Original Article

Immunological Study of Type 2 Diabetic Patients with Periodontal Disease

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ABSTRACT

Objective: To evaluate the IgA, IgG and IgM levels in the serum samples of type 2 diabetic and Periodontal patients of the Peshawar area having different life style set up.

Study Design: Case control study

Place and duration of Study: This study was carried out on subjects who fulfilled our criteria and agreed to participate in the study were included. They were residents of Peshawar area and visited OPDs of Khyber College of dentistry, Peshawar during July, 2012 to June, 2013.

Patients and Methods: Among 120 participants, 30 were healthy, 30 were with periodontitis, 30 had diabetes and the remaining 30 had both diabetes and periodontitis. All of them had at least 20 natural teeth. Diabetic patients had the disease history minimum of five years while the periodontal patients had clinically confirmed the disease. Blood samples were collected from each of the participant and immunoglobulins A, G and M were measured. The observed data were analyzed accordingly through standard statistical methods.

Results: Male patients were found more as compared to females (ratio 1: 0.87) in the two diseases. The age range was 35 to 54 years with the mean 44±5. As per HBA1C results, 40 % had good control of diabetes, 26 % moderate while in 34 % control was poor.

Immunoglobulin A and G levels were found significantly higher ($p < 0.05$) in the three disease groups as compared to control group. Whereas the concentration of IgM was not changed by the said diseases.

Besides, the gender has no influence on the levels of the three immunoglobulins. The IgG levels increased with the increase in severity of the Periodontitis disease. While IgA showed slight decrease with the increase in clinical grades of the Diabetes disease.

Conclusion: The result of the current study indicates the role of humoral immune response in the two mentioned diseases. The higher levels of immunoglobins particularly IgA and IgG might be due to protective mechanism against the weak immune response and the increased bacterial challenge in diabetes and periodontitis.

Key Words: Immunoglobulins, Periodontitis, Diabetes Mellitus.

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INTRODUCTION

Diabetes mellitus is a metabolic disease and a major health problem throughout the world. Its prevalence is increasing not only due to genetic factors but also due to stress and changing lifestyle modification. The number of estimated cases of diabetes increased from 30 million in 1985 to 135 million in 1995 and is projected to increase to 366 million by the year 2030[1]. About 1.5 million cases of diabetes with age above 20 were diagnosed in a single year, 2005[2.] Only in the United States, about 18 million people are suffering from this disease[3]. The prevalence of diabetes mellitus in our country is ranked 8th in the world[1] and its figure is 1.49% in the Khyber PukhtoonKhwa Province[4].

In diabetes, the body metabolism fails to utilize glucose for the production of energy and hence its levels increase in the blood. Besides, glucose levels in the saliva also increase, which act as a fuel substrate for the bacteria in the mouth and hence favor the growth of pathogens in periodontal pockets. In *addition*, *d*iabetic patients develop dry mouth a condition that predisposes to infection. Bacteria and infection in the mouth are a risk factor for initiation and progression of periodontitis. An early study described that people with poor blood glucose control tend to develop periodontal disease more severely and more frequently than people with good control of their diabetes[5]. The dental clinicians also highlighted that Periodontitis is the most widely noted manifestation of Diabetes mellitus[6].

Both diabetes mellitus and periodontal disease are contributing to the dysfunction in the immune system. Besides, self mediated immunity is reported to play a protective or aggressive role in the pathogenesis of periodontal disease[7]. Altered immune function in diabetic patients with periodontitis have been reported by several studies[7,8]. They used salivary immunoglobulins as parameters to assess the status of humoral immunity. Another scientist investigated immunoglobulins in the gingival tissue of diabetic

patients with periodontitis[9]. But there are no such data regarding serum samples, particularly of our population; having different nutrition, lifestyle, environment and socioeconomic condition. The present study was, therefore, undertaken to evaluate the immune profile (IgA, IgG and IgM) in serum among patients and control of this particular area (Peshawar).

