Diabetic status in leprosy[1]

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ABSTRACT — The diabetic status of the local Jhansi patients (120 cases) was established before and after antileprosy treatment. Control studies were performed in normal healthy subjects (50 persons) without family history of diabetes mellitus. Random normals showed an incidence of diabetes only 2%, while leprosy patients (94 males and 26 females) had incidence of diabetic status of 14.2%. The highest incidence (19.3 %) of diabetes was in lepromatous leprosy and lowest incidence (6.4%) in tuberculoid leprosy patients. Repeated studies in leprosy after treatment showed not only clinical improvement for leprosy but also disappearance of the chemical and latent diabetes mellitus and lowering of blood sugar levels in manifest diabetes mellitus. Incidently it was noted that `diabetic status' was worse among males (82.3%) and with advancing age. Association and improvement of diabetic status with specific treatment would tentatively suggest that *Mycobacterium leprae* lesions are not confined to skin alone but somehow also related to carbohydrate metabolism. A careful management of the chemical and latent diabetes may help in clinical management of leprosy too.
Uniterms: Diabetes. Hanseniasis. Hansen's disease. Leprosy.

INTRODUCTION

There is an universal interest in diabetes mellitus as a result of the increasing recognition of its prevalence and widespread complications. Every physician has to suspect probability of diabetes mellitus in a case in whom there is difficulty to overcome an infective episode. Its association with various clinical states has been proved by

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many workers. The patient with diabetes mellitus has an increased susceptibility to bacterial and fungal infections and certain infections may pose a greater problem to the diabetic than to the non-diabetic patients.

Various biochemical changes in leprosy have drawn the attention of many clinicians in recent years. Ross (1964) in her two impressive articles has reviewed some of these changes in detail, covering different facts such as protein, lipids and minerals etc. Studies related to carbohydrate metabolism by and large have been ignored. The present study is an attempt to establish the association of diabetes mellitus with leprosy and to know if any specific association of *Mycobacterium leprae* exists on carbohydrate metabolism.

MATERIAL AND METHODS

One hundred twenty cases of various types of leprosy of different age and sex were selected at random attending Dermato-venereology Department of M.L.B. Medical College, Jhansi, U.P. In addition 50 healthy individuals of comparable age and sex without family history of diabetes mellitus were taken as control. All leprosy patients were subjected to detailed clinical examination and were classified into various types (Indian Classification - Dharmendra, 1967). The diagnosis was made on the clinical grounds, its confirmation was made by histo-pathological examination.

All of them i.e., the control as well as leprosy cases were submitted to standard glucose tolerance test with 100 gms of glucose orally. Those with normal glucose tolerance test were subjected to cortisone primed glucose tolerance test. Blood sugar estimations were done by Somogyi-Nèlson Method. According to W.H.O. (1965) criteria, the manifest and chemical diabetes were labelled on the basis of true blood sugar level over 130 mg% two hours after standard glucose load and the presence or absence of clinical signs and symptoms pertaining to diabetes mellitus. The true blood sugar level over 150 mg% two hours after glucose load in the cortisone primed glucose tolerance test and corresponding two hours value in the standard glucose tolerance test was less than 130 mg% were pointing towards latent diabetes mellitus (Fajans and Conn 1954, Mathur et al., 1966: Nigam et al., 1976). Glucose tolerance test was re-evaluated after four and eight weeks after treatment. Insulin was administered in severely diabetic leprosy patients. (2 cases).

OBSERVATIONS AND RESULTS

The present study constituted of 94 males and 26 females (120 cases), varying in age from 8 years to 82 years with the mean age of 39.6 years and male to female ratio of 3.9:1 (Table I). Amongst 120 cases, 57 had lepromatous, 19 dimorphous and 44 non-lepromatous type of leprosy (Table II). Twenty six patients were in the state of reaction in leprosy in which majority of them from lepromatous group (15 cases with reaction out of 57 lepromatous leprosy). The duration of illness varied from 2 months to 11½ years with the mean duration of illness 2 years and 1 month.

Table III summarises the frequency of diabetes mellitus in control group and leprosy patients. Fourteen or 14.2% of leprosy patients were diabetic as judged by the abnormal initial standard glucose tolerance test and cortisone primed glucose tolerance tests. One of the 50 normal healthy individuals showed abnormal cortisone primed glucose tolerance curve thus giving the incidence of 2% in controls.

