

Diabetes and Arteriosclerosis

A Study on Sixty Diabetic Yemenites

*A. M. Cohen, M.D., Z. Canaani, M.D., J. Landau, M.D., and K. Braun, M.D.
Jerusalem and Rehovoth, Israel*

Arteriosclerosis is rare among the Yemenite "new immigrant" Jews living in Israel less than ten years. On changing their environment and having been settled in Israel for twenty-five years and over, the incidence of arteriosclerosis in these "settled" Yemenites increases, but is still much less than among the Jewish communities coming from western countries.¹⁻³ This change of environment was shown to have an even more pronounced effect on the prevalence of diabetes in the Yemenite Jews. While in the "new immigrant" Yemenites diabetes is extremely rare, the prevalence in the "settled" Yemenites was found to be the same as among Jews coming from western countries.⁴ The purpose of the following investigation is to determine to what extent the presence of diabetes would affect the incidence of arteriosclerosis in Yemenites who, as said, have little tendency to develop arteriosclerosis.

CLINICAL MATERIAL

Sixty diabetic Yemenites—the total known Yemenite diabetic population of Jerusalem and the majority of the Yemenite diabetics of Rehovoth and its environs—were studied during the year 1961. Diabetes was considered to be present when repeated fasting blood sugar was 120 mg. per 100 ml. or more. A complete history was taken and complete physical examination was performed. The following data were recorded: age, sex, duration of diabetes, type of diabetic therapy and resting blood pressure on several occasions. Twelve-lead electrocardiograms were recorded and tele-roentgenograms of the chest and abdominal aorta were obtained; oscillometry of the lower extremities was performed and the ocular fundi were examined in the dark with the aid of a mydriatic. Urine was examined for albumin with sulphosalicylic acid.

The criteria for evaluating the various vascular complications of diabetes were as follows: Diastolic hypertension was considered to be present when the systolic

pressure exceeded 150 mm. Hg and the diastolic pressure 90 mm. Hg; systolic hypertension was diagnosed when the systolic pressure exceeded 150 mm. Hg, while the diastolic pressure was below 90 mm. Hg.

The criteria for the presence of arteriosclerotic heart disease (ASHD) were those set forth by the New York Heart Association.⁵ "Symptomatic arteriosclerotic heart disease" was diagnosed when angina pectoris, myocardial infarction or congestive heart failure (non-valvular) were present. "Probable ASHD" included aortic calcification and cardiomegaly, in the absence of hypertension or definitely abnormal electrocardiogram (ECG); under the term "definitely abnormal ECG" the following changes were included: (1) alterations of the ventricular conduction, as partial and complete bundle branch block; (2) alterations of the final deflection of the ventricular complex, i.e., isoelectric and inverted T waves in more than one lead, apart from leads of L₃ and aVR, where this may be normal; (3) left ventricular hypertrophy with flat, isoelectric or inverted T waves in precordial leads V₅₋₆; these changes are interpreted as an index of myocardial damage, probably as a result of coronary arteriosclerosis, since no other etiological factor could be determined. Under "definitely abnormal ECG" were not included three electrocardiograms with QRS complexes indicating left ventricular hypertrophy, but without accompanying ST-T changes, since the significance of this abnormality cannot be estimated at present.

"Diabetic fundus" included the following: dilated veins; microaneurysms; hemorrhages; hard-edged exudates and proliferating processes. "Arteriosclerotic changes" in the retina included: narrow and pale retinal arteries; straight course of the vessels in at least two out of the four main vessels in each fundus, and narrowness of the angle at the majority of their bifurcations.

The results of the different vascular complications in our group were compared with a series of 185 non-Yemenite diabetic Jews⁶ and with 394 American diabetics reported by Bryfogle and Bradley.⁷ However, comparison with the latter study is limited by the fact

From the Diabetes Outpatient Department and the Department of Medicine B, Hadassah University Hospital, Jerusalem, and the Diabetes Outpatient Station, Kaplan Hospital, Rehovoth, Israel.

that 88 per cent of our patients had diabetes less than ten years, whereas in Bryfogle and Bradley's series 44 per cent had diabetes for more than ten years, and 30 per cent for more than fifteen years.

