The Microbial Etiology and Pathogenesis of Peri-Implantitis

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Abstract

Patients with moderate Perimplantitis is a progressive destructive chronic disease affecting hard and soft tissue structure supporting dental implant. Variety of bacteria involve in etiopathogensis of Perimplantitis. It finally leading to loss of dental implant with consequent economic and health complications. Many studies has been put to establish a criteria for assessment and explain the etiology of peri-implantitis. Objectives: To focus on the role of specific anaerobic bacteria in etiology of peri-implantitis. Materials and Method: 382 sample from sub gingival plaque are collected from patients with peri-implantitis come to specialized health center in department of dental implantology in Al-Ramadi city in period (February 2006- 2018). These patients were grouped according to severity of peri-implantitis in to 4 groups: Healthy control, Patients with Mild peri-implantitis, Patients with Moderate periodontitis, Patients with Sever peri-implantitis. Radiographical examination are done and level of (mesial and distal) Marginal Bone Loss is measured using caliber in (mm) and recorded and compared with health control cases. The sample from sub gingival plaque were collected in thioglycocollate liquid media and send to laboratory for culture. Bacterial culture method is used for isolation of bacterial strains. Results: In peri-implantitis the causative bacteria is Spirocheates and Gram negative anaerobic bacteria. With *T. forsythia* is most likely organism causing the disease, while *A. actinomyceteumcomitans* is the less likely bacteria to cause the disease. The statistical analysis indicate that higher mean value of MBL was in sever peri-implantitis group was (3.7860 ± 0.48605) in comparison with healthy control group. While lowest mean value of mesial and distal MBL was in mild peri-implantitis group was (0.9907 ± 0.31427). While the mean value of MBL in moderate peri-implantitis group was (2.1109 ± 0.31554).The mean difference is significant at 0.05 level ($P<0.05$). Conclusion: Peri-implantitis is a serious destructive disease leading to loss of dental implant. Anerobic bacteria in sub gingival plaque around dental implant in patients with poor oral care in is the main cause of this disease.

Key Words: Peri-implantitis, Dental implant, Microrganisms, Gingival index, Ossteointegration, Anaereobic bacteria, Plaque index

Introduction

Peri-implantitis is a serious disease of multi-microbial in etiology affecting dental implant after placement. It is a wide prevalent disease account about 57%. It is caused by variety of Gram anaerobic bacteria. Risk factor involve in etiology of peri-implant disease are smoking, periodontitis and systemic disease [1,2]. It involve Peri-mplant mucositis a reversible inflammation of gingiva surrounding the dental implant and peri-implantitis a sever destructive disease of 7% prevalence by many studies [3]. It affecting surrounding soft and bone tissue and results in failure of ossteointegation with consequent loss of dental implant [4]. Anaerobic microorganism related to plaque film and unfavorable occlusion were indicated by many studies to cause of peri-implant disease. It has been indicated that marginal bone change during 1st year <1.5 mm, other suggest alveolar bone change <0.2 mm after 1st year. If the marginal bone loss exceed this level mechanical and biological risk factor is a cause for this loss which finally result in total loss of ossteointegration [5]. Gram negative anaerobic bacteria and spirochetes are microorganism involve in etiology of peri-implantitis [6]. Signs of failure of dental implant clinically indicated by vertical bone loss which results in peri-implant pocket, bleeding on probing and suppuration and swelling of the soft tissue, radiographical vertical bone loss with formation of saucer shape defects, ossteointegration only present apically to dental implant and evidence of pain if infection occur [7,8]. Dental implant loss either early within first year after functional load or late loss after more than one year of dental implant placement [9]. Among the risks factors contributing to dental implant loss including, Patients with poor oral care and periodontitis, smokers, procedural error (cemenitis), anatomical factors including poor soft tissue thickness and bone quality at the time of dental implant placement, poor surgical procedures and old history of failure related to dental implant [10]. Microbiological examination are among these parameters used for assessment of peri-implant health in addition to peri-implant probing depth, mobility, amount of discharging pus and radio graphical bone resorbtion [11]. Conservative treatment using manual ablations, laser therapy extended by regimen of antibiotic therapy, are indicated for mild cases of peri-implantitis and mucositis [12]. Treatment of severe cases of peri-implantitis is depend on defects configuration. Surgical resection indicated to remove the pre-implant disease tissue, then regenerative treatment to fill the resulting defects [13,14].

Materials and Method

Sample

382 sample from sub gingival plaque are collected from patients with peri-implantitis age (25-33), come to specialized health center in department of dental implantology in Al-Ramadi city in period (February 2006 to 2018 beginning).

