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Review Article

Evaluation of Periodontal Diseases among patients affected by Non-Communicable Diseases attending Government Run Public Health Centre in Ramapuram, Chennai, India

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ABSTRACT:

Background: A common mechanism for periodontitis to be linked with other Non-Communicable Diseases (NCDs) is shared risk factors and inflammatory and immunological reactions. **Aim:** The study aims to evaluate the status of periodontal tissues among NCD patients attending Primary Health Centres (PHCs) in Chennai, India. **Materials and method:** A descriptive cross-sectional study was conducted among 217 outpatients who visited PHCs from March to September 2024. Socio-demographic data was collected using self-administered questionnaires. A thorough clinical examination was conducted using Oral Health Surveys Basic Methods (WHO, 2005). Russel's Periodontal Index (1956) was recorded among all the eligible participants to assess gingival and periodontal health. A chi-square test was conducted to find the association between several Non-Communicable medical conditions and Periodontal Diseases using the SPSS 27.0 version. **Results:** Of a total of 217 participants, 66.7% participants were diagnosed with Non-Communicable Diseases such as Hypertension (33.6%), Diabetes (15.7%), Heart (5.5%), Kidney (1.8%) diseases and patients with multiple disorders (10.1%). The prevalence of periodontitis among medically compromised individuals (13.8%) is high compared to healthy participants (1.8%). A statistically significant association exists between the health conditions and periodontal health ($P < 0.014$). **Conclusion:** The study concluded with a positive association between periodontal health and non-communicable illnesses. The study also recommended that every public health center establish integrated oral health programs for medically challenged individuals.

Keywords: Oral Health, Diabetes Mellitus, Hypertension, Periodontitis, Public Health Care.

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INTRODUCTION

According to WHO, Non-Communicable Diseases are responsible for 41 million deaths annually, accounting for 74% of all global deaths [1]. In India, the burden of NCDs is particularly severe, with these diseases accounting for approximately 64% of all deaths, surpassing those caused by communicable diseases. According to estimates, the economic loss in India from NCDs will reach $3.55 trillion by 2030 [2]. Non-communicable diseases (NCDs) have emerged as a global health crisis with profound implications for individuals, families, and entire nations. Unlike communicable diseases, which are typically spread from person to person, NCDs are primarily caused by a combination of genetic, physiological, environmental, and behavioral factors [3,4]. These chronic conditions include cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes. The rise of NCDs has been driven by factors such as tobacco use, physical inactivity, unhealthy diets, excessive alcohol consumption, and exposure to air pollution. These risk factors lead to key metabolic changes, including diabetes, hypertension, dyslipidemia, and obesity [5].

Periodontal disease is a chronic inflammatory disease affecting the periodontium and has garnered

significant attention due to its widespread prevalence and potential systemic implications [6]. NCDs, in particular, have implications for overall health due to periodontal disease, which is not just a major oral health concern [7]. Several studies have highlighted a bidirectional relationship between periodontal disease and NCDs, suggesting that not only can periodontal disease exacerbate the conditions associated with NCDs, but the presence of NCDs can also worsen periodontal health. Shared risk factors such as smoking, alcohol consumption, hypertension, hyperglycemia, and aging contribute to this complex interplay [8]. Recognizing this bidirectional relationship underscores the importance of assessing the oral hygiene status of individuals with NCDs. Effective management of periodontal disease in patients with NCDs could improve their overall health outcomes and quality of life [9].

Understanding the link between periodontal health and systemic diseases is crucial for developing comprehensive patient care strategies and preventive measures [10]. The main objective of the study is to evaluate the periodontal status and prevalence of periodontal disease among patients with NCDs attending the Primary Health Centre (PHC) in Ramapuram, Chennai. By focusing on this specific setting, the study seeks to enhance understanding of the oral-systemic health nexus and identify potential opportunities for early intervention and integrated management of periodontal disease alongside NCD care. This study aims to bridge the gap in knowledge regarding the prevalence and impact of periodontal disease among patients with NCDs, ultimately informing better health practices and interventions in primary healthcare settings.

