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Comparing Two Methods for Assessing Periodontal Risk: ARetrospective Study

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ABSTRACT:

AIM: The aim of the present study is to evaluate the level of agreement and validation between the Periodontal Risk Assessment (PRA) and the Periodontal Risk Calculator (PRC).to know the efficacy of risk assessment for use in clinical perspective.
MATERIALS AND METHODS: Periodontal risk was retrospectively assessed among 60 patients using PRA and PRC from the available data after thorough periodontal examination for a period of 1 year in Sree Balaji dental college Chennai. PRA by assessing probing pocket depths and bleeding on probing at six (PRA6) sites per tooth, PRC by permanently marking or unmarking the dichotomously selectable factors and statistical analysis was done to see if there is any correlation between PRA and PRC. RESULTS: Statistically it was analyzed by SPSS version 26. There was no statistically significant relation (p value 0.744) and kappa test was done for level of agreement between risk assessment there was no correlation found between the criteria that were considered to assess risk.
CONCLUSION: PRA and PRC showed no agreement when compared to each other. Specific disease severity may result in improved agreement.

Keywords: Risk, Periodontal Disease, risk indicators, risk determinants, periodontal risk

1. INTRODUCTION:

Periodontal disease encompasses a range of disorders affecting the periodontium, including common conditions like gingivitis and chronic periodontitis. Recent decades have underscored the variability in individual susceptibility to these diseases, influenced by both acquired and intrinsic factors [1,2]. Epidemiological studies suggest that chronic periodontitis affects 35% to 50% of adults [3].

Understanding the complex interplay of factors contributing to disease initiation and progression is crucial. Initially, it was believed that periodontitis stemmed solely from factors like plaque accumulation, poor oral hygiene, and occlusal trauma[4]. However, it's now recognized that specific bacterial infections play a central role, and not everyone is equally susceptible to these infections and their consequences.

Identifying key pathogens is crucial for effective periodontal disease treatment. Periodontal pockets harbor various bacterial species, making it challenging to distinguish between commensals and true pathogens. Supragingival plaque primarily consists of gram-positive facultative anaerobes such as Actinomyces species and streptococci, while gram-negative species include Veillonella and Prevotella, alongside significant pathogens like Porphyromonas gingivalis and Tannerella forsythia. Subgingival plaque houses a similar mix, including Prevotella denticola, Porphyromonas endodontalis, and Porphyromonas gingivalis
2,3

In recent times, risk assessment has become integral to periodontal care. Unlike other fields where risk assessment is applied broadly, in periodontics, it involves a systematic approach tailored to clinical evaluation.[5,6] This includes thorough clinical and radiographic examinations to assess tissue health and biofilm-related issues, consideration of systemic, genetic, medical, and social factors, and formulation of a diagnosis and treatment plan based on these findings. Accurate documentation and ongoing evaluation of treatment outcomes are essential for adjusting therapy as needed. Efforts in this area focus on identifying new risk factors and developing effective algorithms for clinical risk assessment.

2. METHODOLOGY:

The study, approved by the Institutional Ethical Committee of Sree Balaji Dental College and Hospital, involved 60 subjects over a one-year period. Data from patients treated at the outpatient department of Periodontics and Implantology were collected, considering demographics (age, gender), habits (smoking), systemic health (Hb%, WBC count, diabetic status), and periodontal status (staging, grading). Inclusion criteria encompassed age ≥18 years, at least 20 permanent teeth, and complete periodontal assessments including probing depths, clinical attachment levels, and bleeding on probing. Exclusion criteria excluded pregnant or lactating individuals, recent antibiotic or steroid use, recent periodontal treatment,and certain medical conditions.

Patients were classified according to the 1999 periodontal disease classification, with subsequent assessment based on the 2018 criteria. Data, including bone loss measurements and dental history, were input into Periodontal Risk Assessment (PRA) and Periodontal Risk Calculator (PRC) tools for retrospective risk analysis. PRA evaluated parameters like bleeding on probing, pocket depths, tooth loss, periodontal support loss, smoking, and systemic/genetic factors to classify risk as low, moderate, or high. PRC utilized factors such as gender, age, smoking, oral hygiene, recall visits, treatments received, and clinical findings to assign a Gum Disease Risk Score ranging from very low to very high risk.
Statistical analysis using SPSS version 26 assessed correlations between PRA, PRC levels, and variables including age, sex, smoking, systemic health, and periodontal disease status using Pearson chi-square tests and kappa statistics for agreement analysis.

