



## Incidence of Peri-Implantitis after Immediate Implant Placement in Iranian Community after at least 6 Months

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### Abstract

Dental Implantation treatment for the replacement of lost teeth has been warmly welcomed in the recent decades; however, sometimes inflammation of the surrounding tissue of the implant. Peri-implantitis, leads to painful mucositis or even more painful peri-implantitis, leading to the loss of implanted tooth in more severe cases of the inflammation. Our study investigates the causes of peri-implantitis in terms of epidemiology.

**Materials and Methods:** Our study investigates 112 patients with implants. 112 implanted patients were on a cross-section basis. The patients underwent clinical assessments 6 months after they received the immediate implantation surgery in terms of symptoms such as painfulness, mobility, bleeding on probing, exudation, osteointegration, probing depth, and the amount of bone loss. The results thus obtained were depicted in means, percentages and frequencies. It also investigates the relation between peri-implantitis with age and sex.

**Results:** The highest probing depth was 3 mm in 27.7% of the subjects. 4.5% of patients complained of pain, 0.9% of mobility, 2.7% of exudative excretions, 43.8% bleeding on probing around the implant, and 4.5% of patients lacked osteointegration in the implant location. The amount of bone loss was found to be  $1.56 \pm 1.26$  mm. The staging of the patients showed 63.4% in stage 2, 33.9% in stage 1, 2.7% in stage 3 and 0% in stage 4 of peri-implantitis. There was a significant association between the patients' higher age and placement in stage 2 ( $P=0.006$ ) whereas no significant relation was found between sex distribution and their stage of peri-implantitis.

**Conclusion:** The results of the study showed the amount of bone loss during the 6-month study period was something as much as bone loss in similar studies, while this term in the other studies was longer. Considering the fact that most of the patients showed symptoms associated with stage 2 of the disease, it is recommended that patients be closely examined for this issue in order to prevent the advancement of the disorder. Also, our study showed a significant relation between the age of the patients and their affliction with the stage 2 of peri-implantitis.

**Keywords:** Peri-Implantitis; mucositis; dental implantation; peri-implantitis-based diseases; clinical follow-up analysis

### Introduction

Implantation treatment as a substitute for the lost teeth has been used in the past two decades with 95-98 percentage of success. This high percentage of success has encouraged dentists to use this method (1).

This higher rate has resulted in more frequent cases of peri-implantitis. These symptoms have been classified into the two categories of mucositis- and peri-implantitis-based symptoms (2,3).

Mucositis occurs when only the soft tissue around the implantation develops inflammation, resulting in bleeding on probing; whereas peri-implantitis involves bone loss in addition to this symptom (2).

In fact, peri-implantitis is an inflammatory process that affects the surrounding tissues leading to hampered osteointegration and bone disintegration (4).

The frequency of peri-implantitis is widely varied given the different definitions presented in different studies. The frequency of peri-implantitis occurrence has been reported from 15% to 22% in different studies (5,6).

Failure to take care of this disorder or sufficient evaluation of patients with respect to peri-implantitis may exacerbate the disease and result in bone loss and most probably the need for pulling out the implant. Therefore, early diagnosis of the peri-implantitis through clinical examination and radiography is essential for the prevention of the implantation loss (3,4).

In the studies conducted in the past, reports have been given of a 12-month radiographic assessment and early detection of peri-implantitis; however, there are also reports of many cases of delayed diagnosis and necessity of pulling out the implantation (7); thus studies are on demand for determining the right intervals for the diagnosis of peri-implantitis, an issue which was also on the agenda in the 11<sup>th</sup> European periodontology workshop enabling the specialists to share their experiences in this regard (8).

Considering the above, the present study focuses on radiographic and clinical evaluation of the peri-implantitis frequency six months following the implantation.

### Materials and Methods

This is a cross-sectional study conducted on 112 patients (66 male (58.9%) and 46 female (41.1%) and mean age of 44.64±12.11 years) under implant therapy. Patients were followed within 6 months after procedure considering clinical and radiological assessments.

The clinical examination consisted of:

- Probing depth (measurement)
- Bleeding on probing
- Fixture mobility

For measuring the fixture mobility one side of the fixture is held using a metallic tool and the other side is held with a finger and the fixture is moved in all directions. (9)

- Pain
- Exudation

Radiographic examination involved perioptical and panoramic radiography according to the surgeon request with the focus on the following:

- Amount of bone loss
- Osteointegration

Finally the patients were classified as follows given the measured and analyzed symptoms:

	Variable	Number	Percentage
Sex	Male	66	58.9
	Female	46	41.1
Location of implanted tooth	Mandibular alveolus	58	51.8
	Maxillary alveolus	54	48.2
Implant level	Anterior	33	29.4
	Posterior	79	70.5

*Table 1: Frequency distribution of demographic variables in patients under study*

The data thus obtained were fed into SPSS-20 (made by IBM, the USA) for analysis. The statistics used in the report -are mean, standard deviation, frequency and percentage. The data were analyzed using chi-square and T-test. The degree of significance was taken as P=.05.

