International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

A Study of Secondary Bacterial Infections in Diabetes Mellitus Type 1

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Abstract: ***Background: One of the most commonly seen forms of Diabetes Mellitus in the young age group is the type 1. The genes responsible are pin pointed and is more commonly understood that the hereditary factor plays a very important role in the disease. Evidence from clinical studies and the recently progressive evidence based medicine is unable to understand the relations between diabetes and the mechanism in which it forms an immune – compression is yet to be established. The reasons for this are many. One factor which is hindering the progression to understand the depth include incompletely defined abnormalities which are seen in cell mediated immunity and phagocyte function associated with high sugar serum levels and also upto some extent less vascular perfusion of the tissues which are vulnerable to the infections. Diabetes mellitus type 1 is associated with increased rates of infections. The patients also tend to have more frequency and severity of infections. High serum glucose levels in the serum acts as a rich nutrient medium and thus aids the colonization, nurtures and provides a very suitable environment and ultimately helps in the growth of pathogens. This study is intended to help the practicing pediatricians to understand the most common secondary infections that is evident and involved in Diabetes Mellitus Type 1. Methods: Thirty patients who were freshly diagnosed diabetics were included in the study. The study was done in the Department of Pediatrics, …… Medical College…… The study was done from October 2015 to September 2016 . Results: The mean age of the population was found to be 9.45 years and the standard deviation was 5.34 years. In the study the total number of upper respiratory tract infection cases was found to be 2 and the Lower respiratory tract infection was found to be 1, The urinary tract infection was found to be in 2 patients, bacterial skin lesion was diagnosed in three patients, Fungal skin lesion in 2 patients and the systemic skin infections was found to in one patient. The patients who showed the positivity for symptoms were also checked for culture and the positive culture growth was documented and was further tested for significance. There was a strong association of the infections in the diabetic mellitus patients. (P<0.05). Conclusion: Diabetes is successfully linked to the infections and the most common infections along with the association of the sugar level with the same has been proved successfully.***

Keywords: Type 1 Diabetes Mellitus, Fungus, Bacterial, Paracitic Infestations.

1. Introduction

Diabetes mellitus has been associated with increased rates of infections[1,2,3]. Impairment of cell mediated immunity is the chief cause. Respiratory infections, urinary tract infections, Gastro Intestinal tract infections and skin infections are quiet common. Evidence from clinical studies for a causal relation between diabetes and common infections is, however, limited and not consistent [4,5,6]. Fungal infections like candida are more commonly seen in the patients, who are suffering from persistent hyperglycemia[7,]

One of the most commonly seen forms of Diabetes Mellitus in the young age group is the type 1. The genes responsible are pin pointed and is more commonly understood that the hereditary factor plays a very important role in the disease. Evidence from clinical studies and the recently progressive evidence based medicine is unable to understand the relations between diabetes and the mechanism in which it forms an immune – compression is yet to be established. The reasons for this are many. One factor which is hindering the progression to understand the depth include incompletely defined abnormalities which are seen in cell mediated immunity and phagocyte function associated with high sugar serum levels and also upto some extent less vascular perfusion of the tissues which are vulnerable to the infections. Diabetes mellitus type 1 is associated with increased rates of infections. The patients also tend to have more frequency and severity of infections. High serum glucose levels in the serum acts as a rich nutrient medium and thus aids the colonization, nurtures and provides a very suitable environment and ultimately helps in the growth of pathogens. This study is intended to help the practicing pediatricians to understand the most common secondary infections that is evident and involved in Diabetes Mellitus Type 1.

2. Aims and Objectives

To study and understand the infection pattern in Diabetes Mellitus Type 1.

3. Materials and Methods

Thirty patients who were freshly diagnosed diabetics were included in the study. The study was done in the Department of Pediatrics, …… Medical College, ……...

The study was done from October 2015to September 2016 . The study is a multi staged random double blinded study.

Detailed history was taken and prompt immediate treatment for diabetes was started. These patients were followed and the commonly encountered infections were noted for the study period. The serum fasting level glucose was checked and noted for all the individual types of infections and the mean sugar level was noted.

