

# Assessment and Comparison of Nutritional Status and Improvement in Health Status Among Complete Denture Wearers in Rajasthan Population Using Questionnaire and Customised Diet Plan: A Randomised Clinical Trial

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### **Abstract**

**Purpose:** In this trial, we aimed to clarify the combined effect, on the nutritional statuses of edentulous elderly patients, of dentists providing complete dentures with dietary advice.

**Method:** A randomized-clinical trial was performed on a healthy edentulous population. All participants had new complete dentures fabricated and were randomly divided into test group 1 and test group 2. The test group 1 received customised dietary advice through standardized pamphlets and the control group received advice on denture care only. Nutritional status was assessed using the Mini Nutritional Assessment (MNA) and oral health status was assessed using GOHAI before and at 1 and 3 months after treatment. Intragroup and Intergroup comparison between individual groups in relation to different quantitative parameters will be done using Paired 't' test and Independent 't' test respectively.

**Results:** In total, 92 participants completed all trial steps. At 3 months after treatment, the MNA and GOHAI score in the test group 1 was significantly higher than that in the test group 2 ( $p < 0.05$ ).

**Conclusions:** Nutritional statuses of edentulous population can be improved by fabricating new complete dentures and providing customised dietary advice.

**Keywords:** Nutrition, Geriatrics, Customised Diet, Complete denture, Edentulous

## INTRODUCTION

Perfect health is a prize that has been the goal of mankind through all the ages. Oral health is not separate from general health, but maintaining oral health is definitely difficult and different in old age.<sup>1</sup> A variety of changes occur with aging which involves physiological, psychosocial, functional, pharmacological and oral factors,<sup>1,2,3</sup> that can impact and be impacted by nutrition.<sup>2</sup> These changes vary tremendously from person to person.

Diet and nutrition plays an important role in maintaining health and comfort of oral tissues. Elderly individuals with extensive tooth loss preferentially consume soft, easier to chew foods which have a low nutrient density.<sup>4</sup> The lack of all teeth contributes to disability, impairment and handicap, and for most of edentulous patients the rehabilitation with conventional complete dentures is the accessible treatment option.<sup>3</sup> In this context, it is possible that the edentulousness and the wearing of conventional complete dentures can affect the quality of life and patient's health status.<sup>3</sup> Recent studies have indicated that prosthetic treatment with complete dentures combined with customised dietary counselling could be effective at improving food and nutrient intake of edentulous elderly patients.<sup>4,5,6</sup>

Specific tools are available for assessment of nutritional status and oral health related quality of life. In literature, investigations have been done to assess the same by formulating the question. Various studies<sup>10-14</sup> have addressed the assessment of nutritional status using different instruments such as Mini-Nutritional Assessment (MNA) and the General Oral Health Assessment Index (GOHAI) questionnaire. However, limited studies have combined them together. Therefore, in this study we aim to assess the health status of edentulous adults, before and after denture treatment and with or without customised diet, to assess whether this type of intervention can improve nutritional and oral health statuses using MNA and GOHAI questionnaire.

## MATERIALS AND METHODOLOGY

### A. Study Design

A randomized clinical trial was conducted on 50 males and 50 female edentulous subjects reporting to the OPD of department of prosthodontics crown & bridge and implantology, Pacific Dental College and hospital, Udaipur with the research design consisting of subjective assessment of Nutritional status and dietary intake in complete denture wearers and comparison of health status among patients taking regular diet and customized diet assessed by using Mini-Nutritional Assessment (MNA) and the General Oral Health Assessment Index (GOHAI) assessment tools. Subjective assessment was done thrice;

- i. on the day of denture insertion,
- ii. after one month of denture placement and
- iii. after three months of follow-up

Ethical clearance from the Institutional Research Review Board (IRRB) was obtained.

Following were the inclusion and exclusion criteria:

#### **Inclusion Criteria:**

1. Completely edentulous patients opting conventional complete denture therapy
2. New denture wearers and old denture patients opting for new dentures due to worn out or ill-fitting old dentures
3. Age ranging from 45 to 80 years including male and female
4. Patients without any systemic diseases
5. Patient willing to participate and sign consent form

#### **Exclusion Criteria:**

1. Patients with single maxillary or mandibular complete denture
2. Patients desiring for implant therapy
3. Patients suffering from psychological and neurological problems.
4. Patients with systemic diseases

