

# Effect of Time on the Prevalence of Diabetes in the Urban African of Rhodesia

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## SUMMARY

A diabetes survey was conducted in the same African urban township as one done eleven years previously, together with a further survey in a rural area. In the urban survey the prevalence rate rose insignificantly from 0.10 per cent to 0.28 per cent, while no diabetes was discovered in the rural study. A minimal increase of new diabetics was seen during the same period in both the medical wards and obstetric unit, but the disease has not reached the proportions seen either in Europeans or indeed in Africans from certain parts of Southern Africa. A lack of coronary artery disease in diabetes is emphasized. These findings are discussed in the light of experience elsewhere, and some etiologic factors are suggested. *DIABETES* 22:733-37, October, 1973.

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Much interest has centered around the effects of urbanization on black African disease patterns; this is especially true of diabetes. Until comparatively recently most doctors working among Africans were adamant that this disease was rarely encountered.<sup>1,2</sup> However, during the last two decades evidence has rapidly been accumulating (mostly from hospital inpatient statistics), that diabetes is becoming more commonly encountered.<sup>3-10,18,23</sup> Hospital outpatient surveys support this finding<sup>11-13</sup> especially among urban dwellers.<sup>14-17</sup>

Hospital statistics are, however, often misleading and are not always a true reflection of the prevalence of a disease in the general population. In 1960, Carr and Gelfand<sup>18</sup> carried out a small diabetes survey in an African township in Salisbury, Rhodesia. There have been few African diabetes surveys reported outside the

hospital environment,<sup>19</sup> and no longitudinal follow-up survey has ever been reported in Africa. We therefore decided it was worthwhile repeating a similar survey in the same area as the one carried out by Gelfand and Carr<sup>18</sup> eleven years previously, in order to assess any change in disease prevalence. At the same time a similar survey was conducted in the remote rural area of Mount Darwin, Rhodesia. Statistics for hospital inpatient diabetics were also reviewed.

## METHODS AND PROCEDURES

The same simple procedure was used in the 1971 urban and rural surveys as in the 1960 urban survey. Labeled urine-sample bottles were delivered to each household in the evening and collected the next morning. Each person in the house over fourteen years of age was asked to pass a sample of urine into the fully labeled container one hour after his usual evening meal. After collection, the urine samples (without added preservatives) were tested immediately with Clinistix reagent strips. In the 1960 survey urine samples of those with positive reactions were checked both quantitatively and qualitatively with Benedict's solution. In the current surveys the individuals with positive Clinistix reactions were asked to come to Harari Hospital for a glucose tolerance test.

## RESULTS

Of those bottles issued, a high proportion were returned—93 per cent (999) from the rural population and 90 per cent (1,078) from the urban area sample.

The Salisbury urban population has a typical age and sex profile for this part of Africa:<sup>20</sup> it is a migrant labor force having a dual environmental background, with "one foot in the country and one foot in town;" there is a preponderance of young people, an excess of males in the age groups twenty-five to forty-five and a sharp drop in numbers, particularly of women, over forty-five years.

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Table 1 shows the composition of the sample populations for both urban surveys. The present survey contained a higher proportion of people over forty years (9 per cent) than the original survey (7 per cent). However, over-all, there are relatively few people in the over fifty year old group.

TABLE 1  
Age and sex structure of the survey populations

	Urban Surveys				Rural Survey	
	1960		1971		1971	
	M	F	M	F	M	F
	per cent	per cent	per cent	per cent	per cent	per cent
15-20	19	24.5	13	24.5	28.5	38.25
21-30	47	56.75	42.5	48.5	31.75	37
31-40	26.5	12.25	31	21	13	11.25
41-50	6	3.75	10	4.5	16	8.75
51-60	0.5	0.75	2.75	1.25	3.80	1.75
60+	1.0	2	0.75	0.25	6.5	3.0
Total	570-	437-	450-	628-	521-	478-
Per cent	100	100	100	100	100	100

From tables 1 and 2 it appears that the rural survey is most similar to the over-all age/sex structure of Rhodesian Africans. Only one male adult diabetic was found in the 1960 survey. Three diabetics were found in the two current surveys, all in the urban area. Of these, two were known diabetics—a male aged fifty and a female aged forty; the third was a man aged forty-five years who was a bus driver and was unaware of the disease, although on closer questioning he mentioned a lack of energy, a mild thirst and a loss of weight in the last few months. The glucose tolerance curve proved him to be mildly diabetic with a two-hour blood sugar reading of 225 mg./100 ml. The known cases were detected while they lived in the township; they did not take up residence in the township to facilitate clinic attendances.