MATERIALS AND METHODS

A cross-sectional study was conducted at a government-run public health care center in Ramapuram, Chennai, among an underprivileged population using a simple random sampling technique. The study spanned six months, from March 2024 to September 2024. The prevalence of 16.1% was determined from the pilot study. Sample size was calculated based on the formula z^2pq/d^2 where z = 1.96; p = 16.1; q = 1-p; d, allowable error = 5%. Therefore, applying the formula, we obtained a sample size of 217. Medical conditions of the patients were categorized according to the International Statistical Classification of Diseases and Related Health Problems ICD 11, where cardiovascular diseases (I00-I99), Chronic Kidney Disease (N18), and Diabetes Mellitus (E10-E14) [11]. Patients aged 25 and older with and without non-communicable diseases like cardiovascular diseases, metabolic disorders, and Chronic Kidney Disease (CKD) who provided informed consent were included in the study. Patients who gave written consent were a part of the study. Participants with communicable diseases, pregnancy, hearing and speech difficulties, and steroid use for athletic purposes were excluded from the study.

Data collection involved structured in-person interviews and clinical examinations. Case Record Form (CRF) gathered information on socio-demographic data, medical and dental history, drug history, personal habits, oral hygiene practices, and self-rated oral health. Clinical examinations were conducted according to the World Health Organization Type III Examination, with a mouth mirror and a periodontal probe with adequate illumination. Russel's Periodontal Index 1956 was used to assess gingivitis and destructive periodontal diseases; scores of 0, 1, 2, 4, 6, and 8 were given to each tooth based on the stage of the disease [12]. The findings were systematically recorded and assigned to five conditions to evaluate the periodontal status of each individual. Inter-examiner reliability was determined to be 0.84 (Near perfect agreement) between two calibrated dentists.

Statistical analyses were carried out using SPSS 27.0 software. Data was collected, compiled, and organized in Microsoft Excel Version 2011. A descriptive statistical analysis was performed on the data. The Kolmogorov-Smirnov test was used to evaluate whether the data had a normal distribution (significant level of 0.05). A chi-square test was conducted to find the association between non-communicable diseases and periodontal problems.

RESULT

Of the 217 total participants, most were females (62.2%). Maximum people attending PHCs were 40-59 years (36.4%). When their oral symptomology was evaluated,17.5% of the participants had sensitivity on clinical examinations, 12% complained of bleeding gums, 6.5% had halitosis, 6% had pain, and 12.9% had more than 1 symptom, as represented in Table 1. Only 33.2% of participants were out of any medical conditions; most of them suffered from hypertension (33.6%), followed by diabetes (15.7%), and nearly 10.1% of the participants suffered from multiple disorders, as in Table 2. Table 3 represents a statistically significant association between self-reported oral health rating ($p < 0.000$) and systemic medical conditions ($p < 0.014$) with periodontal status. The prevalence of periodontitis among medically compromised individuals (13.8%) is high compared to healthy participants (1.8%). The prevalence of simple gingivitis among medically compromised individuals (23.9%) is high compared to healthy participants (13.3%).

Table 1: Socio-demographic profile of all the included participants

Variables		Frequency (N)	Percentage (%)
Gender	Male	82	37.8
	Female	135	62.2
Age	< 25 years	27	12.4
	26-39 years	69	31.8
	40-59 years	79	36.4
	>60 years	42	19.4
Education	Professional	13	6.0
	Graduate	52	24.0
	Diploma/Intermediate	6	2.8
	High School	42	19.4
	Middle School	65	30.0
	Primary School	25	11.5
	Illiterate	14	6.5
Medical Conditions	None	72	33.2
	Kidney Disease	4	1.8
	Heart Disease	12	5.5
	Diabetes	34	15.7
	Hypertension	73	33.6
	Multiple disorders	22	10.1
Medication History	No	87	40.1
	Yes	130	59.9
Stressful Days	≤ 2 days	79	36.4
	3-4 days	66	30.4
	≥ 5 days	72	33.2
Smoke	Never	188	86.6
	Former smoker	9	4.1
	Current smoker	20	9.2
Alcohol	Never or Lifetime	180	82.9
	Former drinker	3	1.4
	Current infrequent drinker	1	0.5
	Current drinker	33	15.2
Smokeless	Never	206	95.0
	Former user	5	2.3
	Current user	6	2.7
Symptoms	None	96	44.2
	Sensitivity	38	17.5
	Bleeding Gums	26	12.0
	Halitosis	14	6.5
	Pain or Discomfort in teeth/gum	13	6.0
	Loss of Teeth	2	0.9
	More than 1 Symptoms	28	12.9
Oral Hygiene Aids	Multiple Aids	99	45.6
	Fluoridated Toothpaste	116	53.5
	Interdental Brushing	2	0.9
Oral Hygiene Practices	Twice	99	45.6
	Once	116	53.5
	Infrequent	2	0.9
Oral Health Rating	Excellent	14	6.5
	Good	97	44.7
	Fair	88	40.6
	Poor	18	8.3

