that takes just five minutes to finish. It consists of six questions and simple metrics like mobility and body mass index (BMI). Dietary practices, food consumption, cognitive problems, and acute illnesses are all included in the questionnaire. Three levels of malnutrition are indicated by the MNA®-SF score: 0–7 for malnutrition, 8–11 for malnutrition risk, and 12–14 for no malnutrition. Patients received dietary guidance during their whole denture treatment, taking into account the distinct nutritional needs of men and women. At first, people were classified as either well-nourished, at danger of malnutrition, or malnourished. After that, they received full dentures along with nutritional counseling. The patients were instructed to adhere to the dietary guidelines and return after a month, at which point they had another MNA®-SF assessment. The patients' nutritional condition was assessed after three months. The nutritional advice was provided appropriately. Males and females had different nutritional values, therefore their dietary demands were different and met. The patients received initial dietary advice during trial implantation and again after the prosthesis was delivered. All standard denture procedures were adhered to, and the dietary advice was provided in the recorded form. After one and three months of denture installation, the patients received a follow-up call, and their BMI and MNA®-SF were reevaluated. After thoroughly explaining the study's concept and purpose, each participant provided written informed consent. Appropriate ethical approval was obtained from the Institutional Ethical Committee.

Statistical analysis

IBM SPSS Statistics, version 24.0 (IBM Corp., Armonk, NY) was used to analyze the data. MNA®-SF was used to gather data for the study. The relationship between the baseline, one-month, and three-month values was ascertained using the analysis of variance (ANOVA) test. Since three groups were compared at the same time—the baseline, one-month, and three-month groups—ANOVA was utilized for statistical analysis.

III. Results

To compare the proportions, we used the ANOVA procedure. Because the p-value in the aforementioned test was less than 0.05, the statistical significance was considered acceptable. The lowest and highest scores at baseline, one month, and three months are displayed in Table 1. At baseline, the lowest and maximum scores are 6 and 11, respectively. The lowest and maximum scores are 7 and 11 at one month and 7 and 12 at three months, respectively. The minimum and maximum values exhibit notable fluctuations, according to these statistics.

Table 1- MNA®-SF questionnaire maximum and minimum total scores.

Groups	Minimum score	Maximum score
Baseline	6	11
One month	7	11
Three month	7	12

Table 2: Statistical analysis of this study.

Groups	No. of patients	Mean	Standard deviation	F statistics	p-value
Baseline	60	9.74	1.3414	3.493	0.0361
One month	58	9.6417	1.7839		
Three month	56	10.3826	1.6849		

The average scores for the patients at the start of the trial, one month later, and three months later are displayed in Table 2. It also shows the patients' overall scores at the beginning of the trial. Sixty patients had an average score of 9.74 in the first survey. The average score for 56 patients climbed to 10.3826 after three months, whereas the average score for 58 patients increased somewhat to 9.6417 after one month. After comparing the three groups, the p value was 0.0361, which is ≤0.05 and indicates significance.

Table 3: Comparative numbers and percentages of individuals who were well-nourished and at risk of malnutrition at baseline, one month, and three months.

Groups	Risk of Malnutrition		Well-nourished		Total	
	Value	Percentage	Value	Percentage	Value	Percentage
Baseline	18	30%	42	70%	60	100%
One month	12	20%	44	73.33%	56	100%
Three month	9	15%	46	76.66%	55	100%
Total	39	22.8%	132	77.19%	171	100%

Table 3 displays the percentage of individuals who are well-nourished and those who are at risk for malnutrition. At baseline, 70% (42) were well-nourished, whereas 30% (18) were at risk for food. At one month, 73.33% (44) were well-nourished, while 20% (12) were at danger. At three months, 76.66% (46) were well-nourished and 15% (9) were at risk of malnutrition.

