

## CUTANEOUS MANIFESTATIONS ASSOCIATED WITH DIABETIC MELLITUS

YADAV K.S.<sup>1\*</sup>, SMITA PATIL<sup>2</sup>, SHARMILA PATIL<sup>3</sup>, MANJYOT GAUTAM, AND BHUTEY A.K.<sup>4</sup>

Department of Biochemistry and Medicine<sup>1,2,3</sup> Padmashree Dr. D.Y. Patil Medical College, Hospital & Research Centre, Navi Mumbai-706 and Department of Biochemistry<sup>4</sup>, Pad. Dr. PDM Medical College, Amarawati-603, India

\*Corresponding author E-mail: [ksy\\_rahul@rediffmail.com](mailto:ksy_rahul@rediffmail.com)

Received: June 23, 2011; Accepted: October 03, 2011

**Abstract-** Diabetes is a disease characterized by chronic hyperglycemia and several musculoskeletal disorders associates with patients of diabetic mellitus. Some are because of the disease process, others have a higher incidence in those with diabetes, and yet others are likely associated with common etiologies. The objective of the present study is to document the association of cutaneous manifestations and diabetes. Total 90 type I & II diabetic patients were studied for abnormal glucose metabolism and cutaneous manifestations with respect to infections, neuropathy, nephropathy and retinopathy. Out of 90, four percent were type I and Ninety- six percent of patients were type II diabetes. 63 patients were present cutaneous manifestations out of these 49 females (77.78%) and 14 males (22.22%). Infections and other ddermatopathy (76%) were the commonest manifestations. Diabetic retinopathy (13%) and nephropathy (11%) Hypertension (49.20%), Neuropathy (4.76%) and Coronary Disease (12.69 %) were reported. Cutaneous manifestations are quite common in type II diabetes mellitus and patients presents with multiple cutaneous manifestations, should be evaluated for systemic complications.

**Keywords:** Cutaneous\_ Micro-vascular\_ Neurological manifestations diabetic mellitus

### INTRODUCTION

Diabetes represents a spectrum of metabolic disorders, which has become one of the major health challenge worldwide [1] Diabetes is pandemic in both developed and developing countries around the globe. In 2000, there was 175 million people with diabetes worldwide expected 300 million by 2025 and by 2030, the projected estimate of diabetes is 354 million [2]. India has a high prevalence of diabetes mellitus and the numbers are increasing at an alarming rate. In India alone, diabetes is increased from 40.6 million in 2006 and expected 79.4 million by 2030. [3] Abnormalities of insulin secretion and elevated blood glucose level lead to involvement of multiple systems including renal, nervous system, eyes and skin [4]. Diabetes mellitus (DM) is a heterogeneous group of disorders characterized by a high blood glucose level and by disturbances of carbohydrate and lipid metabolism. It is estimated that 11 million persons in the United States have DM, 90% of who have non-insulin-dependent DM i.e. type II DM. At least 30% of persons with diabetes have some type of cutaneous involvement during the course of their chronic disease. This study classifies the cutaneous manifestations in DM into four categories; (i) skin diseases with strong to weak association with DM; (ii) cutaneous infections; (iii) cutaneous manifestations of diabetic complications; and (iv) skin reactions to diabetic treatment. Each of these categories is reviewed as well as the patho-physiology of the normal and diabetic membrane for a better understanding of the cutaneous manifestations of DM. [5] Cutaneous signs of diabetes mellitus are extremely

valuable to the clinician as some of these manifestation can alert the physician to the diagnosis of diabetes and also reflect the status of blood or plasma and urine glucose control and lipid metabolism [6]. It has been observed that without control of glucose level in blood as well as in urine, prognosis is unsatisfactory and may aggravate cutaneous complications [7]. Besides Cutaneous manifestations systemic diseases are strongly associated with diabetes mellitus which needs special attention to minimize risk of organ failure.

