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Original Research Article

Evaluation of psychological morbidities like depression, anxiety and stress as risk predictors of periodontitis using a risk assessment model: an analytical cross-sectional study

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ABSTRACT

Background: Sedentary lifestyles along with the impact of COVID-19 has increased negative life experience events like depression, anxiety and stress among people. This often increases the liability towards periodontal disease.
Methods: An analytical cross-sectional study was conducted on a sample of 340 individuals, from July 2022 to December 2022, visiting the outpatient department of KLE College of Dental Sciences, Bengaluru. Demographic details of those subjects were obtained through a questionnaire. Depression, anxiety and stress were calculated using the DASS 21 scale and the participants were divided into two groups based on the DASS score. Periodontal risk assessment was done using the Lang and Tonetti model. Association between psychological morbidities and periodontal risk was done using chi-square test and logistic regression analysis.
Results: Out of the 340 participants, 42.9% of the females, 71.7% of the participants with BMI≥25, 15.8% of the diabetics, 11.1% of the hypertensives and 75.2% of the current smokers were suffering from some form of psychological morbidity. Furthermore, binary logistic regression analysis suggested that covariates like gender, education and risk of periodontitis were significantly associated with psychological morbidity.
Conclusions: The present study suggested that increase or decrease in the risk of periodontitis was significantly associated with the increase or decrease in the level of psychological morbidity.

Keywords: Depressive disorder, Mental health, Oral health, Phobia, Stress disorders

INTRODUCTION

The term psychological morbidity which can be collectively used for depression, anxiety and stress is the psychological or physical response of a person to emotional, intelligible or social tasks, when the person perceives the situation to be excess and can result in episodes of psychophysical reactions.[1] The frequently encountered major mood disorders like depression, anxiety and stress are among the most common psychiatric disorders.[2] These morbidities sum up to be the leading factor of suicide in India expanding from 7.9 to 10.3 per 100,000 population over the most recent 20 years.[3]

On the other hand, depression, anxiety and chronic stress has been assumed to be related with periodontitis in the past.[4,5] Periodontitis is an inflammatory disease caused by bacteria which leads to destruction of the tooth supporting anatomical structures, bone loss and eventually tooth loss. It is one of the major reasons for loss of tooth in developing countries, its prevalence being directly proportional to age.[6-9] Periodontitis affects about 60.6% of the Indian population between the age group of 65-74

years.[10] The prevalence of periodontal disease in India is 51% and gingivitis is 46.6%.[11] The connecting link between periodontitis and inflammatory conditions is attributed to the common etiopathogenic factors. It is hypothesized that the association is a result of a dialogue between systemic and local cytokines.[12]

However, in the current literature, the evidence of psychological morbidities being a risk factor for periodontitis is still frail due to improper standardization and disparity in the description of exposure and outcome factors. Furthermore, there is a lack of usage of a risk assessment model in the literature to categorize patients with psychological morbidities into low, moderate and high risk of developing periodontitis.

Therefore, this study was conducted to estimate the association between psychological morbidities and periodontitis, contributing to the literature, using a sufficient sample size, which helped in the control of confounding factors.

METHODS

An analytical cross-sectional study was conducted on a sample of 340 individuals in KLE Society's Institute of Dental Sciences from July 2022 to December 2022 with the help of self-administered questionnaires and periodontal status of patients. As per norm, we had obtained ethical clearance (ethical clearance number: KIDS/IEC/05-2022/21) before the commencement of the study from the Ethical Review Board of KLE Society's Institute of Dental Sciences, Bengaluru.

Inclusion criteria

The minimum number of teeth present in the oral cavity of the patient should be greater than four. Patient should be HIV negative. Patient should abstain from the use of anti-inflammatory medication and periodontal treatment in the last 2 months prior to the commencement of the study.

Exclusion criteria

Percutaneous coronary intervention history in the last six months. A multi-stage cluster random sampling method was employed as the sampling technique for this study. In the first stage, Bangalore was divided into four zones (north, south, east and west) and all the dental hospitals in those zones were listed. In the second stage, one hospital from each zone was randomly selected using random number table. In the third stage, subjects from the out patient department of the randomly selected hospital who fulfilled the selection criteria was included until the desired sample size was met.

The following formula was used to estimate the sample size.

n=[DEFF*Np(1-p)]/[($d^2/Z^2 1-\alpha/2$*(N-1)+p*(1-p)]

Where population size (for finite population correction factor) N=10000000. Hypothesized % frequency of outcome (p) =78±5%.[13] This hypothesized frequency was based on prior research. Confidence limit (d)=5%. Design effect (DEFF-for cluster surveys)=1. Hence the calculated sample size was 340 for the study. All 340 individuals were included for the present study.