IV. Discussion

Numerous aspects, including physiological, pathological, neurological, psychological, systemic, oral, and many more, influence the patients' nutritional state. For patients to receive the right amount of nutrients, their oral health depends on their saliva, teeth, and mucosa. In order for patients' nutritional intake to meet their body's needs, their dental health must be in good condition. For healthy mastication, teeth are essential. Without teeth, it might be difficult to chew food, which could lead to malnutrition, insufficient nutritional intake, and digestive problems. Chewing allows food to be sufficiently prepared for swallowing and subsequent processing in the digestive tract, making it the first stage of digestion (van der Bilt et al., 2006). Your mouth secretes saliva to moisten and improve the flavor of the food when you chew it, breaking it up into smaller bits. Food is broken down into smaller bits by the teeth at the occlusal region. The total occlusal surface area, which is influenced by the number of teeth present, determines the degree of fragmentation. If there are no teeth, there will be insufficient occlusal surface area, which will result in improper fragmentation, which will then cause improper deglutition and impact digestion. For those who are toothless, full dentures are typically used to help them regain their ability to chew. Numerous studies have shown how the creation of full dentures affects nutritional intake on its own. Complete dentures may improve nutritional intake, according to research (Soysal et al., 2019). The full denture was provided for the patient's dentate state. The patients' needs cannot be met by the entire denture alone. According to some research, improving the nutritional condition of a patient who only uses a full denture requires simple food recommendations (Suzuki et al., 2018). According to Harris et al. (2012), the dental setting has been recommended as an appropriate setting for doing dietary assessments and providing guidance on nutritional practices. Studies show that dental treatment and one-on-one counseling can change patients' eating habits. The one-day meal plan for men and women is displayed in Tables 4 and 5, respectively. The masticatory function will be improved by complete dentures alone. However, dietary recommendations will also impact the patient's and the elderly's nutritional condition, and nutritional intake is typically insufficient (Sheiham et al., 2001). Reducing protein and micronutrient consumption is therefore essential for avoiding a number of illnesses, including osteoporosis, cardiovascular disease, and sarcopenia (Suzuki et al., 2018). The effects of edentulousness and prosthesis rehabilitation on nutritional status might vary from person to person. A few studies (Nowjack-Raymer and Sheiham, 2003; Moynihan et al., 2012; Suzuki et al., 2019) suggest that dentures may improve food choices for elderly edentulous patients undergoing prosthetic rehabilitation. However, other studies have demonstrated that the use of dentures during rehabilitation did not enhance the eating habits of elderly adults (Bettie et al., 2020). For this study, patients who require complete dentures were selected, and their nutritional status was assessed in accordance with their demands. They were categorized as malnourished at risk of malnutrition and well-nourished at baseline. Following implantation, dentists assessed the denture's stability, support, and retention. The patient received postdenture instructions, including dietary guidelines, following the denture placement. Each patient received instructions on how to utilize dentures correctly at the denture placement visit. Patients received a thorough explanation of the need of follow-up as well as information on denture adaptation in relation to speech and mastication. After a full day, three days, seven days, fifteen days, one month, and three months, the patients were summoned back. Patients were instructed to practice speaking and refrain from wearing dentures during mastication for eight to ten days. They were told about the comfort level and excessive salivation during the first several days. Apart from this, the patients were monitored over the phone for any problems related to their food. When the patients first began chewing, they were told to eat a soft diet and chew on both sides. The patients were then instructed to adhere to the prescribed diet while continuing to masticate the meal on both sides. Some patients were experiencing trouble adjusting their dentures. For ten days, those patients had alternate-day follow-up; following a good follow-up, they received dietary recommendations. At one month, the nutritional assessment had not changed

much, but after three months, it had changed significantly. In comparison to the baseline trial, there was a significant increase in fruit and vegetable consumption throughout the subsequent follow-up. Aside from this, the patients began monitoring their dietary intake and were conscious of their regular routines and nutritional condition. Both the baseline study and the three-month follow-up revealed statistically significant improvements. This suggests that the patient's nutritional state is impacted by the dietary recommendations and full denture.

Table 4: One-day meal plan for women.

Schedule/Time	Diet	Measurement
Early morning (6.00 am)	Milk/Tea/Coffee	1 cup
Morning (8.00 am)	Fruit/lemon water (with sugar and salt)	1 glass
Breakfast (9.00 am)	Bread/uttapam/upma/mix atta roti/dosa/roti + vegetables/shevai/ dhokla/bread sandwich/biscuit	1 plate (large)
Lunch (12.00 pm)	Chapati, dal, rice, veg sabaji, curd/kadi/ buttermilk, salad, sprouted gram	2/3, 1 cup, 1 cup, 1 cup, 1/2 cup, 1 cup, ½ cup
Snack (4.00 pm)	Tea/coffee	1 cup
Dinner (7.00 pm)	Mashed potato+ Mashed roti with spinach stew/Brown rice with palak stew	1 plate (large)

Table 5: One-day meal plan for men.

Schedule/Time	Diet	Measurement
Early morning (6.00 am)	Milk/Tea/Coffee	1 cup
Morning (8.00 am)	Fruit/lemon water (with sugar and salt)	1 glass
Breakfast (9.00 am)	Bread/uttapam/upma/mix atta roti/dosa/roti + vegetables/shevai/ dhokla/bread sandwich/biscuit	1 plate (large)
Lunch (12.00 pm)	Chapati, dal, rice, veg sabaji, curd/kadi/ buttermilk, salad, sprouted gram	4, 1 cup, 1 cup, 1 cup, 1/2 cup, 1 cup, ½ cup
Snack (4.00 pm)	Tea/coffee	1 cup
Dinner (7.00 pm)	Mashed potato+ Mashed roti with spinach stew/Brown rice with palak stew	1 plate (large)

V. Limitations

It is possible to take into account other criteria for evaluating nutritional status. For this investigation, only oral symptoms are taken into account. Oral manifestation is not the only cause of the dietary insufficiency; other variables also play a role. It's critical to recognize that dietary deficiencies can have a variety of underlying causes. Dentate status, often known as oral health, is only one of four elements that might affect an aged person's overall nutritional status and dietary choices. The other variables include dietary practices, psychological well-being, socioeconomic position, and overall health. When evaluating and treating nutritional deficits in older persons, it is essential to take these aspects into consideration.

VI. Conclusions

Rehabilitating individuals who are entirely edentulous is a great way to treat edentulism if it is combined with dietary recommendations. Our study demonstrates that full denture rehabilitation with dietary recommendations and nutritional status are positively correlated. In addition to the fundamental inquiries, the patient's nutritional condition is also determined by a few other inquiries, such as cognitive issues or any stress the patient may be experiencing. This indicates that the patient's reduced food intake is also a result of stress. This suggests that oral, systemic, and overall health should be good; the only people who can enhance their nutritional condition are the patients. In this study, patients also learned about nutritional advice and diet. Patients' ability to chew their food has increased thanks to prosthetic therapy, improving their consumption.

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