

Original Research Article

Russel's score and diabetes mellitus type 2 "finding the association": a cross sectional study from one of the districts in Bihar, India

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ABSTRACT

Background: Diabetes has been on the rise since last decade or so with prevalence rate changing as more research is being done. India is one of the most burdened country from diabetes specially type 2. With changing life style other diseases are also on the rise and evidence is being generated to find tangible association. One such disease is periodontitis. As evidence from the State of Bihar for association between periodontitis and diabetes mellitus is negligible this study was conducted to find the same.

Methods: A cross sectional observational study in community settings was done for three months on 200 diabetic willing participants. Data was generated using a semi structured pretested questionnaire. Data analysis was done using SPSS version 22.0 and statistical measures of central tendency like mean, mode, median and standard deviation were used. For establishing association chi square tests were used. P values < 0.05 were considered to be statistically significant.

Results: 61.5% of the participants were male while 65.5% were from rural area. The study population was on an average on the older side with a mean age of 52±12.15 and on the bulky size with a BMI of 28.85±4.08. Authors got the average Russel's score to be 1.1±1.79. The mean blood sugar level for fasting was 146.40±59.99 and post prandial levels was 211.59±82.49. A Russel score category of established periodontal disease and terminal disease was present in 77.5% of participants having an altered fasting blood sugar level. Majority of the males had established periodontal disease and terminal disease. Patients with elevated postprandial blood sugar levels had more established periodontal disease and terminal disease.

Conclusions: Oral health is definitely associated with diabetes mellitus type 2 and its other factors like duration, glycaemic control, blood sugar levels etc. Public awareness regarding this is minimal. More research and awareness regarding this will help in keeping the diabetic population healthy.

Keywords: Bihar, Diabetes mellitus type 2, Periodontitis, Oral health, Russel's score

INTRODUCTION

Diabetes mellitus covers a group of metabolic disease characterized by hyperglycemia caused by defect in

insulin secretion, its action, or both. The total number of people in the world with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. India was ranked number one as the country with the highest

number of diabetes patients in 1995, at 31.7 million in 2000 with a projected 57.2 million in 2025 and 79.4 million in 2030, retaining it top position, and hence known as “diabetic capital of the world “. Prevalence of diabetes especially type 2 among urban Indian has now risen to 12.1 % and projected to rise further, the prevalence is also on the rise in rural population.^{1,2} Recent evidences has started to point out relationship of systemic diseases with oral conditions.^{3,4}

A chronic often encountered oral condition, characterized by chronic inflammatory condition, is periodontitis. The course of progression is dependent on various factors e.g. systemic diseases present, cytokines, and microorganisms including overall immune system.⁵ Globally the prevalence of the periodontal disease has been on the rise including in India and its association with poor glycemic control has been well documented.⁶⁻⁹ There is an increasing concern regarding the association of periodontitis and diabetes mellitus particularly type 2 owing to its range of complications.

Recent evidence has suggested the possible mechanism for relating type 2 diabetes and periodontitis, a modification of the healing mechanism for the periodontal tissues thus by accelerating the subgingival microbial modulation to alter the cellular, humoral function, genetic expression all associated with periodontal destruction.¹⁰⁻¹²

Off late, researchers have gone at the molecular level and tried to pin point the adipocytokine by the name as “Visfatin” and suggested that its level could be the possible link between diabetes and oral complications.¹³

A scale measuring the diseased condition of the periodontal tissues or periodontitis had been developed by the American researcher Russel A.L way back in 1956, which has weathered the test of time and has been used to establish the extent of disease in field conditions, surveys etc.¹⁴

Keeping in view of these it was decided to know the prevalence of the association of periodontal conditions and diabetes relation in Bihar. Lack of plausible research on this topic gave further motivation for the authors to study the Russel’s score and look for an association with diabetes type 2 in its population. This study was taken with an aim to understand the prevalence of periodontitis and its relation in diabetic population in the selected study population.