Symptoms of the infection was found and noted. Swabs were taken and sent to the Department of Microbiology to find out the positive culture. After the culture showed positive signs definitive treatment was given for the specified type of infection.

The follow up was done after one month of completion of treatment and the treatment of choice in 100% of the cases were Human Insulin. The case was further studied after three months and six months. The initial infections that were tagged for the particular patients were checked again for the recurrence of the same disease and at the same time any other new infections were noted and treated promptly.

All the statistics were done using latest SPSS software 2015, California.

4. Results

Table 1: Mean age of the study population.

	Mean	Std. Deviation
Age	9.45	5.34

The mean age of the population was found to be 9.45 years and the standard deviation was 5.34 years.

Table 2: Frequency of symptoms of different diseases

Symptoms of the disease	Total	Mean fasting serum glucose level (gm/Dl)
upper respiratory tract infection	2	109
Lower respiratory tract infection	1	148
Urinary Tract Infection	2	132
Bacterial skin and mucous membrane infection;	3	176
Mycotic skin and mucous membrane infection	2	178
Systemic Infection	1	191

In the study the total number of upper respiratory tract infection cases was found to be 2 and the Lower respiratory tract infection was found to be 1, The urinary tract infection was found to be in 2 patients, bacterial skin lesion was diagnosed in three patients, Fungal skin lesion in 2 patients and the systemic skin infections was found to in one patient.

The patients who showed the positivity for symptoms were also checked for culture and the positive culture growth was documented and was further tested for significance.

Table 3: Commonest Pathogens in the Specien

Symptoms of the disease	Total	Pathogen
upper respiratory tract infection	2	Staphylococci
Lower respiratory tract infection	1	Streptococci pneumoniae
Urinary Tract Infection	2	Clamydiae
Bacterial skin and mucous membrane infection;	3	Staphylococci
Mycotic skin and mucous membrane infection	2	Candida
Systemic Infection	1	Staphylococci

Table 4: Test for significance

Infections	Culture Positivity		p value
	Present	Absent	
upper respiratory tract infection	2	19	0.030
Lower respiratory tract infection	1		
Urinary Tract Infection	2		
Bacterial skin and mucous membrane infection;	3		
Mycotic skin and mucous membrane infection	2		
Systemic Infection	1		

There is a strong association of the infections in the diabetic mellitus patients. ($P<0.05$)

Table 4: Follow up after 1 month of treatment

Symptoms of the disease	Total	Mean fasting serum glucose level (gm/Dl)	Pathogen
upper respiratory tract infection	Nil	--	
Lower respiratory tract infection	Nil	--	
Urinary Tract Infection	1	156	E Coli
Bacterial skin and mucous membrane infection;	Nil	--	
Mycotic skin and mucous membrane infection	Nil	--	
Systemic Infection	Nil	--	

Table 5: Follow up after 3 months

Symptoms of the disease	Total	Mean fasting serum glucose level (gm/Dl)	Pathogen
upper respiratory tract infection	Nil	--	
Lower respiratory tract infection	1	148	Streptococci
Urinary Tract Infection	Nil	--	
Bacterial skin and mucous membrane infection;	Nil	--	
Mycotic skin and mucous membrane infection	Nil	--	
Systemic Infection	Nil	--	

Table 6: Follow up after 6 months

Symptoms of the disease	Total	Mean fasting serum glucose level (gm/Dl)	
upper respiratory tract infection	Nil	--	
Lower respiratory tract infection	Nil	--	
Urinary Tract Infection	1	138	E Coli
Bacterial skin and mucous membrane infection;	Nil	--	
Mycotic skin and mucous membrane infection	Nil	--	
Systemic Infection	1	184	Staphylococci

