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A COMPARATIVE STUDY ON THE EFFECT OF ANTIBIOTICS ON THE RENAL PROFILE OF PATIENTS WITH DIABETES MELLITUS

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ABSTRACT

Diabetes mellitus is one of the leading causes of mortality and morbidity in modern life. Diabetes mellitus have many complication later on in life i.e., diabetic nephropathy, diabetic neuropathy, diabetic retinopathy, these are the most common complications of diabetes. Nowadays case of injudicious use of antibiotics is increasing day by day. Therefore our study present with the effect of antibiotics in the renal profile of the patient with diabetes mellitus. A total of 80 blood and urine sample each were collected from diabetic patient and tested in automated analyser and dipstick method. Out of 80 samples from the diabetic patient, 22 patients were taking antibiotics and rest 58 were not taking antibiotics. Out of 22 antibiotic intake patients, 14 diabetic patients have deranged renal profile along with abnormal GFR. Antibiotic used in diabetes mellitus leads to derangement of renal profile. The above findings shows the adverse effects of using antibiotics for treating infections in diabetic patients.

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INTRODUCTION

India is one of the epicentres of the global diabetes mellitus pandemic. Rapid socio-economic development and demographic changes, along with increased susceptibility for Indian individuals, have led to the explosive increase in the prevalence of diabetes mellitus in India over the past four decades¹. Available data also suggest that the susceptibility of Asian Indian people to the complications of diabetes mellitus differs from that of white populations. Management of this disease in India faces multiple challenges, such as low levels of awareness, lack of trained medical and paramedical staff and un-affordability of medications and services². Currently, only one half of the people who have diabetes mellitus have been diagnosed. Screening for diabetes mellitus should begin at 45 years of age and should be repeated every three years in persons without risk factors, and should begin earlier and be repeated more often in those with risk factors³. Risk factors include obesity, first-degree relatives with diabetes mellitus, hypertension, hyper-triglyceridemia or previous evidence of impaired glucose homeostasis. Earlier detection of diabetes mellitus may lead to tighter control of blood glucose levels and a reduction in the severity of complications associated with this disease⁴. Type 2 diabetes mellitus (T2D) is a highly prevalent metabolic disorder characterized by an imbalance in blood glucose level, altered lipid profile and high blood pressure. Genetic constituents, high-fat and high-energy dietary habits, and a sedentary lifestyle are three major factors that contribute to high risk of T2D. Several studies have reported gut microbiome dysbiosis as a factor in rapid progression of insulin resistance in T2D that accounts for about 90% of all diabetes cases worldwide. Xenobiotics including dietary components, antibiotics and non-steroidal anti-inflammatory drugs strongly affect the gut microbial composition and can promote dysbiosis. Any change in the gut microbiota can shift the host metabolism towards increased energy harvest during diabetes and obesity⁵. Diabetic foot with subsequent infection is a frequent complication of diabetes both in developed and developing countries one of the most common causes of morbidity and premature mortality in diabetics⁶. The antibiotic treatment plays an important role in therapy of these infections. Moreover, the major side effect of aminoglycosides is nephrotoxicity which may occur in up to 20% of the patients. Also, at initial stage of diabetes, the kidneys grow large and the glomerular filtration rate becomes greater than expected range⁷. The following study aims to observe the effect of antibiotics on the renal profile of patients suffering from diabetes mellitus. Alternate treatment other than antibiotics for treating infections in diabetes patients can prevent the effect of long term use of antibiotics on diabetic patients which further increases the severity of renal profile deranging.

MATERIALS AND METHODS

Collection of Sample:

After receiving consent, blood and urine samples from the diabetic patient of Guwahati Medical College & Hospital were collected for a period of 3 months.

Renal function test –

Renal function was assessed by autoanalyser i.e. VITROS 5600. The parameters are: Serum creatinine:- By enzymatic method (Two point rate), normal range is 0.66mg/dL - 1.25mg/dL, Blood urea nitrogen:- By colorimetric method, normal range is 19.26mg/dL – 42.80mg/dL, Serum uric acid:- By colorimetric method, normal range is 3.50mg/dL – 8.50mg/dL, Serum electrolytes: - By potentiometric method, Normal range- Sodium: 137-145 mmol/L, Potassium: 3.50-5.10 mmol/L, Chloride: 96-106 mmol/L, Calcium: 8.40-10.20 mmol/L

Routine urine examination-

A complete urinalysis consists of physical analysis (parameters seen are odour, color, specific gravity, clarity), chemical analysis (usually done via dipstick and presence/absence of parameters - pH, glucose, protein, bile salts and bile pigments, blood) and microscopic analysis for the presence/absence of casts, crystals, red blood cells, microorganisms.