Demographical criteria of the study

- Age (25-30 year).
- Smoking habits (Yes/No).
- Gender (Male/Female).
- Condition of dentition (fully or partially edentulous patients).
- Presence of gingival bleeding (Yes/No).
- Presence of dental plaque (Yes/No).

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- Peri-implant pocket depth (2-6 mm).
- Timing of initiation of load on implant (2,4 and 6 month after surgery).

Method

The patients were undergoing thorough clinical, radio graphical diagnosis. Medical history is taken about cardiovascular diseases heart disease, hypertension, Diabetes mellitus, Medications. Laboratory investigation relating glucose blood level, HBs Ag, HCV and HIV, complete blood picture and coagulation state. Information regarding the time of initial load of dental implant were taken. The periodontal condition of Patients is examined and oral hygiene criteria of the patients is recorded including: Gingival index (GI), Plaque Index (PI) [15] and Peri-Implant Probing Depth (PPD) was obtained and recorded. From this Criteria the patients were grouped according to severity of peri-implantitis in to 4 groups: Healthy Control (n=7), Patients with Mild Peri-Implantitis (N=97), Patients with Moderate peri-implantitis (N=128), Patients with Sever Peri-Implantitis (N=150). Radiographical examination are done and level of (mesial and distal) marginal bone loss is measured using caliber (in mm) and recorded and compared with health control cases. The sample from sub gingival plaque were collected using sterile paper point and transferred in thioglycocollate liquid media to laboratory for culture. Bacterial culture method using blood agar plate supplemented with horse blood (5% volume/ volume {v/v}), hemin (5 mg/l), and menadione (1 mg/l) and incubated at 37C for up to 14 days is used for isolation of variety of bacteria. The count of each type bacteria was determined.

Statistical analysis

The statistical analysis was performed using the IBM SPSS statistics, Version 21 software. Complete details can be assessed through tabular data (*Tables 1-24*).

Table 1. *Health control.*

Healthy (Control) =1	
Mild Peri- implantitis=2	*A. actinomyceteumcomitans*=1
	P. intermedia=2
	T. forsythia=3
	P. gingivalis=4
	F. nucleatum=5
	P. micra, *C. rectus*=6
Moderate Peri- implantitis=3	
Severe Peri- implantitis=4	

Table 2. *Descriptive statistical table.*

MBL							
	N	**Mean**	**Std. Deviation**	**Std. Error**	**95% Confidence Interval for Mean**	**Minimum**	**Maximum**
					Lower Bound	**Upper Bound**	
	7	0	0	0	0	0	0	0
	97	0.9907	0.31427	0.03191	0.9274	1.0541	0.5	1.5
	128	2.1109	0.31554	0.02789	2.0557	2.1661	1.6	2.6
	150	3.786	0.48605	0.03969	3.7076	3.8644	3	4.6
Total	382	2.4455	1.24267	0.06358	2.3205	2.5706	0	4.6

Table 3. *Anova–test of the level of significance.*

MBL					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	531.02	3	177.007	1167.14	0
Within Groups	57.327	378	0.152		
Total	588.347	381			

Table 4. *Show multiple comparisons in mean value of MBL.*

Dependent Variable: MBL						
LSD						
(I) severit	**(J) severit**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
1	2	-0.99072-*	0.15241	0	-1.2904-	-0.6910-
	3	-2.11094-*	0.15116	0	-2.4082-	-1.8137-
	4	-3.78600-*	0.15059	0	-4.0821-	-3.4899-
2	1	0.99072*	0.15241	0	0.691	1.2904
	3	-1.12022-*	0.05242	0	-1.2233-	-1.0171-
	4	-2.79528-*	0.05074	0	-2.8950-	-2.6955-
3	1	2.11094*	0.15116	0	1.8137	2.4082
	2	1.12022*	0.05242	0	1.0171	1.2233
	4	-1.67506-*	0.04686	0	-1.7672-	-1.5829-
4	1	3.78600*	0.15059	0	3.4899	4.0821
	2	2.79528*	0.05074	0	2.6955	2.895
	3	1.67506*	0.04686	0	1.5829	1.7672
*. The mean difference is significant at the 0.05 level.						