## Results

### Research Data

The present study involved the following data: Number of patients: 112

- Female population: 46 (41.1%)
- Male population: 66 (58.9%)
- Age range: 24-71
- Average years of age: 44.64±12.11
- Average duration of patient follow-up: 10.97±4.67
- The highest probing depth: 3 mm, 5 mm and 7 mm.

Depth in mm	Frequency	Percentage
1	5	4.5
2	10	8.9
3	31	27.7
4	12	10.7
5	28	25
6	1	0.9
7	19	17
9	6	5.4

*Table 2: Probing depth frequency of the patients under study*

The anatomical position of the implanted teeth with the highest probing depth is shown in Table 3. According to the table. As the findings shown in Table 3 indicate, the most frequent depths are distobuccal (49.1%), distolingual (47.3%), mesiolingual (2.7%) and mesial (0.9%).

Variable	Frequency	Percent
Distobuccal	55	49.1
Distolingual	54	47.3
Distolingual	54	47.3
Mesial	1	0.9
Mesiolingual	3	2.7

**Table 3:** The most frequent probing depths in different implanted tooth levels

The patients were also examined for clinical and radiographic symptoms. 5 patients (4.5%) complained of pain and 1 patient complained of implant mobility. Exudative excretions were also reported in 3 patients (2.7%) and 49 patients (49.8%) reported bleeding on probing. 5 patients (4.5%) did not have osteointegration at the implant location.

Table 4 shows the above data in detail. Additionally, the amount of bone loss at the mesial level was calculated to be 1.56±1.26 mm. The amount of damaged bone range from 0 mm to 6 mm.

Variable		Frequency	Percentage
Pain	+	5	4.5
	-	107	95.5
Implant mobility	+	1	0.9
	-	111	99.1
Exudative excretions	+	3	2.7
	-	109	97.3
Bleeding on probing	+	49	43.8
	-	63	56.3
Osteointegration	+	107	95.5
	-	5	4.5

**Table 4:** Clinical and radiographic symptoms among patients examined after 6 months of implantation

The staging of the peri-implantitis intensity was calculated from the set of clinical and radiographic findings mentioned above, which indicate that most of the patients suffered from stage 2 (63.4%) followed by stage 1 (33.9%). Stage 3 comes next with only 3 cases and the lowest frequency belongs to stage 4 with no patients at all (0%).

Variable	Frequency	Percentage
Stage 1	38	33.9
Stage 2	71	63.4
Stage 3	3	2.7
Stage 4	0	0

**Table 5:** Staging of peri-implantitis intensity in patients under study

Age distribution of the patients in terms of staging did not reveal any significant difference; that is, age did not prove an effective factor on peri-implantitis intensity (Table 6).

Sex	Staging			P-value
	Stage 1	Stage 2	Stage 3	
Female	15	29	2	0.65
Male	23	42	1	27.7

**Table 6:** Sex distribution of patients with peri-implantitis in terms of staging

One way analysis of variance (ANOVA) was performed for the effect of aging on the intensity of peri-implantitis, which showed a significant difference between patients with stage 1 and stage 2 intensity of the disease (P=0.006), that is, patients with stage 2 of intensity were of older age than those with stage 1, whereas comparison of stage 1 with stage 3 (P=0.998) and comparison of stage 2 and stage 3 patients (P=0.499) did not reveal any statistically significant difference.

**Discussion and Conclusion**

Dental implantation has been suggested as an alternative treatment throughout the world. Success of this treatment has been reported in a variety of researches with longevities even up to 16 years after implantation (11).

Evidence shows that about 2 million dental implants are performed each year, and it is projected that this figure is on the rise throughout the world (12).

Similar to natural teeth, since the implant is planted inside the mucosal tissue of the alveolus and the contaminated environment of the mouth, it is not beyond expectation that a biofilm be formed around the implant (13).

If the patient receives adequate treatment and attention, and if they observe anatomic and personal factors affecting the implant, dental implants will prove the safest dental treatments; however, it is noteworthy that in recent decades dental implant inflammations that afflict both hard and soft tissues surrounding the implant has increased and this has become a challenge in patients treated with dental implants, hence strategies are under investigation for the prevention and treatment of diseases associated with dental implants throughout the world (14).

In the present research, 112 patients who had received dental implant treatments were studied for the average duration of 10 months ranging from 1-27 months. 51.8% of patients had received dental implants in their lower (mandibular) jaw, and 70.5% had received dental implants with the anterior approach.

In our study, 4.5% of patients showed pain, 0.9% mobility, 2.7% exudation, 4.8% bleeding on probing, and ultimately 4.5% lack of osteointegration after clinical and radiographic examinations. Bleeding on probing accounted for the most frequent factors, which is the main representative of the existence of inflammation (2).