Table 2: Frequency distribution of Non-Communicable Diseases among PHC-attending patients

Groups			None	Kidney disease	Heart disease	DM	HTN	Multiple disorders
Gender	Male	N	32	4	4	11	29	2
		%	39.0	4.9	4.9	13.4	35.4	2.4
	Female	N	40	0	8	23	44	20
		%	29.6	0	5.9	17.0	32.6	14.8
Age	< 25 years	N	18	0	4	0	0	5
		%	66.7	0.0	14.8	0.0	0.0	18.5
	26-39 years	N	26	0	8	10	23	2
		%	37.7	0.0	11.6	14.5	33.3	2.9
	40-59 years	N	20	0	0	22	26	11
		%	25.3	0.0	0.0	27.8	32.9	13.9
	> 60 years	N	8	4	0	2	24	4
		%	19.0	9.5	0.0	4.8	57.1	9.5
Education	Professional	N	6	0	2	1	0	4
		%	46.2	0.0	15.4	7.7	0.0	30.8
	Graduate	N	22	2	4	8	14	2
		%	42.3	3.8	7.7	15.4	26.9	3.8
	Diploma/ Intermediate	N	2	2	0	0	2	0
		%	33.3	33.3	0.0	0.0	33.3	0.0
	High school	N	14	0	4	4	15	5
		%	33.3	0.0	9.5	9.5	35.7	11.9
	Middle school	N	18	0	0	5	8	4
		%	32.0	0.0	0.0	20.0	32.0	16.0
	Primary school	N	8	0	0	5	8	4
		%	32.0	0.0	0.0	20.0	32.0	16.0
	Illiterate	N	2	0	0	4	4	4
		%	14.3	0.0	0.0	28.6	28.6	28.6
Stressful Days	≤2 days	N	34	0	2	8	31	4
		%	43.0	0.0	2.5	10.1	39.2	5.1
	3-4 days	N	22	0	2	12	22	8
		%	33.3	0.0	3.0	18.2	33.3	12.1
	≥5 days	N	16	4	8	14	20	10
		%	22.2	5.6	11.1	19.4	27.8	13.9
Symptoms	None	N	38	2	0	20	32	4
		%	39.6	2.1	0.0	20.8	33.3	4.2
	Sensitivity	N	6	0	8	6	12	6
		%	15.8	0.0	21.1	15.8	31.6	15.8
	Bleeding gums	N	6	0	2	4	12	2
		%	23.1	0.0	7.7	15.4	46.2	7.7
	Halitosis	N	6	0	2	0	4	2
		%	42.9	0.0	14.3	0.0	28.6	14.3
	Pain or discomfort	N	6	2	0	3	0	2
		%	46.2	15.4	0.0	23.1	0.0	15.4
	Loss of teeth	N	2	0	0	0	0	0
		%	100.0	0.0	0.0	0.0	0.0	0.0
	More than 1 Symptoms	N	8	0	0	1	13	6
		%	28.6	0.0	0.0	3.6	46.4	21.4
Smoke	Never	N	68	2	10	31	60	17
		%	36.2	1.1	5.3	16.5	31.9	9.0
	Former	N	0	2	0	0	5	2
		%	0	22.2	0	0	55.6	22.2
	Current	N	4	0	2	3	8	3
		%	20	0	10	15	40	15
Alcohol	Never	N	64	2	10	28	60	16
		%	35.6	1.1	5.6	15.6	33.3	8.9
	Former	N	0	2	0	0	1	0

