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Biochemical Profile in Diabetic Foot Ulcer Patients – A Descriptive Study from Kerala

Dr. Shibu T S[1], Dr. Smitha K S[2], Dr. Gilsa E S[3,] Dr. Ajith V L[4]
[1,2,3]*Assistant Professor In Biochemistry, Govt Medical College, Thrissur*
[4]*Lecturer In Biochemistry, Govt Medical College, Thrissur*

Abstract
Introduction: *Diabetes and its complications pose a major threat to the public health throughout the world. Diabetic foot ulcer is one of the common causes of hospital admissions among diabetics in India. This study was aimed at creating a database on epidemiology and biochemical profile of diabetic foot ulcer patients attending a tertiary care hospital in Kerala.*
Materials and Methods: *A descriptive study was conducted among 32 diabetic foot ulcer patients and various epidemiological data were collected using proforma. Biochemical parameters such as HbA1c, total cholesterol, triglycerides, low density lipoproteins, high density lipoproteins, blood urea and serum creatinine were estimated within 24 hours of hospital admission.*
Results: *Mean age of the study population was 51 years with 65.6% being males. Among 32 patients, 59.4% had diabetic retinopathy changes. History of hypertension was noted in 37.5% of the study subjects. The prevalence of peripheral vascular disease and ischemic heart disease in this study subjects were 21.9% and 12.5% respectively. Mean value of HbA1C,Blood urea, Serum creatinine, total cholesterol, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) and triglycerides (TGs) were 8.24g% (Standard Deviation SD-1.6), 82mg/dl (5.98), 1.62mg/dl (1.08), 225mg/dl (55.6), 62.25mg/dl (14.9), 128.14mg/dl (52.2) and 173.22mg/dl (59) respectively.*
Conclusion: *Patients at risk for diabetic foot diseases must be educated about the risk factors and the importance of foot care to reduce the disease burden especially in developing countries like India.*
Keywords: *Diabetic foot ulcer, HbA1C, Kerala, Lipid profile*

I. Introduction

Diabetes and its complications pose a major threat to the public health throughout the world.[1]India is the (a) country with the largest number of diabetic patients in the world. Diabetic foot ulcer is a major disabling complication of diabetes which often precedes amputation of the limb.[2] According to the Global Lower Extremity Amputation Study Group, 25-90% of all amputations were associated with diabetes. [3] Considering the large population and high prevalence of diabetes in India, the burden of its complication would become enormous. Diabetic foot ulcer is one of the common causes of hospital admissions among diabetics in India. [1] This could be attributed to the lack of awareness, inadequate diabetic care at primary health care level, poor socioeconomic status and even barefoot walking. It has been estimated that about 15% of patients with diabetes are at risk of developing diabetic foot ulcer during the course of the disease. [4]Data from India regarding various aspects of diabetic foot ulcer are very scarce. This study was aimed at creating an idea regarding the various biochemical parameters at admission of diabetic foot ulcer patients who were admitted in a tertiary care hospital in Kerala.

II. Materials & Methods

A descriptive study was conducted among 32 diabetic foot ulcer patients admitted in the surgery department of Government Medical College,Thrissur over a period of 3 months from 1stFebruary 2016 to 30th April 2016.All patients were examined and detailed clinical history was taken. Age, Sex, Height, Weight, Body Mass Index, duration of diabetes, treatment history and history regarding smoking were recorded. All patients were subjected to fundus examination under mydriasis and the presence of diabetic retinopathy was recorded within 24 hours of admission.

Blood pressure was measured in all patients in sitting position on the right arm with a standard sphygmomanometer. Mean value was determined from two independent measurements taken at 5 minutes intervals. Hypertension was defined as the presence of systolic blood pressure of ≥140mmHg and or diastolic blood pressure of ≥90mmHg or when antihypertensive treatment was being taken.

Biochemical parameters including Glycated hemoglobin(HbA1C),Blood urea, Serum creatinine ,total cholesterol,LDL,HDL,triglycerides ,serum electrolytes were estimated within 24 hours of admission in Clinical biochemistry Lab attached to the Central lab, New Medical College hospital, Thrissur. Blood hemoglobin level

was also recorded in all study subjects. Peripheral vascular disease was assessed using Doppler studies. (Philips Affinity 70) Frequency tables, Mean and standard deviation of different variables were analyzed using Epi info version 7.

III. Results

This study was conducted among 32 patients admitted with diabetic foot ulcer in a tertiary care hospital in central Kerala. Mean age of the study population was 51 years with 65.6% being males. Among 32 patients, 59.4% had diabetic retinopathy changes. History of hypertension was noted in 37.5% of the study subjects. Information regarding qualitative variables are given in table 1.The prevalence of peripheral vascular disease and ischemic heart disease in this study subjects were 21.9% and 12.5% respectively. Mean duration of diabetes was11.7 years. Data regarding quantitative variables are depicted in table 2.