RESULT

A total of 80 diabetic patients sample were collected from the blood (serum) and urine during the study period. The diabetic patient isolates were studied to know the effect of antibiotics in renal profile of diabetic patient. Among 80 isolates, age ranging from 29yrs to 75yrs, out of which 39 isolates is from male diabetic patient (n=39, 48.75%) and 41 isolates is from female diabetic patient (n=41, 51.25%). Another data suggestive that, out of 80 isolates, 22(27.5%) were from diabetic patient taking antibiotic and rest 58(72.5%) were from diabetic patient not taking antibiotic (Figure 1).

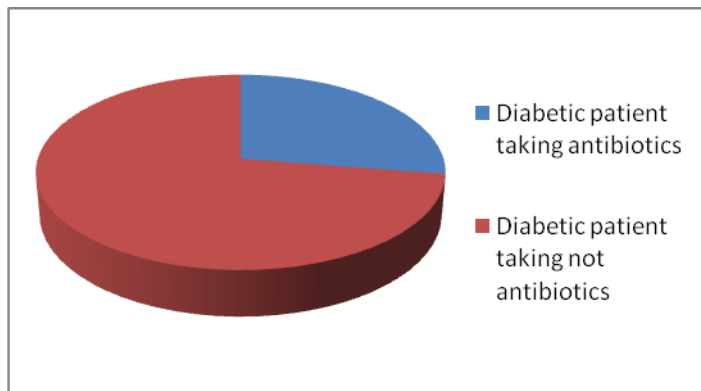


Figure 1: Pie chart showing the distribution of sample of diabetic patient taking antibiotics and not taking antibiotics.

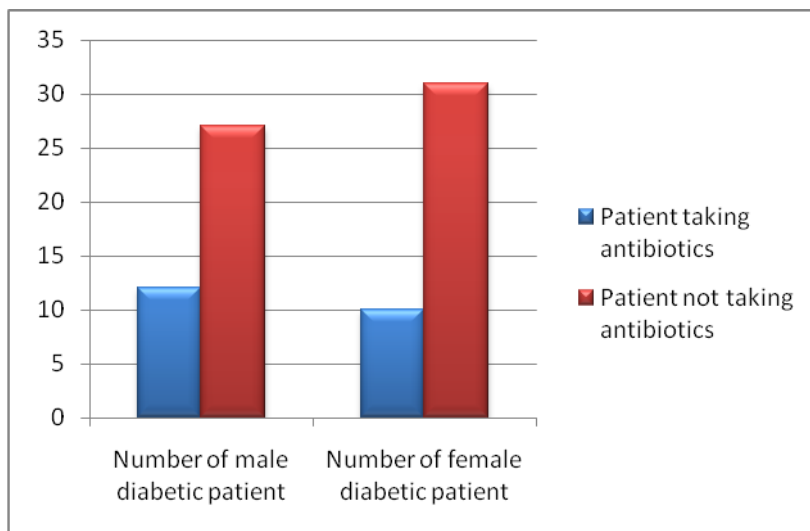


Figure 2: Bar diagram showing the distribution of sample collected from diabetic patients in male and female patient.

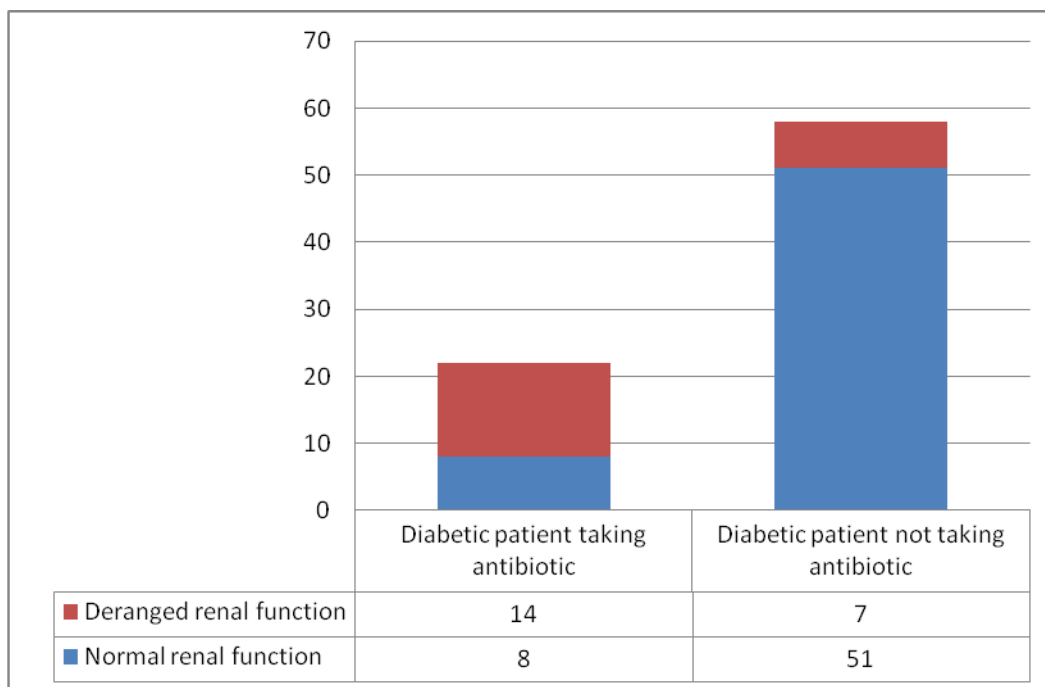


Figure3: Bar diagram showing the comparative effect of antibiotics on the renal profile of diabetic patients.