Table 5. *Case processing summary.*

Case Processing Summary						
	Cases					
	Valid	Missing		Total		
	N	Percent	N	Percent	N	Percent
Severity * Bacteria	382	100.00%	0	0.00%	382	100.00%

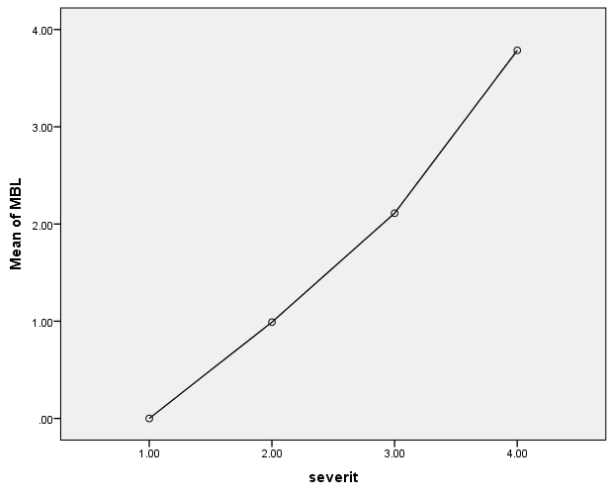

Figure 1. *Show relation between mean value of MBL and severity of peri-implantitis.*

Statistical analysis in *Table 1 and Figure 1* showing that higher mean value of mesial and distal MBL in group with Sever Peri-Implantitis was (3.7860 ± 0.48605) in comparison with healthy control group. While lower mean value of MBL was in group with Mild Peri-Implantitis was (0.9907 ± 0.31427). While mean MBL in group with Moderate Peri-Implantitis was (2.1109 ± 0.31554). *Tables 2 and 3* showing that there is significant difference between the mean value of MBL and severity of Peri-Implantitis at 0.05 level (P<0.05).

Table 6. *Severity * bacteria cross tabulation.*

Severity * Bacteria Cross tabulation									
			Bacteria						Total
			1	5	2	4	6	3	
Severity	1	Count	7	<5	<5	<5	<5	<5	7
		Expected Count	1.3	1	1.6	1.4	n<5	1.7	7
	2	Count	21	<5	27	23	<5	26	97
		Expected Count	18	13.2	22.3	19	n<5	23.6	97
	3	Count	21	25	28	24	<5	30	128
		Expected Count	23.8	17.4	29.5	25.1	n<5	31.2	128
	4	Count	22	27	33	28	<5	37	150
		Expected Count	27.9	20.4	34.6	29.5	n<5	36.5	150
Total		Count	71	52	88	75	<5	93	382
		Expected Count	71	52	88	75	<5	93	382

Table 7. *Chi-square test of the level of significance between bacteria and severity of peri-implantitis.*

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	58.272a	15	0
Likelihood Ratio	64.666	15	0
N of Valid Cases	382		
a. 9 cells (37.5%) have expected count less than 5. The minimum expected count is 0.05.			

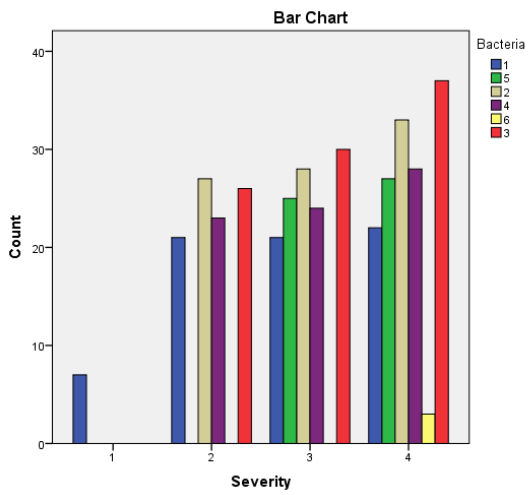

Figure 2. *Show relation between the severity of peri-implantitis and causative bacteria.*

Statistical analysis in *Table 6 and Figure 2* show that there is significant difference between the Severity Of Peri-Implantitis and the Bacteria at 0.05 level (P<0.05).

Table 8. *Case processing summary.*

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Severity * Sex	382	100.00%	0	0.00%	382	100.00%

Table 9. *Severity * sex cross tabulation.*

Severity * Sex Cross tabulation					
			Sex		Total
			2	1	
Severity	1	Count	<5	<5	7
		Expected Count	3.1	3.9	7
	2	Count	40	57	97
		Expected Count	43.2	53.8	97
	3	Count	60	68	128
		Expected Count	57	71	128
	4	Count	67	83	150
		Expected Count	66.8	83.2	150
Total		Count	170	212	382
		Expected Count	170	212	382

Table 10. *Chi-square test of the level of significance between the sex and severity of peri-implantitis.*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	0.720a	3	0.869
Likelihood Ratio	0.721	3	0.868
N of Valid Cases	382		
a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.12.			