In the study of Koldslund., *et al.* Bleeding on probing was found at 4 mm depth at 74.8% of patients and at depth of 6 mm at 43.9% of patients (3) ; While Derks., *et al.* reported a rate of 15% for bleeding on probing(15).

As far as our literature review goes, Misch., *et al.* are the only group of researchers who have identified pain as a representation of peri-implantitis. For this reason, the scope of their evaluation of pain among the patients evaluated is rather limited (9). In another study performed by Ramanauskaite., *et al.* the measurement criteria are not merely bone loss and bleeding on probing. They attribute the bone mobility to bone loss as a diagnosis factor of peri-implantitis (16). These findings have been confirmed in other studies, too (17).

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Norowski, *et al* report similar studies related to exudation as another factor associated with mucositis or a more advanced stage of peri-implantitis. In this study, the existence of exudation has been shown as a factor indicative of the existence of inflammation and something beyond that, i.e. infection and suggest timely prevention or treatment of the pathogenic cause to be a good measure for the prevention of the implant loss (18).

The present research found 1.56 mm bone loss in patients on average.

All patients under study underwent clinical and radiographic examinations. Most of the patients were in stage 2 of peri-implantitis (63.4%). Other implants showed evidences of stage 1, and stage 3 with the frequency of 33.9% and 2.7% with no cases of stage 4 among the patients.

Various studies have performed similar evaluations. Koldsland, *et al.* studied the status of dental implants on 1 to 16 years of age and found 1.02 mm bone loss on average. Our study showed bleeding on probing to be of 406 mm depth and bone loss to be 2-3 mm as peri-implantitis. Their findings showed 47.1% of patients and 36.6 % implanted tooth with peri-implantitis (3).

In another study conducted by Christoph R. E. Hardt, *et al.* during a five year period of follow-up, the amount of bone loss was reported as 1.8 mm. in our study, 34% of patients developed bone loss more than 2mm and 39% reported less than 2 mm bone loss (19).

In a study conducted by Per Åstrand, *et al*, that investigated implants for 20 years, only one case of total destruction of implanted teeth were found and degree of success was reported as 99.2%. Their investigation did not reveal any cases of peri-implantitis and an average of 0.53 bone loss were found among the patients (20).

In a study performed by Attard, *et al.* in Canada, a 1-20 year investigation was made with respect to the results of implantations. The study reported a bone loss average of 0.05 mm per year and the average survival of implants was reported to be 8 years (21).

Smeets, *et al.* also reported a frequency percentage of 56% in peri-implantitis (14).

Hyun-Jin Han, *et al.* reported early implant loss of 57.3% and 47.2% in their 19-year investigation. The major cause of early implant loss was inflammation caused mainly by the maxilar position of the implant, poor stability, excessive surface friction and length of more than 15 mm. they reported the main reason of damage to implants was reported to be overloading the implant (22).

Other investigations in this study goes back to the age and age and sex distribution associated with the staging of the implants that did not reveal any significant association in terms of sex distribution ( $P=0.06$ ). No further association were found with respect to stages 1 and 3 and stage 2 and 3 ( $P>0.05$ ).

In a study performed by McDermott, *et al.* for the risk factgors and development of peri-implantitis, they did not either find any singificant relation between sex and developent of this disorder, wheres contrary to our study, than reported that age did not have any significant relation with periimplantation.

Among the risk factors related to the development of peri-implantitis are tobacco, installation of one-stage implant, kind of prosthesis and rebuilding surgeries that were positively related to the development of peri-implantitis (23).

Chuang, et al. investigated risk factrors related to the development of inflammation around the tooth. They did not introduce age and sex as the cause of developing inflammation around the tooth, whereas the precedent and present tobacco use, posterior or maxillary position of the implant, number of implants, length and size of the implant and the staging of the implant as effective factors in the survival of the implants (10).

Alexandra Marrone, *et al.*, report age over 65 and activeperiodontitis to be among the risk factors of developing peri-implantitis (24). Their finidngs with respect to aging confirms the findings of our study.

In a study performed by Diane M. Dauber, *et al*, 25% of patients and 16.6% of implants developed peri-implantitis. These findings were obtained during a period of 11 years and factors such as periodontal diseases or precedence of diabetes were reported to be among risk factors for the development of peri-implantitis. Age and sex did not show any association with the development of this disorder (25).

Considering the points mentioned above, one can conclude that:

1. Short term examination of patients under implant treatment can be worthwhile, as in our six month investigation, a high percentage of the patients had developed stage 2 periimplantitis.
2. The amount of bone loss in the present study was consistent with the studies carried out in the past, but the important point here is the superiority of some studies in this respect, that can reflect the higher expertise and experience of their researchers.
3. Among the effective factors in the development of peri-implantitis was age, that was also suggested in one study as a factor for the development of peri-implantitis.
4. Our study is among the few studies in which staging of inflammation has been focused on according to this criterion.

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