INCIDENCE OF DIABETES MELLITUS IN THE BUTHA-BUTHE DISTRICT OF BASUTOLAND

BY

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It has been suggested that the prevalence of diabetes mellitus is low in the Bantu (Trowell *et al.*, 1954; Walker and Bersohn, 1957, 1958; Bersohn and Oelofse, 1957). So far as is known there are no figures to support or controvert this contention. Keeley (1957) has mentioned a total of 153 diabetics out of 37,786 admissions to Baragwanath Hospital during 1956 as contradicting this assertion. However, even Keeley's figures show an incidence of only 0.4%, in contrast to those of Wilkerson and Krall (1947, 1953), who in a typical New England town of the United States of America reported an incidence of 1.7%.

The migration of many Bantu to the urban areas of the Union of South Africa has resulted in a change in their way of life from the primitive to the semi-European. As a result of the change in environmental conditions there is the possibility that ultimately the incidence of certain diseases in the Bantu may be altered. Diabetes mellitus is one of those which may be so affected. Boulay (1928) has pointed to the marked rarity of the disease in French West Africa, where he found it pertinent to publish one case of diabetes mellitus discovered there, and mentions the fact that Nogue and Lhuerre had been unable to find a single case after several years' search both in the Native Hospital at Dakar and among the out-patients at the Institute for Social Hygiene.

On the other hand, American authors (Altschul and Nathan, 1942; Cameron, 1943) have found the American Negro to be just as susceptible to diabetes as the White. Joslin *et al.* (1952) notes that "Negroes appeared at one time to be almost immune to diabetes, but the falsity of this concept has long since been evident from clinical and mortality data." In recent years the Metropolitan Life Insurance Company found that the death rate in Negro males was only about 10% less than that of White males, and was actually 10% higher in the case of the Negro females. DeZoysa (1951) has observed the milder clinical pattern of diabetes in Ceylon as compared with that in the Western world, and attributes it to the high-carbohydrate and low-fat diet consumed in that country.

It therefore becomes necessary to study the incidence of diabetes mellitus in communities where the original primitive conditions prevail and where the food habits and way of life have not yet been affected to any extent by European influence. The object of this paper is to study the incidence of diabetes mellitus in such a community.

Subjects and Methods

The area in which this investigation was carried out is one in which the diet is limited in both quantity and

variety. Maize and kaffir corn (in the form of beer and porridge) and vegetables such as wild spinach, pumpkins, peas, and beans are the main items. Meat and eggs are rarely eaten, and milk is obtainable in small quantities during the winter months only.

The body-build of the population varies, most being tall and thin, but a few are obese, particularly older females. Most of the able-bodied males are away working in the mines or are industrial workers, so that the resident population contains a marked preponderance of females.

Three thousand out-patients attending Seboche Hospital were screened for the incidence of glycosuria. All out-patients were accepted for investigation. There were no known diabetics among them. The age of the patients varied from 20 to 85 years (average 36.8 years).

Table I gives an analysis of the age-groups in years involved in this study.

TABLE I.—Age Incidence of 3,000 Basuto Investigated

Sex	Age in Years							Total
	20	21-30	31-40	41-50	51-60	61-70	71+	
Males	15	152	156	156	118	55	21	673
Females	158	933	499	316	244	112	65	2,327

The reasons for their presenting at hospital were, in order of frequency, as follows: gastro-enteritis and other diseases of the gastro-intestinal tract, complaints in association with pregnancy, rheumatic conditions, skin eruptions, bronchitis, pellagra, allergies, pneumonia, accidents, heart disease, gonorrhoea, and other urogenital conditions, and florid syphilitic lesions. Some were healthy individuals accompanying patients.

Urines were passed postprandially in the presence of the examiner, who then tested each specimen for the presence of glucose with "tes-tape." All the tests were carried out by the same investigator. The tes-tape was held with a pair of forceps to prevent contamination. It was dipped into the urine and held in the air for one minute. The result was then read. The presence of glycosuria, as shown by a change in colour from the normal yellow to different tints of green and blue, indicated the necessity for a blood-glucose estimation. Venous blood was collected in a tube containing sodium fluoride and thymol to prevent glycolysis, and was dispatched to the South African Institute for Medical Research, Johannesburg. Blood-sugar estimations were carried out by a modified Folin-Wu method (King and Garner, 1947) which measures the true blood glucose—in contrast to the original Folin-Wu method, which measures blood glucose plus saccharoids.

Results

Twelve patients (three males and nine females) showed glycosuria. Table II gives an analysis of the blood-glucose determinations at the time glycosuria was discovered. It will be noted that seven of these cases had blood-glucose levels over 140 mg./100 ml. None of these had symptoms referable to a diabetic state. In fact, the main reasons for attendance were three for tooth extraction, one for constipation, one for congestive cardiac failure, one for pyoderma, and one accompanying a patient.