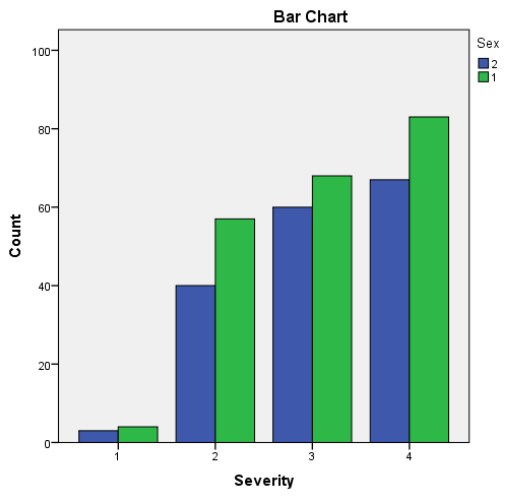

Figure 3. *Show relation between sex and severity of peri-implantitis.*

Statistical Analysis in *Table 10 and Figure 3* and severity *sex cross tabulation analysis indicate that there is no significant difference between Sex and Severity Of Peri-Implantitis (P>0.05).

Table 11. *Case processing summary.*

Case Processing Summary						
	Cases					
	Valid	Missing		Total		
	N	Percent	N	Percent	N	Percent
GI * Severity	382	100.00%	0	0.00%	382	100.00%

Table 12. *GI * severity cross tabulation.*

GI * Severity Cross tabulation							
			Severity				Total
			1	2	3	4	
GI	0	Count	7	<5	<5	<5	7
		Expected Count	0.1	1.8	2.3	2.7	7
	1	Count	<5	97	<5	<5	97
		Expected Count	1.8	24.6	32.5	38.1	97
	2	Count	<5	<5	128	<5	128
		Expected Count	2.3	32.5	42.9	50.3	128
	3	Count	<5	<5	<5	150	150
		Expected Count	2.7	38.1	50.3	58.9	150
Total		Count	7	97	128	150	382
		Expected Count	7	97	128	150	382

Table 13. *Chi-square test of the level of the signifance between the gingival index and severity of peri-implantitis.*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1146.000a	9	0
Likelihood Ratio	882.254	9	0
N of Valid Cases	382		
a. 7 cells (43.8%) have expected count less than 5. The minimum expected count is .13.			

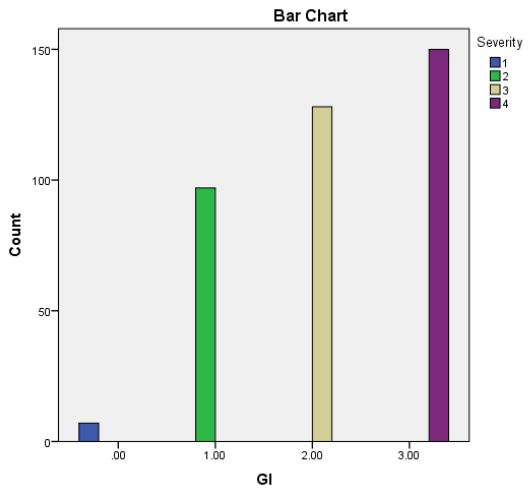

Figure 4. *Show relation between GI and severity of peri-implantitis.*

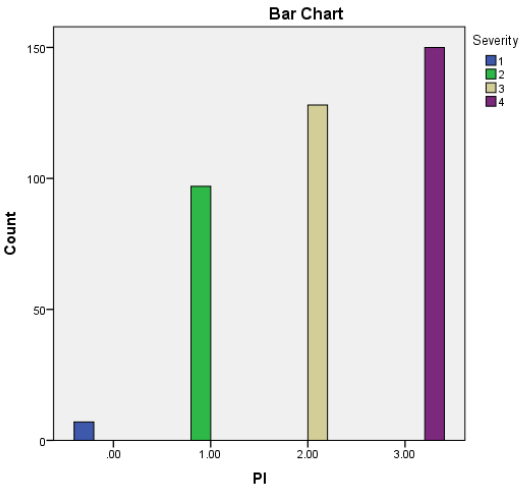

Figure 5. *Show relation between PI and severity of peri-implantitis.*

Table 14. *Case processing summary.*

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PI * Severity	382	100.00%	0	0.00%	382	100.00%

Statistical analysis (*Table 13 and Figure 4*) and GI*Severity cross tabulation analysis show that there is significant difference between the Gingival Index (GI) and Severity Of Peri-Implantitis at 0.05 level (P<0.05).

