

Mean Serum Uric Acid Levels in Type 2 Diabetics with and without Diabetic Peripheral Neuropathy

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ABSTRACT

Background: Scarce local studies have been conducted to determine the frequency of diabetic peripheral neuropathy (DPN) and its association with serum uric acid.

Aim: To determine in diabetic patients the frequency of diabetic peripheral neuropathy and to compare mean serum uric acid in diabetic patients with and without peripheral neuropathy

Methods: This study was carried out at Department of Medicine, University College of Medicine & Dentistry and University of Lahore from 6th March 2015 to 5th September 2015. It was cross-sectional in nature. All patients having diabetes of more than 5 years duration were included. Appropriate investigations were carried out in suspected cases for confirmation of other causes of peripheral neuropathy. Fasting uric acid (12 hours overnight fast) was measured on venous blood samples in all diabetics enrolled in this study and expressed as mg/dL diabetic peripheral neuropathy was labelled.

Results: The mean age was 54.47±2.923 years ranging from 44 to 60 years. 121 patients (60.5%) were below 55 years of age whereas 79 patients (39.5%) were 55 years of age or below. There were 79(39.5%) females and 121(60.55%) males. Eighty eight patients (44%) had diabetic peripheral neuropathy. One patient (0.5%) was in severe category, 42(21%) were in moderate and while 45(22.5%) had mild DPN. Mean serum uric acid was 5.27±1.082 ranging from 3 to 8mg/dl. 88 patients of diabetic peripheral neuropathy had mean serum uric acid value 5.25±1.064 mg/dl.

Conclusion: It is concluded that at current sample size, frequency of diabetic peripheral neuropathy is high (44%). 88 patients with diabetic peripheral neuropathy had mean serum uric acid value 5.25±1.064 mg/dl while it was 5.28±1.1 mg/dl in patients without diabetic painful neuropathy.

Keywords: Serum uric acid, Diabetic peripheral neuropathy, Duration of diabetes, Gout, HbA1C

INTRODUCTION

Diabetes is described by the World Health Organisation (WHO) as one of the four ranked non-communicable diseases (NCDs), along with chronic respiratory diseases, cardiovascular disease, and cancer.¹ According to 2013 WHO report, worldwide 347 million people have diabetes² and within a generation this figure will rise to 500 million. WHO projects that in 2030 diabetes will be the 7th dominating cause of death.³ In International Diabetes Federation (IDF) Atlas by the year 2035 an estimated 12.8 million Pakistanis will have diabetes. According to a survey, in Pakistan diabetes is diagnosed in 35% people over the age of 45 years.⁴ Diabetes leads to macro and micro-vascular complications that subsequently increases morbidity and mortality. A cross sectional study carried out at Sheikh Zaid Hospital, Lahore on 113 patients showed significantly high incidence of micro-vascular complications in diabetics with a poor glycemic control⁵.

Among the complications of diabetes, one of the most common is diabetic peripheral neuropathy. It is roughly estimated that patients experiencing neuropathy are between 3 and 25%⁶ and it is considered as a main pathophysiological risk factor for foot ulcers and amputation^{7,8}.

Serum uric acid (SUA), which is the product of purine metabolism, is used to be considered especially as a predictor of gouty diathesis. Therefore as a member of metabolic syndrome⁹, by upsetting insulin-stimulated glucose uptake, uric acid (UA) could worsen insulin resistance. Two recent meta analysis reported that for the development of type 2 diabetes (T2DM) elevated SUA has been an independent risk factor. In an obesity-adjusted model 20% increased diabetes risk per 59.5 μ mol/L uric acid increase showing for the development of T2DM elevated SUA is an independent risk factor^{10,11}.

Recently, it has been indicated that diabetic dysfunction was associated with high SUA¹². According to a study, in diabetic patients with DPN the mean serum uric acid was 4.70±0.96 and in patients without DPN 4.36±0.89mg/dl (p=0.019), which shows the elevated level of SUA in diabetic patients with DPN¹³.