### MATERIALS AND METHODS

Ninety patients of Diabetic Mellitus from Padamashree Dr. D Y Patil Medical College, Diabetic Clinic, Hospital & research centre, Navi Mumbai were studied in present work. A detailed history was taken in each patient with particular reference to cutaneous complaints, including duration, progression and treatment modalities. A detailed clinical examination especially for the presence of cutaneous lesions was done in natural light. All the patients were evaluated for the status of obesity by calculating the body mass index score (BMI) and were classified according to standard WHO classification i.e. BMI, 1-15 (starvation) ,18.5-25 (normal) , 25-30 ( overweight), 30-40 (obese) and BMI >40 (morbid-obesity). The diagnosis of diabetes mellitus is done as per WHO criteria. [8] Blood sugar, urine examination, liver function tests, kidney function tests, lipid profile, Glycosylated hemoglobin (HbA1c) and 24 hours urinary protein were done in Central Biochemistry Laboratory for assessment of diabetes. Assessment of diabetic

retinopathy was done by an ophthalmologist. Examination of skin lesions and microbiological investigations were carried out to confirm the diagnosis.

## RESULTS AND DISCUSSION

Out of 90 diabetic cases, there were 63 (70%) females and 27 (30%) males; the female: male ratio was 2.3:1. The age of the patients ranged from 24 to 76 years and the most common age groups were 24-35 (10%), 36-45 (19%), 46-55 [35%] and 56-65 [21%] and above 66 years (15%). The majority [96%] of patients was having type II DM and only 4% patients were suffering from type I DM. Out of 90 cases, 63 (70%) patients had some associated cutaneous manifestations comprising 49 (77.78%) females and 14 (22.22%) males. The duration of the diabetes ranged from 01 year to 17 years. Cutaneous manifestations were most prevalent in the age group of 46-55 ye.

Cutaneous signs of diabetes mellitus are extremely valuable to the clinician. They generally appear after the primary disease has developed but may signal or appear coincidentally with its onset, or even precede diabetes by many years. Most documented studies have shown the incidence of Cutaneous disorders associated with diabetes to be between 30 and 71%. [9] In this study out of 90 diabetic patients, 70% were having some form of Cutaneous involvement. Among the dermatosis commonly associated with diabetes mellitus, infections and skin tags were the most common entities seen in 37.50% and 33.82% cases respectively which is shown in Table 3. These manifestations were seen mostly in patients with disease duration of more than one year. The lesser incidence of these conditions in Indian studies has been explained on the dark skin type in Indians [9]. A broad spectrum of Cutaneous disorders may be encountered in patients with both type I and type II DM. At times, these dermatologic findings may even precede any clinical or biochemical evidence for diabetes. Infections were present in 19.6% cases. The incidence of Cutaneous infections was more in uncontrolled diabetics. Cutaneous infections were seen in 19.6% of patients. Fungal infections were seen in 18.84% of the patients. Bacterial infections were seen in 6.5% of the patients. It is widely believed that diabetic patients have an increased risk for infectious diseases, although there is little documented evidence to support it. This risk seems to be higher in poorly controlled patients, but it is often difficult to understand whether poor metabolic control is the cause or the consequence of the concurrent infections. Fungal infections formed the largest group with Onychomycosis being present in 15.94% cases & mucormycosis in 2.89% cases. Dogra et al [10] have reported a high incidence of Onychomycosis in diabetics and it is attributed to increasing age and impaired peripheral circulation. CHD with HT, CHD, Diabetic nephropathy, neuropathy and retinopathy were seen in 59.42%, 11.59%, 6.22%, 8.69%, 4.34% and 7.24% cases respectively in patients having Cutaneous manifestations. High prevalence of systemic complications has been reported in diabetic patients with

cutaneous involvement as compared to diabetics without cutaneous manifestations [11, 12]. The exact pathogenesis of most of these dermatoses is unknown. It is assumed that vessel and connective tissue alterations as well as the impairment of the immune system and other associated metabolic changes caused by diabetes play an important role in Cutaneous manifestations. The main mechanism behind all these changes is thought to be non-enzymatic glycosylation product formation [13].

## CONCLUSION

Diabetes mellitus involves the Cutaneous alterations, which have to be diagnosed on mainly clinical grounds. Some of these can be a consequence or an accompanying symptom of poorly controlled diabetes and therefore these can potentially help the attending physician to prevent more serious complications. Diabetes mellitus involves the skin quite often and whenever patients present with multiple skin manifestations their diabetic status should be checked. Further large scale multicentre studies are required to minimize the frequency of post diabetic cutaneous complications.