Table 15. *PI * severity cross tabulation.*

PI * Severity Cross tabulation							
			Severity				Total
			1	2	3	4	
PI	0	Count	7	<5	<5	<5	7
		Expected Count	0.1	1.8	2.3	2.7	7
	1	Count	<5	97	<5	<5	97
		Expected Count	1.8	24.6	32.5	38.1	97
	2	Count	<5	<5	128	<5	128
		Expected Count	2.3	32.5	42.9	50.3	128
	3	Count	<5	<5	<5	150	150
		Expected Count	2.7	38.1	50.3	58.9	150
Total		Count	7	97	128	150	382
		Expected Count	7	97	128	150	382

Table 16. *Chi-square test for the level of significance between the pi and severity of peri-implantitis.*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1146.000a	9	0
Likelihood Ratio	882.254	9	0
N of Valid Cases	382		
a. 7 cells (43.8%) have expected count less than 5. The minimum expected count is 13.			

Statistical analysis (*Table 16 and Figure 5*) and PI*Cross tabulation analysis indicate that there is significant difference between the Plaque Index (PI) and Severity Of Peri-Implantitis at 0.05 level (P<0.05).

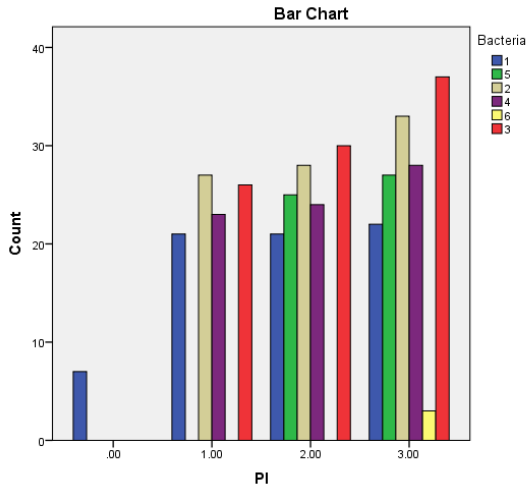

Figure 6. *Show relation between PI and type of bacteria.*

Table 17. *Chi-square test for level of significant difference between PI and type of bacteria.*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	58.272a	15	0
Likelihood Ratio	64.666	15	0
N of Valid Cases	382		
a. 9 cells (37.5%) have expected count less than 5. The minimum expected count is .05.			

Statistical analysis (*Table 17 and Figure 6*) show that relation between the Plaque Index (PI) and TYPE of Bacteria is significant at 0.05 level (P<0.05).

Table 18. Descriptive statistical table showing mean and SD of MBL of each bacteria type.

MBL								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	71	2.0915	1.35812	0.16118	1.7701	2.413	0	4.6
2	88	2.3841	1.24244	0.13244	2.1208	2.6473	0.5	4.6
3	93	2.4581	1.22495	0.12702	2.2058	2.7103	0.5	4.6
4	75	2.3947	1.20583	0.13924	2.1172	2.6721	0.5	4.6
5	52	2.9827	0.94552	0.13112	2.7195	3.2459	1.6	4.6
6	3	4.2	0.1	0.05774	3.9516	4.4484	4.1	4.3
Total	382	2.4455	1.24267	0.06358	2.3205	2.5706	0	4.6

Table 19. Anova- test for the significant level in mean value of MBL and type of bacteria.

MBL					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.676	5	6.735	4.566	0
Within Groups	554.671	376	1.475		
Total	588.347	381			

Statistical analysis (*Tables 18 and 19 and Figure 7*) show the relation between mean value of MBL and type of bacteria. Mutliple comparison table indicate that there is significant difference in mean value of MBL between type (5) *F. nucleatum* and (6) *P. micra*, *C. rectus*. The table also show that the difference is significant in mean value of MBL between other type of bacteria Type (1) A. actinomyceteumcomitans, type (2) *P.Intermedia*, type (3) *T. Forsythia*, type (4) *P. gingivalis*. The mean difference is significant at 0.05 level (P<0.05).

Table 20. Show multiple comparison table of the mean value of MBL.

Dependent Variable: MBL						
LSD						
(I) Bacteriaa	(J) Bacteriaa	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-0.29254-	0.19375	0.132	-0.6735-	0.0884
	3	-0.36652-	0.19141	0.056	-0.7429-	0.0099
	4	-0.30312-	0.20111	0.133	-0.6986-	0.0923
	5	-0.89114-*	0.22169	0	-1.3271-	-0.4552-
	6	-2.10845-*	0.7159	0.003	-3.5161-	-0.7008-
2	1	0.29254	0.19375	0.132	-0.0884-	0.6735
	3	-0.07397-	0.18063	0.682	-0.4291-	0.2812
	4	-0.01058-	0.19087	0.956	-0.3859-	0.3647
	5	-0.59860-*	0.21244	0.005	-1.0163-	-0.1809-
	6	-1.81591-*	0.71309	0.011	-3.2180-	-0.4138-
3	1	0.36652	0.19141	0.056	-0.0099-	0.7429
	2	0.07397	0.18063	0.682	-0.2812-	0.4291