An international study on association between level of serum Uric Acid and Diabetic Peripheral Neuropathy published in Caspian journal of

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International Medicine 2014 showed elevated uric acid in diabetic patients with DPN. No local studies have been found on this topic so far. Frequency of DPN is 40.4% in diabetic patients^{14,15}.

PATIENTS AND METHODS

This cross-sectional study was carried out at Jinnah Allama Iqbal Institute of Diabetes and Endocrinology, Jinnah Hospital Lahore from 6th march 2015 to 5th September 2015. All diabetics having duration of diabetes more than 5 yrs, age 30-70 yrs and both male and female were included. Diabetics having neuropathy due to any other medical or surgical condition, renal disease (serum creatinine) >1.2, thyroid disease (0.4-4.5mU/L), patients on drugs that modify uric acid levels and neuropathy were excluded. The patients were evaluated by history and appropriate examination to rule out other causes of neuropathy as alcoholism, chronic kidney disease, thyroid dysfunction and malabsorption. Appropriate investigations were carried out in suspected cases for confirmation of other causes of peripheral neuropathy. Subsequently, the score for diabetic neuropathy were calculated as well as per the given definitions. Fasting uric acid (12 hours overnight fast) was measured on venous blood samples in all diabetics. Diabetic peripheral neuropathy was labelled. SPSS (17.0) was used for analysis. Student “t” test was used to compare quantitative variables: mean uric acid levels between patients with and without DPN.

RESULTS

One hundred and twenty one patients (60.5%) were below 55 years of age whereas 79 patients (39.5%) were 55 years of age or below with mean age was 54.47±2.923 years. Seventy nine patients (39.5%) were female and 121 patients (60.5%) were male. Eighty eight patients (44%) had diabetic peripheral neuropathy. One patient (0.5%) was in severe category, 42(21%) were in moderate and while 45 (22.5%) had mild DPN. Fifty three patients (26.5%) among our sample population had HbA1C below 7. Eighty five patients (42.5%) had duration of diabetes less than 10 years while remaining 115 (57.5%) had duration of diabetes 10 years or above (Table 1). When diabetic peripheral neuropathy was compared to serum uric acid, the results showed non-significant [P>0.05] (Table 2). When gender was compared with diabetic peripheral neuropathy, 35 females and 53 males had diabetic peripheral neuropathy, the results were not significant [P>0.05] (Table 3). According to HbA1C below 7 with diabetic peripheral neuropathy, results were significant [p=0.001] (Table 4). Twenty four diabetic peripheral neuropathy patients had duration of diabetes less than 10 years and 64

patients had 10 years or more than 10 years, results were significant [p=0.001] (Table 5).

Table 1: Demographic information of the patients

Variable	No.	%
Age (years)		
< 55	121	60.5
≥55	79	39.5
Gender		
Male	121	60.5
Female	79	39.5
Diabetic peripheral neuropathy		
Yes	88	44.0
No	112	56.0
Grades of DPN		
No	112	56.0
Mild	45	22.5
Moderate	42	21.0
Severe	1	0.5
HbA₁C <7		
Yes	53	26.5
No	147	73.5
Duration of diabetes (years)		
<10	85	42.5
≥10	115	57.5

Table 2: Comparison of serum uric acid according to diabetic peripheral neuropathy

Diabetic peripheral neuropathy	Serum uric acid	P value
No	5.28±1.10	P = 0.863 (non-significant)
Yes	5.25±1.06	

Table 3: Comparison of serum uric acid according to gender

Gender	Diabetic peripheral neuropathy		Total
	Yes	No	
Male	53	68	121
Female	35	44	79
Using chi square test, p value=0.94 (non-significant)			

Table 4: Comparison of serum uric acid according to HbA1C <7

HbA1C <7	Diabetic peripheral neuropathy		Total
	Yes	No	
Yes	13	40	79
No	75	72	121
Using chi square test, p value <.001 (Significant)			

