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Serofrequency of Mumps Virus among Children with Type One Diabetes Mellitus Comparing to Control Group in Khartoum State

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ABSTRACT

Background and Objectives: Epidemiological studies suggested that Mumps pancreatitis may associated with subsequent development of type one diabetes mellitus (T1D). This study was aimed to detect sero frequency of Mumps virus among children with T1D mellitus comparing to control group in Khartoum state.

Methods: This was a descriptive case control study involve 90 children with T1D (Test group) and 90 healthy children (Control group) in Khartoum, patients aged between (1-5) years old, conducted in Omdurman Pediatric Teaching Hospital and Gaber Abo Eleiz Hospital - Khartoum State, Sudan, during February to September 2016. Mumps virus IgG for all participants was investigated using commercially available enzyme-linked immunosorbent assay (ELISA). Generated data were analyzed using SPSS and excel software programs.

Results: The results revealed that the frequency of Mumps IgG were 23 (25.6%) and 3 (3.3%) among patients and control group respectively, also shown statistically significant relationship between Mumps virus infection and T1D with P- value (0.048).

Conclusion: The seropositivity of Mumps virus among children with type one diabetes mellitus is significantly detected, further workup is required to co relate and confirmatory test and fellow up with large scale specimen is recommended.

Keywords : Anti Mumps, Type I diabetes mellitus.

I. INTRODUCTION

Epidemiological studies have shown that many viral infections may develop auto immune type I diabetes mellitus (T1D), [(1)]. However, in 1986 and 1987, large outbreaks of Mumps infection occurred among immunized people born between 1967 and 1977, which was due to a single-dose of Mumps vaccine regimen that were develops type one diabetes mellitus (T1D) in a significant number of Mumps infected children's [(1)]. This caused a shift in peak incidence from person's age 5-9 years to those age 10-19 years [(2)], also several study were aimed to co – relates between many viruses infection and pancreatic auto reactivity that ultimately results in β-cell destruction resulting in insulin dependent T1D [(1,2).] It's very clear now; that several viruses, such as certain Coxsackie virus's species, Rubella virus as well as Mumps virus, are able to directly infect and lyses insulin-producing β-cells [(4-6)]. Thus, one mechanism by which viruses might induce T1D is through direct cytopathic effects, resulting in β-cell destruction and pancreatic cells death by auto reactive mimic antibodies [(6)]. The evidence for an involvement of Mumps viruses in triggering auto reactivity is of a different nature [(6,7)]. The destruction of insulin-

producing pancreatic β-cells by an auto reactive immune system is the hallmark of Type 1 diabetes (T1D). The incidence rates of T1D have been rising over the past few decades worldwide by an average of 3% per year new discovered cases [8], and it has recently been predicted that T1D incidence may double in children under the age of 5 years by the year 2020, especially in developed countries [9]. To examining this evidences our study was searching the history of Mumps infection in preschool children those newly develops T1D by detecting Mumps viruses IgG antibodies titer.

II. MATERIAL AND METHOD

This was a descriptive case control study involving 90 children with T1D (Test group) and 90 healthy children matched control group aged between (1-5) years old with age mean of 3.15 years old conducted in Gaber abo Eleiz Hospital and Omdurman Paediatrics Hospital during February to October 2016, data was collected by structured questionnaire. Ethical approval was taken from Al Neelain University Research Ethical Committee.

Experimental work

Blood specimens were collected and serum was separated and screened for anti-Mumps IgG antibodies using enzyme linked immune sorbent assay (ELISA), (Autoimmune - Germany) technique at research laboratory of Omdurman Ahlia University.

Collection of specimens and processing

Three millilitres of blood were collected under aseptic technique into plain container, the sera obtained after centrifugation was kept at -20 until IgG antibodies were qualified by ELISA. All reagents were brought to room temperature before assaying. Fifty micro litter negative control, positive control and samples were dispensed into their respective wells, then 100µ of diluted enzyme tracer (conjugate) were dispensed into all wells, except for the blank well, then the card board sealer was applied on to micro titters wells to prevent evaporation, and incubated for 3 hours at 37°C. The choromogen / substrate was prepared just before the end of incubation, and when incubation was completed, the card board was discarded, and the wells were washed by using automatic washer, after that the wells mouth were turned down on to blotting paper to remove any liquid residue, the a hundred microliter of choromogen / substrate solution was dispensed in to all wells and incubated for 30 minutes at room temperature away from intense light, after that a 100µ of blocking reagent was dispensed into all wells in the same order and at the same rate as for choromogen / substrate.

Measurement

The absorbance of specimens were measured with photometer at 450/630 nm (Readwell TOUCH-India) within one hour of adding the blocking reagent.

Calculation and interpretation

The result calculated by cut-off value. The cut-off value was determined by adding the mean absorbance for the negative control values (NC) multiplied by 0.5 to the mean absorbance for the positive control values (PC) multiplied by 0.5. (0.5 * Negative control values + 0.5 * positive control values) The presence or absence of anti-Mumps was determined by comparing the absorbance of the unknown samples to that of the cut-off value. The unknown samples with absorbance values less than or equal to the cut-off value were considered reactive for anti- Mumps. The unknown samples with absorbance values greater than the cut-off value were considered non-reactive. Samples with absorbance values within ±10% of the cut-off value were retested in order to confirm the initial result. Samples which were repeatedly reactive were considered positive. Samples which were non-reactive at the second test were considered negative.