	4	0.0634	0.1885	0.737	-0.3072-	0.434
	5	-0.52463-*	0.21031	0.013	-0.9382-	-0.1111-
	6	-1.74194-*	0.71246	0.015	-3.1428-	-0.3410-
4	1	0.30312	0.20111	0.133	-0.0923-	0.6986
	2	0.01058	0.19087	0.956	-0.3647-	0.3859
	3	-0.06340-	0.1885	0.737	-0.4340-	0.3072
	5	-0.58803-*	0.21918	0.008	-1.0190-	-0.1571-
	6	-1.80533-*	0.71512	0.012	-3.2115-	-0.3992-
5	1	0.89114*	0.22169	0	0.4552	1.3271
	2	0.59860*	0.21244	0.005	0.1809	1.0163
	3	0.52463*	0.21031	0.013	0.1111	0.9382
	4	0.58803*	0.21918	0.008	0.1571	1.019
	6	-1.21731-	0.72118	0.092	-2.6354-	0.2007
6	1	2.10845*	0.7159	0.003	0.7008	3.5161
	2	1.81591*	0.71309	0.011	0.4138	3.218
	3	1.74194*	0.71246	0.015	0.341	3.1428
	4	1.80533*	0.71512	0.012	0.3992	3.2115
	5	1.21731	0.72118	0.092	-0.2007-	2.6354
*. The mean difference is significant at the 0.05 level.						

Table 21. *Chi-square test for significant level in mean value of PI and type of bacteria.*

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	58.272a	15	0
Likelihood Ratio	64.666	15	0
N of Valid Cases	382		
a. 9 cells (37.5%) have expected count less than 5. The minimum expected count is 0.05.			

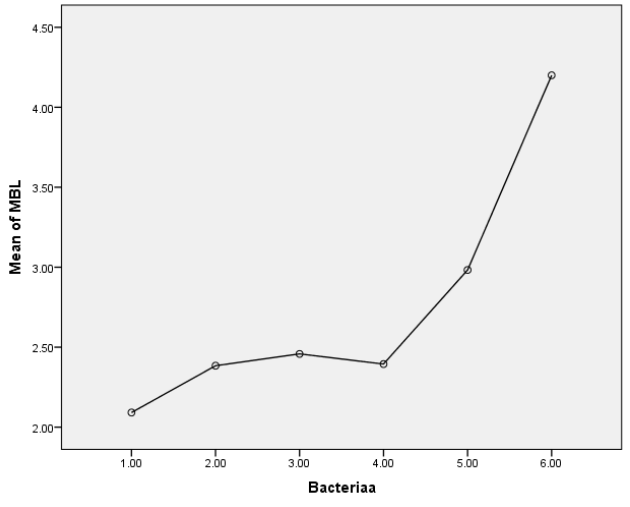

Figure 7. *Show relation between mean value of MBL and type of bacteria.*

Statistical analysis in *Table 21* and PI *Bacteria cross tabulation analysis indicate that there is significant difference in mean value of Plaque Index (PI) and type of Bacteria at 0.05 level (P<0.05).

Table 22. *Case processing summary.*

Case Processing Summary						
	Cases					
	Valid	**Missing**		**Total**		
	N	**Percent**	**N**	**Percent**	**N**	**Percent**
GI * Bacteria	382	100.00%	0	0.00%	382	100.00%

Table 23. *GI * bacteria cross tabulation.*

GI * Bacteria Cross tabulation									
			Bacteria						Total
			1	5	2	4	6	3	
GI	0	Count	7	<5	<5	<5	<5	<5	7
		Expected Count	1.3	1	1.6	1.4	n<5	1.7	7
	1	Count	21	<5	27	23	<5	26	97
		Expected Count	18	13.2	22.3	19	n<5	23.6	97
	2	Count	21	25	28	24	<5	30	128
		Expected Count	23.8	17.4	29.5	25.1	n<5	31.2	128
	3	Count	22	27	33	28	<5	37	150
		Expected Count	27.9	20.4	34.6	29.5	n<5	36.5	150
Total		Count	71	52	88	75	<5	93	382
		Expected Count	71	52	88	75	<5	93	382

Table 24. *Chi-square test for the significant level between.*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	58.272a	15	0
Likelihood Ratio	64.666	15	0
N of Valid Cases	382		
a. 9 cells (37.5%) have expected count less than 5. The minimum expected count is 0.05.			

