

A Hospital Based Cross-Sectional Study on the Pattern of Infections in Diabetes Mellitus

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Abstract: Background: Individuals with Diabetes Mellitus have a greater frequency and severity of infections. The reasons for this include abnormalities in cell mediated immunity and phagocyte function associated with hyperglycemia, as well as diminished vascularization. Diabetics are plagued by an enhanced susceptibility to infection of the skin, as well as to tuberculosis, pneumonia, and pyelonephritis. Such infections cause the death of about 5% of diabetics. The etiology and the antibiotic resistance of pathogens have been changing over the past years. This study is planned to know the pattern of infections occurring in diabetics and to correlate with the duration of diabetics' ant the glycemic control and to know the etiology of the infections in hospitalized diabetics. **Primary objective:** To study the pattern of infection in hospitalized patients. **Secondary objective:** To correlate the duration of diabetics, blood glucose level, HbA1c with infection in hospitalized diabetic patients and to identify the etiology of infection. **Methods:** The study was conducted in Department of Medicine, Madras Medical College, Chennai, from March 2017 to February 2018. Patients above 18 years with diabetes mellitus admitted to Rajiv Gandhi Govt Hospital with presence of infections were included in the study. Patients with stress hyperglycemia, with HIV, those on immune suppressants or having malignancy were excluded from the study. The duration of diabetes was noted and the glycemic control was observed with the help of HbA1c and blood sugars and correlated with the various types of infections. The etiology of infections was studied the help of culture of appropriate samples like urine, blood, pus, and sputum. **Statistical method:** The statistical software namely, SPSS 22.0, and R environment ver.3.3.2 were used for the analysis of the data and Microsoft Word and Microsoft Excel have been used to generate graphs, tables etc. **Results:** the sample size was 100 patients, with 51 were males and 49 were females. The most common infection found was skin and soft tissue infections (44%) of which diabetic foot infection (32%) was the commonest. The most common cause of infection was Klebsiella. The next common infection was urinary tract infection (33%) and the most common cause of infection was Escherichia coli. On comparing the mean duration of diabetes, HbA1c and blood sugar of various types of infections, no significant difference was found between the mean durations, HbA1c and blood sugars of different infections, though the mean HbA1c levels in all the infections were well above 7% indicating uncontrolled blood sugars. **Conclusion:** The most common infections found were skin and soft tissue infections, followed by UTI and RTI. The mean HbA1c was found to be higher than recommended levels in all types of infection. The most common organism isolated was Klebsiella in pus and sputum cultures, E.coli in urine cultures. There was no significant difference between mean HbA1c and blood sugars of various infections.

Date of Submission: 16-03-2018

Date of acceptance: 31-03-2018

I. Introduction

Diabetes mellitus (DM) is a major and increasing public health and clinical problem. Diabetes mellitus affects function of multiple organ systems and thus impose a tremendous burden on individuals with diabetes and on health care systems. Individuals with diabetes have a greater frequency and severity of infections. The reason for this includes abnormalities in cell mediated immunity and phagocyte function associated with hyperglycemia, as well as diminished vascularization¹. Diabetics are plagued by an enhanced susceptibility to infections of skin, as well as to tuberculosis, pneumonia and pyelonephritis. Such infections cause the deaths of about 5% of diabetics². This study was planned to know the pattern of infections occurring in diabetics and to correlate with the duration of diabetes and the glycemic control and to know the etiology of the infections in the hospitalized diabetics.

II. Aims and objectives

Primary objectives: To study the pattern of infections in hospitalized diabetic patients.

Secondary objectives: To correlate the duration of diabetics, blood glucose levels, HbA1c with infections in hospitalized diabetic patients. To identify the etiology of infectious diseases in diabetics.

III. Materials and Methods:

The study was conducted in Department of medicine, Madras Medical College, Chennai, from March 2017 to February 2018.

Inclusion criteria:

1. Age more than 18 years
2. Patients with diabetes mellitus (both known and newly diagnosed) admitted for infection

Exclusion criteria:

1. Age less than 18 years.
 2. Stress hyperglycemia.
- HIV infection, patient on immune suppressants or steroids, patients with malignancy.

Method of collection of data:

Detailed history, comorbid conditions, clinical examination and following investigation were done. Complete hemogram. HbA1c, Blood sugars (fasting and post prandial), urea, creatinine, electrolytes, urine routine, chest x-ray, blood culture, urine culture, sputum culture, pus culture. Statistical software: The statistical software namely, SPSS 22.0 and R environment ver.3.3.2 were used for the analysis of data and Microsoft Word and Microsoft Excel have been used to generate tables.

IV. Results and analysis

This study was done with a sample of 100 out of which 51 were males and 49 were females.

Pattern of infections: In our study the most common infection found was skin and soft tissue infections (44%) of which diabetic foot infection (32%) was the commonest. The most common soft tissue infection was Klebsiella. The next most common infection was urinary tract infection (33%) and the most common cause for urinary tract infection was Escherichia coli. A total of 95% patients recovered in our study.

