

LEVEL OF CHEWING ABILITY WITH VARIOUS CATEGORIES OF FUNCTIONAL TOOTH UNITS IN SUBJECTS REPORTING TO A TEACHING HOSPITAL OF PESHAWAR

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ABSTRACT

Objective: To determine the level of chewing ability with various categories of FTUs in subjects reporting to Prosthodontics department, Khyber College of Dentistry, Peshawar, Khyber Pakhtunkhwa.

Materials and Methods: It is a descriptive, cross-sectional study conducted in Department of Prosthodontics, Khyber College of Dentistry, Peshawar from January to November, 2016. In this study a total of 166 patients were observed and a questionnaire consisting of demographic information (age and sex), number and category of FTUs and the chewing ability test questions about 15 Pakistani common test foods was filled, with 95% confidence level in 6% margin of error. The subjects who will declare all food items as easy to chew/eat will be considered to have sufficient chewing ability. Moreover, nonprobability consecutive technique was used for data collection

Results: Out of 166 subjects, majority (95.2%) of the subjects belonging to ">8 FTUs" category showed sufficient chewing ability, while 70.6% of the individuals in "8 FTUs" category and 49.3% of the individuals from "<8 FTUs" category showed sufficient chewing ability.

Conclusion: This study confirms that the number of retained natural teeth and categories of FTUs, consisting of posterior occluding units, are key factors to chewing ability. Eight FTUs serve acceptable chewing ability in patients who eat common Pakistani food.

Keywords: Functional tooth units, chewing ability, posterior occluding pairs, masticatory function

INTRODUCTION

Functional tooth units (FTUs), defined as pairs of posterior opposing natural and/or artificial teeth, is a significant index used in evaluation of dental status and oral function.¹ Tooth loss, either due to caries, progressive periodontal disease or trauma, decreases the number of FTUs hence affecting the masticatory function.^{1,2,3} Impaired masticatory ability not only affects physical functioning but also

has negative impact on mental health, food choice, nutritional status, general health, level of functional capacity, cognitive status and cerebral blood volume thus impairing the oral health related quality of life (OHRQoL)^{3,4,5}

Mastication or chewing is a centrally-controlled unilateral or bilateral process and mainly depends on the function of posterior teeth (premolars and molars).⁶ It is believed that presence of at least one molar and 3 premolar occluding units are essential for sufficient chewing ability.⁷ Impaired chewing ability is highly prevalent among the adults and as aging is unavoidable, the preservation of healthy remaining teeth plays a significantly important role

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in the maintenance of masticatory ability among middle-aged and elderly people.⁸

Masticatory function is assessed both objectively and subjectively. Objective method is a more accurate way to test the ability to pulverize the test food by the patient but it consumes more time and cost. The subjective method, based on questionnaire and interview results is a simple, affordable and easily applicable method but its credibility and accuracy become uncertain due to individuals' perceptive variability.³

According to WHO criterion, a functional natural dentition should have at least 20 or more natural teeth (NT) and 8 FTUs.^{3,9} One of the study has shown that patients without chewing difficulty had 8.1 natural teeth FTUs and 9.6 fixed teeth FTUs.¹⁰ Ueno et al determined subjective masticatory function using Yamamoto's chewing ability test and found out that 72% of the subjects with greater than 8 FTUs, 70% of the subjects with 8 FTUs and 19.2% of patients with less than 8 FTUs could chew all 15 test foods showing sufficient masticatory ability.¹

Several studies have been carried out in other countries which showed that the number of functional units is a main factor which effects the masticatory ability. No such study has been carried out in Pakistan. This study will provide useful information for enabling the dental practitioners to determine the need for prosthetic restoration and to select an appropriate design of prosthesis which could provide a desirable masticatory function and in preservation of needed healthy functional units.