		%	0.0	66.7	0.0	0.0	33.3	0.0
	Current Infrequent	N	0	0	0	1	0	0
		%	0.0	0.0	0.0	100.0	0.0	0.0
	Current regular	N	8	0	2	5	12	6
		%	24.2	0	6.0	15.1	36.3	18.1

Table 3: Association between periodontal status and socio-demographic variables

Groups		Clinically Normal Supportive Tissues	Simple gingivitis	Beginning destructive periodontal disease	Established destructive periodontal disease	Terminal disease	p-value
Gender	Male	38 (46.3)	27 (32.9)	9 (11)	7 (8.5)	1 (1.2)	0.228
	Female	66 (44.6)	64 (47.4)	54 (40)	4 (3)	4 (3)	
Age	<25 years	20 (74.1)	7 (25.9)	0	0	0	0.204
	26-39 years	26 (37.7)	31 (44.9)	8 (11.6)	3 (4.3)	1 (1.4)	
	40-59 years	39 (49.4)	26 (32.9)	7 (8.9)	5 (6.3)	2 (2.5)	
	>60 years	17 (40.5)	17 (40.5)	3 (7.1)	3 (7.1)	2 (4.8)	
Education	Professional	9 (69.2)	4 (30.8)	0	0	0	0.125
	Graduate	30 (57.7)	14 (26.9)	6 (11.5)	1 (1.9)	1 (1.9)	
	Diploma or intermediate	2 (33.3)	4 (66.7)	0	0	0	
	High school	21 (50.0)	18 (42.9)	2 (4.8)	1 (2.4)	0	
	Middle school	23 (35.4)	26 (40.0)	7 (10.8)	6 (9.2)	3 (4.6)	
	Primary school	12 (48.0)	10 (40.0)	3 (12.0)	0	0	
	Illiterate	5 (35.7)	5 (35.7)	0	3 (21.4)	1 (7.1)	
Medical Condition	None	39 (54.2)	29 (40.3)	2 (2.8)	1 (1.4)	1 (1.4)	0.014*
	Kidney disease	2 (50.0)	2 (50.0)	0	0	0	
	Heart disease	5 (41.7)	4 (33.3)	3 (25.0)	0	0	
	Diabetes	12 (35.3)	11 (32.4)	2 (5.9)	6 (17.6)	3 (8.8)	
	Hypertension	30 (41.1)	29 (39.7)	10 (13.7)	3 (4.1)	1 (1.4)	
	Multiple disorders	14 (63.6)	6 (27.3)	1 (4.5)	1 (4.5)	0	
Medication History	Yes	42 (48.3)	33 (37.9)	5 (5.7)	4 (4.6)	3 (3.4)	0.719
	No	60 (46.2)	48 (36.9)	13 (10.0)	7 (5.4)	2 (1.5)	
Smoking	Never	89 (47.3)	69 (36.7)	15 (8)	11 (5.9)	4 (2.1)	0.677
	Former user	3 (33.3)	4 (44.5)	1 (11.1)	0	1 (11.1)	
	Current user	10 (52.6)	7 (36.8)	2 (10.6)	0	0	
Smokeless	Never	98 (47.6)	74 (35.9)	18 (8.7)	11(5.4)	5 (2.4)	0.163
	Former user	2 (40)	3(60)	0	0	0	
	Current user	2 (33.3)	4 (66.7)	0	0	0	
Alcohol	Never	85 (47.2)	66 (36.7)	16 (8.9)	9 (5.0)	4 (2.2)	0.750
	Former regular	1 (33.3)	2 (66.7)	0	0	0	
	Current infrequent	0	1 (100)	0	0	0	
	Current regular	16 (48.5)	12 (36.3)	2 (6.1)	2 (6.1)	1 (3.0)	
Stressful Days	≤2 days	32 (40.5)	33 (41.8)	8 (10.1)	2 (2.5)	4 (5.1)	0.321
	3-4 days	36 (54.5)	21 (31.8)	4 (6.1)	4 (6.1)	1 (1.5)	
	≥5 days	34 (47.2)	27 (37.5)	6(8.3)	5 (6.9)	0	
Symptoms	None	45 (46.9)	43 (44.8)	4 (4.2)	3 (3.1)	1 (1.0)	0.584
	Sensitivity	18 (47.4)	11 (28.9)	7 (18.4)	1 (2.6)	1 (2.6)	
	Bleeding gums	11 (42.3)	8 (30.8)	3 (11.5)	3 (11.5)	1 (3.8)	
	Halitosis	6 (42.9)	6 (42.9)	1 (7.1)	1 (7.1)	0	
	Pain or discomfort	7 (53.8)	3 (23.1)	0	2 (15.4)	1 (7.7)	
	Loss of teeth	1 (50.0)	1 (50.0)	0	0	0	
	More than one symptom	14 (50.0)	9 (32.1)	3 (10.7)	1 (3.6)	1 (3.6)	
Oral Hygiene Aids	Multiple aids	51(51.5)	34 (34.3)	7 (7.1)	5 (5.1)	2 (2.0)	0.979
	Fluoridated toothpaste	50 (43.1)	46 (39.7)	11 (9.5)	6 (5.2)	3 (2.6)	
	Interdental brushing	1 (50.0)	1 (50.0)	0	0	0	
Oral	Twice	51(51.5)	34 (34.3)	7 (7.1)	5 (5.1)	2 (2.0)	0.979