5. Discussion

The infections are quiet common in the diabetes. Our study is in agreement with a similar study conducted by Ananth Pai et al [8]. In our study a sincere effort has been put to understand the link between the association of infections and the glucose in the serum levels. Diabetes type 1 is indeed the

most discussed topic now days. The glucose level in the serum has to be maintained within normal limits in order to have a healthy and an infection has to be in check. The insulin is the Gold standard of treatment. Newer modalities have come with promising future. Successes with islet cell and pancreas transplantation have provided proof of concept for cell-based therapies for type 1 diabetes. However, the demand for donor pancreases far exceeds the number available, and maintenance of long-term graft survival is a problem. The search for a renewable source of stem cells capable of regenerating pancreatic islets has therefore been intensive. Pancreatic beta cell turnover occurs even in the normal pancreas, although the source of the new beta cells remains controversial. This persistent turnover suggests that, in principle, it should be possible to develop strategies for reconstituting the beta cell population in diabetics. Attempts to devise techniques for promoting endogenous regenerative processes by using combinations of growth factors, drugs, and gene therapy have failed thus far, but this remains a potentially viable approach. A number of different cell types are candidates for use in stem cell replacement strategies, including iPS cells, ES cells, hepatic progenitor cells, pancreatic ductal progenitor cells, and MSCs. Successful therapy will depend on the development of a source of cells that can be amplified to produce large numbers of progeny with the ability to synthesize, store, and release insulin when it is required, primarily in response to changes in the ambient level of glucose. The proliferative capacity of the replacement cells must be tightly regulated to avoid excessive expansion of beta cell numbers and the consequent development of hyperinsulinemia/hypoglycemia; moreover, the cells must withstand immune rejection. Although it has been reported that ES and iPS cells can be differentiated into cells that produce insulin, these cells have a low content of insulin and a high rate of apoptosis and generally lack the capacity to normalize blood glucose levels in diabetic animals. Thus, ES and iPS cells have not yet been useful for the large-scale production of differentiated islet cells. During embryogenesis, the pancreas, liver, and gastrointestinal tract are all derived from the anterior endoderm, and transdifferentiation of pancreas to liver and vice versa has been observed in a number of pathologic conditions. There is also substantial evidence that multipotential stem cells reside within gastric glands and intestinal crypts. These observations suggest that hepatic, pancreatic, and/or gastrointestinal precursor cells may be reasonable candidates for cell-based therapy for diabetes, although it is unclear whether insulin-producing cells derived from pancreatic stem cells or liver progenitors can be expanded in vitro to clinically useful numbers. MSCs and neural stem cells both reportedly have the capacity to generate insulin-producing cells, but there is no convincing evidence that either cell type will be clinically useful. Clinical trials of MSCs, USCs, HSCs, and ASCs in both type 1 and type 2 diabetes are ongoing.

Diabetes Mellitus patients as discussed earlier are at increased risk for developing common infections. In this study were able to study associations of diabetes with common infections involving different organ systems. Statistically significant associations were found out between the incidence of infections and diabetes mellitus Type 1. The reason for these infections is the decreased immunity in the human body. The reason for this include incompletely defined abnormalities in cell mediated immunity and phagocyte function associated with hyperglycemia and also less vascular perfusion of the tissues.

Many aspects of immunity are altered and diseased in patients with diabetes mellitus. Leukocyte particularly Polymorphonuclear types function is depressed and acidosis is also present this doubles the effects. Its chemotaxis, adherence and phagocytosis will be affected. Antioxidant systems involved in bactericidal activity will be pathologically impaired. The study to support humoral immunity pathogenicity is limited, but responses to vaccines appear to be normal. Skin responses to antigen prick test challenges and measures of T-cell function may be depressed.

The need of the hour is to identify the disease and to treat the same with great effectiveness. In this study it proves that there is a strong link between the sugar serum level and the infection rates. So it is the need of the hour especially in a developing economy like ours to find a permanent solution to the ever up going problem.

6. Conclusion

Diabetes Mellitus depresses the immunity and causes a plethora of infections. This study helps the practicing pediatricians to understand the common secondary infections and thus help them in their daily practice. The most commonly encountered pathogens have also been mentioned which is also very helpful to treat the patients.

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