

# Functional and psychological evaluation of premenopausal and postmenopausal women after provision of a complete denture prosthesis

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## Abstract

**Aim:** The purpose of this clinical study was to assess and compare the occlusal forces and satisfaction levels with complete dentures in premenopausal and postmenopausal completely edentulous participants.

**Methodology:** Twenty premenopausal (group pre-MP) and 20 postmenopausal (group post-MP) completely edentulous participants were selected based on inclusion and exclusion criteria, and estradiol levels were measured. Complete dentures were delivered to all participants following standard fabrication and insertion protocols. Three months after denture insertion, when participants were free of postinsertion complaints, satisfaction level (by using a valid and reliable questionnaire), depression level by using the Patient Health Questionnaire, (PHQ-9) and occlusal force (with a gnathodynamometer) were measured. The obtained data of all parameters were tabulated and compared by using a statistical software program ( $\alpha=.05$ ).

**Results:** For questions pertaining to the overall satisfaction of maxillary and mandibular dentures, the 2 study groups encountered a significant difference with the premenopausal group showing significantly higher satisfaction levels ( $P<.001$ ). Depression scores in the postmenopausal women group were significantly higher than those of the premenopausal women group ( $P<.001$ ). A negative correlation was found between the overall satisfaction with complete dentures and depression levels in the participants indicating decreased overall satisfaction with increasing depression levels in participants ( $\rho=-0.698$ ). The premenopausal group recorded significantly higher estradiol levels than the postmenopausal group ( $P<.001$ ). Mean occlusal force with complete dentures in the premenopausal women group was significantly higher than that of the postmenopausal women group ( $P<.001$ ).

**Conclusion:** Satisfaction levels and occlusal force with complete dentures were significantly higher in premenopausal women group than in the postmenopausal group.

**Keywords:** anxiety, depression, menopause, middle-aged women.

## INTRODUCTION

Menopause transition is characterized by a massive drop of estrogen levels (the main feminine sex hormone), ovarian failure, and menstrual irregularities.<sup>1</sup> Menopause is described as cessation of menses for 12 sequential months after the last period.<sup>2</sup> It is a universal physiological condition that annually affects more than 500 million women aged 42 to 55 years with an average age of onset of 51 years.<sup>2-4</sup> Hormonal changes that accompany the onset of menopause trigger the development of several physical, sexual, vasomotor, and psychological symptoms.<sup>4</sup> Compared with premenopausal women, menopausal women express a wide range of psychological symptoms including poor memory and concentration, depression, anxiety, insomnia, fatigue, irritability, and a high level of distress, which may impede coping and decrease quality of life in this group.<sup>5</sup> Symptoms of depression, anxiety, and sleep disturbance are other neuropsychiatric symptoms linked to cognitive performance at midlife transition in women, but they do not explain memory declines in menopause. Women are at a greater risk for depression than

men, and such risk heightens with aging.<sup>6</sup> Women in menopausal transition are at two- to fourfold higher risk for major depressive disorders than premenopausal women. Perimenopausal women often experience different depressive symptoms (e.g., low mood, lack of motivation, lack of pleasure sense, and disrupted sleep), which can severely impair their quality of life.<sup>7</sup> Bone mineral density (BMD) changes little before menopause or during the early perimenopause, while BMD declines substantially in the late perimenopause. A direct correlation has been reported between reduced BMD and osteoporosis and the decline in masticatory efficiency and occlusal force. Singhal et al<sup>8</sup> reported that participants with osteoporosis present with more postinsertion prosthesis complaints because of increased ridge resorption and reduced masticatory function and efficiency. Occlusal force is a fundamental variable to investigate oral function related to dentition, occlusal factors, complete dentures, temporomandibular joint disorders, and neuromuscular changes.<sup>9</sup> As the declining sex hormone (estrogen) level directly or indirectly affects BMD, muscle strength, and power in postmenopausal women, occlusal force may also be affected. However, studies that focused on the effect of diminishing estrogen levels in postmenopausal women on occlusal force are lacking. Considering the age of menopausal women as well as the expected tooth loss, satisfactory oral rehabilitation and successful management become pertinent. Conventional complete dentures have been traditionally provided as the most cost-effective option. However, patient satisfaction level and functional aspect related to complete dentures play a key role in determining the success during treatment procedure along with other factors including retention, stability, phonetics, and mastication.<sup>10</sup> In addition, the patient's psychological response to receiving the prostheses could provide useful information for the prediction of an acceptable outcome of complete denture therapy.<sup>11-14</sup> The onset of depression is a characteristic of times when estrogen levels are relatively low,<sup>15-16</sup> adversely affecting the psychological standing of an individual and impacting ability to adjust to removable prostheses.<sup>17</sup> Considering these factors, satisfaction with complete denture prostheses may be reduced in postmenopausal women.

