

# Assessment Of Effect Of Serum Vitamin D, Calcium, And Phosphorus On Mandibular Residual Ridge Resorption In Completely Edentulous Patients

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## ABSTRACT

**Background:** Skeletal growth depends on factors including vitamins, minerals, and hormones. The present study was conducted to assess effect of serum vitamin D, calcium, and phosphorus on mandibular residual ridge resorption in completely edentulous patients.

**Materials & Methods:** 164 completely edentulous patients were enrolled. The amount of resorption, total calcium and phosphorus and vitamin D3 were determined.

**Results:** Age group 40-50 years had 14 males and 10 females, 50-60 years had 25 males and 15 females, age group 60-70 years had 25 males and 25 females and age group 70-80 years had 35 males and 20 females. The difference was significant ( $P < 0.05$ ). The mean calcium level (mg/ml) in males was 9.2 and in females was 8.9. The mean phosphorus level (mg/ml) was 3.6 in males and 3.4 in females. The difference was significant ( $P < 0.05$ ). The mean vitamin D level in males was 16.5 mg/ml and in females was 15.2 mg/ml. The difference was significant ( $P < 0.05$ ). The mean mandibular resorption in males was 11.2 mm and in females was 9.5 mm. The difference was significant ( $P < 0.05$ ).

**Conclusion:** There was influence of serum vitamin D3, calcium, and phosphorus levels was found on mandibular residual ridge resorption.

**Key words:** calcium, phosphorus, vitamin D3

## Introduction

Minerals, vitamins and hormones are among few factors which affect skeletal growth.<sup>1</sup> Calcium is absorbed from the small intestine in the presence of vitamin D3, hence there is increase in intestinal calcium absorption,

calcium homeostasis, and bone metabolism. It is also observed that phosphorus and crystals forms hydroxyapatite that helps in mineralizing and strengthening bones.<sup>2</sup> Reduced bone mineral density is seen due to low dietary calcium intake and subclinical vitamin D3

deficiency. All these factors contribute for osteoporosis and ultimately resulting into fractures. Hence, a diet containing adequate calcium, phosphorus, and vitamins is important for the proper mineralization of bone.<sup>3</sup>

Atwood<sup>4</sup> stated that the degree of mandibular alveolar bone loss is three to four times higher than maxilla alveolar bone resorption. This is because of smaller denture-bearing area in the mandible and hence a greater load per square cm.<sup>5</sup> It is evident that differences in bone resorption can have effects on the alveolar process in the maxilla and not extending into its body, whereas in mandible changes also affect the other parts such as mandibular angle, resulting into atrophy.<sup>6</sup> Alveolar loss in the maxilla runs from the cheek to the palate in the horizontal plane, in the mandible the alveolar ridge becomes atrophic in the glosso-buccal direction in its lateral parts, while in the anterior part this occurs from the oral vestibule.<sup>7</sup> The present study was conducted to assess effect of

serum vitamin D, calcium, and phosphorus on mandibular residual ridge resorption in completely edentulous patients.

### Materials & Methods

The present study comprised of 164 completely edentulous patients of both genders. The consent was obtained from all enrolled patients. Data such as name, age, gender etc. was recorded. All patients underwent oral examination followed by panoramic radiograph. All measurements were made digitally, and the amount of resorption was calculated using the Wical and Swoope method. 5 ml of venous blood was obtained and the total calcium and phosphorus were determined by using spectrophotometer method and blood plasma levels of vitamin D3 were determined by using the direct competitive chemiluminescence immunoassay (CLIA) method. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