The study consisted of the following steps: 1) questionnaire, 2) screening, 3) investigations.

Questionnaire

A self-administered questionnaire was distributed among the study subjects and was filled by interviewing the study subjects by the investigator. It consisted of the following details: socio-demographic details: name, age, sex, socio-economic status (SES) was assessed using modified Kuppuswamy's scale.[14] Diet details: sugar exposure per day and staple diet. Brushing habits and oral hygiene practices. History of any systemic illnesses. Close ended questionnaires were used in Kannada as well as in English based on the choice of the participants. The questionnaire consisted of three broad domains namely socioeconomic and demographic characteristics, food habits and oral hygiene practices. The first domain consisted of eight questions, the second four questions and the third eight questions respectively.

Screening

The patients were screened for psychological morbidities in the out patient departments of the respective colleges and grouped into two groups using the DASS 21 questionnaire.

Screening was done based on the score obtained in the DASS 21 questionnaire.[15] The participants were guided by the investigator to fill the DASS 21 questionnaire appropriately.

DASS 21 consists of five conventional severity levels namely normal, mild, moderate, severe and extremely severe. Those participants who got a score below the moderate level were grouped in the below average group. The participants who obtained a score equal to or greater than the moderate level of the scale were grouped in the above average group.[16]

The group consisted of the following: group A consisted of participants who obtained a score above average declaring them positive with psychological morbidities. Group B consisted of participants who obtained a score below average in the DASS 21 scale, were declared negative for the presence of psychological morbidities. Table 1 shows recommended cut-off score for conventional severity levels of DASS 21 scale according to Lovibond et al.[15]

Table 1: Recommended cut-off score for conventional severity levels of DASS 21 scale according to Lovibond et al.[15]

Severity	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely severe	28+	20+	34+

Investigation

All the patients were investigated for the following risk factors as given in the periodontal risk assessment model by Lang and Tonetti.[17] The Lang and Tonetti model is a predetermined model for determination of the risk of periodontitis where on entering the data for the following risk factors, the model provides the risk of periodontitis in the patient which can be either mild, moderate or severe- age; number of sites per tooth/implant; number of bleeding on probing positive sites; number of sites with periodontal pocket depth greater than or equal to 5 mm; percentage alveolar bone loss; presence of systemic diseases; smoking status.

The values thus obtained were entered into the model software and the risk of periodontitis were evaluated in each patient (Figure 1). Furthermore, the results were associated with the different levels of psychological morbidities of the individuals using different statistical test.

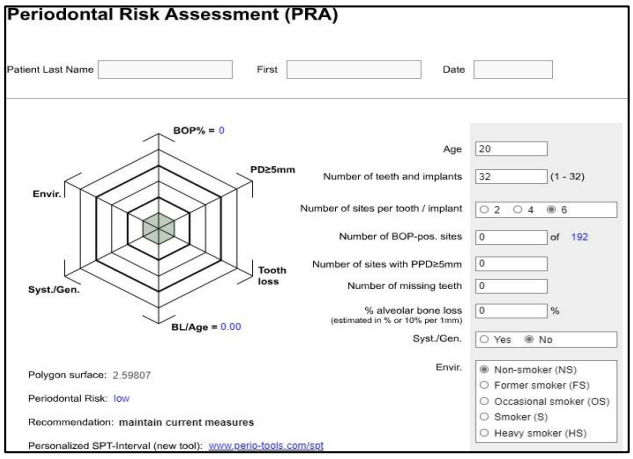

Figure 1: Periodontal risk assessment- Lang and Tonetti model.

In this analysis we took the aid of SPSS 25.0 (SPSS for Windows, version 25.0, SPSS Inc., Chicago, IL, USA). The analysis of data, graphs and tables were created with the help of Microsoft Word and Microsoft Excel. Descriptive and inferential statistical analysis were employed. Mean±SD (min-max) was used to present continuous measurements. Categorical data was presented in percentage form. Significance was assessed at 5% level of significance. Chi square test was used to asses any association between periodontal risk level and psychological morbidities. Binary logistic regression analysis was employed for identifying the variables significantly associated with psychological morbidity. Sub group analysis of the variables was done using generalized linear models.

RESULTS

Among the 340 participants in the study, out of the total female population, 73 (42.9%) were suffering from psychological morbidity and 45 (26.4%) were not suffering from psychological morbidity. Out of the total population who had BMI≥25, 122 (71.7%) were suffering from psychological morbidity and 145 (85.2%) were free from psychological morbidity. Among the diabetic patients, 27 (15.8%) were suffering from psychological morbidity and 13 (7.6%) were free from psychological morbidity. Among the total hypertensives, 19 (11.1%) were suffering from psychological morbidity. Among the total current smokers in the present study, 128 (75.2%) were with psychological morbidity and 75 (44.1%) were without psychological morbidity (Table 2).