METHODS

The present study was a cross –sectional observational prevalence study done in field setting using the dental screening camps organized. Sample Size was calculated using the latest census data, adding a 2.1% growth rate for projecting the population in 2017, and overall estimated prevalence of diabetes type 2 in the sample

district population.¹⁵ District of Gaya was selected owing to the limited resources available and the heterogeneity of the population residing in the district providing a good sample estimate of Bihar. We used an overall prevalence rate provided by WHO in Urban India to be 12%.¹⁶ Daniels formula was used to arrive at the sample size of 197.¹⁷ We took 200 study subjects. Study was conducted over three months starting January 2017- March 2017.

All participants having known diabetes mellitus for last one year minimum were taken after their informed consent. All included patients were asked for any known dental treatment and if the answer were affirmative were excluded. Any participant with a history of tobacco chewing or smoking were not included in the study. The selection age group was of 30-60 years. A pretested semi structured questionnaire was used to collect data. All study subjects were examined following their consent and willingness after having an informed consent. Standard procedures were used to take their height, weight, etc. Dental examination was done using sterile equipment and adhering to all other standard protocols for gingival examination. Blood samples were collected before breakfast and after breakfast. Authors evaluated fasting blood sugar, Glycosylated hemoglobin (HbA1C), and post prandial blood sugar levels. During data analysis we categorized the HbA1C scores, Pre-prandial blood sugar levels and Post prandial blood sugar levels thus obtained in accordance with American Diabetes Association guidelines.¹⁸ Similarly BMI was categorized using the standard accepted cut off values.¹⁹ Data analysis was done using SPSS ver 22.0 after data entry in MS excel. Descriptive statistical measures for central tendency like mean, mode and median were used to illustrate the quantitative measures, while qualitative measures were described using proportions as percentages. Association was established using chi square tests. P values less than 0.05 were considered to be statistically significant.

RESULTS

Present study subjects were mostly males (61.5%), residing in rural areas (65.5%) with overall literacy rate (82.5) (Table 1).

Most of the participants were having diabetes for less than 5 years (68.5%), majority (57.5%) were not taking exercise for at least 30 minutes a day, Table 1 and almost all (87%) were brushing their teeth only one time in 24 hours. The study population was on an average on the older side with a mean age of 52±12.15 and on the bulky size with a BMI of 28.85±4.08 Table 2. Authors got the average Russel’s score to be 1.1±1.79 with a wide range Table 2.

Overall neither the participants knew that there is a possible association between periodontitis and diabetes mellitus (98.5%) neither their treating physicians told them about this association (99.5%) (Table 3).

Table 1: Frequency distribution table of various demographic traits of the study population.

Total number (N=200)	Frequency	Percent
Gender		
Male	123	61.5
Female	77	38.5
Locality		
Urban	69	34.5
Rural	131	65.5
Education		
Illiterate	35	17.5
literate	35	17.5
High School	41	20.5
Intermediate	38	19.0
Graduate	51	25.5
Duration of diabetes (in years)		
1.0	35	17.5
2.0	40	20.0
3.0	41	20.5
4.0	18	9.0
5.0	3	1.5
6.0	27	13.5
8.0	20	10.0
9.0	4	2.0
10.0	5	2.5
12.0	5	2.5
13.0	2	1.0
Exercise for 30 days six days in a week		
No	115	57.5
Yes	85	42.5
Brushing twice in 24 hours		
No	174	87
Yes	26	13
Total	200	100.0

Authors looked for possible association of the Russel's category of the diseased condition of the periodontitis based on the scores obtained and found sex, glycemic control, BMI HbA1C blood levels, fasting blood sugar levels, post prandial blood sugar levels to be statistically associated with overall scores obtained (Table 4).

Authors found males to be having more periodontitis, obese class I and obese class II having more periodontitis in the form of established destructive periodontal disease and terminal disease.

Pre-diabetic and diabetic participants categorized on the basis of post prandial blood sugar level had more destructive periodontitis in the form of previously mentioned category (Table 4). Fasting blood sugar levels too if altered were having more periodontal damage and P values <0.00 signify very high statistical significance. Poor glycemic control categorized on the basis of HbA1C levels were having more established destructive periodontal disease and terminal disease.