### Results

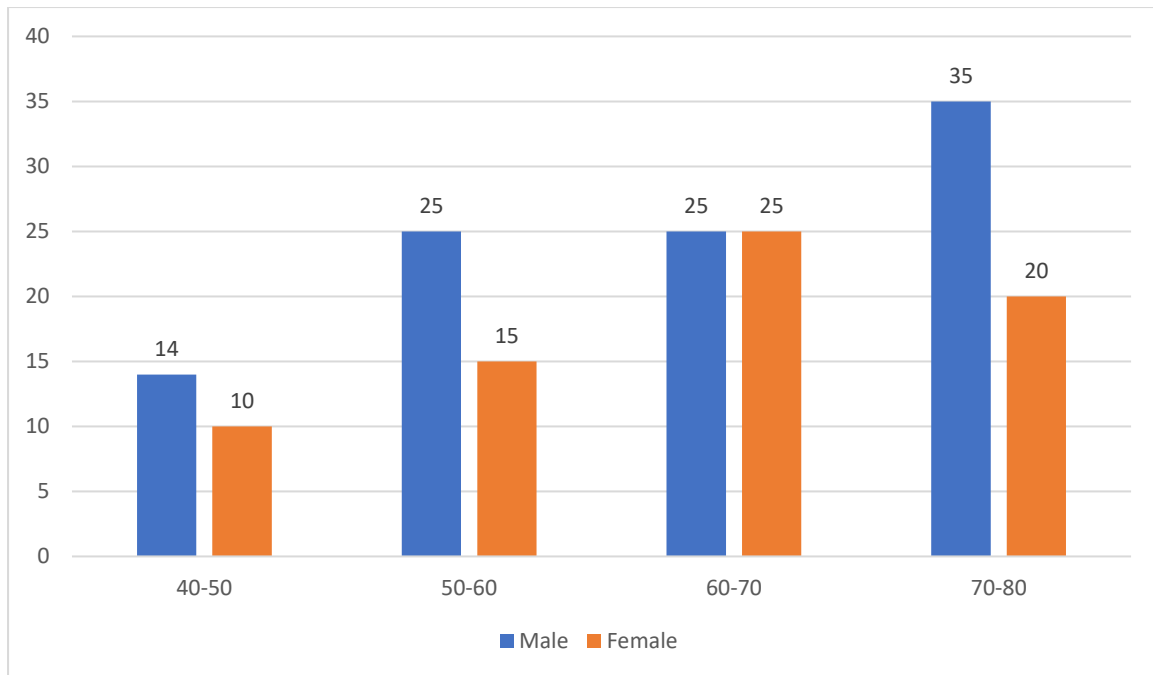
**Table I Distribution of patients**

Age group (years)	Male	Female	P value
40-50	14	10	0.15
50-60	25	15	0.03
60-70	25	25	1
70-80	35	20	0.01

Table I shows that age group 40-50 years had 14 males and 10 females, 50-60 years had 25 males and 15 females, age group 60-70 years had 25 males and 25 females and age group 70-

80 years had 35 males and 20 females. The difference was significant (P< 0.05).

### Graph I Distribution of patients



**Table II Assessment of calcium and phosphorus level**

Parameters (mg/ml)	Male	Female	P value
Calcium	9.2	8.9	0.05
Phosphorus	3.6	3.4	0.11

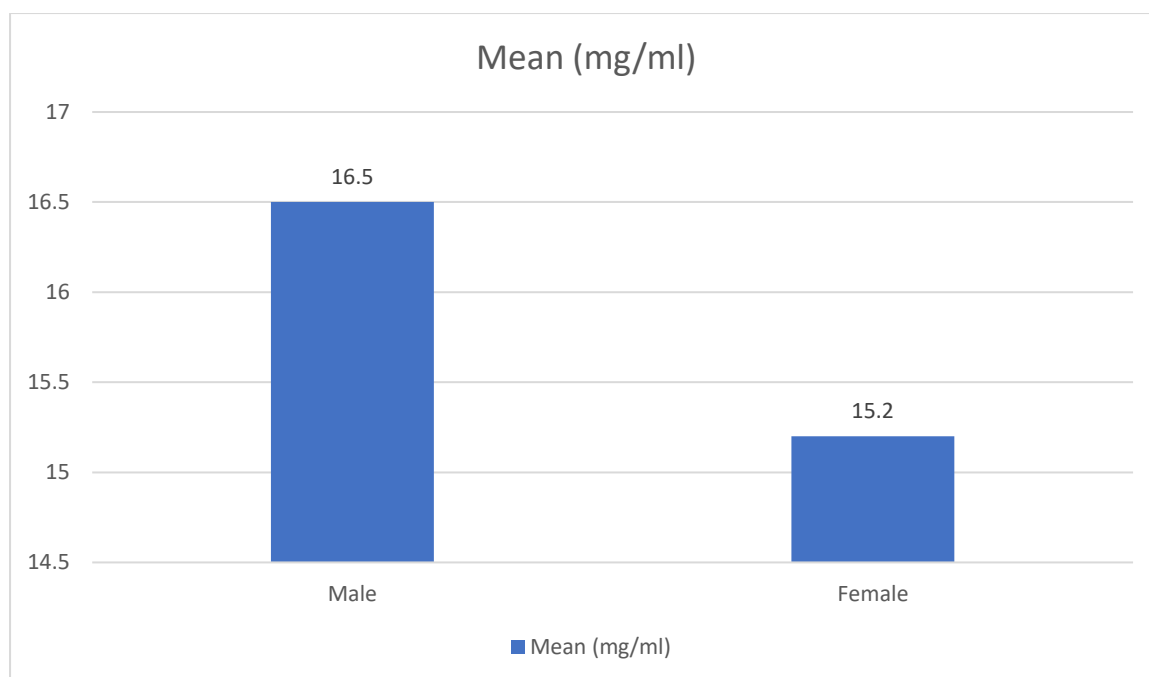
Table II shows that mean calcium level (mg/ml) in males was 9.2 and in females was 8.9. The mean phosphorus level (mg/ml) was 3.6 in males and 3.4 in females. The difference was significant ( $P < 0.05$ ).