Operational definitions:

i- Functional Tooth Units:

Functional tooth units are referred to all the posterior occluding pairs of teeth (maxillary and mandibular) either natural teeth (i.e., sound, natural or D1-D4 carious teeth) or artificial (i.e., implant supported or fixed prosthesis [crown or bridge abutment and pontics]). Teeth which did not occlude with each other in centric relation of jaws were not considered as a functional tooth unit. A pair of antagonist premolars was defined as one FTU and a pair of antagonist molars as two FTUs with 12 FTUs of a complete dentition (excluding third molars). The occlusal contact status of FTUs was determined by using an articulating paper to see markings on the

occlusal surfaces created upon bringing to occlusal contact position i.e., RCP/ ICP.

ii- Category of FTU: For this study FTUs is categorized as following:

1. More than 8 FTUs
2. 8 FTUs
3. Less than 8 FTUs

iii- Easy to chew: Food items which are easily crushed with teeth eaten without any difficulty, according to the patient, are considered as 'easy to chew'.

iv- Difficult/ unable to chew: Food about which patients comment 'takes long time to chew', 'jaws get painful or exhausted after chewing', 'cannot be chewed' or 'swallowed coarsely' are considered difficult or unable to eat.

v- Chewing ability: This is determined from the patients' perceived level of ability of restricting his/her diet to specific mentioned food presented to him/her. The chewing ability is then categorized into following levels:

Insufficient: when the subject has difficulty in chewing any one or more than one test food items.

Sufficient: when the subject can chew all the test food items easily.

MATERIALS AND METHODS

It is a descriptive, cross-sectional study conducted in Department of Prosthodontics, Khyber College of Dentistry, Peshawar from January to November, 2016. In this study a total of 166 patients were observed and a questionnaire consisting of demographic information (age and sex), number and category of FTUs and the chewing ability test questions about 15 Pakistani common test foods was filled, with 95% confidence level in 6% margin of error. The subjects who will declare all food items as easy to chew/eat will be considered to have sufficient chewing ability. Moreover, nonprobability consecutive technique was used for data collection

Selection Criteria

Inclusion criteria

1. Adult male and female patients with age range from 40 to 65 years.

2. Completely dentate (with dentition at least to 2nd molars) or partially edentulous patients (Kennedy class I, class II or class III partially edentulous areas posterior to canines)

Exclusion criteria

1. Patients with oral ulcers or other oral mucosal conditions affecting chewing ability.
2. Patients with acute dental and periodontal diseases.
- 3- Patients with subjective symptoms of temporomandibular disorders.
- 4- Terminally ill patients or mentally abnormal patients.
- 5- Vegetarian patients

RESULTS

Data from 166 subjects who were related to various categories of FTUs, i.e., >8 FTUs, 8 FTUs and <8 FTUs were collected. The age of the subjects which was from 40yrs to 65yrs were stratified into 3 age groups. The mean age of the subjects was found to be 51.9±7.66 (SD) years. There were 79 (47.6%) subjects in the age group 40-50yrs, 64 (38.6%) subjects were in the age group 51-60yrs, and 23 (13.9%) subjects were >60yrs of age. Hence showing majority of the subjects from the age group of 40-50yrs and least number of subjects from the age group of >60yrs. (chart 1)

Out of 166 subjects, 84 (50.6%) were male and 82 (49.4%) were female. Male to female ratio was 1.02:1, which showed almost equal participation of both gender.

The most frequent FTU category was “<8 FTUs” consisting of (n=73.44%) of the total 166 subjects. Fifty one (30.7%) subjects belonged to “8 FTUs” category and the least number of subjects (n=42, 25.3%) belonged to “>8 FTUs” category. (chart 2)

While checking for the perceived level of chewing ability, majority of the patients i.e., 112 (67.5%) subjects agreed to the fact that they could easily eat/chew all the 15 local Pakistani test foods showing sufficient chewing ability, while 54 (32.5%) of the subjects either couldn’t eat/chew or experienced difficulty in chewing any one or more of the test foods and were categorized in insufficient level of chewing ability. (chart 3)

Out of 79 subjects in age group of “40-50”, 61 subjects showed sufficient level of chewing ability while 18 subjects showed poor level of chewing ability. Out of 64 subjects in age group “51-60”, 41 had sufficient and 23 had poor levels of chewing ability. In age group “>60”, 13 had poor and 10 had sufficient level of chewing ability. (Table 1) Majority of the younger individuals had sufficient chewing