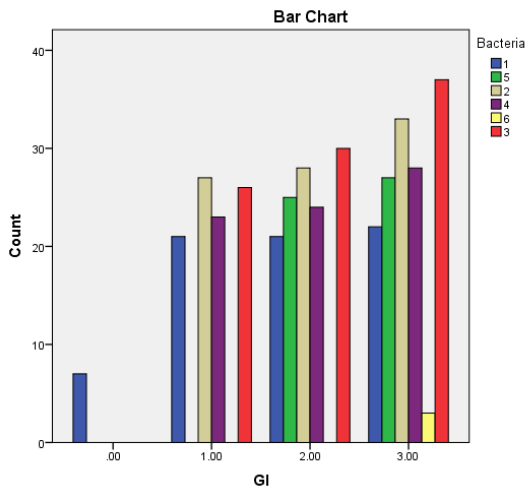

Figure 8. *Show relation between GI and type of bacteria.*

Statistical analysis in (*Table 24 and Figure 8*) and GI *Bacteria cross tabulation analysis indicate that there is significant difference in mean value of Gingival Index (GI) and type of Bacteria. The mean difference is significant at 0.05 level (P<0.05).

Discussion

Peri-implantitis is serious disease affecting the dental implant supporting structure. It is caused by response of body immune system against specific types of anaerobic bacteria present in sub gingival plaque accumulated around dental implant that lead to inflammation and at the end cause tissue destruction. Intially this reaction leading to peri-implant mucositis which an inflammation of gingiva around dental implant. Later on it leading to peri-implantitis [16]. Our result was done to focus on the microorganism most likely causing Peri-implantitis that ultimately leading to loss of dental implant with consequent economical and health morbidity [17]. By clinical examination of cases with sever peri-implantitis and radiograph in addition to result of bacteriological culture from sample obtained from sub-gingival plaque. The results indicate that the area of deep pocket around dental implant harbor variety of anaerobic bacteria and spirochete causing tissue breakdown. The *T. forsythia* is most likely organism to cause the disease. While *A. actinomyceteumcomitans* is the less likely bacteria causing the disease. Statistical analysis in *Table 1 and Figure 1* indicate that highest mean mesial and distal MBL in cases with sever peri-implantitis was (3.7860 ± 0.48605) in comparison with healthy control group. While lowest mean value of MBL in mild cases of peri-implantitis was (0.9907 ± 0.31427). While the mean value of mesial and distal MBL in moderate cases of peri-implantitis was (2.1109 ± 0.31554). The mean difference is significant at 0.05 level (P<0.05). *Table 7 and Figure 5* indicate that there is

significant difference between the Plaque Index(PI) and Severity Of Peri-Implantitis at 0.05 level (P<0.05). Also statistical analysis in *Table 6 and Figure 4* indicate that there is significant difference between the Gingival Index (GI) and Severity Of Peri-Implantitis at 0.05 level(P<0.05). *Tables 9,12,13 and Figures 7,8* indicate that there is significant difference between MBL, GI and PI and type of bacteria at 0.05 level (P<0.05). Statistical Analysis in *Table 5 and Figure 3* indicate that there is no significant difference between Sex and Severity Of Peri-Implantitis (P>0.05). Sanchez et al. [16] indicate that Peri-implantitis is an inflammation with consequent bone destruction and peri-implant pocket formation. Clinical diagnosis of area with peri-implantitis is pain, tenderness, Swelling, mobility of dental implant, suppuration, formation of fistulous tract, increase tendency to bleeding, increase per-implant probing depth and radiographic bone loss. Ajay et al. [21] indicate that the surface of ossteointegrated dental implant harbor variety of bacteria which ultimately lead to failures of dental implant and loss of ossteointegration [18]. These bacteria are mainly motile anaerobic gram –ve bacteria and rods. Studies indicate that majority of bacteria colony in deep area of peri-implant pocket is spirochetes and motile rods [22,23]. This also consistent with results of other studies which indicate that this area also harbor many types of anaerobic bacteria like (*B. forsythia, F. nucleatum, Cambylobacter, Prevotella Intermedia, Peptostreptococcus micros*). The microorganism less likely to cause peri-implantistis are Staphylococcus spp, enteric bacteria and candida [21]. The results of present study is consistent with results conducted by Rutger et al. and Tamura et al. [20]. who indicate the area of deep pocket in peri-implantitis is suitable environment for growth of obligate anaerobes (Gram–ve rod) and gram +ve asaccharolytic anaerobic bacteria which the causative microorganism of peri-implantitis. Knowing of treatment strategies by using manual ablative and regenerative surgery to remove disease tissue and reconstruct the resulting defects to reestablish the ossteointegration and functional dental implant is available today [24-26].