Organisms grown in urine culture of patients studied:

Organism grown in urine	Number	Percentage
E.coli	11	29.7%
Non albicans candida	4	10.8%
sterile	16	43.2%
Klebsiella	3	8.1%
Not available	3	8.1%
Total	37	100%

Organism grown in pus culture of patients studied:

Organism grown in pus	Number	Percentage
Klebsiella	14	31.8%
Pseudomonas	10	22.7%
Proteus mirabilis	1	2.3%
Gram negative non fermenters	1	2.3%
No growth	8	18.2%
E.coli	4	9.1%
Proteus vulgaris	2	4.5%
Non amenable for culture	4	9.1%
Total	44	100%

In a study by Burekovic et.al³ showed that almost half of the hospitalized diabetic patients had acute infectious conditions. The study included 450 diabetic patients hospitalized in 24 months period. Most frequent were Urinary Tract Infection and commonest agent was E. coli. The most common cause of soft tissue infection was Staphylococcus aureus. In a study by Porwal M et.al⁴ 200 patients with diabetes mellitus admitted to intensive care unit were studied. Out of 200 patients, 30% of patients had acute infections. Urinary tract infections were the commonest cause of admissions. Foot ulcers were common in males above 46 years, elderly females were prone to urinary tract infection and and young diabetics were prone for respiratory tract infection.

In the present study, on comparing the different age groups in various infections, it was found that urinary tract infection were more in the age group of 40-60 years, respiratory tract infections were more in the age group of 40-50 years and skin and soft tissue infections were more in the age group of 60-70 years. We found that urinary tract infections were more common in females, whereas skin and soft tissue infections and respiratory tract infections were predominantly found in females.

Distribution of duration of diabetes in various infections:

Infection	Mean duration(yrs.)	SD	Number
Abdominal infection	4.25	4.92	4
Eye infection	0.00	0.00	2
Respiratory tract infection	4.19	4.31	23
Skin and soft tissue	7.39	6.78	44
Tuberculosis	0.41	0.50	4
Urinary tract infection	6.03	5.23	37

P Value= 0.050(not significant)

Distribution of HbA1c in various infections:

Infection category	HbA1c	Standard deviation	No.
Skin and soft tissue	10.55	2.84	44
Urinary tract	9.81	2.82	37
Respiratory tract	9.86	2.35	23
Tuberculosis	7.17	0.84	4
Abdominal infection	9.65	2.42	4
Eye infection	12.45	1.34	2

p- Value= 0.151(not significant)

Urinary tract infections:

A study by Aswani SM et.al⁵ which included 181 diabetics and 124 non diabetic subjects with culture positive UTI, showed that almost 30% of patients presented with asymptomatic bacteriuria and the prevalence of pyelonephritis were significantly higher. The majority of diabetics with UTI (87.14%) had HbA1c <6.5 with p<0.001. the isolation rate of E.coli from urine culture was 64.6% followed by Klebsiella(12.1%). In the present study UTI were common in females and in the age group of 50-60 years. The mean HbA1c in this category was 9.81±2.82%. we can infer from this that the average HbA1c was higher than the recommended levels of 7% by ADA.

Foot infections:

A study by Goldstein EJC et.al⁶ found that staphylococcus aureus was the most common isolate (76%), including methicillin resistant S. aureus(MRSA) in 5 of 25 patients. Sparfloxacin and Levofloxacin were the most active agents tested with activity against ≥ 88% of the isolates. They concluded that MRSA and enterococci and now a common cause of diabetic foot infections. In the present study, out of the 44 patients with skin and soft tissue infections, foot infections (32%) were the commonest infections found in hospitalized patients. Klebsiella was the most common organism isolated in pus culture.

Respiratory tract infections:

A study by Muller LMJA et.al⁷ concluded that patients with diabetes were at increased risk for lower respiratory tract infection, urinary tract infection and skin and mucus membrane infection. In our study we found that klebsiella was the commonest organism (30.4%) isolated in sputum cultures.

Tuberculosis:

In a cross-sectional study by Raghuraman S et.al⁸ done in Puducherry, a total of 223 patients with tuberculosis were screened for the presence of diabetes mellitus and also the details of the patients who had already been diagnosed for diabetes were taken. They found that the prevalence of diabetes in tuberculosis patients was found to be 29%. Diabetes was significantly associated with old age, family history of diabetes, consumption of alcohol and sputum positivity.

In our study 4 out of 100 patients were found to have tuberculosis. The mean HbA1c was found to be 7.17±0.84%. One of the patients had pulmonary tuberculosis and 3 patients had extrapulmonary tuberculosis. We compared the mean HbA1c, fasting and post prandial blood sugars of various types of infections to know if there is any relationship between particular infections and HbA1c levels. No significant correlation was found though the mean HbA1c levels in all the infections were well above 7% indicating uncontrolled blood sugars.

V. Conclusions

1. The most common infection found were skin and soft tissue infections, followed by UTI and RTI>
2. The mean HbA1c was found to be higher than recommended levels in all types of infections.
3. The most common organism isolated was klebsiella in pus cultures and sputum cultures, E.coli in urine cultures.
4. There is no significant difference between mean HbA1c and blood sugars of various infections. Also there was no significant difference between the mean duration of diabetes among different infections.

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Dr. D. Damodaran "A Hospital Based Cross-Sectional Study on the Pattern of Infections in Diabetes Mellitus. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 17, no. 3, 2018, pp 01-03.