## ACKNOWLEDGEMENT

We would like to express our gratitude to Dr. Priya Patil-Cholera, Dr. Rashmin Cholera, Dr. Vijaya Badwar, Dr. Shirish Patil, for encouragement. I am obliged to patients, technical and paramedical staff of this institution who helped us to peruse this work.

## References

- [1] King H., Aubert R.E., Herman W.H. (1998) *Diabetes Care*, 21:1414-31.
- [2] Wild S., Roglic G., Green A., Sicree R., King H. (2004) *Diabetes Care*, 27: 1047-1053.
- [3] Vishwanathan M., Ram, et al. (1997) *Diabetologia*, 40[2]; 232-237
- [4] Urbach K., Lentz J.W. (1965) *Arch Dermatol Syphilol.*, 52: 301- 304.
- [5] Perez M.I., Kohn S.R. (1994) *J Am Acad Dermatol.*, 30[4]:519-31.
- [6] Romano G., Moretti G., Di Benedetto A., Giofre C., Di Cesare E., Russo G., (1998) *Diabetes Res Clin Pract.*, 39:101-6.
- [7] Pastras T., Beerman H. (1964) *Am Med J* 1964; 247: 563- 566.
- [8] Report of WHO Expert Committee on the diagnosis and Classification of Diabetes Mellitus (1997) *Diabetes Care*, 20:1183-97.
- [9] Mahajan S., Koranne R.V., Sharma S.K. (2003) *Indian J Dermatol Venereol Leprol.*, 69:105-8.
- [10] Dogra S., Kumar B., Bhansali A., Chakrabarty A. (2002) *Int J Dermatol.*, 41: 647- 651.
- [11] Bhat Y.J., Gupta V., Kudyar R.P. (2006) *Int J DiabDev Ctries.*, 26: 152- 15.

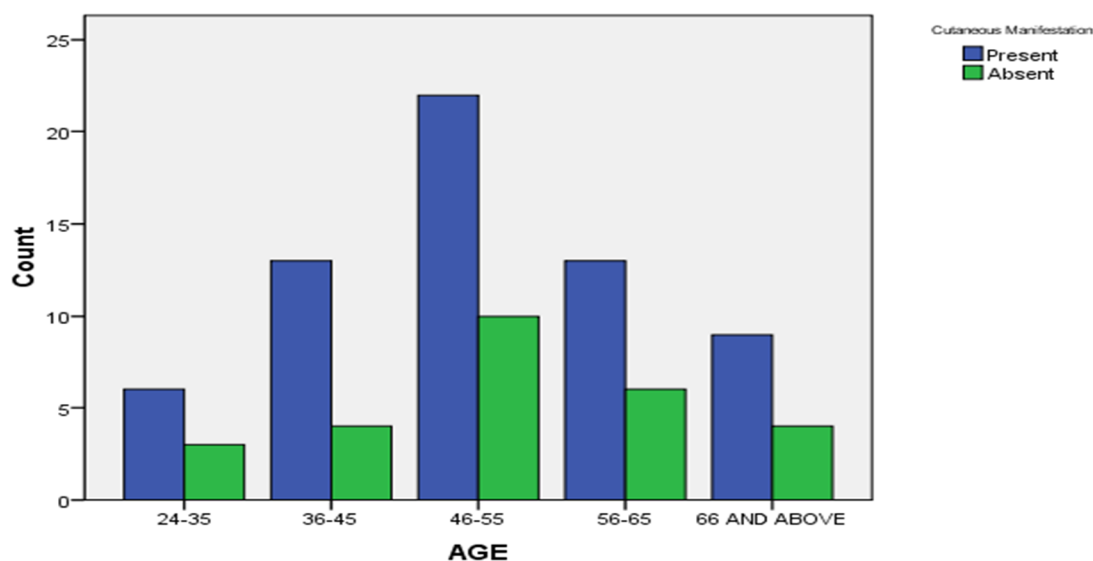
[12] Schemer A., Bergiman R., Linn S., Kantor Y., Friedman - Birnbaum R. (1998) *Int J Dermatol.*, 37: 113- 115.

[13] Brownlee M., Vlassara H., Kooney A., et al. (1986) *Science*, 232: 1629-32.