RESULTS AND COMMENTS

Age, sex, duration of disease and treatment are specified in tables 1, 2 and 3. There were twenty-three female patients and thirty-seven males. A similar sex ratio was noted in a previous study.⁴ This male-to-female ratio differs from that in other ethnic groups where diabetes is more prevalent in females.⁴ Of the sixty patients, forty-nine were "settled" and eleven were "new immigrants."

Arteriosclerotic Heart Disease. Symptomatic ASHD was established in seven individuals (four females and three males), i.e., in 11.8 per cent, or in 13 per cent of those aged forty years and above and in 22.7 per cent of those aged fifty years and above. All the patients with symptomatic ASHD were detected in the "settled," while none was found in the "new immigrants." However, only six of the eleven "new immigrants" had had clinical diabetes for more than two years. This result is similar to that reported in 185 non-Yemenite diabetic Jews.⁶ However, this incidence of symptomatic ASHD in Yemenites is less than that given by Bryfogle and Bradley⁷ who reported 18.1 per cent, a difference which may be explained by the fact that in Bryfogle and Bradley's group 44 per cent of the patients had had diabetes for more than ten years and 30 per cent for more than fifteen years, while 88 per cent of our patients had had diabetes for less than ten years.

When "probable ASHD" in the diabetic Yemenites

is considered together with "symptomatic ASHD," the percentage rises to forty-five. These figures do not differ from the incidence reported in American diabetics by Bryfogle and Bradley who found 40.1 per cent, and those of Liebow et al.⁸ who found 42 per cent.

Hypertension. The incidence of both "systolic" and "diastolic" hypertension together was 35 per cent, compared to 37 per cent in the non-Yemenite diabetic Jews⁶ and 28.4 per cent in Bryfogle and Bradley's survey.⁷ "Diastolic hypertension" was found in all age groups to be at a ratio of 1.4 females to one male. When we compare the incidence of "diastolic hypertension" in diabetic Yemenites with that in nondiabetic Yemenites—"settled" and "new immigrants"—it may be seen that hypertension is far more frequent in the diabetics (table 4).

Peripheral vascular disease, as manifested by intermittent claudication and reduced oscillometry, was found in 12.0 per cent of our cases. This figure compares with 5 per cent found among 185 non-Yemenite diabetic Jews⁶ and 15.7 per cent in Bryfogle and Bradley's survey.⁷ However, in the latter series 50 per cent of those reported with peripheral vascular disease had undergone at least a partial amputation, while none of our patients had gangrene of the extremities.

Albuminuria was detected in eight cases, or in 13.2 per cent of the diabetic Yemenites, a figure close to that reported in Bryfogle and Bradley's series (10 per cent). It should be pointed out that five of these eight cases were in the age group of sixty years and above.

Diabetic fundus was found in ten cases out of the forty-nine examined, i.e., in 20.4 per cent. In the re-

TABLE 1
Age and sex distribution of diabetic Yemenites

Age (years)	30-40	41-50	51-60	61-70	70+	All ages
No. of cases	6 (4)	14 (6)	17 (5)	16 (6)	7 (2)	60 (23)
Per cent	10 (6.7)	23.3 (10)	28.3 (8.3)	26.6 (10)	11.8 (3.3)	100 (38.3)

*Figures in brackets refer to females.