Data Analysis

The generated data were analysed by using master sheet and Statistical Package for Social Sciences (SPSS) program and Excel. The seropositivity of anti-Mumps (IgG), and related to type one diabetes mellitus and statistical significant relationship was obtained by P-value ($P \leq 0.05$).

Table 1. Age distribution of study population

Age in years	Patents Group Frequency (%)	Control Group Frequency (%)
Less than 2	21 (23.3%)	15 (16.7%)
2 – 3	30 (33.3%)	27 (30.0%)
3 – 4	23 (25.6%)	40 (44.4%)
5 – 6	16 (17.8%)	8 (8.90%)
Total	90 (100%)	90 (100%)

Table 2. Sero frequency of Mumps virus among test (T1D children's) and healthy children's (control group)

Anti-Mumps IgG	Patients Group (TID)	Control Group (Healthy)	Total
Positive	23 (25.6)	3 (3.3)	26
Negative	67 (74.4)	87 (96.7)	154
Total	90 (100%)	90 (100%)	180

P- Value of (0.048).

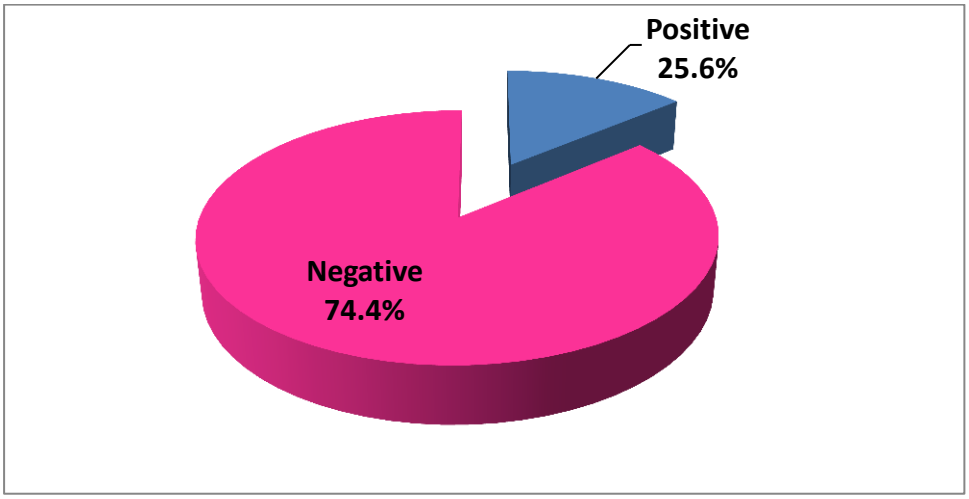

Figure 1. Serofrequency of Mumps IgG among known T1D patients.

III. RESULTS

A total of 90 T1D children patients and 90 healthy participants who attending different hospitals in Khartoum, were enrolled in this study, the patients group age ranged between (1 -5 years) with mean (±3.15) years, of them 41 (45.5%) were males and 49(54.5%) were females. Out of them 23 (25.6%) were seropositive for Mumps IgG, (Figure 1, Table 2), from them 16 patients (69.6%) were males and 7 were female (30.4%). And out of the 90 health children (Control Group) only 3 of them (3.3%) were Sero positive to Mumps virus one of them was male and the remaining (two) were females. Obtained results showed strong statistical relation between Mumps virus IgG sero prevalence and T1D with P-value of (0.048).

IV. DISCUSSION

Several researches have been made and different results reported in various countries focusing on many Viruses associated out immune diabetes mellitus type one, especially Mumps viruses. This study aimed to estimate the Serofrequency of Mumps viruses among T1D patients. The overall seropositive of Mumps viruses IgG among T1D patients were 23 (25.5%), also statistical analysis showed significant relation P- value of (0.048), which is study very similar to the study reported by Ragi Walium et al, in Netherland (2000), they found Sero prevalence of Mumps viruses among T1D (20.4%), [8]. Also, relatively and closely lower to study conducted by Hyoty Hamilton et al, 1993 [9], in Finland, they found Mumps sero prevalence in T1D children patients as (17%), other study result obtained by Haller Magellan et al, 2005 [10], in North America found the Mumps associated T1D in 250 patients was 10.4% by using molecular techniques, our results was higher than them results. However; it was lower result than that obtained by Goto A, Takahashi et al, 2008 [11], in Japan, who detected (32%) in their study. In the present study, the relation between Mumps seropositivity and children patients age; demonstrated that 53 (29.4%) were in-between 4 – 5 years old followed by 41 (22.8%) were more than 5 years old. In conclusion this study reported high result for Serofrequency of Mumps IgG among T1D patients that indicate the important of screening for Mumps infection for all school aging children's and intensive fellow up.

V. CONCLUSION AND RECOMMENDATION

The seropositivity of Mumps virus among children with type one diabetes mellitus is significantly detected, further workup is require to co relate and confirmatory test like Island of Langerhans Antibody (ICA- IgG) and fellow up with large scale specimen is recommended.

All preschool children must be immunized against Mumps viruses to minimize the T1D incidences. Further confirmation and mentoring with large scale specimen is recommended to validate the results.

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