The ages in this hyperglycaemic group ranged from 30 to 80 years (average 50.6 years). Of these, six were above the age of 40. The total number of out-patients

examined below the age of 40 was 1,913 (323 males and 1,590 females), while above that age there were 1,087 (350 males and 737 females). Thus the incidence of hyperglycaemia in the under-40 age-group was 0.05%, whereas in the above-40 age-group this had increased to 0.55%.

TABLE II.—Analysis of Patients Showing Glycosuria

Case No.	Sex	Age in Years	Blood Glucose (mg./100 ml.)
1	F	65	368
2	F	42	254
3	F	30	200
4	M	42	177
5	M	80	165
6	F	45	163
7	F	50	144
8	F	37	132
9	F	45	101
10	F	35	94
11	M	55	81
12	F	33	75

Discussion

This study was carried out on a primitive out-patient community who resent investigation and demand that only immediate illness be attended to. For this reason, a quick easy method of urine examination and as few blood tests as possible were essential requirements for this study. In view of the rapidity of its action tes-tape was thought to be a simple and ideal method of urine investigation. While its value as a quantitative test for glucose has been questioned its value as a qualitative test has been widely accepted (Moran *et al.*, 1957; Jabłokow *et al.*, 1957; Leonards, 1957). It has been shown that tes-tape is more sensitive in discovering glycosuria than is Benedict's or a commercial copper-sulphate test (Moran *et al.*, 1957; Chertack and Sherrick, 1959). The latter workers found the results of urine-testing with this procedure to be comparable to those obtained in more elaborate surveys where blood-glucose levels were utilized as the screening procedure.

One possible inaccuracy is that glycosuria may not be apparent where blood-glucose levels are below 175 mg./100 ml. As a result a number of cases could be missed in the absence of glycosuria and the omission of blood-glucose estimations. The figures of Wilkerson and Krall (1947) are of value in this respect. In their survey of 3,516 people they showed that only 8 instances of diabetes were discovered among cases showing initial hyperglycaemia without glycosuria. They consider a venous blood-sugar level over 160 mg./100 ml. as abnormal. The American Diabetes Association (1950), however, has adopted a figure in excess of 150 mg./100 ml. as indicating abnormality. An investigation of the glucose-tolerance test in the healthy Bantu (Politzer, 1955) revealed that the peak level was never higher than 143 mg./100 ml. Lukens (1944) regarded 140 mg./100 ml. as the upper limit of normal. In the present investigation it was decided that this latter level should be adopted as the upper limit of normal, and by this criterion it was found that 7 out of 3,000 cases (0.23%) were diabetic.

Survey findings of Wilkerson and Krall (1947, 1953) in the United States of America indicate that the incidence of diabetes mellitus is 1.7% of the population—that is, 51 diabetics would be expected in a population of 3,000. Our figures indicate a very low incidence of diabetes among the Basuto population analysed. As has been indicated above, it is possible that certain cases

might have been missed as a result of blood-glucose estimations having been limited to those cases showing glycosuria. If a similar incidence of hyperglycaemia *sine* glycosuria manifested itself in our Basuto population, as was shown in the Wilkerson and Krall survey, seven further cases would have been found in our present investigation. This would have brought the case total to 14—that is, 0.47% of the population tested. Even this figure must be regarded as a very low incidence, and this in spite of our investigation being carried out on a series of out-patients among whom the incidence might be expected to be higher than that in the general population.

The reason for the variable incidence of diabetes mellitus is not known, but it is of interest to note the few cases reported among the population of French West Africa compared with the high incidence in the Negroes of the United States of America. The difference in the mode of life, particularly food habits, may be important in this connexion. In our present investigation the population analysed live in primitive conditions on a low-calorie diet consisting mainly of carbohydrates. The effects of a low-calorie, low-fat diet were strikingly apparent during the war years, when Himsworth (1949) in Great Britain and Abramson (1947) in Sweden were able to demonstrate a marked reduction in the death rate from diabetes. Similarly, Brauss (1953) has stated that in Germany during both world wars the incidence of diabetes dropped considerably as a result of the reduced food intake. Himsworth (1935a, 1935b, 1936) and Himsworth and Marshall (1935) think that the high proportion of fat in the diet rather than carbohydrate favours the development of diabetes.

The strong possibility exists, therefore, that with the changing conditions of life in the rural areas themselves and with the shift of large portions of these populations to urban areas, there may gradually become evident an increase in the incidence of diabetes among these people. The present investigation highlights the necessity for further studies of a similar nature among primitive communities for comparison with similar undertakings among communities of more advanced status. Only in this way will it be possible to assess the importance of diet and living conditions on the incidence of diabetes mellitus.

Summary

In an examination of 3,000 Basuto in the Butha-Buthe area 12 cases of glycosuria were discovered.