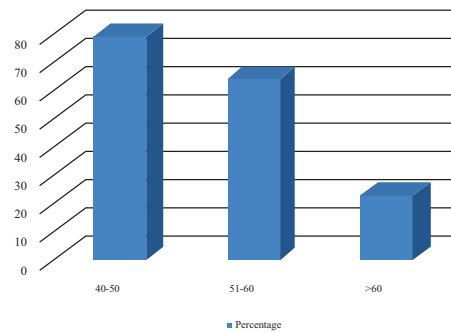


Figure 1: frequency of age groups

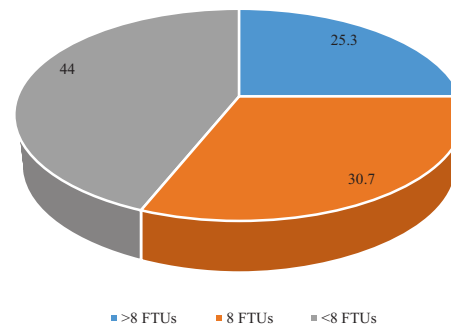


Figure 2: frequency of FTU categories

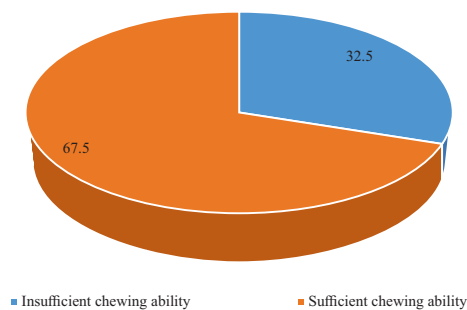


Figure 3: frequency of subjects with chewing sufficiency ability. The differences of chewing ability among age groups were statistically significant (p = 0.007).

As far as gender was concerned, females showed more sufficiency towards their chewing ability

Table 1: Stratification of level of chewing ability by age groups

Age groups (yrs)	Level of chewing ability		Total n (%)	Pearson Chi-Square	P value
	Insufficient n (%)	Sufficient n (%)			
40-50	18 (22.8%)	61 (77.2%)	79 (100.0%)	9.789	0.007
51-60	23 (35.9%)	41 (64.1%)	64 (100.0%)		
>60	13 (56.5%)	10 (43.5%)	23 (100.0%)		
Total	54 (32.5%)	112 (67.5%)	166 (100.0%)		

Table 2: Stratification of level of chewing ability by genders

Gender	Level of chewing ability		Total n (%)	Pearson Chi-Square	P value
	Insufficient n (%)	Sufficient n (%)			
Male	34 (40.5%)	50 (59.5%)	84 (100.0%)	4.89	0.027
Female	20 (24.4%)	62 (75.6%)	82 (100%)		
Total	54 (32.5%)	112 (67.5%)	166 (100%)		

Table 3: Stratification of level of chewing ability by FTU categories

Category of FTUs	Level of chewing ability n (%)		Total n (%)	Pearson Chi-Square	P value
	Insufficient	Sufficient			
>8 FTU	2 (4.8%)	40 (95.2%)	42 (100.0%)	25.94	0.00
8 FTU	15 (29.4%)	36 (70.6%)	51 (100.0%)		
<8 FTU	37 (50.7%)	36 (49.3%)	73 (100.0%)		
Total	54 (32.5%)	112 (67.5%)	166 (100.0%)		

Table 4: Stratification of categories of FTU with age groups

Age group (yrs)	Category of FTUs			Total n (%)	Pearson Chi-Square	P value
	>8 n (%)	8 n (%)	<8 n (%)			
40-50	24 (30.4%)	29 (36.7%)	26 (32.9%)	79 (100%)	11.11	0.025
51-60	16 (25.0%)	17 (26.6%)	31 (48.4%)	64 (100%)		
>60	2 (8.7%)	5 (21.7%)	16 (69.6%)	23 (100%)		
Total	42 (25.3%)	51 (30.7%)	73 (44.0%)	166 (100%)		

as compared to the male counterparts. Therefore the differences of chewing ability among gender were statistically significant ($p = 0.027$). Sixty two (75.6%) of all the females as compared to 59.5% of total males showed sufficient level of chewing ability. (Table 2)

The differences of chewing ability among various categories of FTUs were also statistically significant ($P = 0.00$). Majority (95.2%) of the subjects belonging to ">8 FTUs" category showed sufficient chewing ability, while 70.6% of the individuals in "8 FTUs" category and 49.3% of the individuals from "<8 FTUs" category showed sufficient chewing ability. (Table 3) Therefore, the lesser the number of FTUs the more the individuals with insufficient

chewing ability.