5. Patients not willing to sign the consent form
- **Customized Diet plan: (Table 1,2,3)**
  - Diet plan was formulated by maintaining the dietary guidelines for Indians<sup>9</sup> and Balanced diet food pyramid as given in Dietary guidelines for Indians- A Manual, by National institute of Nutrition, Hyderabad, India and customized based on the local population of Rajasthan by consulting a registered dietician.
  - Different diet plans are formulated depending on their, **gender (Male, Female), dietary restrictions (Veg/Non-Veg), age (45-60 and 60-80 years of age) and caloric requirement.**
  - **Patient Sampling**  
A total of 100 sample size was determined, of which 25 males and 25 females were selected by lottery method in Test group 1: who were provided with customized diet plan along with denture treatment and 25 males and 25 females were included in test group 2: who were provided with only denture treatment with regular post denture instructions and no diet plan.

#### **B. Methodology / Data sources or Measurement**

A study was explained to patients and informed consent was taken before proceeding to procedure. To eliminate operator or investigator's influence, patient and examiner were blinded. The dentures were fabricated by the post graduate scholar under the supervision of senior prosthodontist following standard clinical and laboratory protocol. Patients were recalled after 1 week for follow up to address complaints and do denture adjustment if needed to ensure that there are no ill-fitting dentures. The questionnaires forms were presented on the day of denture insertion in the local language by Post graduate student (Figure 1). Samples in test group 1 were provided with formulated customized diet plan along with post denture insertion instruction and was explained to the patients as well as to their family member who took care of their meals and pamphlets were given to the patient. They were instructed and motivated to maintain the record of daily dietary intake in a diary.

Samples in test group 2 were just given post denture insertion instructions with no dietary advice, but were asked to maintain the daily dietary record. The health and nutritional status was again assessed after one month and after three month of denture placement using:

- i. Mini nutritional Assessment (MNA)
- ii. Geriatric Oral Health Assessment Index (GOHAI)

#### **iii. Assessment using MNA (Figure 2):<sup>15</sup>**

1. Name , Gender, Age, Weight (kg) and Height (cm) was recorded.
2. MNA questionnaire form combines Screening and assessment features, which include total of 18 items. These items are divided into 4 Domains and considered for evaluation of health status. The 4 Domains include:
  - i. Anthropometric Measurement
  - ii. Global Evaluation
  - iii. Dietic Assessment
  - iv. Subjective Assessment
- v. **Assessment Using GOHAI (Figure 2):<sup>12,16</sup>**

The participants were interviewed and asked to estimate the frequency of problems in GOHAI questionnaire using a five point Likert scale rating (always [5], often [4], sometimes [3], seldom [2] or never [1]). The 12-item questionnaire was classified into four major domains which were the functional limitation, pain or discomfort, psychological and behavioral impact. The GOHAI score was determined by summing the final score of each of the 12 items ranges from 0 to 60. The score for GOHAI item number 3, 5 and 7 were reversed in order to attain a positive oral health GOHAI score. The higher GOHAI score denotes better oral health status perceived by the participants themselves.

It comprises 12 items grouped into three fields:

- 1) The **functional** field → Limit eating, biting or chewing, speaking and swallowing.
- 2) The **psychosocial** field → concerns, relational discomfort and appearance.

- 3) The **pain or discomfort** field → drugs, gum sensitivity and discomfort when chewing certain foods.

Maximum score is 60, minimum score is 17. Score between 57 to 60 indicate good oral quality of life while <50 indicate poor oral quality of life.

### CUSTOMISED DIET PLANS

<u>SCHEDULE</u>	<u>DIET FOR 3 DAYS POST DENTURE INSERTION</u>
Morning	Milk with oats mix grain /biscuit
Breakfast	Semi liquid <u>upma</u> / <u>sattu flour larsi</u>
Mid-morning	Fruit juice orange/ sweet lime / pineapple/ mashed apple /Coconut water
Lunch	Soft moong dal <u>larsi</u> with Gram flour curry and Buttermilk <u>Daliya</u> add veg ( potato+ capsicum+ cauliflower all veg mashed) + dal
Evening	Fruit Juice and carrot / mushroom / tomato soup
Dinner	Mashed potato + mashed roti with spinach stew OR Brown rice with <u>palak</u> stew