Male and female diabetic patients under antibiotherapy showed a **creatinine** value of **4.12±0.86** (n=7, mean±sd) and **4.3±0.79** (n=7, mean±sd) respectively. Antibiotherapy was also seen to effect the **GFR** value of the above patients. Male and female diabetic patients using antibiotics showed a mean GFR value of **19.71** (n=7) and **12.28** (n=7) respectively. However, there is a minimal number of patients (both male and female) who were not under antibiotherapy but yet showed abnormal creatinine and GFR values (*Figure 3*).

DISCUSSION

Diabetes mellitus is one of the global pandemic in India. Increase in blood sugar levels leads to various underlying diseases in the patients which has become one of the main mortality reasons⁸. In our study, we have taken 80 sample from the diabetic patient, where male diabetic patient were 39 female diabetic patient were 41 (*Figure 2*). This implies that diabetes is now common in both male and female almost equally. Diabetic patients are often seen to suffer from diabetic foot ulcers, urinary tract infections, etc. which do not heal within a short period of time as compared to non-diabetic individuals because of which use of antibiotics for a prolonged period is suggested⁹. Such prolonged use of antibiotics in diabetic patients is studied to have adverse effects on their renal profile¹⁰.

In our study we have taken 80 sample from the diabetic patient out of which 22(27.5%) are the patient who are taking concurrent antibiotics and rest 58(72.5%) are the patient who are not taking concurrent antibiotics. Those diabetic patients who are taking antibiotics, 14(63.7%) out of 22 patient have deranged renal profile i.e. serum creatinine(high/low), serum urea (high/low), serum electrolytes and presence of casts in urine routine examination were observed; and rest 8(36.3%) out of 22 patient who are taking antibiotics have normal renal profile, which shows a significant impact of antibiotics in the renal profile in diabetic patient, which is similar to the study conducted by Yuan J et al¹¹. Those diabetic patients who are not taking antibiotics, 7(12%) out of 58 patient also had deranged renal profile which signifies that diabetes itself can lead to the deranged renal profile, which is similar to study conducted by Unnikrishnan R et al². Ming Ye, Robson PJ et al. also studied a nested case control study on “systemic use of antibiotic and risk of diabetes in adult” where they determined the risk of diabetes with antibiotic use. The study included 1676 cases of diabetes and 13401 controls. Although 17.9% of cases received more than 5 courses of antibiotics, compared to 13.8% of controls (P < .0001), the association between antibiotic use and risk of diabetes was progressively reduced as important clinical and lifestyle factors¹².

In the above study, it was found that male and female diabetic patients under antibiotherapy showed a creatinine value of **4.12±0.86** (n=7, mean±sd) and **4.3±0.79** (n=7, mean±sd) respectively. Antibiotherapy was also seen to effect the GFR value of the above patients. Male and female diabetic patients using antibiotics showed a mean GFR value of **19.71** (n=7) and **12.28** (n=7) respectively. However, there is a minimal number of male (n=1) and female (n=5) diabetic patients who were not under antibiotherapy but yet showed abnormal creatinine and GFR values. It is worth mentioning that abnormal renal profile is seen in diabetic patients with antibiotherapy irrespective of their gender and age. Such use of antibiotics for curing various underlying infections can be the root cause for deterioration of their renal profile which can further worsen the health conditions of the patients which suggests that prolonged use of antibiotics in diabetic patients by clinicians should be carefully practised¹³⁻¹⁵.

CONCLUSION

The findings of the above study demonstrate the effect of antibiotic in the renal profile of patients with diabetes mellitus. However, the effect of antibiotherapy is dependent on the dose, composition, underlying disease and duration of its use. Use of antibiotics for curing UTI or diabetic foot should be done judiciously as this therapy leads to nephrotoxicity and effects the GFR of diabetic patients. Though, this study was conducted in a short period of time with less number of samples, the study can be further done for a specific period of time and data so obtained can be assembled to be analysed statistically.

Conflict of interest

None

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ABBREVIATION

GFR - Glomerular Filtration Rate
 UTI - Urinary Tract Infection
 T2D - Type 2 Diabetes
 sd - Standard Deviation
 mg/ml - Miligram per decilitre
 mmol/L - Mili Moles per Litre

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