Table 1- Age wise statistics of Cutaneous Manifestations in Diabetic Mellitus.

Age in years	Cutaneous Manifestation		Total
	Present	Absent	
24-35	6	3	9
36-45	13	4	17
46-55	22	10	32
56-65	13	6	19
66 AND ABOVE	9	4	13
	63	27	90

Bar Chart



Association Test:

The association between cutaneous manifestation and age is tested. The chi-square test is used to test the association between these attributes.

Null hypothesis: The presence and absence of cutaneous manifestation is independent of age groups.

Alternative hypothesis: The presence and absence of cutaneous manifestation associated with different age groups. Level of significance: 5%

Table 2- Taste results

Chi-Square Tests			
	Value	Df	p-value
Pearson Chi-Square	.437a	4	.979

The chi-square p-value is 0.979 which is greater than that of 0.05 therefore the null hypothesis of independency is accepted and we conclude that there is no association between age group and Cutaneous.

Table 3- Micro-vascular, Neurological and Cutaneous Complications in DM

Micro-vascular manifestations			Neurological manifestations			Cutaneous Infections		
Findings	'n'	%	Findings	'n'	%	Findings	'n'	%
Skin spots	11	17.8	Paresthesia	13	20.6	Onychomycosis	11	10.3
Sclerosis fingers	6	9.7	Hyperhidrosisface	3	4.6	Tineapedis	5	4.7
Rubeosisfaciei	5	8.1	Hyperhidrosis	2	3.2	Cellulitis	2	1.8
Palmar erythema	3	4.8	Diabetic bullae	2	3.2	Herpes zoster	1	1
Diabetic hands	2	3.2	Diabetic feet	1	1.6	Mucormycosis	2	1.8

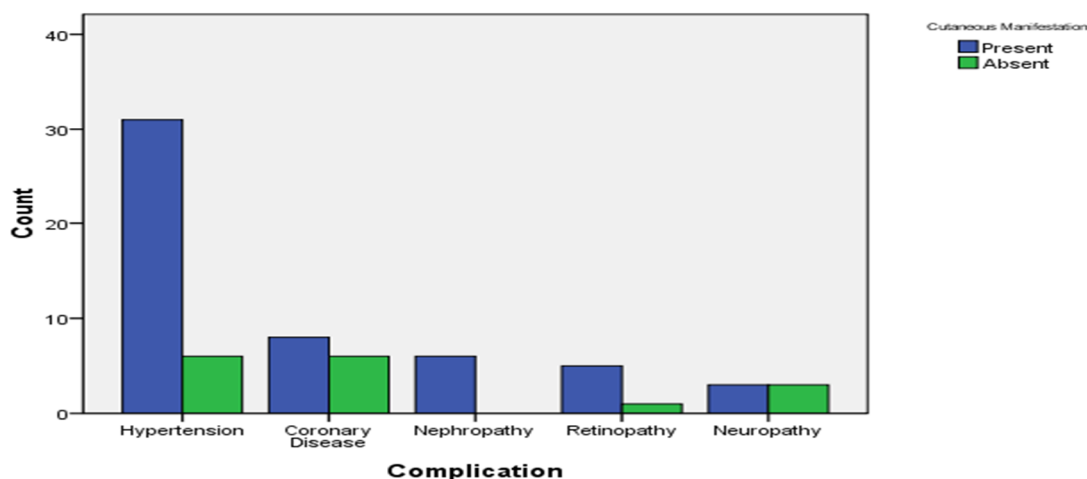
Out of 90 patients, 27 (20 females and 7 males) did not have any dermatological findings. Rest of them revealed a wide spectrum of cutaneous signs. Skin manifestations were classified into various categories, e.g. Micro-vascular, neurological, neurovascular, infections and systemic complications. The systemic complications in patients of DM with and without cutaneous manifestations shown in Table 3. Hypertension was seen in a higher percentage of diabetics with cutaneous manifestations (53%) than in those without such manifestations (18%). Likewise coronary artery disease nephropathy and retinopathy were seen in a higher percentage of diabetics with cutaneous manifestations, i.e., 12.69% vs. 6.06%, 9.52% vs. 0% and 7.93 vs. 3.03 in controls respectively.