## AIM OF THE PRESENT STUDY

The purpose of this clinical study was to assess and compare the occlusal forces and satisfaction levels with complete dentures in premenopausal and postmenopausal completely edentulous participants.

## METHODOLOGY

This prospective study was conducted between October 2020 to September 2022. Institutional ethical clearance was provided before the start of the study. Twenty premenopausal (group pre-MP) and 20 postmenopausal (group post-MP) completely edentulous participants were enrolled based on predetermined eligibility criteria. Enrolled participants were informed regarding the nature and course of the study, and a written informed consent was obtained. The participants were clinically examined and a detailed history recorded. The basis of assignment to group pre-MP or group post-MP was the levels of estradiol (E2). If the estradiol levels were found to be in the range 30 to 400 pg/mL, women were considered premenopausal, while estradiol levels lower than 30 pg/mL represented a postmenopausal state. Dentures were fabricated and delivered for participants in both groups, following standard protocols. Follow-up visits were scheduled for the postinsertion adjustments. Quality assessment of each denture was carried following the Sato et al<sup>18</sup> quantifying method of denture quality assessment, as per which, 7 factors were assessed to evaluate quality: interocclusal space, occlusion, articulation, anterior teeth arrangement, retention and stability of the mandibular dentures, and border extension of mandibular denture. Thereafter, category scores of each factor were calculated and then converted into an integer so that the total sum of the category scores of the remaining significant factors was distributed from 0 to 100. Based on these scoring as specified by Sato et al, only good-quality dentures (scores 81-100) were included in this clinical study. Participants were asked to wear dentures on regular basis (at least 8 hours daily). Level of satisfaction was evaluated for both groups at 3 months after denture insertion (when participants were free of postinsertion complaints) by using a valid and reliable questionnaire. The questionnaires were independently completed by participants, and raw data were saved in a record base. The questionnaires included participant's satisfaction of retention, stability, support, comfort, mastication, appearance, and speech. The ratings of these questions were performed on a Likert scale. Depression levels were determined and compared with the Patient Health Questionnaire (PHQ-9). The PHQ-9 had 9 questions that assessed the level of depression among the participants over the past 2 weeks. Occlusal force was measured in the molar region bilaterally 3 times by using a gnathodynamometer (Digital Indicator; Load Master). The Mann-Whitney U test was applied for data regarding depression level from PHQ-9 as well as for calculating overall satisfaction with dentures, and the Student t test for analysis of the data for occlusal forces with complete dentures and estradiol levels of the participants ( $\alpha=.05$ ).

## RESULTS

Forty edentulous participants (20 premenopausal and 20 postmenopausal) satisfying the eligibility criteria were enrolled in the study. Dentures were delivered to participants in both groups. Data for serum estradiol levels, denture satisfaction, depression levels, and occlusal force was recorded. On comparing the overall satisfaction with dentures, group pre-MP recorded a higher mean score ( $4.45 \pm 0.89$ ) than group post-MP ( $3.15 \pm 1.18$ ), with a statistically significant difference ( $P < .001$ ). The mean depression scores in group post-MP were found to be higher ( $10.45 \pm 3.27$ ) than those in group pre-MP ( $4.30 \pm 1.63$ ), with a statistically significant difference ( $P < .001$ ). (Table 1) The Spearman rank coefficient correlation showed a negative correlation between the overall satisfaction with complete dentures and depression levels in the participants indicating decreased overall satisfaction with increasing depression levels in participants ( $\rho = -0.698$ ). (Table 2) The mean serum estradiol levels (E2) (pg/mL) in group pre-MP and group post-MP were found to be  $182.97 \pm 9.74$  and  $25.22 \pm 2.07$  respectively, with the premenopausal group showing significantly higher estradiol levels than postmenopausal participants ( $P < .001$ ). On comparison of mean occlusal force (N), group pre-MP recorded higher mean occlusal force ( $22 \pm 2.80$ ) than group post-MP ( $16.62 \pm 2.13$ ). Statistical comparison of the data showed significant differences in terms of occlusal forces between the 2 study groups with the premenopausal group showing higher occlusal force values ( $P < .001$ ). The Pearson correlation showed a positive correlation between the estradiol levels and occlusal forces in the participants indicating that with decreasing estradiol levels, the occlusal forces decrease in the participants ( $r = 0.740$ ).