The incidence of diabetes amongst the various types leprosy was much more in lepromatous leprosy cases (19.3% or 11 out of 57 cases of lepromatous leprosy) as compared to other clinical forms of leprosy ((Table IV). The incidence of diabetes rises as age advances (Table V). Males were more prone to diabetes as compared to females. It has been further observed that frequency of abnormal glucose tolerance curve was much more in patients with reaction as compared to the leprosy patients without reaction (Table VI) (8 out of 26 patients with reaction in leprosy or 30.8%) . This depends upon the severity and extent of manifestations of reaction in leprosy.

TABLE I

Age and Sex distribution in various clinical forms of leprosy

Clinical types of leprosy	Sex	Age groups in years							Total	Incidence
		0-10	11-20	21-30	31-40	41-50	51-60	above 60		
Lepromatous leprosy	Male	1	2	3	22	13	3	1	45	37.5%
	Female	1	1	1	7	1	1	—	12	10.0%
Dimorphous leprosy	Male	—	1	3	6	3	1	—	14	11.7%
	Female	—	—	1	—	3	1	—	5	4.2%
Tuberculoid leprosy	Male	1	3	4	9	5	1	1	24	20.0%
	Female	—	—	2	4	1	—	—	7	5.8%
Polyneuritic leprosy	Male	—	—	1	2	2	—	—	5	4.2%
	Female	—	—	1	—	—	—	—	1	0.8%
Maculo-anaesthetic leprosy	Male	—	1	1	2	—	1	1	6	5.0%
	Female	—	—	—	—	1	—	—	1	0.8%
Total		3	8	17	52	29	8	3	120	100.0%

Age range = 8 — 82 years, Mean age = 39.6 years, Sex ratio = male : female = 39.9 : 1.

Range of duration of illness = 2 months — 11½ years, Mean duration of illness = 2 years and 1 month

TABLE II

Patients with reaction in leprosy

Clinical types of leprosy	Number of cases			Cases with reaction			
	Male	Female	Total	Male	Female	Total	%
Lepromatous leprosy	45	12	57	12	3	15	26.3%
Dimorphous leprosy	14	5	19	4	1	5	26.3%
Tuberculoid leprosy	24	7	31	5	1	6	19.3%
Polyneuritic leprosy	5	1	6	—	—	—	—
Maculo-anaesthetic leprosy	6	1	7	—	—	—	—
Total	94	26	120	21	5	26	21.6%

TABLE III

Diabetic status in normal healthy persons and leprosy patients

Diabetic Status	Healthy Individuals		Leprosy Patients	
	N.° of cases	Incidence	N.° of cases	Incidence
Manifest diabetes	—	—	3	2.5%
Chemical diabetes	—	—	5	4.2%
Latent diabetes	1	2%	9	7.5%
Non-diabetic state	49	98%	101	84.2%
Incidence of diabetic state		2%		14.2%

TABLE IV

Diabetic status in relation to various clinical types of leprosy

Clincal types of Leprosy	Total No. of Cases	Diabetic Status				
		Manifest	Chemical	Latent	Total	Incidence
Lepromatous leprosy	57	2	3	6	11	19.3%
Dimorphous leprosy	19	1	1	1	3	15.2%
Tuberculoid leprosy	31	—	1	1	2	6.4%
Polyneuritic leprosy	6	—	—	1	1	14.3%
Maculo-anaesthetic leprosy	7	—	—	—	—	00.0%
Total	120	3	5	9	17	
Incidence	—	2.5%	4.2%	7.5%	14.2%	

TABLE V

Diabetes in leprosy in relation to age and sex

Age groups	No. of cases	Number of cases diabetes mellitus			
		Males	Females	Total	Incidence
up to 20 years	11	1	—	1	9.1%
21 — 40 years	69	7	1	8	11.6%
41 — 60 years	37	5	2	7	18.9%
above 60 years	3	1	—	1	33.3%
Sex ratio & Incidence		4.6	: 1	—	14.2%

TABLE VI

Diabetic status and effect of treatment on it.