3. RESULTS:

In a retrospective study of 60 patients (29 females, 31 males) aged 18 to 60 years, clinically categorized by periodontitis staging and grading, the mean age associated with PRA and PRC was 5.010 and 2.638, respectively. Statistical analysis showed no significant correlation between age and PRA ($p = 0.542$) or PRC ($p = 0.853$). Gender analysis revealed mean PRA and PRC values of 1.355 and 4.423, respectively, with no significant association found between gender and PRA ($p = 0.508$) or PRC ($p = 0.110$). Similarly, no significant correlations were observed between Hb% and PRA ($p = 0.651$) or PRC ($p = 0.307$). WBC counts also showed no significant association with PRA ($p = 0.491$) or PRC ($p = 0.234$). Regarding diabetic status, no statistical significance was found with PRA ($p = 0.802$) or PRC ($p = 0.545$). Analysis of periodontitis staging ($p = 0.819$ for PRA, $p = 0.348$ for PRC) and grading ($p = 0.773$ for PRA, $p = 0.238$ for PRC) similarly showed no significant associations. Cohen's kappa agreement between PRA and PRC was -0.705, indicating poor agreement between the two methods.

4. DISCUSSION

Periodontitis is a chronic inflammatory disease driven by bacterial pathogens and one of the most common oral infections worldwide (WHO 2004) that affects around 5-20% of adult population globally[7]. Although in population with poor oral care, the prevalence of periodontitis as high as 60% and up to 90% for gingivitis[8], the host response to periodontal pathogens represents a crucial determinant of the individual's susceptibility to periodontitis. Risk assessment has become a regular feature in both dental practice and society, and principles used to assess risk in society are like those used in a clinical setting. Although the concept of risk assessment as a sign for periodontal disease incidence and activity is well established for managing periodontitis, the use of risk assessment to manage the treatment of periodontitis practically and its sequelae appears to have weak foundation. Initial risk assessment system uses Basic Periodontal Examination (BPE), clinical, medical, and social factors. The risks of not treating the patient are considered as failure and the problems of successful treatment are illustrated by the practical management of post -treatment. Periodontal risk assessment may help clinicians to identify patients with an impaired periodontal prognosis as well as determine the impact of treatment on prognosis[9]. It is incumbent upon the clinician to recognize when treatment has been less successful and to reassess the situation to try and identify the reasons for the lack of a positive treatment response. This study aimed to evaluate the level of agreement between the Periodontal Risk Assessment (PRA) and the Periodontal Risk Calculator (PRC) and was done to evaluate if

both risk analysis methods i.e; periodontal risk assessment (PRA)and periodontal risk calculator (PRC) differ from each other about calculated risk categories in the first visit of theindividual.

In this study, we assessed PRC and PRA for 60 patients. According to PRC and PRA, patients were categorized into low, medium and high risk. In PRC, 6 were categorized as low risk and in PRA 1 individual is in low-risk category, in PRC 7 are in medium risk group and in PRA 10 are in medium risk group and in PRC 47 are in high risk and in PRA 49 are in high risk. The difference between PRC and PRA among the study groups is because of the variability in the parameters taken to calculate. In PRC parameters like previous history of periodontal surgery, furcation involvements, subgingival restorations and calculus seen in radiographs or below the gingival margins have been taken. Whereas in PRA greater detail about bleeding sites than PRC and details of the genetic makeup of the patient were used. While in the PRC pocket depth are assessed segment wise in the PRA pocket depth is assessed tooth wise. Other differences are that while PRA assesses for tooth loss, PRC does not.

In a study done by Hari Petsos[10] in 2020 on periodontal risk assessment tools, results showed that PRA4 and PRCred did not match p=0.13 and concluded that the assessment of the individual risk for the progression of periodontitis using 2 risk assessment methods showed only a minimal agreement. In the current study p-value is 0.87 which is >0.01 showing that PRA and PRC has no correlation indicating no agreement between the tools when compared.

In a similar study by Naga Sai Sujai[11], it was concluded that there is a significant relation between PRA and PRC ($p < 0.05$) indicating accuracy of both the tools. However, in the present study, it is found that there is no significant relationship between the tools (PRA and PRC).