DISCUSSION

One of the earliest evidences for the association of diabetes type 2 and periodontal disease was probably established way back in 1991, and the association of diabetes progression and exercise has been widely advocated by WHO to be done five days a week for thirty minutes.^{20,21} Followed by consecutive studies exploring association of periodontitis with duration of diabetes.²² Following these, evidences were established for association of diabetes type 2 duration, glycemic control, duration and fasting blood glucose levels with the periodontal health.²³⁻²⁵

In present study authors found all the participants having some periodontitis as their Russell's score were in the grade of either beginning of destructive periodontal disease, established destructive periodontal disease or terminal disease.¹⁴

Table 4, In present study noticed majority having other factor for poor glycemic control as exercise as suggested by WHO was not being followed and brushing was also poor which can lead to poor periodontal health.²⁰ However these type of findings were similar to studies conducted in India. Evidences, in diabetic population, have recorded a high prevalence of poor periodontal health.^{26,27}

Table 2: Descriptive stats for various quantitative parameters.

	N	Minimum	Maximum	Mean	Std. Deviation
Age	200	14.0	85.0	52.335	12.1586
Weight (in kg)	200	40.0	95.0	73.780	11.7209
Height(centi-meter)	200	145.0	182.0	159.805	6.2580
FBS	200	70.0	462.2	146.402	59.9824
PPBS	200	100.7	497.1	211.596	82.4965
Hb-A1C (%)	200	5.2	15.0	8.108	2.1156
Russell score	200	1.1	7.7	4.520	1.7998
BMI	200	17.31	39.04	28.854	4.088

Table 3: Knowledge aspect about relationship of diabetes mellitus and periodontitis.

Patient knowing about association of diabetes mellitus and periodontitis		
	Frequency	Percent
No	197	98.5
Yes	3	1.5
Physician information about association of diabetes mellitus and periodontitis		
No	199	99.5
Yes	1	0.5
Total	200	100.0

Table 4: Association in terms of chi- square and P value of Russel’s score and various categorized quantitative variables.

Various variables		Russel Category			Total	Chi Square	p value
Variables	Category	Beginning of destructive periodontal disease	Established destructive periodontal disease	Terminal disease			
Sex	Male	3	64	56	123	6.748	<0.05
	Female	8	42	27	77		
Glycemic control	Not achieved	1	46	74	121	53.64	<0.00
	achieved	10	60	9	79		
BMI categorized	Normal	3	25	8	36	15.32	<0.05
	Overweight	7	35	26	68		
	Obese class I	1	44	45	90		
HbA1C blood levels categorized	Excellent	4	32	6	42	67.29	<0.00
	Good	6	28	3	37		
	Acceptable	1	28	22	51		
	Poor	0	18	52	70		
Fasting blood sugar level categorized	Altered	6	81	74	161	9.8	<0.05
	Normal	5	25	9	39		
Post prandial blood sugar levels categorized	Normal	5	21	5	31	61.65	<0.00
	Increased glucose tolerance	1	18	6	25		
	Prediabetes	5	44	12	61		
	Diabetes	0	23	60	83		

While studies done on diabetic population globally, too show similar trends, where the authors found the glycemic control and diabetes mellitus type 2 to be associated.^{28,29}

Authors encountered poor oral hygiene in 87% of the study participants which is higher than recently concluded study with three groups, diabetes type 2 being one, however there too the poor oral hygiene percentage was more than 65%.³⁰ Of the available evidences authors failed to sight any singular study showing any knowledge based findings like ours.

Authors found that awareness about any possible association of oral health and diabetes type coupled with its duration is not present for general public. Since authors didn’t interview the care givers, authors cannot comment on their understanding but for sure they didn’t informed patients about this association. In present study authors had more male participants owing to the sociodemographic status prevalent in rural areas of Bihar.

Limitations of the study were to have selected only one district of the state of Bihar and authors could have more study participants to serve as control groups to compare.

CONCLUSION

The authors conclude that the association between type 2 diabetes mellitus and periodontitis is definitely present and there is lack of awareness regarding this fact in general population including the practicing physicians. Oral hygiene is an important aspect associated with diabetes and overall control of diabetes is associated with better results. Fasting blood sugar levels if maintained will help in having a better oral mucosal health. Similarly, glycemic control is also helping in keeping a healthy oral mucosa. Authors recommend a dental checkup at least annually in all diabetic population and stringent glycemic control for better overall health.

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