**Table 1: Diet for 3 days post denture insertion: Generalized for all**

<u>Schedule</u>	<u>Non-Vegetarian Male</u>	<u>Non-Vegetarian Female</u>
Early morning	Luke warm water with lemon juice OR Cumin seeds OR Honey+ Turmeric OR Basil seeds OR Cinnamon	Luke warm water with lemon juice OR Cumin seeds OR Honey+ Turmeric OR Basil seeds OR Cinnamon
Breakfast	Bread 2 + omelette 2/ Boiled eggs 2 +Milk 250 ml(1 glass)	<u>Bajara</u> roti + Garlic chutney (16 cal)/ Stuffed moong dal and potato roll +Milk 250 ml(1 glass)
Mid-Morning	Orange juice 1 glass OR Carrot juice	Coconut water OR <u>Amla</u> juice
Lunch	Chicken OR Laal <u>maas</u> + dal 1 bowl+ roti 1 and 1/2 + rice 1 bowl+ salad OR Boiled Chicken	Mutton + rice 1and 1/2 bowl+ salad OR <u>Gatta+rice</u> 1 bowl
Evening	<u>Dhokala</u> 3 + red chutney OR Sprout paneer chat	Sprout paneer chat
Dinner	Dal khichadi OR Chicken biryani	Fish curry OR <u>Kolambi</u> Roti 1and 1/2+ dal 1 bowl OR Boiled chicken

**Table 2: Vegetarian Diet for Males and Females, Age 45-60 and 60-80 years**

<u>Schedule</u>	<u>Non-Vegetarian Male</u>	<u>Non-Vegetarian Female</u>
Early morning	Luke warm water with lemon juice OR Cumin seeds OR Honey+ Turmeric OR Basil seeds OR Cinnamon	Luke warm water with lemon juice OR Cumin seeds OR Honey+ Turmeric OR Basil seeds OR Cinnamon
Breakfast	Bread 2 + omelette 2/ Boiled eggs 2 +Milk 250 ml(1 glass)	<u>Bajara</u> roti + Garlic chutney (16 cal)/ Stuffed moong dal and potato roll +Milk 250 ml(1 glass)
Mid-Morning	Orange juice 1 glass OR Carrot juice	Coconut water OR <u>Amla</u> juice
Lunch	Chicken OR Laal <u>maas</u> + dal 1 bowl+ roti 1 and 1/2 + rice 1 bowl+ salad OR Boiled Chicken	Mutton + rice 1and 1/2 bowl+ salad OR <u>Gatta+rice</u> 1 bowl
Evening	<u>Dhokala</u> 3 + red chutney OR Sprout paneer chat	Sprout paneer chat
Dinner	Dal khichadi OR Chicken biryani	Fish curry OR <u>Kolambi</u> Roti 1and 1/2+ dal 1 bowl OR Boiled chicken

**Table 3: Non-vegetarian diet for males and females**

# Mini Nutritional Assessment MNA®

Last name:		First name:		
Sex:	Age:	Weight, kg:	Height, cm:	Date:

Complete the screen by filling in the boxes with the appropriate numbers.  
Add the numbers for the screen. If score is 11 or less, continue with the assessment to gain a Malnutrition Indicator Score.