Matuliene G[12]used PRA for assessing recurrence of periodontitis and tooth loss and stated that patients with a high-risk profile after APT were more prone to recurrence of periodontitis and to tooth loss than patients with a moderate or a low risk profile. But in the current study PRA is only calculated in the first visit and the individuals were categorized into high, medium, and low profiles but prediction of recurrence of disease was not assessed.

Mayer baumer[13]A done a study to evaluate the predictive value of the modified periodontal risk assessment (PRA) in patients with aggressive periodontitis (AgP). for the first time on 86 patients and results showed that total of 14 patients showed a localized AgP, 60 a high-risk-profile and 19 were compliant with the proposed maintenance-interval and concluded that the prognostic value cannot be confirmed in case of aggressive periodontitis. But in this study, newclassification of periodontitis(2017) was considered. Since there is no category for aggressive periodontitis in the current classification, individuals were categorized into stagingand grading and results showed that among 60 patients 47 has high risk profile, 10 medium risk and 1 lowrisk profile.

Yong Hur[14]conducted a study to check the association between risk calculator and microbial testing in periodontitis pts in 74 patients and concluded that 46 patients scored as“very high” risk of periodontitis and 22 patients scored as “high” risk of periodontitis by PRC. Patients with a risk score of “very high” risk showed a higher detection of each bacterium except *C. spec*. than the rest of the study population. *Treponema denticola*and *Prevotella intermedia* (*p*

= 0.01 and p = 0. 02, respectively) were two bacteria that showed statistical significance between patients at very high
risk. But, in the present study, no microbiological assessment was done. Due to the retrospective nature of our study, it was not possible to retrieve information on the causes for tooth loss or extraction. In absence of this information, it is uncertain whether tooth loss may represent here a true indicator of periodontitis progression. BOP or BI reflects the inflammatory status of the gingiva. Combined with the presence of deep pockets, BOP >30% is known as a risk factor for TL. The present study suggests that the prevalence of BOP was high in individuals who has high risk category when PRA tool was used. But in PRC, BOP was recorded dichotomously.

This is the first study where hematological parameters like Hb% and WBC were correlated with PRA and PRC. However, the results doesn't show any statistical significance. The limitation of the current study is there is no equal distribution of cases that lead to variations in the results.

In all the other studies, patients were categorized according to AAP 1999 classification, whereas in the current study, new classification (world workshop 2017) was used to categorize the individuals into staging and grading. However, when periodontal status is correlated with periodontal tools like PRA and PRC, no statistical significance was found.

No data, however, is available on the impact that risk assessment may have on patient management. In this aspect the use of risk assessment to determine the frequency of supportive periodontal care appointments has been proposed along with the idea that it may help in treatment approach.

To further elucidate the use of risk assessment tools, a long-term study with large sample of subjects with equal distribution of samples should be carried out.

5. CONCLUSION:

In today's healthcare environment, effective decisions for preventing and treating periodontal diseases hinge on accurate risk assessment to identify high-risk populations, potentially reducing the need for complex therapies and improving outcomes. Risk assessment enables clinicians to tailor treatment plans based on disease severity and individual risk factors, facilitating targeted interventions. Site-specific risk assessments aid in evaluating disease activity and guiding supportive periodontal therapy. Utilizing chair-side tools like PRA and PRC supports personalized treatment strategies, fostering interdisciplinary care. These tools contribute to more consistent clinical decisions, enhanced oral health, and a shift towards a wellness-oriented care model. However, further longitudinal studies are needed to validate and refine risk assessment models for optimal clinical integration and patient care efficiency.

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TABLE 1: CO -RELATION OF AGE WITH PRA AND PRC:

Age*PRA					
		PRA			Total
		Low	Medium	High	
≤30Years	Count	0	2	8	10
	Row%	.00	20.00	80.00	100.00
31–40	Count	0	5	17	22
	Row%	.00	22.73	77.27	100.00
41–50	Count	1	1	11	13
	Row%	7.69	7.69	84.62	100.00
>50Years	Count	0	2	13	15

	Row%	.00	13.33	86.67	100.00
Total	Count	1	10	49	60
	Row%	1.67	16.67	81.67	100.00
Pearson Corelation test Value:5.010; **P=0.542**					