**Table III Vitamin D level**

Vitamin D	Mean (mg/ml)	P value
Male	16.5	0.05
Female	15.2	

Table III, graph II shows that the mean vitamin D level in males was 16.5 mg/ml and in females was 15.2 mg/ml. The difference was significant ( $P < 0.05$ ).

**Graph II Vitamin D level**



**Table IV Assessment of mean mandibular resorption**

Gender	Mean mandibular resorption (mm)	P value
Male	11.2	0.05
Female	9.5	

Table IV shows that mean mandibular resorption in males was 11.2 mm and in females was 9.5 mm. The difference was significant ( $P < 0.05$ ).

**Table V Relationship between mandibular resorption and calcium, phosphorous, and vitamin D3 levels**

Parameters	value	Resorption	Calcium	Phosphorus	Vitamin D3
Resorption	Rho	1	-0.32	-0.33	0.24
	p	-	0.01	0.001	0.02
Calcium	Rho	-0.32	1	0.51	0.41
	p	0.01	-	0.01	0.01
Phosphorus	Rho	-0.34	0.52	1	0.36
	p	0.01	0.01	-	0.02
Vitamin D3	Rho	-0.22	0.41	0.36	1
	p	0.01	0.001	0.01	-

Table V shows that increase in the levels of vitamin D3 was seen in the serum with increased levels of calcium and phosphorus. The Spearman correlation test showed a weak positive correlation between vitamin D3 and calcium ( $\rho=0.41$ ) and with phosphorus ( $\rho=0.36$ ).

## Discussion

Residual ridge resorption in partially or completely edentulous patients is a chronic, progressive, irreversible, and disabling disease.<sup>8,9</sup> It has multifactorial origin.<sup>10,11</sup> The amount of bone loss differs patient to patient, however, significant changes occur in the

mandibular ridge. Tallgren<sup>12</sup> found that the mean ratio of residual ridge reduction [RRR] ie anterior maxillary to anterior mandibular was 1:4. The reason being mandibular ridge harbors higher functional forces which are transmitted through the dentures than the maxillary ridge due to its smaller area and less advantageous shape of the lower basal seat. Denture stability and retention can be affected by continuous residual ridge resorption, especially in the mandible.<sup>13</sup> Gross resorption of the edentulous mandibular alveolar process over a period of time leading to excessive loss of the denture bearing ridge and mostly the overlying thin and atrophic mucosa over it makes it more difficult to withstand the masticatory load. The mucosa gets impinged between the sharp ridge and the denture resulting in severe pain and discomfort to the patient.<sup>14</sup> The present study was conducted to assess effect of serum vitamin D, calcium, and phosphorus on mandibular residual ridge resorption in completely edentulous patients.

We observed that age group 40-50 years had 14 males and 10 females, 50-60 years had 25 males and 15 females, age group 60-70 years had 25 males and 25 females and age group 70-80 years had 35 males and 20 females. Kalavathy et al<sup>15</sup> assessed the degree of mandibular residual ridge resorption in completely edentulous 300 (men (55%) and women (45%) patients. The amount of resorption, vitamin D3, total calcium and phosphorus were determined. Results. Showed that calcium ( $P=.003$ ) and phosphorus ( $P<0.01$ ) levels were significantly increased in the females as compared to males. Vitamin D3 levels were similar in both genders. Metabolic levels of calcium ( $\rho=-0.09$ ), phosphorus ( $\rho=-0.10$ ), and vitamin D3 ( $\rho=-0.02$ ) decreased with increasing age.

We found that the mean calcium level (mg/ml) in males was 9.2 and in females was 8.9. The mean phosphorus level (mg/ml) was 3.6 in males and 3.4 in females. Baylink et al<sup>16</sup> found that genetic factors influence bone density.

We observed that the mean vitamin D level in males was 16.5 mg/ml and in females was 15.2 mg/ml. We observed that the mean mandibular resorption in males was 11.2 mm and in females was 9.5 mm. An increase in the levels of vitamin D3 was seen in the serum with increased levels of calcium and phosphorus. The Spearman correlation test showed a weak positive correlation between vitamin D3 and calcium ( $\rho=0.41$ ) and with phosphorus ( $\rho=0.36$ ). Dawson-Hughes et al<sup>17</sup> found that that dietary supplementation with calcium and vitamin D reduced bone loss moderately in men and women 65 years of age. The acquisition and maintenance of bone mass and strength are influenced by environmental factors, including physical activity and nutrition. The mineral phase of bone is an analog of the naturally occurring mineral hydroxyapatite.

## Conclusion

Authors found that there was influence of serum vitamin D3, calcium, and phosphorus levels was found on mandibular residual ridge resorption.

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