Screening	
<p><b>A Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?</b> 0 = severe decrease in food intake 1 = moderate decrease in food intake 2 = no decrease in food intake</p>	<input type="checkbox"/>
<p><b>B Weight loss during the last 3 months</b> 0 = weight loss greater than 3kg (6.6lbs) 1 = does not know 2 = weight loss between 1 and 3kg (2.2 and 6.6 lbs) 3 = no weight loss</p>	<input type="checkbox"/>
<p><b>C Mobility</b> 0 = bed or chair bound 1 = able to get out of bed / chair but does not go out 2 = goes out</p>	<input type="checkbox"/>
<p><b>D Has suffered psychological stress or acute disease in the past 3 months?</b> 0 = yes      2 = no</p>	<input type="checkbox"/>
<p><b>E Neuropsychological problems</b> 0 = severe dementia or depression 1 = mild dementia 2 = no psychological problems</p>	<input type="checkbox"/>
<p><b>F Body Mass Index (BMI) (weight in kg) / (height in m<sup>2</sup>)</b> 0 = BMI less than 19 1 = BMI 19 to less than 21 2 = BMI 21 to less than 23 3 = BMI 23 or greater</p>	<input type="checkbox"/>
<p><b>Screening score (subtotal max. 14 points)</b></p> <p>12-14 points:      Normal nutritional status 8-11 points:        At risk of malnutrition 0-7 points:         Malnourished</p> <p>For a more in-depth assessment, continue with questions G-R</p>	<input type="checkbox"/> <input type="checkbox"/>
Assessment	
<p><b>G Lives independently (not in nursing home or hospital)</b> 1 = yes      0 = no</p>	<input type="checkbox"/>
<p><b>H Takes more than 3 prescription drugs per day</b> 0 = yes      1 = no</p>	<input type="checkbox"/>
<p><b>I Pressure sores or skin ulcers</b> 0 = yes      1 = no</p>	<input type="checkbox"/>
<p><b>J How many full meals does the patient eat daily?</b> 0 = 1 meal 1 = 2 meals 2 = 3 meals</p>	<input type="checkbox"/>
<p><b>K Selected consumption markers for protein intake</b></p> <ul style="list-style-type: none"> <li>At least one serving of dairy products (milk, cheese, yoghurt) per day      yes <input type="checkbox"/> no <input type="checkbox"/></li> <li>Two or more servings of legumes or eggs per week      yes <input type="checkbox"/> no <input type="checkbox"/></li> <li>Meat, fish or poultry every day      yes <input type="checkbox"/> no <input type="checkbox"/></li> </ul> <p>0.0 = if 0 or 1 yes 0.5 = if 2 yes 1.0 = if 3 yes</p>	<input type="checkbox"/> <input type="checkbox"/>
<p><b>L Consumes two or more servings of fruit or vegetables per day?</b> 0 = no      1 = yes</p>	<input type="checkbox"/>
<p><b>M How much fluid (water, juice, coffee, tea, milk...) is consumed per day?</b> 0.0 = less than 3 cups 0.5 = 3 to 5 cups 1.0 = more than 5 cups</p>	<input type="checkbox"/> <input type="checkbox"/>
<p><b>N Mode of feeding</b> 0 = unable to eat without assistance 1 = self-fed with some difficulty 2 = self-fed without any problem</p>	<input type="checkbox"/>
<p><b>O Self view of nutritional status</b> 0 = views self as being malnourished 1 = is uncertain of nutritional state 2 = views self as having no nutritional problem</p>	<input type="checkbox"/>
<p><b>P In comparison with other people of the same age, how does the patient consider his / her health status?</b> 0.0 = not as good 0.5 = does not know 1.0 = as good 2.0 = better</p>	<input type="checkbox"/> <input type="checkbox"/>
<p><b>Q Mid-arm circumference (MAC) in cm</b> 0.0 = MAC less than 21 0.5 = MAC 21 to 22 1.0 = MAC 22 or greater</p>	<input type="checkbox"/> <input type="checkbox"/>
<p><b>R Calf circumference (CC) in cm</b> 0 = CC less than 31 1 = CC 31 or greater</p>	<input type="checkbox"/>
<p><b>Assessment (max. 16 points)</b></p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<p><b>Screening score</b></p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<p><b>Total Assessment (max. 30 points)</b></p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
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<p><b>Malnutrition Indicator Score</b></p> <p>24 to 30 points      <input type="checkbox"/>      Normal nutritional status 17 to 23.5 points      <input type="checkbox"/>      At risk of malnutrition Less than 17 points      <input type="checkbox"/>      Malnourished</p>	

Figure 1: Mini Nutritional Assessment Questionnaire<sup>17</sup>

GOHAI		Scores				
Sr. No	Questions	Always 1	Often 2	Sometimes 3	Seldom 4	Never 5
1	How often did you limit the kinds or amounts of food you eat because of the problems with your teeth or dentures?					
2	How often did you have trouble biting or chewing any kinds of food such as firm meat or apples?					
3	How often were you able to swallow comfortably?					
4	How often have your teeth or dentures prevented you from speaking the way you wanted?					
5	How often were you able to eat anything feeling discomfort?					
6	How often did you limit contacts with people because Of the condition of your teeth or denture?					
7.	How often were you pleased or happy with the looks of your teeth and gums, or dentures?					
8.	How often did you use medication to relive pain or discomfort from around your mouth?					
9.	How often were you worried or concerned about the problems with your teeth, gums or dentures?					
10.	How often did you feel nervous or self-conscious because of problems with your teeth, gums or dentures?					
11.	How often did you feel uncomfortable eating in front of people because problems with your teeth or dentures?					
12.	How often were your teeth or gums sensitive to hot, cold or sweets?					

**Figure 2: Geriatric Oral Health Assessment Index (GOHAI)<sup>16</sup>**

### Statistical Analysis

- Statistical analysis was performed using Statistical Product and Service Solution (SPSS) version 16 for Windows (SPSSInc, Chicago, IL).
- Descriptive quantitative data is expressed in mean and standard deviation.
- Confidence interval is set at 95% and probability of alpha error (level of significance) set at 5%.
- Power of the study set at 80%.
- Intragroup comparison between individual groups in relation to different quantitative parameters will be done using Paired ‘t’ test
- Intergroup comparison between both groups in relation to different quantitative parameters using Unpaired/ independent ‘t’ test.