The chi square value for the following study (χ^2=183.087; p<0.001) revealed that there is a degree of association between the levels of periodontitis and the presence of psychological morbidity. People with a greater risk of periodontitis had a higher chance of getting diagnosed with psychological morbidity (Table 3).

Multivariate binary logistic regression analysis showed that gender (crude OR- 4.867, p=0.01), education (crude OR- 0.67, p=0.01) and risk of periodontitis (crude OR- 3.803, p=0.01) were significantly associated with psychological morbidity (Table 4).

Generalized linear model was utilized to evaluate the subgroups of the variables that were significantly associated with psychological morbidities. This model was adjusted for the effects of other confounders on the outcome variable (Table 5).

Gender (reference- male) (adjusted OR- 2.145, p=0.01)- the results indicated that females were 2.145 times more likely as compared to males to be predisposed to psychological morbidities.

Education (reference- no formal education) (adjusted OR- 3.142, p=0.01)- the results indicated that subjects who were graduates, were 3.142 times less likely to be predisposed to Psychological Morbidities when compared to a subject with no formal education.

Table 2: Characteristics of the sample according to the diagnosis of psychological morbidities.

		With psychological morbidities (170) N (%)	Without psychological morbidities (170) N (%)
Sex	Female	73 (42.9)	45 (26.4)
	Male	97 (57.05)	125 (73.5)
BMI	≥25	122 (71.7)	145 (85.2)
	<25	48 (28.23)	25 (14.7)
Diabetes	With diabetes	27 (15.8)	13 (7.6)
	Without diabetes	143 (84.11)	157 (92.11)
Hypertension	With hypertension	19 (11.1)	10 (5.8)
	Without hypertension	151 (88.8)	160 (94.11)
Frequency of brushing	<twice daily	54 (31.7)	57 (33.5)
	≥twice daily	116 (68.23)	113 (66.47)
Alcohol	Habit present	49 (28.8)	43 (25.2)
	Habit absent	121 (71.11)	127 (74.7)
Current smoking habit	Habit present	128 (75.2)	75 (44.1)
	Habit absent	42 (24.7)	125 (73.5)
Education	Illiterate	15 (8.8)	5 (2.9)
	Primary school	1 (0.5)	1 (0.5)
	Middle school	1 (0.5)	1 (0.5)
	High school	9 (5.2)	6 (3.5)
	Diploma	13 (7.6)	27 (15.8)
	Graduate	68 (40)	83 (48.8)
	PG Masters	61 (35.8)	47 (27.6)
	PG PHD	1 (0.5)	1 (0.5)
Occupation	Unemployed	2 (1.1)	1
	Unskilled worker	16 (9.4)	3
	Semiskilled worker	8 (4.7)	1
	Skilled worker	1 (0.5)	1 (0.5)
	Clerical	71 (41.7)	66 (38.8)
	Semi profession	55 (32.3)	89 (52.3)
	Professional	18 (10.5)	8 (4.7)
Income	≤7315	5 (2.9)	1 (0.5)
	7316-21913	16 (9.4)	1 (0.5)
	21914-36526	6 (3.5)	4 (2.3)
	36527-45588	5 (2.9)	9 (5.2)
	45589-54650	77 (45.2)	57 (33.5)
	54651-59251	44 (25.8)	69 (40.5)
	59252-63853	1 (0.5)	11 (6.4)
	63854-68454	2 (1.1)	5 (2.9)
	68455-73053	13 (7.6)	3 (1.7)
	73054-109579	1 (0.5)	3 (1.7)
	109580-146103	1 (0.5)	4 (2.3)
	≥146104	1 (0.5)	1 (0.5)
Age in years	25-34	17 (10)	15 (8.8)
	35-44	55 (32.3)	50 (29.4)
	45-54	64 (37.6)	47 (27.6)
	55-64	32 (18.8)	33 (19.4)
	≥65	31 (18.23)	26 (15.29)
Sugar Exposure	5	37	51
	10	45	44
	≥15	88	75
Diet	Vegetarian	67 (39.4)	58 (34.11)
	Non vegetarian	103 (60.5)	112 (65.8)

Table 3: Association of periodontal risk levels with psychological morbidities.

Periodontitis	Psychological morbidities		χ^2 Statistic	P value
	Present	Absent		
Low risk	7	120	183.087	0.001*
Medium risk	51	38		
High risk	112	12		

*-Significant

Table 4: Binary logistic regression analysis identifying the variables significantly associated with psychological morbidity.