Table 1- Comparison of depression levels and overall satisfaction with dentures between group pre-MP and group post-MP

Parameter	Group	N	Mean $\pm$ SD	Mean	Z value	P
Depression level (PHQ 9)	Group Pre-MP	20	$4.30 \pm 1.63$	0.36	-5.08	<.001
	Group Post-MP	20	$10.45 \pm 3.27$	0.73	-	-
Overall satisfaction with dentures	Group Pre-MP	20	$4.45 \pm 0.89$	0.19	-3.55	<.001
	Group Post-MP	20	$3.15 \pm 1.18$	0.26	-	-

Table 2- Correlation between overall satisfaction with dentures and depression scores of participants using Spearman's rank coefficient correlation

	Overall Satisfaction with dentures	Depression Level PHQ-9
Spearman's rho Correlation Coefficient	1.000	-.698*
Sig. (2-tailed)		<.001
N	40	40

^PHQ-9, Patient Health Questionnaire. \*Correlation is significant at the .01 level (2- tailed).

## DISCUSSION

Literature regarding satisfaction with complete dentures in postmenopausal women is sparse. This clinical study was the first attempt at direct comparison of the performances in terms of satisfaction and mastication (occlusal force) with the complete dentures in premenopausal and postmenopausal women groups. Results of this study found that there existed statistically significant difference between overall satisfaction and occlusal forces in premenopausal and postmenopausal women after provision of a complete denture prosthesis, hence rejected the hypothesis of the study. Group pre-MP exhibited higher overall satisfaction with complete dentures than group post-MP. This might be attributed to various systemic and oral adaptive changes

occurring during menopause, such as decreased salivary flow, burning mouth syndrome, as well as other oral conditions. There is also supporting literature for hormone related psychological changes in postmenopausal women.<sup>19</sup> Mahmoud Mohammed and Mohammed reported a positive statistically significant correlation between total menopausal symptoms, anxiety, and depression scores. Depression levels were found to be more in group post-MP compared with group pre-MP in the present study. Overall satisfaction with dentures was found to be higher in group pre-MP than in group post-MP. Hence, it can be deduced that the overall satisfaction with complete dentures can be inversely related to the depression levels. Occlusal forces were found to be significantly reduced in group post-MP compared with group pre-MP in the present study. This can be attributed to the generalized loss of muscle mass which decreases muscle strength and power, contributing to significantly reduced occlusal forces. The primary cause of this muscle loss is imbalance between muscle protein breakdown and synthesis and increase in menopause-associated catabolic processes such as inflammation and oxidative stress. Increased bone resorption can be attributed to a weakened inhibition of both osteoclastogenesis and osteoclast activity, owing to decreased estrogen levels. Various studies have reported that average reduction in BMD is approximately 10% during the menopausal transition period.<sup>20</sup> About 25% of postmenopausal women are fast bone losers and can be discovered by the bone resorption markers and bone loss measurement. Seifert-Klauss et al reported that women undergoing menopausal transition demonstrated significant reduction in BMD. This loss can be attributed to lower levels of estrogen in menopausal states. Prestwood et al found that postmenopausal women taking 0.25mg/d of estrogen for 3 years reported a significant increase in total BMD. Hence, it can be deduced that reduced estrogen levels affects the muscle mass and BMD, which affects the occlusal force. This supports the results that occlusal force in postmenopausal women decreases.

## CONCLUSION

Overall satisfaction levels with complete dentures were significantly higher in premenopausal women group as compared with the postmenopausal group. The results of the present study can be used to understand the effect of decreasing estrogen levels postmenopause on the psychological behavior such as depressive symptoms in women as well as physiological aspects such as occlusal force with complete dentures.

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