IV. Discussion

Diabetic foot ulcer is the most common complication of diabetes mellitus. The lifetime prevalence of foot ulceration is about 15%.[4]Macro and microvascular involvement and neuropathy plays a major role in the pathophysiology of diabetic foot ulcers.[5] According to the Diabetes Atlas 2013 published by the International Diabetes Federation, the number of people with diabetes in India currently is 65.1 million, which is expected to rise to 142.7 million by 2035. [6]

Mean age of the study population was 51 years, which is in par with the previous studies in India.[1, 7] Uncontrolled glycemic level is considered as a strongest indicator of development of complications in diabetes. Here, most of the patients had poor glycemic control at admission with a mean HbA1C level of 8.24±1.6.These findings support the results of Goldin A etal, who point out the concept of advanced glycation end products (AGEs) and vascular complications. [8]An increase in HbA1C by 1% can result in more than a 25% risk of peripheral arterial disease. [8]

Out of 32 patients 19 had diabetic retinopathy changes at admission. These findings reflect the lack of awareness regarding the pathophysiology and the need of glycemic control of diabetes among thelow socioeconomic group and hence many patients are not reporting to the healthcare facility at an early stage of disease.

Our data shows that mean serum creatinine level of this diabetic foot ulcer patients as 1.62,that itself showing the possibility of kidney dysfunction associated with the diabetic foot disease. The diabetes mellitus itself is associated with an increased kidney related morbidity and mortality. [9]

Regarding lipid profile, the level of serum cholesterol, triglycerides and LDL are higher in this group of patients. This finding can be correlated to the fact that being a metabolic disorder diabetes mellitus causes altered protein and lipid metabolism and thereby favors the disease progression. Mean serum cholesterol level in our patients was higher as compared to the data from a recent multicentric study from India. [7] These findings demand the need of education among diabetics regarding the risk factors in our area.

Our data also shows that majority of the patients with diabetic foot ulcer are males and with age of more than 40years.This finding isalso similar to that in the previous literature. [1, 7] 59.4% had positive history of smoking. Proper foot care was lacking in almost all the study subjects, which also could be one of the causes for increased prevalence of foot infections. The study conducted by Viswanathan etal, reported the prevalence of various diabetic foot complications from various parts of India and the results of the study found that the major cause for amputation among these patients was infection. [7, 10]

The care of diabetic patients should start with preventive measures. According to Viswanathan V et al, strategies such as intensive management of diabetes and foot care education are helpful in preventing newer complications and surgery in diabetic foot disease. [7]

In summary, diabetic patients at risk for diabetic foot diseases must be educated about the risk factors and the importance of foot care such as self-inspection and foot hygiene. Also this study emphasizes the need for a multidisciplinary team for diabetic foot diseases management including adiabetologist, podiatrist, vascular surgeon, radiologist and ophthalmologist.

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Table 1. Basic Characteristics of the study subjects

Parameter	**Number**	**%**
Age		
41-50	14	43.8
51-60	15	46.8
61-70	3	9.4
Sex		
Male	21	65.6
Female	11	34.4
Diabetic Retinopathy		
Yes	19	59.4
No	13	40.6
History of Smoking		
Yes	19	59.4
No	13	40.6
History of Hypertension		
Yes	12	37.5
No	20	62.5
Presence of PVD		
Yes	7	21.9
No	25	78.1
History of Ischemic Heart Disease		
Yes	4	12.5
No	28	87.5
Treatment History		
Insulin	9	28.1
OHA	15	46.9
Both	8	25

[PVD-peripheral vascular disease, OHA-oral hypoglycemic agents]

Table.2 Distribution of various biochemical parameters of the study subjects

Variable	**Mean ± Standard Deviation**
Age(Years)	51±5.6
Body Mass Index(Kg/m^2)	26.04±2.08
Duration of diabetes(Years)	11.71±4.93
Blood Urea(mg/dl)	82.06±5.98
Serum creatinine(mg/dl)	1.62±1.08
HbA1C (g %)	8.24±1.60
Total Cholesterol(mg/dl)	225.03±55.6
High Density Lipoprotein(mg/dl)	62.25±14.9
Triglycerides(mg/dl)	173.22±59.0
Low Density Lipoprotein(mg/dl)	128.14±52.2
Hemoglobin (g %)	9.48±1.32
Sodium(mmol/L)	131.91±4.09
Potassium(mmol/L)	4.01±0.42