Table 5: Comparison of serum uric acid according to duration of diabetes

Duration of diabetes	Diabetic peripheral neuropathy		Total
	Yes	No	
< 10 years	24	61	85
≥ 10 years	64	51	115
Using chi square test, p value <.001 (Significant)			

DISCUSSION

Mean serum uric acid distribution in diabetic patients with diabetic peripheral neuropathy (which is the most common complication reported so far and is the major factor leading to amputations) may be helpful in reducing morbidity. When timely assessed, such patients can be guided early regarding lifestyle management and dietary advice to lower the uric acid levels. In our study, 88 patients (44%) had diabetic peripheral neuropathy. One patient (0.5%) was in

severe category, 42(21%) were in moderate and while 45(22.5%) had mild diabetic peripheral neuropathy. This implies a very high prevalence in diabetics. It was roughly estimated that patients experiencing neuropathy are between 3 and 25%⁶ and viewed as a main risk factor leading to foot ulcers and amputation^{7,8}. In a previous study, frequency of diabetic peripheral neuropathy came out 40.4% in diabetic patients¹⁵.

Patients had mean serum uric acid value 5.27 ± 1.08 ranging from 3 to 8 mg/dl. Mean serum uric acid value 5.25 ± 1.064 mg/dl was found in 88 patients of diabetic peripheral neuropathy. While mean serum uric acid value 5.28 ± 1.1 mg/dl was found among 112 patients without diabetic peripheral neuropathy. In patients with and without diabetic painful neuropathy there was no significant difference in mean serum uric acid level. According to a previous study, in diabetic patients with DPN the mean serum uric acid was 4.70 ± 0.96 and in patients without DPN was 4.36 ± 0.89 mg/dl ($p=0.019$), which shows the elevated level of SUA in diabetic patients with DPN.¹³ In the present study population 200 patients had mean age distribution 54.47 ± 2.92 ranged from 44 to 60 years of age. One hundred and twenty one patients (60.5%) were below 55 years of age whereas 79 patients (39.5%) were 55 years of age or below. 88 patients of diabetic peripheral neuropathy had mean age 54.63 ± 3.2 years. It implies that age is not a risk factor for development of diabetic painful neuropathy. Seventy nine patients (39.5%) were female and 121 patients (60.55) were male. On cross tabulating gender with diabetic peripheral neuropathy, results were non-significant. 35 females and 53 males in our sampled population had diabetic peripheral neuropathy. It implies that either sex is not associated with development of diabetic painful neuropathy.

Thirty five patients (26.5%) among our sample population had HbA1C below 7. When we cross tabulated HbA1C below 7 with diabetic peripheral neuropathy, results were significant when we applied chi-square test ($p=0.001$). Thirteen patients of diabetic peripheral neuropathy had HbA1C lower than 7. It implies that as diabetes become uncontrolled, it may lead to development of diabetic painful neuropathy.

Eighty five patients (42.5%) had duration of diabetes less than 10 years while remaining 115 (57.5%) had duration of diabetes 10 years or above. Duration of diabetes was between 5 to 15 years with mean of 10.10 ± 3.102 in our study population. 24 diabetic peripheral neuropathy patients had duration of diabetes less than 10 yrs and 64 pts had 10 yrs or more than 10 yrs. Results were significant ($p=0.001$).

It implies that as duration of diabetes is related to development of diabetic painful neuropathy.

CONCLUSION

The frequency of diabetic peripheral neuropathy is high (44%). One patient (0.5%) was in severe category, 42 (21%) were in moderate and while 45 (22.5%) had mild DPN. 88 patients with diabetic peripheral neuropathy had mean serum uric acid value 5.25 ± 1.06 mg/dl while it was 5.28 ± 1.1 mg/dl in patients without diabetic painful neuropathy.

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