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Prevalence of Diabetic Cheiroarthropathy in Patients of Diabetes Mellitus and Its Correlation with Diabetic Triopathy

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Abstract: ***Background: Diabetic mellitus can lead to a myriad of complications (both microvascular and macrovascular). Diabetic cheiroarthropathy is a musculoskeletal complication of diabetes characterized by limited movement of the joints of the hands along with thickening of the skin on the palmar and dorsal surfaces. Studies have found an association between diabetic cheiroarthropathy and microvascular complications of diabetes. The present study was conducted to study the prevalence of diabetic cheiroarthropathy in patients of diabetes mellitus and its correlation with diabetic triopathy. Materials & Methods: This was conducted on 200 patients in the department of Medicine, Government Medical College, Amritsar. The study protocol was approved by the institutional ethics committee. The patients were enrolled in the study after obtaining written informed consent. All the patients were interviewed and examined for peripheral neuropathy, retinopathy by ophthalmoscopy and presence of albuminuria. The results were then analyzed. Results: Out of 200 patients, 104 patients had cheiroarthropathy. Majority of the patients with cheiroarthropathy (33) were in the age group 61 - 70 years. The mean age of patients with and without cheiroarthropathy were 61.3±13.6 years and 45.8±9.8 years, respectively (p value= 0.000). Proteinuria was present in 102 patients (1+ in 13 patients, 2+ in 40 patients, 3+ in 37 patients, and 4+ in 12 patients). With respect to retinopathy, mild NPDR was present in 24 patients, moderate NPDR in 45 patients, severe NPDR in 20 patients, and proliferative diabetic retinopathy (PDR) in 1 patient. Diabetic neuropathy was present in 16 patients. The mean diabetes' duration in absence of cheiroarthropathy was 4.3±2.5 years, while in presence of cheiroarthropathy it was 12.6±5.7 years (p value= 0.000). Conclusion: Advancing age plays in the determination of the severity of diabetic cheiroarthropathy. Also, as the incidence of diabetic cheiroarthropathy rises with the increase in the severity of diabetic retinopathy, cheiroarthropathy can be utilised as a marker for indirect proof of the existence of diabetic retinopathy. Diabetic cheiroarthropathy have a positive correlation with neuropathy and increasing grades of proteinuria, suggesting that cheiroarthropathy can also be used as a proxy for their existence.***

Keywords: Diabetes mellitus, Diabetic neuropathy, Diabetic nephropathy, Diabetic retinopathy, Cheiroarthropathy

1. Introduction

Diabetic mellitus carries a risk for a myriad of complications which can be microvascular and macrovascular in origin. [1] Diabetic cheiroarthropathy is an under diagnosed musculoskeletal complication of diabetes characterized by limited movement of the joints of the hands along with thickening of the skin on the palmar and dorsal surfaces. [2, 3]Some of the medically equivalent terminology used includes the syndrome of reduced joint mobility, diabetic sclerosis, pseudosclerodermatous hand of the diabetic, and diabetic stiff hand. It can occur in both type 1 and type 2 diabetes mellitus. [4]The overall prevalence is often quoted as 30%; with different studies giving prevalence ranging from 8% to 50%. [5, 6, 7]There is an association between diabetic cheiroarthropathy and microvascular complications of diabetes. [3]The present study was conducted to study the prevalence of diabetic cheiroarthropathy in patients of diabetes mellitus and its correlation with diabetic triopathy.

2. Materials and Methods

This study was conducted on 200 diabetic patients admitted in the department of Medicine, Guru Nanak Dev Hospital, Government Medical College, Amritsar (Punjab). The study protocol was approved by the institutional ethics committee and the patients were enrolled in the study after obtaining written informed consent.

Inclusion criteria

- Patients who are known cases of diabetes mellitus.
- Patients who have joint involvement.
- Patients who opted for voluntary participation.

