RETINOPATHY AND DIABETIC CONTROL*

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THIS paper is based on a review of 847 patients attending the Diabetic Clinic of the Northern Hospital, Liverpool. The eyes of 695 of the patients were examined by two independent observers and at the time of the examination neither of these observers was aware of the other factors involved in the survey.

The degree of retinopathy was graded from 0 to 5 by the following criteria:

- 0 Retina not seen because of cataracts, etc.
- 1 Normal fundus.
- 2 Excessive venous tortuosity and dilatation.
- 3 Few capillary microaneurysms and haemorrhage with or without exudates.
- 4 Numerous capillary microaneurysms and haemorrhage with or without exudates.
- 5 Retinitis proliferans.

A study of the records enabled a reasonable clinical assessment to be made of the type of diabetes, and all but twenty patients were classified under two headings:

Type A Those requiring insulin.

Type B Those not requiring insulin.

The duration of the diabetes was taken as the period between the onset of symptoms and the retinal examination.

The degree of diabetic control was assessed by clinical rather than biochemical features as good, bad, or intermediate:

- Good:** (1) No symptoms of diabetes.
(2) Satisfactory weight loss in the obese diabetic and the maintenance of a steady weight in the non-obese diabetic.
(3) Absence of diabetic coma, and absence or only mild occurrence of ketonuria.
- Bad:** (1) Symptoms of diabetes persisting after the commencement of treatment.
(2) Failure of the obese diabetic to lose weight and of the non-obese diabetic to maintain a steady weight.
(3) Occurrence of diabetic ketosis and coma.

Intermediate: The bad features occurred in a mild degree.

Casual blood pressures were recorded and the patients classified 0 to 5 as follows:

- 0 Not recorded.
- 1 Diastolic pressure below 100 mm. Hg at all times.
- 2 Occasional diastolic readings above 100 mm. Hg.
- 3 Constant diastolic readings above 100 mm. Hg.
- 4 As 3, with x-ray and/or E.C.G. changes of left ventricular hypertrophy.
- 5 As 4, with albuminuria.

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Methods of Analysis

Since each criterion when applied singly divides the patients into three or more groups, it follows that when they are applied simultaneously the patients may be divided into more than 200 groups.

Although records were available for 847 patients they would be impossible to interpret if broken down into such a large number of groups.

It is known that if the data from a multiple contingency table of this kind are submitted to extensive pooling, associations may appear to be present which have no foundation, while at the same time real associations may be submerged.

In view of these difficulties the following analyses were chosen on the basis of medical knowledge of what factors were likely to be important, using the χ^2 test of association.

Results

Retinopathy and Type of Diabetes (Table I).—At first glance the results would suggest that retinopathy is more common and more severe in Type A than Type B, but a further analysis showed that there were relatively more early cases in Type B, and when this was taken into account the apparent differences in the incidence of retinopathy between the two types disappeared.

TABLE I

Grade of Retinopathy	Type of Diabetes			Total
	A	B	Not Known	
0	18	14	1	33
1	213	239	8	460
2	30	24	1	55
3	55	29	2	86
4	31	18	1	50
5	6	4	1	11
Not Known	75	71	6	152
Total	428	399	20	847

The data provide no evidence that retinopathy is more likely to occur in or is more severe in one type of diabetes than in another.

Retinopathy and Duration of Diabetes (Table II).—When the age at onset of diabetes in Types A and B was analysed the degree of retinopathy appeared to increase

TABLE II

Grade of Retinopathy	Duration of Diabetes (yrs)							Total
	0-1	1-2	2-3	3-4	4-5	5-10	Over 10	
0	3	1	2	2	3	8	14	33
1	35	40	44	36	46	158	101	460
2	5	2	2	7	4	17	18	55
3	4	6	6	5	2	25	38	86
4	1	1	2	2	5	12	27	50
5	—	—	—	—	—	3	8	11
Not Known	11	10	9	13	15	47	47	152
Total	59	60	65	65	75	270	253	847

with the duration of diabetes, the strength of association between these two quantities being independent of the age at first examination and the same for both A and B.

Retinopathy and Degree of Control (Table III).—For the purpose of analysis certain categories of retinopathy were combined. No association was found between the degree of retinopathy and the degree of control for either Type A or Type B or both combined.

TABLE III

Grade of Retinopathy	Degree of Control				Total
	Good	Bad	Intermediate	Not Known	
0	27	5	—	1	33
1	393	32	27	8	460
2	45	3	6	1	55
3	70	8	6	2	86
4	45	3	1	1	50
5	9	1	—	1	11
Not Known	121	14	11	6	152
Total	710	66	51	20	847

Retinopathy and Blood Pressure (Table IV).—Certain of the categories of retinopathy were combined and allowance was made for the duration of diabetes.

The degree of retinopathy appeared to increase with the degree of hypertension and the strength of this association was independent of the duration of diabetes.

TABLE IV

Grade of Retinopathy	Class of Blood Pressure						Total
	0	1	2	3	4	5	
0	2	19	3	6	3	—	33
1	35	275	80	56	14	—	460
2	3	36	8	5	3	—	55
3	5	45	20	10	6	—	86
4	2	21	12	10	5	—	50
5	2	2	3	2	—	2	11
Not Known	152	—	—	—	—	—	152
Total	201	398	126	89	31	2	847

Summary

The frequency and severity of retinopathy showed an association with hypertension and increasing duration of diabetes. No relationship was demonstrated with the clinical types or with the degree of clinical control of the diabetes.

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