The crude prevalence rate in the township has there-

TABLE 2  
1969 Census  
Age and sex structure of the African population

	Males	Females
15-20	246,820 (19%)	244,800 (20%)
21-30	341,990 (27%)	393,270 (32%)
31-40	284,730 (22%)	273,640 (22%)
41-50	199,620 (16%)	168,270 (14%)
51-60	120,460 (10%)	84,050 (7%)
60+	77,770 (6%)	63,620 (5%)
Total	1,271,390 (100%)	1,227,650 (100%)

fore risen from 0.10 per cent to 0.28 per cent. With such a few cases, standardization of the population for age and sex is unwarranted. The results suggest only that there has probably been a small but insignificant increase in the prevalence of the disease.

#### DISCUSSION

The average age of the samples, which are fairly typical of the African age and sex structure in this country, is young compared to a European population. The figure of 0.28 per cent is clearly lower than prevalences found in European populations.<sup>25-28</sup> This fact may be partly explained by the few people screened over the age of fifty, whereas in Europeans the main prevalence occurs in this age group.<sup>21</sup> Fewer men were screened in the current survey (42 per cent) than in the 1961 survey (57 per cent). In some African countries diabetes is more prevalent in males in the age group under forty,<sup>6,10,22,23</sup> but in Rhodesia the sex incidence of diabetes is equal in this age group<sup>24</sup> and the alteration in balance between the sexes in the two urban surveys should not interfere with the prevalence findings here.

In one African diabetes survey performed outside the hospital environment by Goldberg<sup>19</sup> in South Africa, two African groups were investigated after an oral glucose load. One group was from an urban area in the Cape where a total prevalence rate of 2.7 per cent was found for all people over the age of ten years. The second survey was of an urban group in the Transvaal where a total prevalence rate of 2.95 per cent was found. These figures are much higher than our result of 0.28 per cent in the urban survey (with no cases in the rural survey) but much lower than most reported European series.<sup>25-28</sup> However, the circumstances differ in all these surveys, not only in the age distribution of the population examined, but the technics of investigation and the criteria adopted by the various workers to define what constitutes a diabetic tolerance curve.

A number of criticisms can be leveled justifiably at our surveys. First of all the number of people screened was small compared with the large series reported from Europe and the United States (3,516 Oxford, Massachusetts;<sup>25</sup> 25,701 Bedford, England;<sup>26</sup> 18,532 Birmingham, England<sup>27</sup>). Secondly, although representative, a young population was studied with only 1.5 per cent of females over the age of fifty. It is in this age group, especially if obesity is present, that diabetes has its peak occurrence in most reported European series.<sup>21,25,28</sup> Again, postprandial urine testing alone is generally a poor screening procedure,<sup>19,29-31</sup> especially for latent diabetics in the older age groups.

Despite these criticisms it is fair to state from previous work<sup>24</sup> that as the peak prevalence of diabetes occurs between forty and fifty years of age in the Rhodesian African and as there were only 1.5 per cent of people screened over the age of fifty, it is unlikely that we missed many of the latent diabetics.

Further information which supports this low prevalence figure of 0.28 per cent is the number of new diabetics being seen each year at Harari Hospital.

As can be seen from table 3 the number of new diabetics more than doubled over a ten year period, but over the last seven years the number remained remarkably constant. Moreover, this early rise in prevalence is not as dramatic as the increase seen in the urban African in South Africa.<sup>8,33</sup> So far as the pattern of hospital admissions is concerned the diabetics are older but have approximately the same sex ratio.<sup>24</sup> Some of the increase could be attributed to improved diagnostic standards, e.g. from 1961 to 1971 the number of full-time doctors serving the hospital increased from about fifteen to 105.

In addition to the increase of new diabetic admissions to hospital, an increase has also been seen in the maternity department. In 1963 Bland<sup>34</sup> reported only one black African diabetic mother out of 15,521 deliveries in the Harari maternity unit, an incidence of 0.0064 per cent. Between October 1970 and September 1971 out of 8,129 deliveries only seven patients were found to have glycosuria of which five had a diabetic glucose tolerance curve.<sup>24</sup> Three of them were known diabetics and two were new diabetics, giving an over-all incidence of 0.061 per cent, a figure much lower than that seen in most European maternity centers,<sup>35</sup> and also less than the recorded incidence found by Notelovitz in pregnant Africans in Durban.<sup>36</sup> However, Notelovitz also