Conclusion

Peri-implantitis is a serious disease of poor outcome. Enough knowledge about etiology and pathogenesis is important to direct the preventive and therapeutic strategies. To make our attention to the risk factors of the disease i.e. systemic health, smoking, periodontal health and occlusal load. Select appropriate design of dental implant and good surgical procedure is our aim to prevent the occurrence of this disease with it's economic and social complications.

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Recommendations

Maintaining good oral hygiene is important healthy peri-implant condition and successful ossteointegrtaion.

References

1. Jung O, Henningsen A, Stein J. Etiology and treatment of peri-implant disease. *Head and Face Medicine.* 2014; **12**: 45-76.

2. Heydenrijk K, Vinssink A, Stegenga B. Microbiology of bacteria around dental implant. *The International Journal of Oral and Maxillofacial Implants.* 2002; **70**: 977-1087.

3. Mobelli A, Lang NP. Treatment and diagnosis of peri-implantistis. *Journal of Periodontology Online.* 2000; **20**: 80-88.

4. Berglundh T, Persson L, Klinge B. Prevalence of technical and biologic problem related to dental implant. *Journal of Periodontology Online.* 2002; **50**: 200-217.

5. Oh TJ, Yoon J, Misch CE.The cause of early implant bone loss. *Periodontology.* 2002; **5**: 56-89.

6. Feller L, Meyero R, Lemmer J. Peri-implant mucositis:clinical characteristics and treatment. *South African Dental Journal.* 2012; **70**: 200-260.

7. Luke C, John C, Tak Wah C, Nikos M. Bone stability around dental implant in elderly patients with reduced bone mineral dentsity. *Clinical Oral Implants Research.* 2017; **28**: 966-973.

8. Ashly ET, Covington LL, Bishop BG. Ailing and failing of endosseous dental implants. *The Journal of Contemporary Dental Practice.* 2003; **22**: 66-89.

9. Charyeva O, Sabdanaliev A. Long term dental implant success and survival. *Swedish Dental Journal.* 2012; **50**: 40-77.

10. Faggion CM, Atiech MA, Duncan WJ. Frequency of Peri-implantitis. *Journal of Periodontolology.* 2012; **87**: 800-889.

11. Jayachandarn P, Neethu S. Peri-implant Management. *Dental Research Journal.* 2012; **20**: 177-207.

12. Hallstrom H, Olofsson M, Renvert S. Antibiotic and debridement of mucositis around dental implant. *Journal of Clinical Periodontology.* 2012; **50**: 700-790.

13. Zeza B, Pilloni A. Treatment of mucositis around dental implant. *Annals of Stomatology.* 2012; **11**: 166-177.

14. Renvert S, Claffey N. Control of peri-implantitis by surgery. *Clinical Oral Implant Research.* 2012; **30**: 90-199.

15. Harald Loe. The gingival index , the plaque index and the retention index systems. *Journal of Periodontology.* 1967; **36**: 600-610.

16. Sanchez G, Gay-escoda C. Peri-implantitis. *Medicina oral, patología oral y cirugía bucal.* 2004; **17**: 77-118.

17. Klinge B, Multin M, Berglundh T. Peri-implantitis. *Dental Clinics of North America.* 2005; **60**: 789-890.

18. Lang NP. Complications of dental implant. *Clinical Oral Implant Research.* 2000; **20**: 200-277.

19. Mobelli A, Lang NP. Diagnosis of peri-implantistis. *Periodontology.* 2000; **30**: 73-89.

20. Tamura N, Ochi M, Miyakawa H, Nakzawa F. Analysis of bacteria associated with peri-implantitis. *The International Journal of Oral and Maxillofacial Implants.* 2013; **40**: 117-120.

21. Ajay S. Management of peri-implantitis. *Periodontology.* 2017; **16**: 78-117.

22. Persson GR, Stefan. Bacteria cluster with peri-implnatitis. *Clinical Implant Dentisty.* 2014; **26**: 800-890.

23. Ralf S, Anders H, Ole J, Max H, Christian H, et al. Treatment and prevention of peri-implantitis. *Head and Face Medicine.* 2014; **10**: 34.

24. Mombelli A, Lang NP. Diagnosis and treatment of peri-implantitis. *Periodontology.* 2002; **14**: 76-115.

25. Hurzeler MB, Quinones CR, Schupback P, Morrison EC, Caffesse. Treament of Peri-implantitis using guided tissue regeneration bone regeneration. *Clinical Implants Research.* 2002; **18**: 176-190.

26. Deppe H, Mucke T, Wangenpfeil S, Kesting M, Sculean A. Non-surgical treatment of Peri-implantitis using photodynamic therapy. *Clinical Implant Research.* 2013; **6**: 200-216.