

## ORIGINAL ARTICLE

## ASSESSMENT OF DIABETIC PATIENT'S RESPONSE TO VACCINATION OF TETANUS

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**Background:** Type I diabetes has been associated with multiple abnormalities of T-cell function and quantities. Initial studies proved that decreased CD4/CD8 lymphocyte ratios reduced lymphocyte blastogenesis and acquired defects in interleukin-2 production in people affected by DM. Subsequent research revealed reduced T-cell primary responses to protein antigens. Tetanus accounts for large number of deaths particularly in developing countries. Hence; we assessed the response of patients with diabetes to vaccination of tetanus. **Materials & Methods:** The present study included a total of 90 patients suffering from type-2 diabetes who referred to the department of medicine of the institution. The tetanus antitoxin levels of all participants were below 0.1 IU/ml. Type 2 diabetes mellitus (DM) has feature of insulin resistance in peripheral tissue and an insulin secretory defect of the beta cell. Vaccination of the participants is done at 0, 1, and 12 months and venous blood samples were taken at the fourth week after each vaccination. Serums were kept at -70 degree C until analysis. Tetanus antitoxin levels were detected using a commercial ELISA kit. Antitoxin level >5.0 IU/ml: re-vaccination should be administered after 10 years. Patients were stratified into three groups according to the duration of diabetes mellitus as < 5 years, 6-10 years and >11 years. All the result were analysed by SPSS software. **Results:** Mean age of the patients in the diabetic group was 56.5 years. Out of a total of 90 patients, 58 were males while 32 were females. 64 patients undergoing treatment for DM were on oral anti-diabetic therapy while 26 of them were on insulin therapy. In the control group, mean age of the patients was 53.5 years. 42 patients in the control group were males. Most of the patients in diabetic group were of age group 61 to 70 years, while in the control group, most of the patients were of the age group of 51 to 60 years. **Conclusion:** Significant amount of comparability exist in relation to the response to tetanus vaccination, between patients with and without diabetes.

**Key Words:** Diabetic, Tetanus, Vaccination

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**I**NTRODUCTION

Multiple abnormalities of T-cell function and quantities has been associated with Type I diabetes (DM). Initial studies proved that decreased CD4/CD8 lymphocyte ratios, reduced lymphocyte blastogenesis and acquired defects in interleukin-2 production in people affected by DM.<sup>1-3</sup> Subsequent research revealed reduced T-cell primary responses to protein antigens.<sup>4</sup> A suppression of a T-helper cell 1 phenotype with a reduced expression of Th1- associated chemokine receptors and a decreased secretion of Th1 cytokines have been demonstrated by other investigations.<sup>5</sup> Despite being very potential infectious

disease, tetanus can be prevented by vaccination. It accounts for large number of deaths particularly in developing countries.<sup>6,7</sup> Hence; we assessed the response of patients with diabetes to vaccination of tetanus.

**MATERIALS & METHODS**

The present study included a total of 90 patients suffering from type-2 diabetes who referred to the department of medicine of the institution. Ethical clearance was taken from the institution after explaining them in written the entire study protocol. The tetanus antitoxin levels of all participants were below 0.1 IU/ml. Type 2 diabetes mellitus has feature of insulin resistance in peripheral tissue and an insulin secretory defect of the