TABLE 3  
New diabetic admissions per year

Year	Hospital admissions	New diabetic admissions
1961	16,969	44
1962	13,552	62
1963	15,644	82
1964	15,480	87
1965	15,705	90
1966	16,226	97
1967	15,431	108
1968	18,846	93
1969	18,226	88
1970	20,270 (22% over 40)	104 (62% over 40)
1971	19,923 (45% female)	101 (47% /female)

noticed that the prevalence had increased from 0.06 per cent in 1964 to 0.15 per cent in 1968. The prevalence was 0.25 per cent in Nigerian African maternity cases.<sup>37</sup>

It would appear, therefore, that there has been an increase in the number of African diabetics seen in hospital practice in Salisbury, but prevalence has not yet reached that seen in European centers and is certainly lower than that seen in urban Africans in South Africa.<sup>8,33</sup>

These results emphasize the pitfalls involved when comparing inpatient hospital statistics with those of the general population, especially in developing countries. The medical facilities, diagnostic aids, a greater awareness of the disease both on the part of the doctor and the patient, and a more willing attitude on the part of the population to come to hospital tend to produce an artificial increase in a disease even in the outpatient department. Other factors, such as superstition, come into play before a patient agrees to admission.

To what extent has the Rhodesian African been affected by modernization and has it increased his likelihood of developing diabetes? There has certainly been a tendency for most Rhodesian black Africans to move away from their traditional African diet, which consists of a high carbohydrate base (maize) with low refined sugar and fat content, to a more European-type diet with a much greater intake of refined sugar. Bread consumption among Africans living in Salisbury increased from 12.2 lb. per man unit month in 1963/64 to 13.6 lb. in 1968.<sup>38</sup>

As can be seen from table 4, refined sugar consumption was also estimated in ninety-five diabetic inpatients<sup>24</sup> and forty-four nondiabetic controls from the amount of sugar ingested in tea, coffee and on porridge, and in addition, the daily consumption of soft drinks. This table shows that the rural group ate significantly less than the urban controls ( $t = 3.498$ ;  $.01 > p > .001$ ) and are significantly less than the urban and rural diabetics who had been advised to try to limit their intake, a difficult problem for the patient due to economic reasons. No other differences were statistically

TABLE 4  
Daily consumption of refined sugar

Group	Average daily sugar intake in grams	No. interviewed
Urban diabetics	97.92	49
Rural diabetics	94.02	46
Urban controls	85.77	22
Rural controls	41.77	22

significant although the urban controls ate less sugar than both diabetic groups, and the urban diabetics ate slightly more than the rural diabetics.

These same groups were further questioned as to whether they ate sweets, cane sugar per se, jam, bread, biscuits and eggs, and whether they drank tea or coffee daily. Significantly more diabetics ate bread ( $X^2 = 5.01$ ;  $.05 > p > .01$ ). No other difference was statistically significant except for sugar consumption in tea or coffee ( $X^2 = 4.98$ ;  $.05 > p > .01$ ). Both Campbell<sup>15</sup> and Politzer and Schneider<sup>17</sup> incriminate the marked increase in sugar consumption of urban Africans compared to their rural compatriots as a major etiologic feature. Using the standard weight for height tables constructed by the Metropolitan Life Insurance Company,<sup>42</sup> 69 per cent of thirty-five nonsteatorrheatic female diabetics were overweight compared with 59 per cent of 475 female controls. However, only 12 per cent of thirty-one male diabetics were overweight compared with 25 per cent of 1,409 male controls.<sup>24</sup> Certainly the rarity of ischemic heart disease due to atheroma among Rhodesian black Africans is a matter of record. Ross<sup>41</sup> found the coronary death rate among autopsies done on cases of sudden or unnatural death was 1 per cent among black Rhodesians and 20 per cent among whites.

In addition to this dietary factor, Campbell<sup>15</sup> noted that there appeared to be a definite relationship between the length of time of urban exposure and the development of diabetes, this being approximately twenty years. In a recent study of 100 consecutive new diabetics seen at Harari Hospital,<sup>24</sup> eighty-five were born in the rural areas but at presentation fifty-seven had been living in an urban environment with a mean exposure time of nineteen years. However, there were still forty-three who had not left a rural environment.

Gelfand,<sup>39</sup> although willing to accept that the diet had changed, believed that there were many other factors involved apart from diet. It is the view of Prof. Reader\* that there are indications that the reaction of the local African to modernization may be dissimilar to that of Europeans.<sup>40</sup> It will be interesting to see whether further exposure to urbanization will result in an increase in prevalence to that experienced among the urban Africans in South Africa and ultimately to that in European populations.

It is further interesting to note that during the past five years we have not had a single case of angina or

myocardial infarction in a diabetic<sup>24</sup> on the wards of Harari Hospital, and indeed out of a total of 92,696 (20 per cent medical) admissions, only nine patients with myocardial infarctions have been seen.

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