Seven of these cases were found to have blood-glucose levels above 140 mg./100 ml.—that is, 0.23% of the cases examined.

This figure is discussed in the light of a similar investigation in the United States of America, and points to a low incidence of diabetes mellitus in a primitive community.

Stress is laid on the necessity for further studies among similar racial groups living under primitive and under more advanced conditions.

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NITROGEN MUSTARD IN THE PALLIATION OF LUNG CANCER

BY

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Nitrogen mustard (methyl bis(β -chloroethyl)amine), or HN2, has been in use clinically since 1943. Either mustard or its derivatives have been used in the treatment of a variety of malignant diseases. Of these, bronchial carcinoma would seem to be a growth that by virtue of its anatomical site in the lungs would be susceptible to an intravenous cytotoxic agent. Unfortunately the neoplasm does not derive its arterial supply from the pulmonary arteries, but from the bronchial arteries. This means that an intravenous dose of HN2 does not in fact truly perfuse the growth until it has been diluted in the systemic circulation. Nevertheless, the mustard reaching the lung via the pulmonary arteries may be said to bathe the tumour, if only for a very short time.

While all agree that mustard is never curative, there is evidence that a fair proportion of patients do in fact get some alleviation of distress. Thus, Hatch, Bradford, and Ochsner (1956) found in their series of 198 patients that improvement occurred in 46% and that symptomatic relief resulted in more than half the group.

Lynch, Ware, and Gaensler (1950) described the response to HN2 in relation to the histology of the growth: 83% of anaplastic growths, 50% of squamous carcinoma, and 33% of adenocarcinoma were improved.

In a disease problem of the magnitude of lung cancer, which is reaching epidemic proportions, any agent which will produce symptomatic relief in such percentages of patients is worthy of consideration. It is because of the discrepancy between published results and the reluctance of clinicians to use nitrogen mustard that the present series is described.

Present Series

Twenty-five patients were treated with HN2 at three hospitals during the period of 1955–9. All the patients

had been rejected for surgery and were also considered unsuitable for radiotherapy. In a sense, therefore, these patients are a selected series in that they were all "poor-risk" cases with advanced disease.

Because of the evil reputation attached to nitrogen mustard for causing many unpleasant side-effects a standard regime was devised to minimize these. Nausea and vomiting are the most constant, and because of this the mustard was always given at night after a light evening meal. The drug was given as an intravenous injection into the rubber of a running normal saline drip. The drip was run very fast for one minute, immediately after the injection, in order to flush the mustard out of the vein. It was allowed to run normally for a further 10 minutes and then taken down.

Two hours prior to treatment sodium amylobarbitone, 3 gr. (0.2 g.), was given and this was repeated one hour before, and again at the time of the injection. If the patient awoke during the night a further 3 gr. (0.2 g.) was given. This 9-gr. (0.6-g.) dose of sodium amylobarbitone was usually adequate to ensure deep sleep until next morning. Occasionally, patients required 12 gr. (0.8 g.), especially if they had been taking barbiturates regularly before admission to hospital.

I have used a number of different drugs, including chlorpromazine, opiates, and cortisone, to determine whether alone or in combination they would prove superior to sodium amylobarbitone. They have not done so, and morphine is particularly noteworthy for its tendency to provoke nausea and vomiting when given after nitrogen mustard.

Initially a dose of 0.1 mg./kg. body weight was given on four successive nights. However, this regime was soon abandoned for a single treatment using 0.4 mg./kg. Quadrupling the dose did not make any significant change in the side-effects observed, and patients appreciated one infusion in place of the four. The patients were admitted for one night, and were then followed in the out-patient department. The treatment was repeated every eighth week.

Malignant pleural effusions resulting from bronchial carcinoma have been treated with local instillations of mustard into the pleural cavity. The procedure is a modification of Weisberger's (1958) method. The effusion is aspirated as completely as possible, and a standard dose of 15 mg. of HN2 diluted in 100 ml. of normal saline is instilled. This is sometimes painful, and, because of this, pethidine, 100 mg. intramuscularly, may be given half an hour before the procedure.

A reactionary effusion may form within 48 hours, and, though it usually reabsorbs, if large, requires aspiration. If fluid is still re-forming, the whole procedure is repeated after one week. Because little HN2 gets out into the general circulation after an intrapleural injection, the dose may be repeated at weekly intervals, or in combination with intravenous mustard without fear of producing bone-marrow depression.

The ages of the 25 patients (4 women and 21 men) ranged between 52 and 72 years (see Table). All were seen as in-patients, and after physical examination had standard chest x-ray films taken. Wherever possible, bronchoscopy was performed and a biopsy of the growth taken.

The 25 patients reported here came from a larger group, some of whom have been excluded because an exact histological diagnosis could not be made.