The statistical significant values (P value = 0.025) have been found while determining relation of categories of FTUs in various age groups. With age the number of FTUs decreased significantly. Therefore majority of the subjects, 69.6%, belonged to FTU category of "<8 FTUs" who were in age group of ">60" (yrs) and the least number of subjects, 32.9%, belonging to age group of "40 – 50", were in the same category of FTUs. And 48.4% of the individuals in age group of "51 – 60" had <8 FTUs. Category "8 FTUs" consisted of 36.4% subjects in "40-50" age group, 26.6% subjects in "51-60" age group and 21.7% subjects in ">60" age group. In category ">8 FTUs" majority of the subjects, 30.4%,

belonged to the age group of “40- 50” (yrs), 25% belonged to the “51-60” and only 8.7%, which is the least number of subjects, belonged to the “>60” age group. (Table 4)

DISCUSSION

This study of the relationship among the number and various categories of FTUs and the chewing ability through a subjective masticatory test using a 15 Pakistani food items have indicated that retaining as many FTUs directly affects the chewing ability. In this study it has been determined that categories with 8 or more than 8 FTUs served sufficient chewing ability. More than 95% of the subjects who belonged to “>8 FTUs” category and more than 70% with “8 FTUs” category had sufficient level of chewing ability as compared to the 49% of sufficiency level seen in “<8 FTUs”. This result is similar to the studies conducted in Japan in which a category of 8 FTU served enough chewing ability and preservation of at least 8 FTUs became their utmost goal in elderly. In their study more than 72% of the individuals belonging to a category of “>8 FTUs” could chew all Japanese test foods, while 70% were those who belonged to “8 FTUs” category and 19.2% were those who belonged to “<8 FTUs”.¹ Similar conclusions were also drawn in Taiwanese individuals whose perceived chewing ability is tested with 14 Taiwanese test food questionnaire. It was also suggested by them that 8 FTUs are necessary for acceptable chewing of their local cuisine.³ Also similar results are seen in a study by Sarita et al in 2003, in which it was found that intact premolars and at least 1 molar FTU (total of 8 FTUs) are necessary for sufficient chewing ability and 97% of such subjects showed sufficient level of chewing ability.¹¹

In the present study, 67.5% of the total 166 individuals had sufficient chewing ability. On the contrary, a studies by Meeuwissen J.H et al found 97% of the sample with sufficient chewing ability even with reduced dentitions. Therefore they concluded that majority of elderly are satisfied with their dental state and do not opt for any dental prosthesis.¹² This difference is found may be because of the age difference found in both studies, variation in adaptive capability or may be because of the differences in food, and chewing pattern of both populations.

In this study almost equal participation of both gender has been observed. The gender has been

found to have a variable influence on chewing ability as females showed more satisfaction to their chewing ability as compared to the male gender even with the less number of FTUs. This was also determined in previous study and it might be due to differences in food selection and chewing patterns between both genders.¹³ A study by Dr. Richard also reported less chewing sufficiency in men (11%) than women (6%).¹⁴

As far as effects of age on chewing ability is concerned, it has been determined that chewing ability becomes poorer with advancing age due to increasing number of FTUs loss. As age exceeds 65yrs the number of subjects belonging to the category “<8 FTU” increases significantly to 69.6% as compared to 32.9% of subjects in 40- 50 years and 48.4% of subjects in 51-60 years group. This result is consistent to the other study, in which a number of FTUs also had a decreasing trend with age.¹

CONCLUSION

This study confirms that the number of retained natural teeth and categories of FTUs, consisting of posterior occluding units, are key factors to chewing ability. Eight FTUs can serve acceptable chewing ability in patients who eat common Pakistani food. Preservation of at least these needed healthy FTUs should be the ultimate goal of every dental practitioner. The restoration of dental arches to attain complete set dentition might not be necessary for all individuals and it not only puts financial burden on the patient but also leads to the waste of time, energy and material of any developing country, with limited resources, like Pakistan.

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