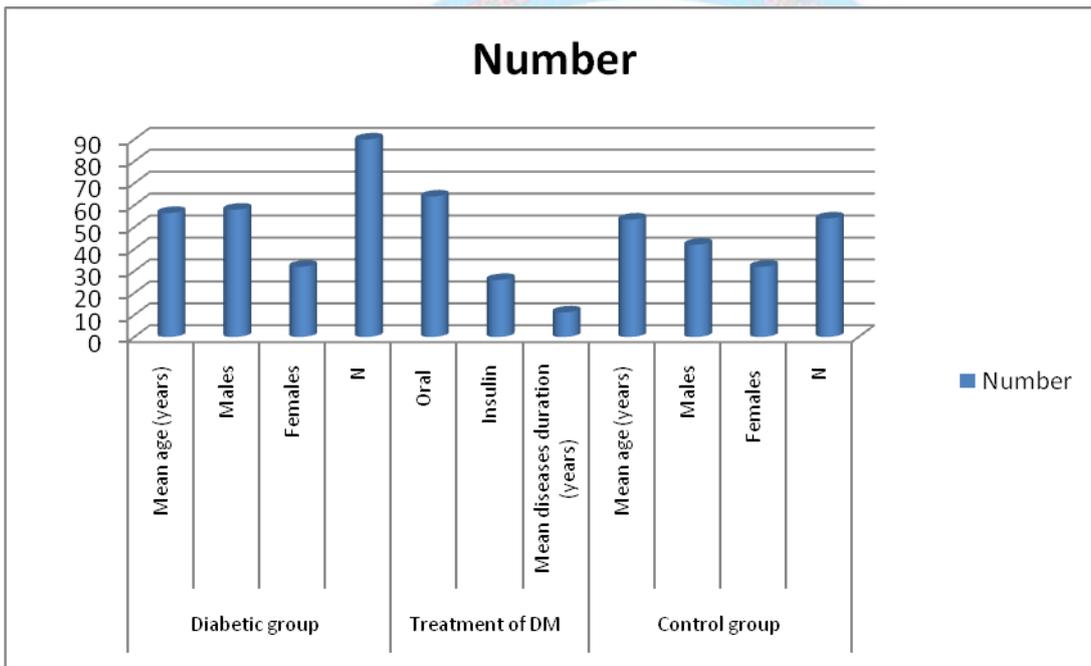
beta cell. The proprietaries are by using a glucose load containing the equivalent of 75g anhydrous glucose dissolved in water (American Diabetes Association, 2005). Patients with chronic or autoimmune diseases were excluded from the study. Each patient completed a standard questionnaire including information about age, sex, telephone contact information, duration of disease, and treatment modality. Vaccination of the participants is done at 0, 1, and 12 months and venous blood samples were taken at the fourth week after each vaccination. Serums were kept at -70 degree C until analysis. Tetanus antitoxin levels were detected using a commercial ELISA kit. Antitoxin level of less than 0.1 IU/ml was considered under the category of no protection, primary vaccine should be administered. Antitoxin level 0.1- 0.5 IU/ml was categorized under partial immunity is present; re-vaccination should be administered. Antitoxin level 0.6-1.0 IU/ml was put under the category of adequate immunity is present; re-vaccination should be administered within 2 years. Antitoxin level 1.1-5.0 IU/ml: long-term immunity is present; revaccination should be administered within 5-10 years. Antitoxin

level >5.0 IU/ml: re-vaccination should be administered after 10 years. Patients were stratified into three groups according to the duration of diabetes mellitus as < 5 years, 6-10 years and >11 years. All the result were analysed by SPSS software. Chi-square test and student t test was used for assessment of level of significance.

**RESULTS**

**Graph 1** highlights the demographic details of the patients. Mean age of the patients in the diabetic group was 56.5 years. Out of a total of 90 patients, 58 were males while 32 were females. 64 patients undergoing treatment for DM were on oral anti-diabetic therapy while 26 of them were on insulin therapy. In the control group, mean age of the patients was 53.5 years. 42 patients in the control group were males. **Graph 2** and **Table 1** shows the distribution of the patients according to different age groups. Most of the patients in diabetic group were of age group 61 to 70 years, while in the control group, most of the patients were of the age group of 51 to 60 years.

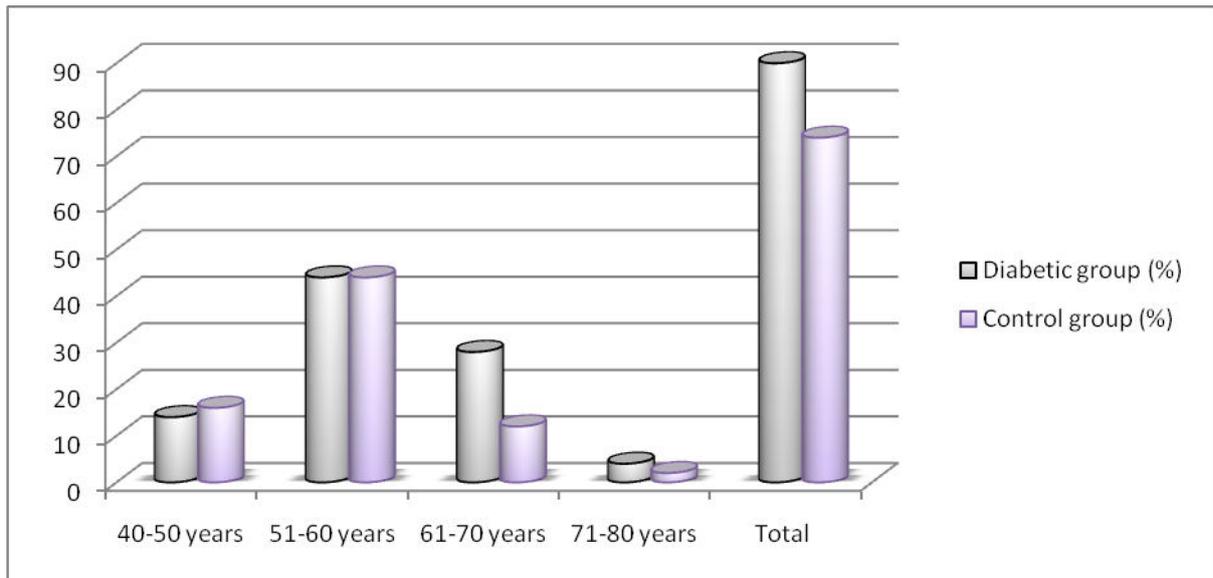
**Graph 1:** Demographic details of the patients