MATERIALS AND METHODS

One hundred and twenty patients who visited Khyber College of dentistry, Peshawar, for treatment during July, 2012 to June, 2013, fulfilled our criteria and agreed for this case control study were investigated. The subjects were divided into four groups as described in table-1. Information regarding age, sex, education level, occupation, dietary history, family income and previous laboratory investigation were also collected from each of them.

The age range of all volunteers of the four groups was between 35 to 54 years. All of them had at least 20 permanent teeth in the mouth and without caries. Diabetic patients had history of the disease at least for the past 05 years. Periodontal patients had clinical attachment loss ≥ 2mm and pocket depth ≥ 4 mm in each quadrant of their mouth. Patients having severe respiratory tract infections, hypertension, liver disease, coexistent lesions, rheumatoid factor above 500 iu/ml, Albumin above 07 g/dl, allergy or autoimmune disorders were excluded from the study.

Participants were explained the objectives of the study and assured of the confidentiality. Informed consent was obtained from each subject enrolled in the study. The work was approved from the local ethical research committee of the institute. Five ml fasting venous blood was collected from all the patients and serum was separated. The specimens were stored at -20^{0}C till immunoglobulin estimations was carried out.

Immunoglobulins A, G and M were quantitatively determined with the help of diagnostic kits as used for instrument, Cobas Integra 400 Roche company[10]. The normal reference ranges as described by this method are 0.7 to 4.0 g/l for IgA, 7.0 to 16.0 for IgG and 0.4 to 2.3 g/l for IgM. The observed data was tabulated. Karl Pearson correlation test was used to correlate the association between various parameters. Comparison of different parameters between control and disease groups was done by t-test. A p-value less than 0.05 were considered statistically significant.

RESULTS

Sixty three (52.5 %) males and 57 (47.5 %) females were investigated in the present study. Their education levels are described in figure-1. Twenty two patients had diabetes for the past 20 years, 24 for the past 10 years, whereas 14 patients had duration of the disease in between 05 to 09 years. Figure-2 is regarding control of the disease(as per HbA1C result) among diabetic patients.

The reasons to visit the dentist are described in table-2. Besides, 58 % of the participants mentioned that they had visited the dental hospital for the first time. The most common reasons mentioned for the hesitation of no dental visits was viral transmission due dental instruments, unpleasant/time consuming dental procedure and the expensive treatment.

The average concentrations of the three immunoglobulins are described in table-3. Males and females had the same pattern of the three immunoglobulins among all the groups. The IgA and IgG levels were found significantly higher ($p < 0.05$) in the serum of the three disease groups as compared to control group. Whereas the concentration of IgM was not changed and showed almost similar patterns in all the four groups. Besides, the IgG levels increased with the severity of the periodontal disease. While IgA showed slight decrease with the increase in clinical grades of the diabetes disease. Both these immunoglobulins A and G decreased in all subjects with the progress of the age.

Table No.1: Distribution of subjects by sex.

Subject	Males	%age	Females	%age
Healthy	15	50.0%	15	50.0%
Periodontitis	17	56.7%	13	43.3%
Diabetes	16	53.3%	14	46.6%
Diabetes with Periodontitis	15	50.0%	15	50.0%
Total	63	52.5%	57	47.5%

Table No.2: Reasons to visit the dentist among the total.

Reason	Number of subjects	Percent
Tooth pain	36	30.0 %
Mouth Infection	24	20.0 %
Bleeding with a brush	22	18.3 %
Extraction	21	17.5 %
Periodontal problem	17	14.2 %

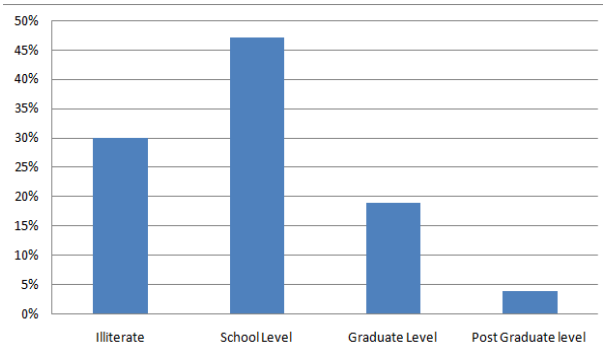

Figure No.1: Education Levels of the Participants

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Table No.3: Mean Immunoglobulin Levels among Participants.