### RESULTS

The total of 100 subjects including 50 males and 50 females treated with conventional complete denture treatment were selected for this study. Among them, 6 subjects did not report for 1 month follow up hence, were eliminated from the study. Among remaining 94, 2 patients did not report for 3 month follow up period. Hence, a total of 92 patients were included and their data were statistically analysed; and a total attrition of 8 patients was observed.

There was significant improvement in nutritional status and health status in subjects of test group 1 i.e. samples on customised diet plan and test group 2 i.e. samples on Regular diet as assessed by MNA and GOHAI before and post 1 month and post 3 month of denture treatment with p value <0.05.

Nutritional status analysed by MNA revealed that there was significant difference between Pre-treatment and post 1-month dental treatment, Pre-treatment and post 3 month and post 1 month and post 3 month of complete denture treatment among subjects of Test group 1 and subjects of Test group 2 with p value < 0.05.

However, the difference in values between post 1 month and post 3 month revealed insignificant improvement with p value 0.946.

The nutritional status or improvement in health status as assessed by GOHAI revealed that there was no significant difference among both the test group  $p > 0.05$ , except for pain parameter which revealed significant difference in 3<sup>rd</sup> month follow up  $p = 0.01$  and between 1 month and 3 month follow up with  $p = 0.025$ .

Also, on comparison of GOHAI between 1 month and 3 month follow up revealed significant difference with  $p = 0.05$ ; as assessed by Independent t test.

## DISCUSSION

In the current study two different nutrition and health assessment tools were used, MNA and GOHAI to evaluate improvement in nutrition and health status of 92 edentulous patients between subjects on customised diet plan prescribed by us and those on regular diet before and after one month and three months of denture insertion.

The null hypothesis was there will be no difference in the health status of complete denture wearers before and after denture treatment with or without customized diet This hypothesis was rejected as there was significant improvement and the effect of prescribing customized diet proved to be more efficient as compared to the samples on regular diet as assessed by MNA and GOHAI tools.

As per the assessment score for MNA, <17 indicates undernutrition, 17-23.5 indicated at risk of undernutrition and >24 indicated well nourished. The mean of pre-treatment total assessment score indicated that majority of patients were at the risk of malnutrition prior to the treatment. However, test group 1 samples showed significant improvement in nutritional status and majority were scored as well-nourished at 1 month follow up, which showed further improvement by the 3<sup>rd</sup> month with mean of 26.01. this is in accordance with the study by

Prakash et. al.<sup>15</sup> in the year 2012, who also reported higher MNA scores on follow up compared to pre-treatment in complete denture wearers who were explained about importance of well-balanced diet.

The samples in test group 2 also showed significant improvement in nutritional status from pre-treatment to 1 month follow up, which showed further improvement by the 3<sup>rd</sup> month with mean of 24.57 were majority scored as well-nourished. This is in accordance with the study done by Prasad et al.<sup>17</sup> who reported that prosthetic rehabilitation of edentulous patients improves nutritional status of edentulous patients. As compared to test group 2, more significant improvements were seen in test group 1 in total assessment score of MNA and GOHAI. This is in accordance with the study of Suzuki et al.<sup>6</sup> which stated that dentures alone are insufficient to improve nutritional statuses in healthy elderly population, and that the treatment should be combined with the simple dietary advice.

Thus, both the groups showed significant improvement in nutritional and health status compared to pre-treatment assessment; where the patients who received customized diet plan showed better improvement as compared to the patients with only denture care and no dietary advice.

## CONCLUSION

The aim of this study was to assess nutritional status and dietary intake in patients before and after complete denture insertion and to compare improvement in health status among patients taking regular diet and customized diet using Mini-Nutritional Assessment (MNA) and the General Oral Health Assessment Index (GOHAI) questionnaire.

Based on the results it is concluded that:

1. There is significant improvement in health status of individuals before and after treatment with conventional complete denture in patients on regular or no diet plan.
2. There is significant improvement in health status of individuals before and after treatment with conventional complete denture in patients on customized diet plan.
3. On comparison between Regular and customized diet plan, the patients on customized diet plan showed more improvement compared to the ones with no diet



plan. Thus, within the limited conditions of this trial, we suggest that dentists might be able to improve the nutritional statuses of edentulous

patients by fabricating new complete dentures and providing simple dietary advice.

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