Diabetic status			Duration of treatment	
		Initial stage	4 weeks	8 weeks
Group A:	Reaction in leprosy cases.			
	Manifest diabetes	2	2	1
	Chemical diabetes	2	1	—
	Latent diabetes	4	2	—
	Total	8	5	1
Group B:	Leprosy patients without reaction.			
	Manifest diabetes	1	1	—
	Chemical diabetes	2	1	—
	Latent diabetes	6	2	—
	Total	9	4	—
	Grand Total	17	9	1

There have been quantitative improvement in diabetic status with the treatment (Table VI). Insulin was needed in two cases who were with reaction in leprosy. The insulin was withdrawn after 12 weeks of therapy and glucose tolerance test became normal.

DISCUSSION

Leprosy is considered to be a systemic disease because of involvement of internal organs (Karat *et al.,* 1971; Nigam *et al.,* 1976). The involvement of liver and kidneys especially in lepromatous leprosy is well documented as alteration in kidney and liver functions. Leprosy may contribute substantially to recognise a diabetic metabolic disturbance and certain clinical manifestations may give a clue or raise a suspicion towards the underlying carbohydrate metabolism disturbance thus may serve as guidepost for early detection of diabetes in general practice. Whether such relationship exists between leprosy and diabetes mellitus still remains unsettled.

It is widely held clinical axiom that the patients with diabetes mellitus have an increased susceptibility to bacterial and fungal infections because metabolic aberration and complications of diabetes mellitus may significantly alter the efficiency of the body's defense mechanism (Johnson 1970). Drachmann *et al.* (1970) in their experiments revealed that hyperglycaemia acts probably as an osmotic deterrent to phagocytic function.

The incidence of diabetes mellitus in general population varies from 0.78% to 2.9% (Nigam *et al.,* 1975, 1976; Vaishnava *et al.,* 1964; Patel and Dhirwani, 1953). In the present group of healthy individuals only one person showed abnormal cortisone primed glucose tolerance test.

The incidence of diabetes in the present series of Hansen's disease worked out to be 14.2% giving the 95% statistical confidence limit as between 10% to 26%. In general population the incidence is far below the lower confidence limit and varies from 0.78% to 2.9% which hence is statistically significant. Tyagi and Sehgal (1971) could not find any influence of leprosy on blood sugar levels. However, no identical report on the subject is available to compare our results.

We have observed the increased incidence of diabetes in lepromatous leprosy and in patients with reactions. This might be the metabolic consequences of severity and acuteness of infection and stress, which are predominantly catabolic (Beisel, 1966, 1967). Increased gluconeogenesis results. Other consequences of it include hyperglycaemia, mobilisation of fatty acids etc. The net result of these changes is that insulin may be, needed for maintenance as it happened in two of our cases. During the treatment the glucose tolerance in diabetes showed trend towards normalisation. A marked significant change in glucose tolerance was observed in chemical and latent diabetes. From the present study one can find reason to suspect a relationship chiefly from the point of maintaining chronicity and deciding number of exacerbations even though a large number of studies are required to conclusively establish a causal relationship between diabetes and leprosy.

RESUMO — "O estado diabético" foi determinado em pacientes de hanseníase (120 casos) antes e depois do tratamento anti-hansênico. O grupo controle constitui-se de indivíduos normais, sadios (50 pessoas) sem história familiar de *diabetes mellitus*. O grupo controle mostrou uma incidência de diabetes de somente 2%, enquanto que nos pacientes de hanseníase (94 homens e 26 mulheres) a incidência do estado diabético foi de 14,2%. A maior incidência de diabetes (19,3%) foi verificada em pacientes virchowianos e a menor (6,4%) em doentes do tipo tuberculóide. Estudos repetidos após o tratamento mostraram não somente melhora clínica da hanseníase, como também o desaparecimento do *diabetes mellitus* químico e latente, com diminuição dos níveis sangüíneos de açúcar em casos de "diabetes mellitus" manifesto. Observou-se que o "estado diabético" é mais freqüentemente encontrado nos indivíduos de sexo masculino (82,3%) e em idade avançada. Esta associação e a melhoria do "estado diabético" com o tratamento específico poderiam sugerir que as lesões causadas pelo *Mycobacterium leprae* não estariam restritas à pele, mas também de alguma maneira, relacionadas ao metabolismo dos carbohidratos. O tratamento cuidadoso do diabetes químico e latente poderia também auxiliar o tratamento da hanse-níase.
Unitermos: Diabetes. Hanseníase. Doença de Hansen. Lepra.

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