Exclusion criteria

- Patients with trauma to hands.
- Patients with liver cirrhosis.
- Patients with rheumatoid arthritis.
- Patients on Phenytoin

All the patients were interviewed and examined for peripheral neuropathy (assessed clinically) by history of pain, paresthesia, burning sensation and hypoesthesia with signs of absent ankle jerks, knee jerks and reduced vibration sensibility over the lateral malleoli. Cataracts and retinopathy by ophthalmoscopy on dilated pupils were looked in diabetes formicroaneurysms, non - macular hemorrhages and exudates. Presence of albuminuria and indolent foot ulcerations was also looked for. The results of observations of individual patients were tabulated and analyzedusing appropriate statistical software.

3. Results

Baseline data of patients: There was a slight male preponderance (51% male vs 49% female patients). Most of the patients (89%) had type 2 diabetes mellitus and remaining 11% had type 1 diabetes mellitus. Proteinuria was present in 81.5% patients (1+ in 27% patients, 2+ in 25% patients, 3+ in 22% patients, and 4+ in 7.5% patients). With respect to retinopathy, mild non - proliferative diabetic retinopathy (NPDR) was present in 26% patients, moderate NPDR in 25.5% patients, severe NPDR in 11% patients, and proliferative diabetic retinopathy (PDR) in 1.5% patients. Diabetic neuropathy was present in 66.5% patients. Cheiroarthropathy was present in 104 (52%) patients.

Association of various factors in patients with Cheiroarthropathy: Out of 104 patients with Cheiroarthropathy, majority of the patients (33) were in the age group 61 - 70 years.81 patients were of rural household and 23 patients were of urban household. Peripheral signs of atherosclerosis were noticed in 29 patients by presence of Xanthelesma, Tendon Xanthomata and diminished Peripheral pulses. Proteinuria was present in 102 patients (1+ in 13 patients, 2+ in 40 patients, 3+ in 37 patients, and 4+ in 12 patients). Urine albumin to creatinine ratio of grade A1 was present in 16 patients, A2 in 38 patients and A3 in 53 patients. With respect to retinopathy, mild NPDR was present in 24 patients, moderate NPDR in 45 patients, severe NPDR in 20 patients, and proliferative diabetic retinopathy (PDR) in 1 patient. Diabetic neuropathy was present in 16 patients. Glycosuria was present in 87 patients (1+ in 24 patients, 2+ in 30 patients, 3+ in 16 patients, and 4+ in 17 patients) (Table 1).

Comparison of various factors in patients with or without Cheiroarthropathy: Age comparison showed that in absence of cheiroarthropathy mean age was 45.8±9.8 years, and in presence of cheiroarthropathy mean age was 61.3±13.6 years. This association was statistically significant (p value= 0.000). DM Duration comparison showed that mean DM duration in absence of cheiroarthropathy was 4.3±2.5 years, and in presence of cheiroarthropathy was 12.6±5.7 years. This association showed positive relation and was also statistically significant (p value= 0.000). Mean of HbA1c in absence of cheiroarthropathy was 7.5±1.1 %, and in presence of cheiroarthropathy was 8.6±1.2 %. This relation showed positive association with statistical significance (p value= 0.000) (Table 2).

Association of various complications of diabetes with Cheiroarthropathy: Out of 90 patients with both diabetic neuropathy and retinopathy, 77 patients had cheiroarthropathy. Out of 113 patients with both diabetic nephropathy and retinopathy, 88 patients had cheiroarthropathy. Out of 111 patients with both diabetic nephropathy and neuropathy, 86 patients had cheiroarthropathy. Diabetic triopathy was present in 84 patients, of which 75 patients had cheiroarthropathy (Table 3).