Group	IgA (g/l)	IgG (g/d)	IgM (g/l)
Healthy	2.3	10.21	1.05
Periodontitis	4.3	15.93	0.96
Diabetes	4.8	14.52	0.87
Diabetes with Periodontitis	5.3	16.34	0.81

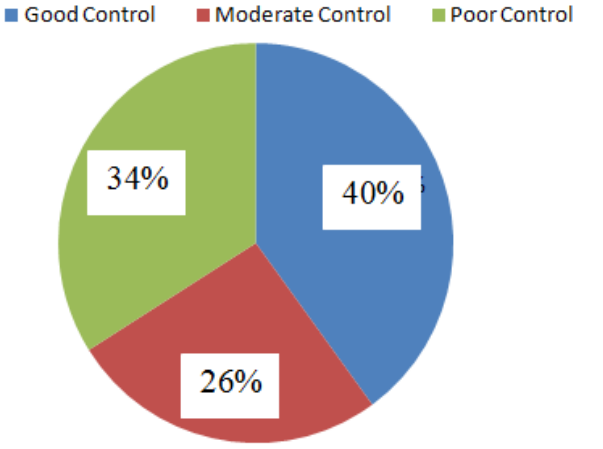

Figure No.2: Control of disease among diabetic patients

DISCUSSION

The humoral immune response plays an important role in the two diseases i.e. diabetes and periodontitis. We also found altered immunoglobulin levels in the mentioned diseases. The literature review highlighted that periodontitis is a frequent complication of diabetes, and diabetic subjects often exhibit decreased immune response and more complications[9]. Besides, like our study, other study also documented that the oral complications of diabetes increase with the age and poor control of the disease[11].

Both males and females exhibited a similar pattern of immunoglobulins in the controls as well as in the diseased subjects. Similar findings were observed earlier[7]. The level of serum IgA and IgG in the diseased group was found elevated. Another study also showed increased levels of IgA and IgG in the diseased group as compared to the healthy subjects[9]. The most probable reason for this elevation might be the tissue alterations in the same disease and increased antibody production as required for neutralization of toxins. Some scientists demonstrated that IgA and IgG play a protective role in the pathogenesis of periodontal disease[12]. While Vaziri and his coworkers reported no significant difference in the salivary IgA levels between control and diabetic subjects[13].

The IgG levels increased with the increase in severity of the Periodontitis disease. The reason might be that more antibodies are needed for chronic infection. Other scientists also agreed with such findings[9]. While IgA showed slight decrease with the increase in clinical grades of the diabetes disease. This may be either due to the weak response of the diabetes or special homeostatic mechanism of the body. The literature review is not clear regarding this point. Moreover, immunoglobulins A and G decreased with the progress of the age in the present study. This is in agreement with normal physiological function.

The IgM level was not changed in the diseased group. These findings are in accordance with the previous studies[7,9]. The possible explanation may be that local synthesis of immunoglobulin M does not occur in the periodontitis and hence there is no diffusion of IgM unlike IgA and IgG in the blood stream from a local source. In addition, the synthesis of the same immunoglobulin is slow in diabetes and increase usually in the autoimmune diseases and viral infections[14]. Hence the information regarding the immune response in the two diseases is contradictory and has not been studied extensively in our country. Therefore, it should be given special attention and further study comprising of large sample size including other parts of the country has to be designed so as to clarify all these observations.

CONCLUSION

The result of the current study indicates the role of humoral immune response in the two mentioned diseases. The higher levels of immunoglobins particularly IgA and IgG might be due to protective mechanism against the weak immune response and the increased bacterial challenge in diabetes and periodontitis.

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