Age*PRC					
Age		PRC			Total
		Low	Moderate	High	
≤30Years	Count	2	1	7	10
	Row%	20.0	10.0	70.0	100.0
31–40	Count	1	3	18	22
	Row%	4.5	13.6	81.8	100.0
41–50	Count	2	1	10	13
	Row%	15.4	7.7	76.9	100.0
>50Years	Count	1	2	12	15
	Row%	6.7	13.3	80.0	100.0
Total	Count	6	7	47	60
	Row%	10.0	11.7	78.3	100.0
Pearson Corelation test Value:2.638; **P=0.853**					

FIGURE 3:CO -RELATION OF AGE WITH PRA AND PRC

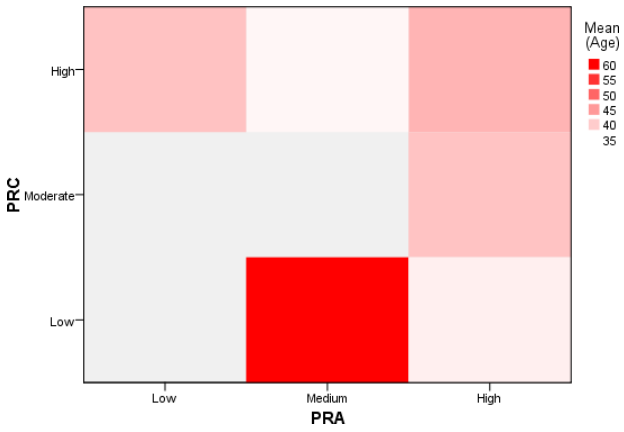

TABLE 2:CO-RELATION OF GENDER WITH PRA AND PRC:

Gender*PRA				
Gender	PRA			Total
	Low	Medium	High	

Female	Count	1	4	24	29
	Row%	3.4	13.8	82.8	100.0
Male	Count	0	6	25	31
	Row%	.0	19.4	80.6	100.0
Total	Count	1	10	49	60
	Row%	1.7	16.7	81.7	100.0
Pearson Corelation test Value:1.355; **P=0.508**					
Gender * PRC					
Gender		PRC			Total
		Low	Moderate	High	
Female	Count	1	2	26	29
	Row%	3.4	6.9	89.7	100.0
Male	Count	5	5	21	31
	Row%	16.1	16.1	67.7	100.0
Total	Count	6	7	47	60
	Row%	10.0	11.7	78.3	100.0
Pearson Corelation test Value:4.423; **P=0.110**					

FIGURE 4:CO-RELATION OF GENDER WITH PRA AND PRC:

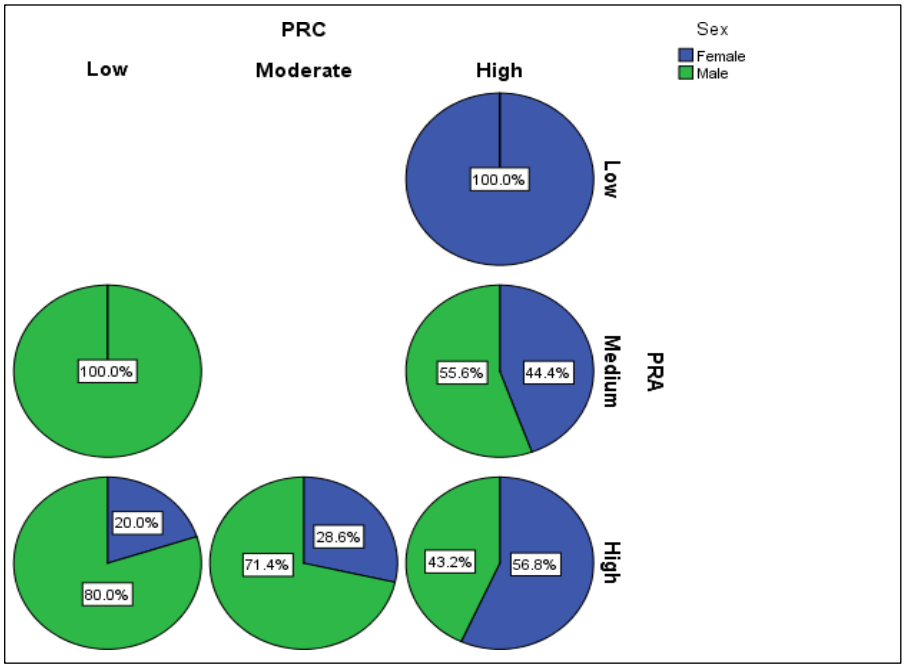

TABLE 3:CO-RELATION OF ANEMIA WITH PRA AND PRC:

Anemic/Normal*PRA					
Anemic/Normal		PRA			Total
		Low	Medium	High	
Anemic	Count	1	6	27	34
	Row%	2.9	17.6	79.4	100.0
Normal	Count	0	4	22	26
	Row%	.0	15.4	84.6	100.0
Total	Count	1	10	49	60
	Row%	1.7	16.7	81.7	100.0
Pearson Corelation test Value:0.859; **P=0.651**					
Anemic/Normal * PRC					
Anemic/Normal		PRC			Total
		Low	Moderate	High	
Anemic	Count	2	3	29	34
	Row%	5.9	8.8	85.3	100.0
Normal	Count	4	4	18	26
	Row%	15.4	15.4	69.2	100.0
Total	Count	6	7	47	60
	Row%	10.0	11.7	78.3	100.0
Pearson Corelation test Value:2.359; **P=0.307**					

FIGURE5:CO-

RELATION OF ANEMIA WITH PRA AND PRC:

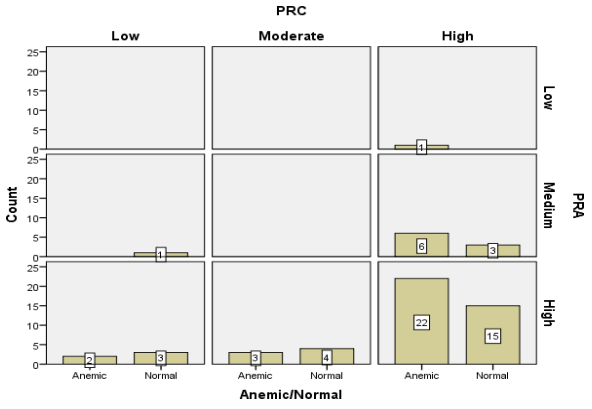

TABLE 4:CO-RELATION OF WBC WITH PRA AND PRC:

	PRA						Independent Samplest-test	
	Low		Medium		High			
	Mean	SD	Mean	SD	Mean	SD	t-Value	P-Value
WBC	6540.0	.	7885.0	1556.6	7561.4	1300.7	.694	**.491**

	PRC						Oneway ANOVA	
	Low		Moderate		High			
	Mean	SD	Mean	SD	Mean	SD	F-Value	P-Value
WBC	8448.3	1060.8	7725.7	1079.1	7491.1	1384.9	1.488	**.234**

FIGURE 6:CO-RELATION OF WBC WITH PRA AND PRC:

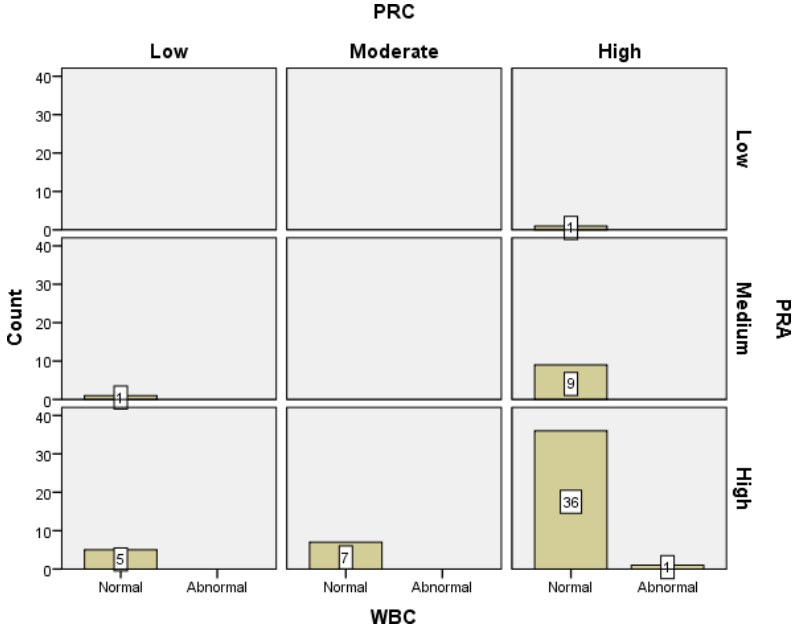

TABLE 5:CO-RELATION OF DIABETES WITH PRA AND PRC:

Diabetic/Non-diabetic*PRA					
Diabetic/Non-diabetic		PRA			Total
		Low	Medium	High	
	Count	0	1	8	9