TABLE 2

Duration of disease in diabetic Yemenites compared to Bryfogle and Bradley's series⁷

Years	0-5	8-10	11-15	15-20	20+
Yemenites					
No. of cases	37	16	6	1	0
Per cent	61.8	26.5	10	1.7	0
Bryfogle and Bradley's series					
Per cent	31.7	18.8	18.8	16.5	14.2

TABLE 3

Treatment of diabetes and incidence of diabetic fundus and arteriosclerotic heart disease

	Treatment			Diet alone
	Orsinon*	Insulin Up to 40 U	40-60 U	
No. of patients	13	14	5	28
Diabetic fundus (No. of patients)	3	—	2	5
Symptomatic ASHD (No. of patients)	—	3	—	4

*N-(4 methyl benzensulfonyl) N-butyl urea.

TABLE 4
Frequency of diastolic hypertension in diabetic and nondiabetic Yemenites

Age (years)	30 to 55			55 and above		
	Total	Male	Female	Total	Male	Female
Diabetic	12 per cent	10 per cent	14 per cent	35 per cent	30 per cent	42 per cent
Nondiabetic*						
"Settled"	7.5 per cent	7 per cent	8 per cent	20 per cent	20 per cent	21 per cent
"New immigrants"	1 per cent	0	2 per cent	7 per cent	4 per cent	11 per cent

*125 "settled" (fifty-five males and seventy females) and 147 "new immigrants" (seventy males and seventy-seven females).

(See reference No. 3.)

maining eleven patients it was impossible to examine the fundus because of opacities in the cornea, cataracts, etc. In Bryfogle and Bradley's series the number of diabetics with a duration of the disease up to fifteen years was 273; 23 per cent of these had diabetic retinitis—a figure very close to ours. It should be stressed that no cases of malignant diabetic retinopathy were found in our series. The reason for this may be the relatively short duration of the disease in these cases. Cataract was noted in three cases below the age of forty years.

Arteriosclerotic changes in the fundus were found in twenty-eight cases out of the forty-nine examined, i.e., in 57 per cent. It is noteworthy that the incidence of arteriosclerotic changes in the fundi of diabetic Yemenites in the age group of thirty to fifty-five years is almost the same as in the higher age group (table 5). On comparing these results with those found in nondiabetic Yemenites,³ it may be seen that in the age groups below fifty-five years the percentage of arteriosclerotic changes of the retina in the "new immigrant" Yemenites is three, in the "settled" Yemenites—eighteen, while in the diabetic Yemenites it is fifty (table 5).

In the diabetic Yemenites there was 50 per cent incidence of vascular complications of one or more of the following: diabetic fundus, hypertension, symptomatic arteriosclerotic heart disease (ASHD), peripheral vascular disease, and albuminuria. This figure is very close to that found in the non-Yemenite diabetic Jews⁶

and in diabetics in general.⁷

DISCUSSION

The material presented consists of all the known diabetic Yemenites living in Jerusalem and the majority of the Yemenite diabetics of Rehovoth and its environs. Although the total number is relatively small, it may be assumed that this series constitutes a representative sample of the diabetic Yemenite population in Israel. The criteria for evaluation of various vascular complications of diabetes were the same as those of Bryfogle and Bradley.⁷ The incidence of these complications in our group was compared with that in a series of 185 non-Yemenite diabetic Jews and with that in 394 non-Israeli diabetics.⁷ However, comparison with the latter is limited by the fact that in Bryfogle and Bradley's group 30.7 per cent of the patients had had diabetes for more than fifteen years, while all our patients had had the disease for less than fifteen years.

Our results show that the incidence of vascular complications in diabetic Yemenite Jews is not different from that in diabetics in general. However, this observation does not accord with the report of Brunner:⁸ a possible explanation for this may be the fact that, as he states in his article, not all of his patients were examined for the presence of vascular complications. The incidence of diabetic fundi in Yemenites of our series was the same as in Bryfogle and Bradley's series of diabetics with a similar duration of the disease. The incidence of "arteriosclerotic changes" of the retinal vessels could not be compared, since in Bryfogle and

TABLE 5
Frequency of arteriosclerotic changes in fundi of diabetic and nondiabetic Yemenites

Age (years)	30 to 55			55 and above		
	Total	Male	Female	Total	Male	Female
Diabetic	50 per cent	50 per cent	40 per cent	60 per cent	60 per cent	58 per cent
Nondiabetic*						
"Settled"	18 per cent	7 per cent	27 per cent	34 per cent	26 per cent	33 per cent
"New immigrants"	3 per cent	0	5 per cent	8 per cent	9 per cent	6 per cent

*See footnote table 4.