**Table 1:** Distribution of patients in both the groups according to the age group

Age group	Diabetic group (%)	Control group (%)
40-50 years	14	16
51-60 years	44	44
61-70 years	28	12
71-80 years	4	2
Total	90	74

**Graph 2:** Age distribution of the patients



**DISCUSSION**

Diabetes mellitus is an endocrine disease that profoundly affects the immune system. Hyperglycemia largely influences neutrophil and macrophage functions. Impairment in functions such as chemotaxis, phagocytosis, and adherence and killing of microorganisms within the cell occurs during this endocrine disease.<sup>8</sup> In diabetic patients in whom their blood sugar level is well controlled, continuous disturbance is not generally observed in host resistance against infections; however, in those in whom blood sugar levels are not controlled, impairment in chemotaxis, phagocytosis and microbicidal functions has been demonstrated. After entry into the body *C. tetani* transforms into a vegetative rod shaped bacterium and produces the tetanus toxin.<sup>9</sup> This toxin binds tightly and irreversibly to receptors on the spinal cord and brain stem thus blocking neurotransmission. Dis-inhibition of anterior horn cells and autonomic neurons result in increased muscle tone, painful spasms, and widespread autonomic instability.<sup>10, 11</sup>

In the present study, we couldn't observe any significant correlation between patients in the diabetic group and the control group in context of the immune response against vaccination of tetanus. Similar result has been reported by previous authors who observed good response against influenza vaccine in 70% of patients with type 1 diabetes mellitus. Investigators determined a statistically insignificant difference in response between the healthy group and type 2 diabetes mellitus patients in the research.<sup>12</sup> Rogers et al reviewed the data in diabetic foot patients receiving tetanus prophylaxis. The infected or ulcerated diabetic foot is a suitable environment for *Clostridium tetani*. Tetanus intoxication as a result of foot ulcer has been described in the literature. Immunopathy, vasculopathy, and ulceration place the diabetic patient at risk for developing tetanus. Of diabetic patients who contract generalized tetanus in the United

States, foot ulcer or gangrene are responsible for 25% of cases. Patients who have diabetic wounds should receive tetanus prophylaxis.<sup>13</sup> Talan et al evaluated the tetanus seroprotection rates and physician compliance with tetanus prophylaxis recommendations among patients presenting with wounds. They prospectively analyzed patients aged 18 years or older who presented to 5 university-affiliated emergency departments (EDs) because of wounds was conducted between 1999 and 2000. Serum antitoxin levels were measured by enzyme immunoassay with seroprotection defined as more than 0.15 IU/mL. They observed that among 1988 patients, the seroprotection rate among was over 90%. From the results, they concluded that in today's scenario, a better awareness of tetanus prophylaxis recommendations is necessary.<sup>14</sup> Eisenhut et al assessed the antibody responses to T-cell dependent and independent antigens in children with Diabetes Mellitus (DM) and compared them to children without DM. They observed that in 36 children with DM and 36 age matched controls, mean age was 10 years. There was no difference in antibody levels against the antigens tested between groups. From the results, they concluded that in children with DM, there was no evidence for a reduced antibody response to T-cell dependent antigens given during childhood.<sup>15</sup> Dashti et al evaluated the antibody responses to vaccines in a group of children with diabetes and in the controls. They assessed 90 children less than 15 years of age with a history of type 1 DM, referred to endocrinology clinics of university hospitals. They observed that among 90 patients with diabetes, 48% were male and 52% were female and in the control group 49% were male and 51% were female. From the results, they concluded that between patients with diabetes and controls who were vaccinated with pertussis, diphtheria, tetanus and mumps vaccines, no significant difference was found.<sup>16</sup>

## CONCLUSION

From the above results, it can be concluded that significant amount of comparability exist in relation to the response to tetanus vaccination, between patients with and without diabetes. However, future researches are advocated for better results.

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