Diabetic	Row%	.0	11.1	88.9	100.0
Non-Diabetic	Count	1	9	41	51
	Row%	2.0	17.6	80.4	100.0
Total	Count	1	10	49	60
	Row%	1.7	16.7	81.7	100.0
PearsonChi-Squaretest:		Chi-SquareValue:0.440; **P=0.802**			

Diabetic/Non-diabetic * PRC

Diabetic/Non-diabetic		PRC			Total
		Low	Moderate	High	
Diabetic	Count	0	1	8	9
	Row%	.0	11.1	88.9	100.0
	Count	6	6	39	51

Non-Diabetic	Row%	11.8	11.8	76.5	100.0
Total	Count	6	7	47	60
	Row%	10.0	11.7	78.3	100.0
PearsonChi-Squaretest:		Chi-SquareValue:1.212; **P=0.545**			

FIGURE 7:CO-RELATION OF GENDER WITH PRA AND PRC:

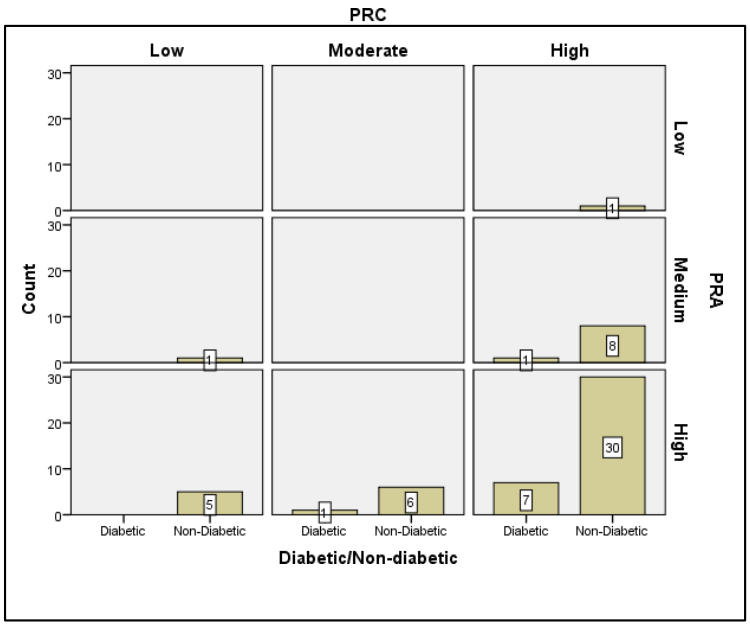

TABLE 6:CO-RELATION OF PERIODONTITIS STAGING WITH PRA AND PRC:

Staging*PRA					
Staging		PRA			Total
		Low	Medium	High	
StageI	Count	0	2	7	9
	Row%	.00	22.22	77.78	100.00
StageII	Count	0	4	16	20
	Row%	.00	20.00	80.00	100.00
StageIII	Count	1	4	26	31
	Row%	3.23	12.90	83.87	100.00
Total	Count	1	10	49	60
	Row%	1.67	16.67	81.67	100.00
Pearson Corelation test Value Value:1.541; **P=0.819**					
Staging*PRC					
Staging		PRC			Total
		Low	Moderate	High	
StageI	Count	2	2	5	9
	Row%	22.22	22.22	55.56	100.00
StageII	Count	1	1	18	20
	Row%	5.00	5.00	90.00	100.00
StageIII	Count	3	4	24	31
	Row%	9.68	12.90	77.42	100.00
Total	Count	6	7	47	60
	Row%	10.00	11.67	78.33	100.00
PearsonChi-Squaretest: Chi-SquareValu:4.457;**P=0.348**					