Bradley's series these changes were not specified. Comparison with the incidence of arteriosclerotic changes in the fundi of nondiabetic Yemenites revealed a far greater incidence in the diabetic Yemenites, even in the age groups of thirty to fifty-five years. The frequency of peripheral vascular disease and albuminuria in the diabetic Yemenites did not differ, either, from that in diabetics in general.

The incidence of "probable" arteriosclerotic heart diseases in the diabetic Yemenites was about the same as in diabetics in general. The frequency of "symptomatic" heart disease in the Yemenite diabetics was also the same as in the non-Yemenite diabetic Jews,⁶ but less than that reported by Bryfogle and Bradley.⁷ From the above it is evident that the frequency of the various vascular complications in the Yemenite diabetics does not differ from that in diabetics in general. However, these complications are less severe, i.e., no cases of gangrene or malignant diabetic retinopathy were detected. This may be explained by the relatively short duration of the disease in these patients. It is probable that with a longer duration of the disease the vascular complications will progress to more severe manifestations.

Diabetes is known to accelerate the appearance and to increase the frequency of arteriosclerosis.¹⁰⁻¹² Arteriosclerosis is extremely rare in the "new immigrant" Yemenites in Israel, but increases among Yemenites who have been settled in the country for more than twenty-five years,^{1,2} although it is still far less frequent than in other ethnic groups.² On the other hand, the incidence of diabetes in the "settled" Yemenites is the same as that in other ethnic groups of Jews coming from western countries, despite the extremely low incidence in "new immigrants."⁴ The present data show that in the diabetic Yemenites the incidence of arteriosclerotic complications is similar to that in the diabetic population in general. This suggests that, in a definite population, diabetes is a major factor in promoting the appearance of arteriosclerosis, far and above all other environmental factors. Could the increased incidence of metabolic disturbances in diabetes be a cause for the increased incidence of arteriosclerosis in a definite population?

SUMMARY

Sixty diabetic Yemenite Jews were examined for the presence of vascular complications. The results were compared with those found in 185 non-Yemenite diabetic Jews, in nondiabetic "new immigrant" and "settled" Yemenites, and in 394 non-Israeli diabetics. The incidence of the various vascular complications in the

diabetic Yemenites was found to be similar to that in diabetics in general. Development of vascular complications in diabetic Yemenites is not different from that in diabetics in general. A comparison of the vascular complications in diabetic and nondiabetic Yemenites suggests that in a definite population diabetes is a major factor in promoting the appearance of arteriosclerosis, far and above all other environmental factors.

SUMMARIO IN INTERLINGUA

Diabete e Arteriosclerosis: Un Studio de Sexanta Yemenites con Diabete

Sexanta judeos diabetic de Yemen esseva examine con respecto al presentia de complicationes vascular. Le resultatos esseva comparate con illos trovate in 185 judeos diabetic non de Yemen, in 394 diabeticos non-israelitic, e in yemenites non-diabetic de immigration recente e etiam de establimento jam prolongate. Le incidentia del varie complicationes vascular in le yemenites diabetic esseva simile a ille incidentia in diabeticos in general. Le disveloppamento de complicationes vascular in yemenites diabetic non differe ab illo in diabeticos in general. Un comparation del complicationes vascular in yemenites diabetic e non-diabetic suggere que in un population specific le presentia de diabete es un major factor in promover le apparition de arteriosclerosis e que le signification de iste factor excede per multo le signification de omne le altere factores ambiental.

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