Hygiene Practices	Once	50 (43.1)	46 (39.7)	11 (9.5)	6 (5.2)	3 (2.6)	
	Infrequent	1 (50.0)	1 (50.0)	0	0	0	
Oral Health Rating	Excellent	8 (57.1)	6 (42.9)	0	0	0	0.000***
	Good	60 (61.9)	32 (33.0)	2 (2.1)	2 (2.1)	1 (1.0)	
	Fair	32 (36.4)	42 (47.7)	8 (9.1)	5 (5.7)	1 (1.1)	
	Poor	2 (11.1)	1 (5.6)	8 (44.4)	4 (22.2)	3 (16.7)	

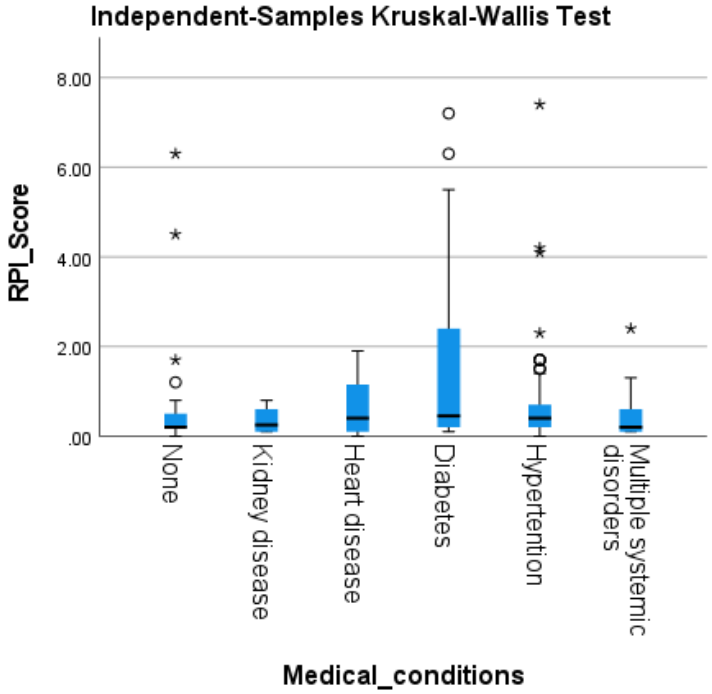

Figure 1: Box and whisker plot comparing the Non-Communicable Diseases with Russel Periodontal Index Score

DISCUSSION

A link to the crucial intersection between periodontal disease and non-communicable diseases (NCDs), emphasizing the shared and overlapping risk factors that connect these conditions and the significant societal burden they impose, was discovered [13]. It also highlights the need to bridge the gap between oral and systemic health in education and practice. The research gaps that hinder thorough evaluations and significant findings of offering unbiased and potentially critical analysis within the current healthcare discourse around NCDs were discovered [14]. Although India's economy is expanding, many studies mention a significant gap in access to essential care and suggest the need for improvement in the public healthcare system [15,16]. Thus, the current study concerning non-communicable illnesses and periodontal diseases is intended to determine how primary health centers meet the needs of marginalized populations. At the initial point of interaction with the community, a paradigm change for a public health strategy is required, bringing together various health experts who deal with oral health and NCDs at the same location [17].