Out of 63 patients with Cutaneous manifestations, 36 (57.14%) had uncontrolled and 27 (42.86% had controlled Glycosylated hemoglobin (HbA1C) level.

Table 4 -Complication \* Cutaneous Manifestation Cross tabulation

		Cutaneous Manifestation		Total
		Present	Absent	
Complication	Hypertension	31	6	37
	Coronary Disease	8	6	14
	Nephropathy	6	0	6
	Retinopathy	5	1	6
	Neuropathy	3	3	6
Total		53	16	69

Bar Chart



Association Test:

The association between Cutaneous manifestation and age is tested. The chi-square test is used to test the association between these attributes.

Null hypothesis: the presence and absence of Cutaneous manifestation is independent of complications.

Alternative hypothesis: the presence and absence of Cutaneous manifestation associated with complication. Level of significance: 5%

Table 5- Taste results

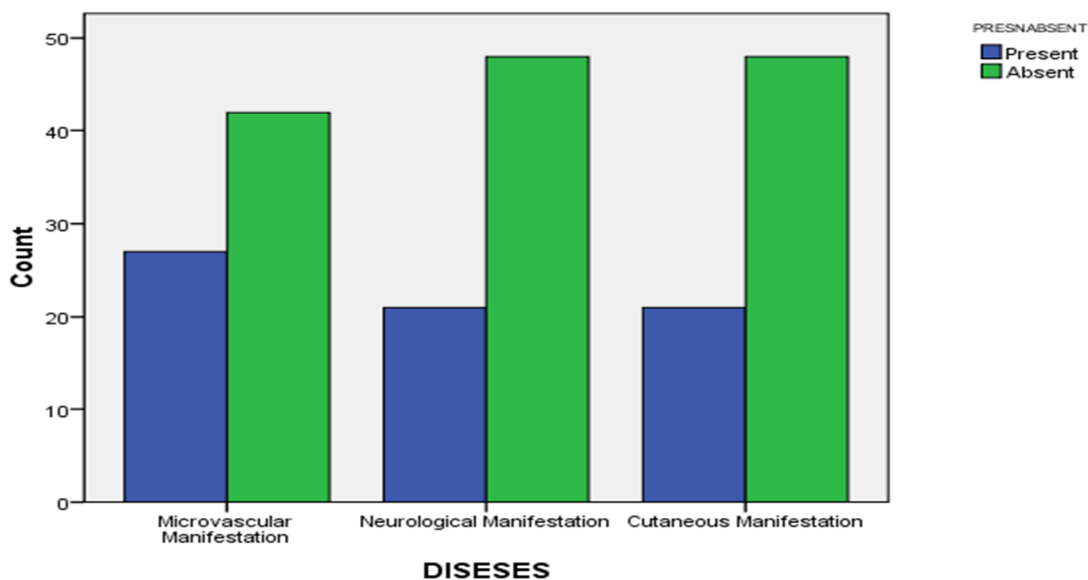
Chi-Square Tests			
	Value	Df	p-value
Pearson Chi-Square	8.427a	4	.077

The chi-square p-value is 0.077 which is greater than that of 0.05 therefore the null hypothesis of independency is accepted and we conclude that there is no association between age group and Cutaneous.

Table 6- DISESES \* PRESENT Cross tabulation

		PRESENT		Total
		YES	NO	
Skin Manifestation	Micro-vascular Manifestation	27	42	69
	Neurological Manifestation	21	48	69
	Cutaneous Manifestation	21	48	69
Total		69	138	207

Bar Chart



The Chi-square test of homogeneity provides an alternative method for testing the null hypothesis that two population proportions are equal. Moreover, it can be extended, to several populations similar to the ANOVA test that compares several means. Accordingly the null hypothesis is written for differences.

Null hypothesis: There is no significant difference between the proportions. i.e.H0: P1 = P2 = P3

Alternative hypothesis: There is significant difference between the proportions of presence of categories of skin manifestation. Level of significance: 5%

Table 7- Taste results

Chi-Square Tests			
	Value	Df	p-value
Pearson Chi-Square	1.565a	2	.457

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.00.

The chi-square p-value is 0.457 which is greater than that of 0.05 therefore the null hypothesis of no significant difference is accepted.