Table 1: Association of various factors in patients with cheiroarthropathy

Parameters	Variables	Cheiroarthropathy		Total
		Absent	Present	
Age (years)	≤30	8	4	12
	31 - 40	23	8	31
	41 - 50	39	9	48
	51 - 60	21	29	50
	61 - 70	5	33	38
	>70	0	21	21
Household	Rural	58	81	139
	Urban	38	23	61
Atherosclerosis	Absent	75	29	104
	Present	21	75	96
Grades of proteinuria	Negative	35	2	37
	1+	41	13	54
	2+	10	40	50
	3+	7	37	44
	4+	3	12	15
Urinary ACR	A1	76	13	89
	A2	9	38	47
	A3	11	53	64
Retinopathy	Normal	58	14	72
	Mild NPDR	28	24	52
	Moderate NPDR	6	45	51
	Severe NPDR	2	20	22
	PDR	2	1	3
Diabetic neuropathy	Absent	51	16	67
	Present	45	88	133
Glycosuria	Negative	66	17	83
	1+	18	24	42
	2+	6	30	36
	3+	5	16	21
	4+	1	17	18

Table 2: Comparison of various factors in patients with or without Cheiroarthropathy

Factors	Cheiroarthropathy	
	Absent	Present
Age (years)	45.8±9.8	61.3±13.6
DM duration (years)	4.3±2.5	12.6±5.7
HbA1c	7.5±1.1	8.6±1.2

Table 3: Association of various complications of diabetes with Cheiroarthropathy

	Cheiroarthropathy		Total
	Present	Absent	
Diabetic neuropathy+ retinopathy	77	13	90
Diabetic nephropathy+ retinopathy	88	25	113
Diabetic neuropathy+ nephropathy	86	25	111
Diabetic neuropathy+ nephropathy+ retinopathy	75	9	84

4. Discussion

Age group and cheiroarthropathy: In age group ≤ 30 years, out of the 12 patients only 4 had cheiroarthropathy. In age group 31 - 40 years, 8 (out of 31 patients) had cheiroarthropathy; in 41 - 50 years age group, 9 (out of 48 patients) had cheiroarthropathy; in 51 - 60 years group, 29 (out of 50 patients) had cheiroarthropathy; in 61 - 70 years age group, 33 (out of 38 patients) had cheiroarthropathy and among > 70 years age group, all the 21 patients had cheiroarthropathy. In the absence of cheiroarthropathy mean age is 45.8 years, and in the presence of cheiroarthropathy mean age is 61.3 years. This showed that with increasing age, the prevalence of diabetic cheiroarthropathy also increased, and it showed positive correlation with p value= 0.000 (statistically significant). Paul A et al (2023) found that the prevalence of cheiroarthropathy increases with increasing age. [2]Parappil SM et al (2019) found that prevalence of cheiroarthropathy in diabetics increases with increasing age (p value= 0.001). [8]

Atherosclerosis with cheiroarthropathy: Out of a total of 104 patients who showed no signs of atherosclerosis, 29 patients had cheiroarthropathy. While among the 96 patients with signs of atherosclerosis, 75 patients had cheiroarthropathy. This is a positive correlation between Atherosclerosis and cheiroarthropathy, and is statistically significant (p value< 0.05).

Retinopathy and Cheiroarthropathy: Out of a total of 72 patients with no evidence of retinopathy, only 15 patients had cheiroarthropathy. Whereas among 52 patients with mild NPDR, 24 patients had signs of cheiroarthropathy. Among 51 patients with moderate NPDR, 45 patients had cheiroarthropathy; in 22 patients that had severe NPDR, 20 of them had cheiroarthropathy. Out of 3 patients with PDR, only 1 patient had cheiroarthropathy. The observations suggested that with increasing grades of retinopathy, more were the allied complication like cheiroarthropathy. This showed positive association and statistical significance (p value< 0.000). Paul A et al (2023) reported that on comparing diabetic retinopathy and diabetic cheiroarthropathy, 35.7% patients with diabetic cheiroarthropathy had diabetic retinopathy compared to 9.6% without, which had a statistically significant difference. [2]Amer AE et al (2014) revealed that retinopathy was associated with presence of cheiroarthropathy and was statistically significant with p value< 0.05. [9] Al - Sergany MA et al (2003) showed that patients of retinopathy alone had more percentage of positive prayer signs, and quantitative evidence of limited range of motion of MCP and wrist joints with statistical significance (p value< 0.05). [10]