The results of the study revealed that, compared to men, women are more likely to seek treatment assistance from PHCs. According to Carretero MT et al. study (2014), the predominance of women patients utilizing PHC facilities has been obtained, attributed to their higher morbidity burden [18]. Similarly, the study conducted by Al-Abadi et al. in 2018 also showed that females are the frequent attenders in PHCs [19]. The obtained frequency can be on the grounds of the convenience of patient visitation time, in tandem with their household responsibilities, the expense for treatment modality, affordability, ease of transportation, availability of multiple nearer locations, reduced waiting time, cultural competence, government support, and reduced reliance on their partner. The lowered men predilections can be due to the inconvenience of PHC visitation timings due to work, perception of health, social and cultural norms, financial concerns, and peer stigma. A greater mass of the participants of this study belongs to the literate category with graduates and receivers of secondary education. Increased patient visits in PHCs by this population can be due to their exposure to the the importance of dental care in need of taking care of one own overall health for a prosperous life and awareness of the hidden danger behind ignorance of one's health.

The age group of 40-59 years (36.4%) marks the majority among the patients visited, followed by the age group 26-39 (31.8%) in the present study. A study

by AK Srivastava et al in the year 2023, has revealed that patients aged 45 and older make up nearly half (47.9%) of PHC's patient population [20]. This can be accounted for increased healthcare needs: physical and psychological, ease of approaching healthcare facilities by this specific population due to financial independence, transport facilitation, time convenience, flexible working environment, and increased concern for maintaining good health. A comparatively lesser percentage of the geriatric population (19.4%) can be seen, which may be due to limited mobility and poor health literacy, where some older individuals may struggle to understand when to seek medical attention, financial constraints, high cost of health care and lack of insurance, the complexity of care as many may be suffering from multiple health issues, fear of diagnosis and treatment, homebound status, rural locations and polypharmacy such as managing multiple medications can create complexity that discourages seeking medical attention.

The major dental issues manifested in the study population were sensitivity, bleeding gums, halitosis, pain and a combination of multiple manifestations indicative of increased need of medical attention. The increased incidence of sensitivity and associated dental problems can be due to a lack of knowledge of proper means of maintaining oral hygiene, such as proper brushing technique, frequency, and the need to use auxiliary aids. The present study results demonstrated the significant association between the Non-Communicable Diseases and Periodontal status. A lack of awareness about the bidirectional relationships exists between an individual's health and overall systemic health. A study conducted by Kapil YL et al. (2021) provides an insight into the bidirectional and multimodal relationship between systemic health and periodontal health mediated by predisposing and precipitating factors like genetic factors, environmental factors, medications, altered human responses, and bacterial dysbiosis [21]. Most commonly, physical and mental stress at work and personal habits such as smoking, alcohol consumption, and improper dietary habits will inevitably be reflected in the general and oral health of an individual. The findings supported the study conducted by Sato Y et al. (2021) revealed the great influence of psychological or physical stress, posing a risk of developing dental problems like dental caries and periodontitis [22].

One of the study's main limitations is its study design, which makes it difficult to determine the temporality of the association. Secondly, a smaller sample size was recruited and limited to two primary health centers. Thirdly, the cross-sectional study is more prone to exhibit 'sample' and 'response' bias. A major strength of the study is that it identified the distribution and impact of periodontal disease across several health conditions.

CONCLUSION

The study results revealed the association between Non-communicable diseases and periodontal health. The study serves as a basis for the need to conduct cohort studies in the future in order to establish a causal effect relationship. The government should reform its policies, and new integrated oral health programs among medically compromised people to be implemented at every Subcentre, Primary Health Centres, and Community Health Centres.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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None

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