Covariables	Standard error	Odds ratio	95% CI		P Value
			Lower	Upper	
Gender	0.401	4.867	1.214	5.23	0.001*
Education	0.160	0.671	0.214	0.998	0.003*
Occupation of the head of the family	0.162	1.193	0.914	1.526	0.117
Family income per month	0.091	0.892	0.245	0.946	0.211
Socio-economic status	0.526	1.185	0.984	2.015	0.240
Presence of allergy	0.445	0.303	0.045	0.981	0.006
Smokeless tobacco use	0.147	2.757	0.004	3.578	0.410
Alcohol consumption	0.420	0.733	0.145	1.875	0.733
Risk of periodontitis	0.273	3.803	0.922	5.213	0.001*

*-Significant

Table 5: Subgroup analysis of the variables significantly associated with psychological morbidity.

Covariables	Standard error	Odds ratio	95% CI		P value
			Lower	Upper	
Gender (reference- male)	0.401	1	-	-	0.001*
Female	0.470	2.145	0.866	3.456	
Education (reference- no formal)	0.414	1	-	-	
Primary education	1.22	0.144	0.012	0.514	0.213
Secondary education	0.313	2.122	0.145	3.415	0.414
Graduate	0.014	3.142	1.856	4.978	0.003*
Pg masters	1.213	0.33	0.002	0.812	1.33
PG PHD	0.141	1.211	0.234	1.950	0.322
Risk of periodontitis (reference-low risk)	0.03	1	-	-	
Medium risk	0.455	1.75	0.176	0.245	0.001*
High risk	0.122	2.33	1.013	3.524	0.001*

*-Significant

Risk of periodontitis (reference- low risk) adjusted OR-1.75, p=0.01*)- the results indicated that subjects with medium risk of periodontitis were 1.75 times more inclined to be suffering from psychological morbidity as compared to a subject who has a low risk of periodontitis.

Risk of periodontitis (reference- low risk) (adjusted OR-2.33, p=0.01*)- the results indicated that subjects with high risk of periodontitis were 2.33 times more inclined to be suffering from psychological morbidity as compared to a subject who has a low risk of periodontitis.

DISCUSSION

The cross-sectional study revealed that an association prevails between increased risk of periodontitis and psychological morbidity. This further supports the evidence that psychological factors such as anxiety, depression and stress contribute towards the progression of periodontitis. This result provided a similar inference with a study conducted by Gustavo et al stating that people with depression are at a higher risk of suffering from periodontitis (risk ratio 1.19).[18] In a systematic review conducted by Aragao et al, eight out of eleven observational studies suggested a positive association between anxiety and periodontitis which is having a similar inference with this present study.[19] Furthermore, a systematic review by Castro et al suggests that a certain association exists between stress and periodontitis, intensifying the relationship that has been explored in this study.[20]

These associations can be attributed to the fact that during such psychologically demanding situations, adrenal glands release cortisol a glucocorticoid hormone which in turn has a diminishing effect on the secretion of immunoglobulin A and G. These immunoglobulins are crucial to guard against microbial pathogens. Furthermore, TNF-α, IL-6 and C-reactive protein secretion increases with increased level of cortisols which being inflammatory cytokines cause adverse effects.[21] Such changes in the immune system might increase the pathogenicity of microorganisms, leading to destruction of periodontal tissues and inducing signs and symptoms of periodontitis.

This study also discussed the predisposition of females towards periodontitis as compared to males which is in similar line to previous studies. It has been reported that women are at higher risk for the development of depressive and anxiety disorders.[22] It has been argued that several household responsibilities, hormonal levels and various roles in the society exposes them to a higher risk of developing anxiety and depression. In addition to this, women bear the burden of discrimination and violence in many traditional societies which intensifies the effect of psychological morbidity.[23]

This study also laid emphasis on the fact that level of education was inversely associated with psychological morbidities. Lack of education represents less opportunities for people to gain access to resources that might improve their situation. The significant association between psychiatric morbidity and the various indices of poverty such as lack of formal education and level of financial burden seems to be a robust finding.[24]

Causal relationship was failed to be established in the study due to its cross-sectional nature. A multicentric longitudinal approach would provide a greater amount of representativeness and generalizability to the study. It would further establish a sense of causality between the variables and the outcomes. Further research using a more robust study design is recommended.

CONCLUSION

The results of the study showed that the prevalence of psychological morbidity was more among female subjects as compared to male subjects. It also portrayed that people belonging to the lower strata of socioeconomic status had a greater susceptibility towards psychological morbidity. Furthermore, subjects with the habit of smoking had a greater prevalence of psychological morbidity. This study also depicted that increase or decrease in the risk of periodontitis was significantly associated with the increase or decrease in the level of psychological morbidity. The periodontal risk assessment model used in this study suggested that psychological morbidities can be introduced as a major risk factor for the development of periodontitis.

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