FIGURE 8:CO-RELATION OF PERIODONTITIS STAGING WITH PRA

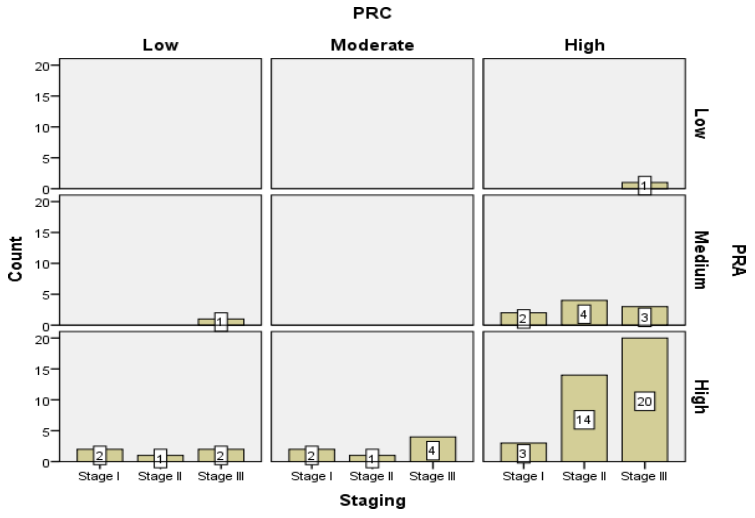

TABLE 7:CO-RELATION OF PERIODONTITIS GRADING WITH PRA AND PRC:

Grading*PRA					
Grading		PRA			Total
		Low	Medium	High	
GradeA	Count	0	2	7	9
	Row%	.00	22.22	77.78	100.00
GradeB	Count	0	4	23	27
	Row%	.00	14.81	85.19	100.00
GradeC	Count	1	4	19	24
	Row%	4.17	16.67	79.17	100.00
Total	Count	1	10	49	60
	Row%	1.67	16.67	81.67	100.00
PearsonChi-Squaretest:		Chi-Square Value:1.798; **P=0.773**			
Grading*PRC					
Grading		PRC			Total
		Low	Moderate	High	
GradeA	Count	2	2	5	9
	Row%	22.22	22.22	55.56	100.00
GradeB	Count	1	4	22	27
	Row%	3.70	14.81	81.48	100.00
GradeC	Count	3	1	20	24
	Row%	12.50	4.17	83.33	100.00
Total	Count	6	7	47	60
	Row%	10.00	11.67	78.33	100.00
PearsonChi-Squaretest:		Chi-Square Value:5.518; **P=0.238**			

FIGURE 9:CO-RELATION OF PERIODONTITIS GRADING WITH PRA AND PRC:

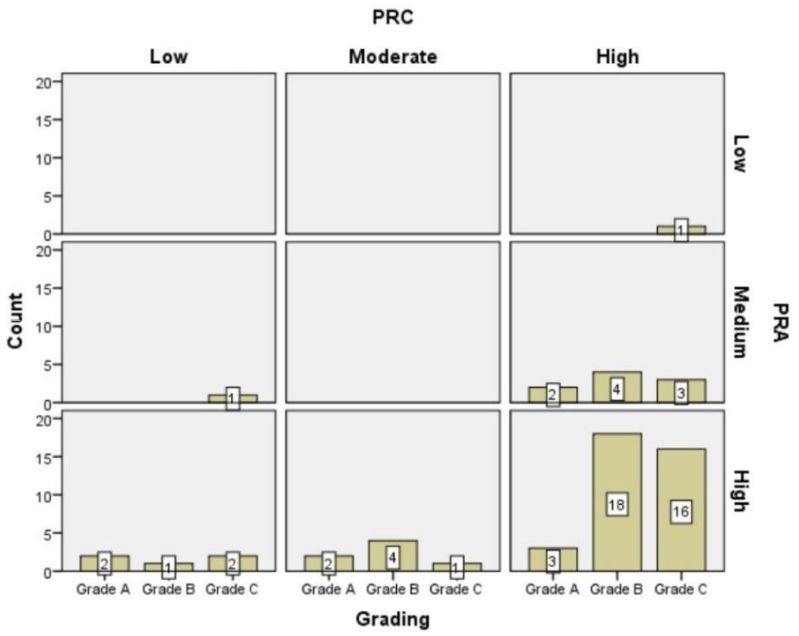

TABLE 8:CO-RELATION BETWEEN PRA AND PRC:

PRA*PRC					
PRA		PRC			Total
		Low	Moderate	High	
Low	Count	0	0	1	1
	Row%	.0	.0	100.0	100.0
Medium	Count	1	0	9	10
	Row%	10.0	.0	90.0	100.0
High	Count	5	7	37	49
	Row%	10.2	14.3	75.5	100.0
Total	Count	6	7	47	60
	Row%	10.0	11.7	78.3	100.0
PearsonChi-Squaretest:		Chi-SquareValue:1.9572;**P=0.744**			

FIGURE 10:CO-RELATION BETWEEN PRA AND PRC: