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Original Research

Assessment of correlation of Low serum vitamin D and early dental implant failure

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***ABSTRACT*:**
Background: Despite the importance of vitamin D and its effects on bone metabolism few studies have, to date, investigated the effects of its depletion on the osseointegration of dental implants. **Material and method:** A total of 90 patients were selected for this retrospective study. Patients were divided into two age groups based on age: Group 1: less than 40 years, Group 2: ≥ 40 years. Patient's serum Vitamin D status at the time of implant surgery was also obtained from the clinical records. Number of cases of early implant failure was recorded. Early implant failure, occurring within 5 months after implant placement and prior to placement of the prosthetic restoration and the functional load of the implant, was the primary criteria evaluated. **Results:** 49 out of 90 patients were males comprising of 54.44% of the study sample. Females accounted for 45.55% of the sample size (table 1). The current study observed that 37 out of 90 patients who were a part of this study were below 40years of age accounting for 41.44% of the sample size. 15 patients had Vitamin D levels of less than 10ng/ml. In these patients 2 cases of early implant failure were recorded. There were 44 patients with Vitamin D levels between 10-30ng/ml. Amongst these patients 3 early implant failure cases were reported. Only 1 failure case was reported amongst 31 patients with serum Vitamin D levels in excess of 30ng/ml. This relation was however not statistically significant with P-value of 0.18. **Conclusion:** A definitive link between low serum vitamin D levels and early dental implant failure could not be established.
Key words: Vitamin D deficiency, Early implants failure, Osseointegration.

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INTRODUCTION

Osseointegration is a complex phenomenon and depends on many factors; some are related to the implant (material, macroscopic design, and implant surface), others to the surgical-prosthetic protocol (surgical technique, loading conditions, and time), and others to the patient (quantity/quality of bone at the receiving site and the host response[1-2]. Systematic reviews demonstrated that an antibiotic regimen before dental implant placement subtly reduces the early implant infection and consequently implant failure[3-4]. In orthopedics, the risk to develop a periprosthetic joint infection has been associated with a low vitamin D level[5]. It is well known that vitamin D deficiency can impair the correct immune response to oral microbial infections, increasing the risk of periodontitis[6]. Moreover, vitamin D plays an important role in the metabolism of bone[7]. There is now substantial literature on the negative effects of low levels of vitamin D, especially in severely compromised patients: vitamin D deficiency seems to be associated with increased mortality, cardiovascular events, and reduced functioning of the immune and musculoskeletal systems[8]. A relationship between bone metabolism, vitamin D, and early implant failure in human has not been proven to date. Vitamin D induces bone formation around implants in rodents[9]. Hence, this retrospective study was undertaken to assess the correlation of Low serum vitamin D and early dental implant failure.

MATERIAL AND METHOD

The purpose of this retrospective study was to assess the correlation of Low serum vitamin D and early dental implant failure. A total of 90 patients were selected for this study who had received dental implant for tooth replacement in the oral surgery department of the dental college. The demographic details of the patients were obtained from the hospital records. Detailed clinical and radiographic data pertaining to each patient was obtained from the patient records. Patients were divided into two age groups based on age: Group 1: less than 40 years, Group 2: ≥ 40 years. Patient's serum Vitamin D status at the time of implant surgery was also obtained from the clinical records. Patients with missing or incomplete clinical records were excluded from the study. Number of cases of early implant failure was recorded. Early implant failure, occurring within 5 months after implant placement and prior to placement of the prosthetic restoration and the functional load of the implant, was the primary criteria evaluated. Entire data was recorded in the Microsoft excel sheets. SPSS software was used for statistical analysis. Chi square test and student T test were use to compare the variables. P-value of less than0.05was considered significant.

RESULTS

The purpose of this retrospective study was to assess the correlation of Low serum vitamin D and early dental implant failure. In the current study 49 out of 90 patients were males comprising of 54.44% of the study sample. Females accounted for 45.55% of the sample size (table 1).

Table 1: Gender-wise distribution of patients

Gender	Number of patients	Percentage of patients
Male	49	54.44
Female	41	45.55
Total	90	90

The current study observed that 37 out of 90 patients who were a part of this study were below 40years of age accounting for 41.44% of the sample size. 53 out of the 90 patients were above 40 years of age. They constituted 58.88% of the study sample (table 2).

Table 2: Distribution of patients according to age

Age group (years)	Number of patients	Percentage of patients
< 40 years	37	41.44
≥40 years	53	58.88
Total	90	90

Based on the serum Vitamin D levels of the patients, 15 patients had Vitamin D levels of less than 10ng/ml. In these patients 2 cases of early implant failure were recorded. There were 44 patients with Vitamin D levels between 10-30ng/ml. In these patients 3 early implant failure cases were reported. Only 1 failure case was reported amongst 31 patients with serum Vitamin D levels in excess of 30ng/ml. This relation was however not statistically significant with P-value of 0.18 (Table 3).

Table 3: Co-relation of serum Vitamin D levels and early implant failure

Serum Vitamin D level	Number of patients	Cases of implant failure	Failure Percentage	P-value
< 10 ng/ml	15	2	13.33	0.18
10-30 ng/ml	44	3	6.81	
>30 ng/ml	31	1	3.2	

DISCUSSION

Vitamin D deficiency is a worldwide public health problem that spans across all age groups from children to adults. Naturally, as we age, our ability to absorb vitamin D is also decreased. The major source of vitamin D is directly from sunlight exposure along with the very few foods that naturally contain sufficient doses. Unfortunately, direct sunlight has tremendously decreased in modern society with the increased number of desk-related jobs. Epidemiological studies have now shown that roughly 70% of society is deficient[10].

Vitamin D plays a fundamental role in bone metabolism. It is a fat-soluble vitamin which promotes the absorption of calcium in the intestine and regulates calcium and phosphate homoeostasis in the tissues and it is a fundamental element in the mineralization of bones and teeth[11-12]. Currently, vitamin D insufficiency is defined as serum level ranges between 21 and 29 μg/l, a serum level below <20 μg/l as vitamin D deficiency (severe deficiency <10 μg/l)[13].

The purpose of this retrospective study was to assess the correlation of Low serum vitamin D and early dental implant failure. In the current study 49 out of 90 patients were males comprising of 54.44% of the study sample. Females accounted for 45.55% of the sample size (table 1). Francesco Mangano et al investigated whether there is a correlation between early dental implant failure and low serum levels of vitamin D. All patients treated with dental implants in a single centre, in the period 2003–2015, were considered for enrollment in this study. The main outcome was early implant failure. The influence of patient-related variables on implant survival was calculated using the Chi-square test. 822 patients treated with 1625 implants were selected for this study; 27 early failures (3.2%) were recorded. There was no link between gender, age, smoking, history of periodontitis, and an increased incidence of early failures. Statistical analysis reported 9 early failures (2.2%) in patients with serum levels of vitamin D > 30 ng/mL, 16

early failures (3.9%) in patients with levels between 10 and 30 ng/mL, and 2 early failures (9.0%) in patients with levels <10 ng/mL. Although there was an increasing trend in the incidence of early implant failures with the worsening of vitamin D deficiency, the difference between these 3 groups was not statistically significant ($P = 0.15$). This study failed in proving an effective link between low serum levels of vitamin D and an increased risk of early implant failure. Further studies are needed to investigate this topic[14].

The current study observed that 37 out of 90 patients who were a part of this study were below 40years of age accounting for 41.44% of the sample size. 53 out of the 90 patients were above 40 years of age. They constituted 58.88% of the study sample (table 2). Tobias Fretwurst et al illustrated two case reports with vitamin D deficiency and early implant failure. Prior to implant placement, the first patient received crestal bone grafting with autologous material. Both patients received dental implants from different manufacturers in the molar region of the mandible. In the case of bone grafting in the first patient, all implants were placed in a two-stage procedure. All implants had to be removed within 15 days after implant placement. Vitamin D serum levels were measured: Both patients showed a vitamin D deficiency (serum vitamin D level <20 µg/l). After vitamin D supplementation, implant placement was successful in both patients. Prospective, randomized clinical trials must follow to affirm the relationship between vitamin D deficiency, osteoimmunology, and early implant failure[15]. Based on the serum Vitamin D levels of the patients, 15 patients had Vitamin D levels of less than 10ng/ml. In these patients 2 cases of early implant failure were recorded. There were 44 patients with Vitamin D levels between 10-30ng/ml. Amongst these patients 3 early implant failure cases were reported. Only 1 failure case was reported amongst 31 patients with serum Vitamin D levels in excess of 30ng/ml. This relation was however not statistically significant with P-value of 0.18 (table 3 and graph1). Francesco Guido Mangano et al investigated whether there is a relationship between low serum levels of vitamin D and early dental implant failure (EDIF). Data used for this retrospective study were derived from the records of a private dental clinic. Inclusion criteria were patients who had been treated with dental implants, inserted with a submerged technique from January 2003 to December 2017. EDIF was the outcome of this study. Chi-squared test was used to investigate the effect of patient-related variables (age, gender, smoking habit, history of periodontal disease and serum levels of vitamin D) on EDIF. Originally, 885 patients treated with 1,740 fixtures were enrolled in this study. Overall, 35 EDIFs (3.9%) were reported. No correlation was found between EDIF and the patients' gender (P=0.998), age (P=0.832), smoking habit (P=0.473) or history of periodontal disease (P=0.386). Three EDIFs (11.1%) were reported in 27 patients with serum levels of vitamin D <10 ng/mL, 20 EDIFs (4.4%) in 448 patients with levels between 10 and 30 ng/mL, and 12 EDIFs (2.9%) in 410 patients with levels >30 ng/mL. Although there was a clear trend toward an increased incidence of EDIF with lowering of serum vitamin D levels, no statistically significant difference (P=0.105) was found among these three groups. Within its limitations (retrospective design, low number of patients with severe blood levels of vitamin D enrolled), this study failed to demonstrate a significant relationship between low serum levels of vitamin D and increased risk of EDIF. However, since a dramatic increase in EDIFs with lowering of vitamin D levels in the blood has been reported, further clinical studies with appropriate design (prospective or randomized controlled studies on a larger sample of severely deficient patients) are needed to better investigate this topic[16].

CONCLUSION

From the above study the author concluded that a definitive link between low serum vitamin D levels and early dental implant failure could not be established. Further studies are recommended.

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