Neuropathy and Cheiroarthropathy: Out of a total of 67 patients that had no evidence of neuropathy (checked by 10g monofilament test), only 16 (23.8 %) patients had diabetic cheiroarthropathy, whereas of the total 133 patients that had neuropathy, 104 (78.2 %) patients had cheiroarthropathy. These observations suggested that neuropathy was positively related with cheiroarthropathy and also was statistically highly significant (p value< 0.000). Al - Sergany MA et al (2003) showed that limited joint mobility (LJM) was associated with 55.88 % of patients with neuropathy, as compared to 25.76 % patients without neuropathy, these observations being statistically significant (p value< 0.05). [10] Pandey A et al (2013) also suggested that LJM was positively associated with presence of diabetic neuropathy with statistical significance (p value< 0.001). [11]

Proteinuria and Cheiroarthropathy: A total of 37 patients had no proteinuria, of which only 2 patients had cheiroarthropathy. Among 54 patients with 1+ proteinuria, 13 patients had cheiroarthropathy; among 50 patients with 2+ proteinuria, 40 patients had cheiroarthropathy; among 44 patients had 3+ proteinuria, 37 had cheiroarthropathy and among 15 patients with 4+ proteinuria, 12 had diabetic cheiroarthropathy. These findings suggested that with increase in grade of proteinuria, there was also increase in percentage of signs of cheiroarthropathy with statistical significance of p value< 0.000. Al - Sergany MA et al (2003) compared association between diabetic nephropathy and diabetic cheiroarthropathy, and found that 60 % of patients with nephropathy had cheiroarthropathy, whereas 25.71 % patients with no nephropathy had cheiroarthropathy. These findings were statistically significant (p value< 0.05). [10] Pandey A et al (2013) showed that 47 (58.0 %) out of 81 patients with LJM had associated nephropathy, and 28 (23.5 %) out of total 119 patients with no LJM had associated nephropathy. This also implied to have positive association and statistical significance (p value< 0.001). [11]

Duration of Diabetes and Cheiroarthropathy: The mean DM duration in patients without cheiroarthropathy was 4.3 years, and in patients with cheiroarthropathy was 12.6 years. This implied that with increasing duration of diabetes mellitus the incidence of cheiroarthropathy also increases. These findings were statistically significant with p value= 0.000. Al - Sergany MA et al (2003) concluded that LJM was significantly associated with longer duration of DM with p value< 0.05. [10]Antony J et al (2019) also found cheiroarthropathy to be statistically significantly associated with DM duration (p value= 0.016). [12]

HbA1c and Cheiroarthropathy: The mean of HbA1c in patients without cheiroarthropathy was 7.5 %, and in patients with cheiroarthropathy was 8.6 %. This suggests positive association between poor glycemic control and

presence of diabetic cheiroarthropathy with significance of pvalue= 0.000. Antony J et al (2019) concluded relation between HbA1c and Cheiroarthropathy, 8 patients that had cheiroarthropathy in their study had corresponding HbA1c of 8.1 to 10 %, and this observation was statistically significant (p value= 0.04). [13]Parappil SM et al (2019) observed positive association between poor glycemic control and cheiroarthropathy, with HbA1c of 9.84 % in patients with cheiroarthropathy and 9.19 % in patients without cheiroarthropathy. This association was also statistically significant (p value= 0.009). [8]

5. Conclusion

The present study found that advancing age plays a role in the severity of diabetic cheiroarthropathy as well as diabetic microvascular consequences. Also, as the incidence of diabetic cheiroarthropathy rises with the increase in the severity of diabetic retinopathy, cheiroarthropathy can be utilised as a marker for indirect proof of the existence of diabetic retinopathy. Diabetic cheiroarthropathy and neuropathy have a positive correlation, suggesting that cheiroarthropathy can also be used as a proxy for the existence of neuropathy. Similarly, the presence of cheiroarthropathy was observed to be related with increasing grades of proteinuria, suggesting that the more severe the microvascular problem, the more cheiroarthropathy would be present.

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