IV. Diabetes Mellitus

A DIABETES / SURVEY AND 10 YEAR FOLLOW UP OF DIABETIC PERSONS EMERGED FROM THE SURVEY

Since the introduction of Diabetes Survey by Wilkerson and Krall, (1947) in Oxford, Massachusetts, much work has been done to elucidate the incidence of glycosuria in selected as well as in a representative sample of the population. The largest population study reported to date, is by the college of general practitioners wherein 10 practitioners of Brimingham (England) collaborated to cover a population of 19,412. (Diabetes Survey Working Party, 1962).

In India, the survey has been mostly confined to selected population studies. One such interesting pilot survey is by Ahuja et al, (1966) in New Delhi. They have reported an abnormal glucose tolerance test in 7.6 per cent of an unknown group of 834 cases.

The present paper deals with the results of a door to door diabetic survey conducted in the years 1967-68 in Bangalore and the fate of the diabetic persons emerged from this survey during the next ten years.

Set Up of the Survey (1967-68) :

Student volunteers. assisted by medical practitioners and organisers approached citizens from door to door. A clean empty bottle duly labelled and a questionaire were distributed to every member of the family above the age of five. They were requested to collect urine 11/2 to 2 hours after the largest meal and return it with the questionaire answered. The urine samples were tested for glucose by using enzyme test paper. Persons with positive

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test for glucose were asked to report for interview, detailed examination and 50 g. oral glucose tolerance test. Blood sugar was estimated by modified King's method. (Wooton, 1964).

Area and Period of Survey :

The area of survey comprised of South of Bangalore and included ten geographical extensions. The survey was started in July 1967 and completed by October 1968. The field work of the survey was confined to Saturdays and Sundays of every week but G.T.T. and medical check up were done every day;

The Results :

Among the 40,008 persons belonging to 8,002 families who received the bottles 25,273 (63, one per cent) gave urine samples. 14,735 (36.9 per cent) returned the bottles empty. When tested, out of 25,273 samples received 870 were positive for glucose.

In the 40.008 persons who ac-women. Among those who responded 13,160 cepted the bottles there were 20,604 52.5 (52.10 per cent) were men and 12,113 (47.90 percent) men and 19,404 (47.5 per cent) women. (Table 1).

TABLE 1

RESULTS

Arey	Days	House appro- ached	Bottles distri- buted	Urine sample collected	Number refused	Positire results	Normal	Infirmed	Total
South of Bangalore	Every Saturday &Sunday	8,002	40,008	25,273 (63.1per cent	14,735 (36.9 per cent	870	785	508	586

The age sex distribution of non-tested and tested population shows that a majority of persons tested belong to the group of adolescents and adults (Fig. 1A). There has been no significant sex difference as far as response or refusal rates were concerned (Fig. 1B).

Incidence of Glycosuria :

The incidence of glycosuria among tested population was 3.44 per cent (870 cases). The incidence of glycosuria was 2.08 per cent (525 cases) for males and 1.36 per cent (345 cases) for females. (Table 2). The sex

TABLE 2

INCIDENCE OF GLYCOSURIA

Glycosurics	Number	Percentage
Male	525	2.08
Female	345	1.36
TOTAL	870	3.44

ratio was approximately 4 : 3 in favour of males, 586 (67. 4 per cent) of the 870 glycosurics reported for examination and 50 g. oral G.T.T. Of these persons, 78 (9.0 per cent) were found to have normal G.T.T. The incidence of normal G.T.T. pattern is 2.5 per cent (10) among newly detected glycosurics and 3.4 per cent (68) in the known group. False positives in the tested groups could be due to misreading, contamination, pregnancy and intermittent glycosuria.
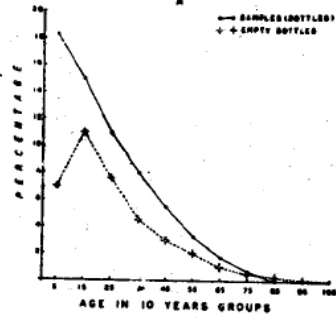

Fig. 1A

Age distrubution of total survey population and non-tested Population.
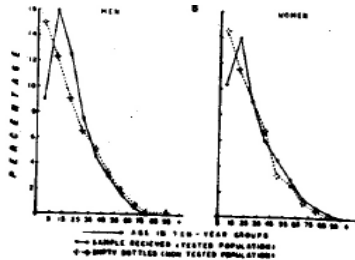

Fig. 1A

Fig. 1B

Age-sex distrubution of tested population and

non-tested population.

Ont of 508 proved abnormal G.T.T., 303 were known diabetics and 205 newly detected ones. For every 3 previously known cases there appeared to be 2 undiscovered cases of abnormal glucose tolerance. (Table 3).

TABLE 3

TOTAL NUMBER OF G.T.T.= 586

Known diabetics	303	10
Detected diabetics	205	68
TOTAL	508	78

TABLE 4

SEX DISTRIBUTION

Type	Male	Female	Ratio
Known diabetics	193	110	2 : 1
Detected diabetics	152	53	3 : 1
TOTAL	345	163	3 : 2

In the known diabetic group there were 193 males and 110 females. In the discovered abnormal G.T.T., 152 were males and 53 were females. The sex ratio for the combined figure is 3 : 2 in favour of males. (Table 4).

G.T.T. Results :

The results of the glucose tolerance tests were interpreted as taking the same criteria as was followed by the Diabetes Working Party (1962), from Birmingham.

Fig. 2 gives the superimposed blood glucose value of 287 cases where the fasting values exceeded 130 mg/100 ml. At this figure all agree that the diagnosis is beyond doubt. There are 56 cases with the fasting values between 110 to 130mg/

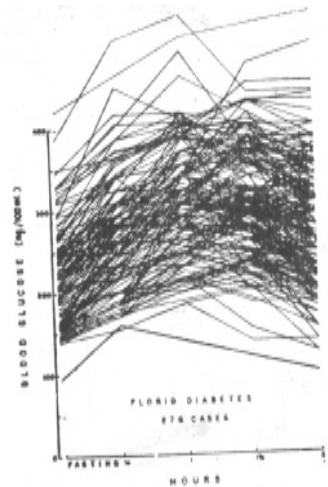100 ml and 68 cases where the fasting values were less than 100 mg/100 ml.

Fig. 2

Florid diabetes. Fasting values exceeding 130 mg./100 ml. (thick black line in this and in every subsequent similar figures represents the upper limit of normal).

(Fig. 3A&3B). In all these one hour blood glucose figures exceeded 180 mg/100 ml and 2-hour figure 120 mg/100 ml. 55 cases have been classified as miscellaneous abnormality subdivided into three categories (Fig. 4A, B and C). Accordingly there were 15 cases where the fasting value exceeded 110

3A and 3B
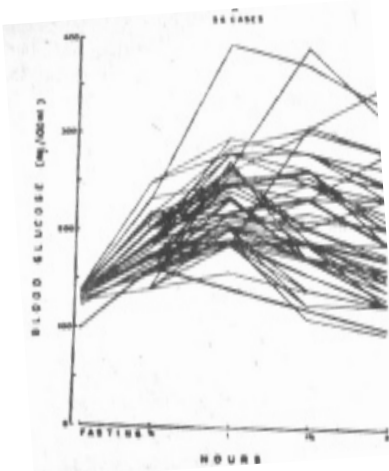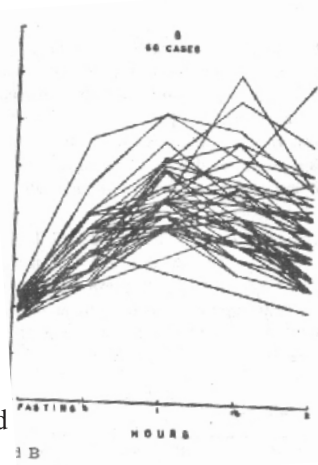
G.T.T.-A diabetes. Fasting values between 110 to 130 mg./100 ml.; G.T.T.-B diabetes. Fasting values below 110 mg./100 ml.
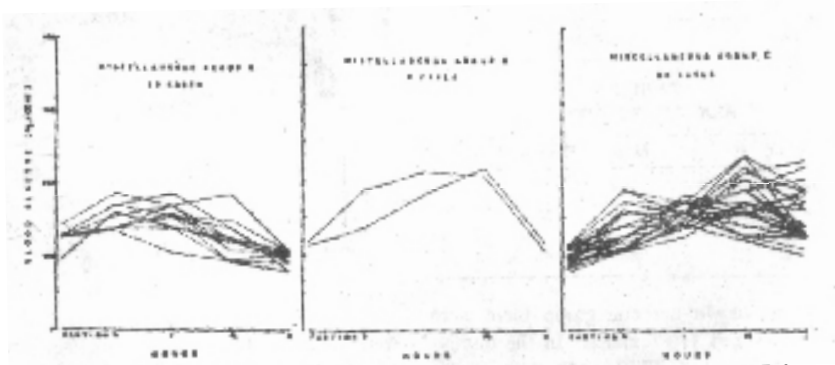
Miscellaneous A. Fasting value exceeded 110 mg./100 ml. and 2-hour figure below 120 mg./100 ml. Miscellaneous B. Fasting level below 110 mg./100 ml., 2-hour figure exceeded 160 mg./100 ml. And ½ or 1 hour or both exceeded 180 mg./100 ml. Miscellaneous C. Fasting and 1 hour values normal and 2-hour figure exceeded 120 mg./100 ml.

but the 2-hour below 120 mg/ was below 110 mg/100 ml and 2-hour figure 100 ml. In 2 curves, 11/2 hour figure exceed below 120 mg/100 ml.

In 38 cases 2 hour ed 160 mg/100 ml while the fasting level figures exceeded 120 mg/100 ml while fasting and one hour values were normal. There were 10 cases of renal glycosuria (Lawrence, 1947), and 3 cases of high renal threshold. In 29 cases the results could not be conforming to any of these categories (Fig. 5).

The rate per cent of prevalence of established diabets of 411 cases works out to be 1.62 per cent. For known diabetics it is 1.06 per cent and for ready detected ones 0.56 per cent. The rate per cent for various categories has also been depicted (Table 5).

The prevalence rate of diabetes for the entire population of 40,008 would be 1.24 per cent.

TABLE 5

RESULTS IN SURVEY GROUP

Category			KNOWN		DISCOVERED		TOTAL	
			Number	Rate Percentage	Number	Rate Percentage	Number	Rate Percentage
Diabetic abnormality		..	267	1.06	144	0.56	411	1.62
Florid	..	..	207	0.82	80	0.32	287	1.14
110 mg. Fasting	..	..	29	0.11	27	0.11	56	0.22
110 mg. Fasting	..	..	31	0.12	37	0.15	68	0.27
Miscellaneous abnormality	..		19	0.08	36	0.14	55	0.22
A	..	..	7	0.028	8	0.032	15	0.06
B	..	..	1	0.005	1	0.005	2	0.01
C	..	..	11	0.04	27	0.11	38	0.15
Renal glycousuria	..	..	–	–	10	0.04	10	0.04
High Renal threshold		..	3	0.01	–	–	3	0.01
Unclassifiable	..	..	10	0.04	19	0.07	29	0.11
TOTAL	..	..	299	1.18	209	0.83	508	2.01

Estimated Values for Entire Population of (40,0008) Persons.

Known = 267.0 (0.67 per cent)

Discovered = 228.6 (0.57 per cent)

Total = 495.6 (1.24 per cent)
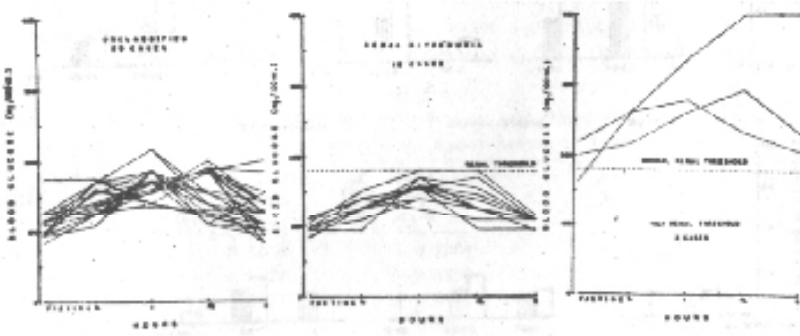
Unclassifiable, G.T.T. results not confirming with any of the previous categories. Renal glycosuria; and high renal threshold.

Distribution of Diabetic Persons in Different Age Groups :

In both the known and detected groups 93.69 per cent of diabetics were above the age of 35 years. 70 per cent of diabetics of both sexes were seen between the ages of 25 and 70 years. Men outnumbered women in all age groups (Fig. 6). Fig. 7 depicts age distribution of diabetics in different categories.

Family History :

Authentic family history was available in 190 cases. 31. 10 per cent (158) gave a diabetic family history in their first rank blood relatives and 6.30 per cent (32) in their second rank blood relatives.
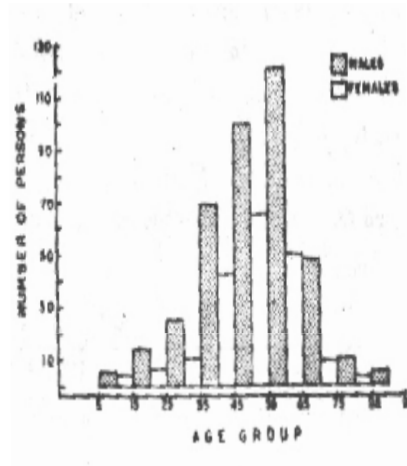
Distribution of diabetic persons in different age groups.

Fig. 7

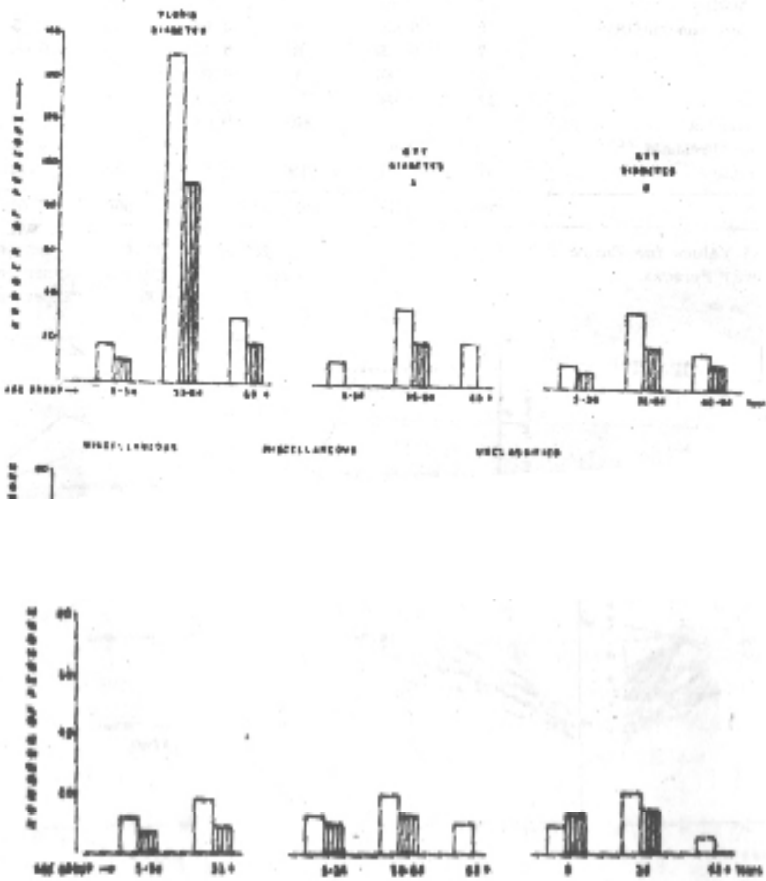Age group of diabetics in different G.T.T. categories.

Body Weight and Diabetes :

Applying the height and weight table supplied by LIC of India 41.6 per cent of diabetics were found to be obese i.e. more than 20 per cent of the average and 19.5 per cent of them were below 20 per cent of normal weight. Female diabetics of all age groups were in general much less weightier than their male counterpart (Fig. 8).
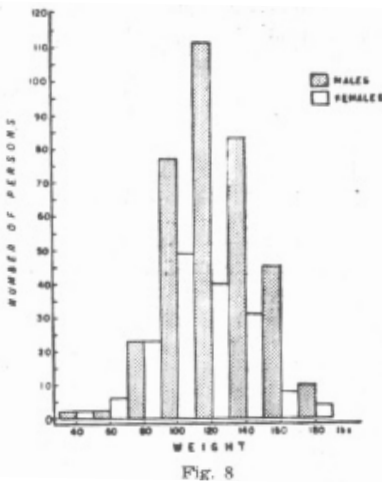
Fig. 8

Fig. 8

Thin (less than 20 per cent of average) and obese (more than 20 per cent of average) diabetic persons in different categories of G.T.T. diabetes.

Body Weight and Blood Sugar Levels :

In 272 florid diabetics corrected weights were available. The mean weight of these was 61 kilos and the mean fasting blood sugar level 273.1 mg/l00 ml. The correlation co-efficient between weight and fasting sugar level for florid category has been worked out and found to be 0.5930 which shows a positive relation; the regression lines being -

(1) X -.0.45Y - 80.7l = O.

(2) Y - 0.78X - 114.36 = O. with standard error 0.0393.

The correlation co-efficient between weight and 2 hour sugar level is -O.1901; the regression lines being -

(1) X + 0.53Y - 345.9 = 0.

(2) Y + 0.14X- 172.1 = O. with standard error 0.0608.

Similar correlation co-efficients have been worked out for all categories and are enlisted in Table 6. It is evident from the analysis that in all types of G. T.T. diabetes the fasting blood sugar level increases, whereas the 2 hour levels have an inverse or no relation with the body weight. The relation between body weight and fasting sugar levels is more significant in florid than in other types of G.T.T. diabetes. Minimum positive correlation between body weight and fasting levels is observed in miscellaneous A group, but a more significant direct relationship exists between weight and 2 hour levels in this group. In un-classifiable category no decisive conclusions can be drawn. as the correlation coefficients, are not significant.

TABLE 6

Various Correlation Co-efficients Between Body Weight and Blood Sugar Levels and Correlation Co-efficient between Age and Blood Sugar Levels in Different Categories.

Category of Diabetics	Weight and fasting	Weight and 2nd hour level	Age and fasting	Age 2nd hour level
Florid	0.5930	-0.1901	0.1585	0.1766
G.T.T.-A	0.1479	-0.3856	0.0148	0.1337
G.T.T.-B	0.1171	0.1077	0.0154	0.2307
Miscellaneous-A	0.1833	0.4019	0.6915	0.2136
Miscellaneous-B	The number of observations were small.			
Miscellaneous-C	0.2436	-0.2795	-0.1469	-0.0306
Unclassified	-0.2609	-0.0197	-0.1109	-0.0886

Age and Blood Sugar Levels:

Table 6 shows various correlation co-efficients between age and blood sugar levels in different categories of G.T.T. The correlation co-efficient between age and fast ing sugar level in florid category has been 0.1585 which shows a positive relationship, the regression lines being -

(I) X - 0.7984 Y = 161.95.

(2) Y - 0.0315 X = 46.80 with standard error 0.0591.

The correlation co-efficient between age and 2 hour sugar level being 0.1766 and the corresponding regression lines, are –

(1) X -'1.09 Y = 219.61.

(2) Y -0.0285 X = 45.79 with standard error 0.0588.

On the basis of these and by further analysis, it was evolved that both the fasting and 2 hour blood sugar levels increase as age advances in all types of G.T. T. diabetes and in miscellaneous - A group. However such a relationship is less pronounced in G.T .T. - A and B categories than in florid type.

In miscellaneous and unclassifiable categories the sugar levels seem to decrease with advancing age.

An interesting observation is that one fifth of thin diabetics gave no family history of diabetes; a majority belonged to florid type; they were not susceptible to infection but suffered mostly from vascular complications.

Dwelling Houses, Diet and Occupation:

The dwelling places of diabetics have been classified as bungalows, middle class houses, masonry and thatched houses. The type of the houses while indicating the socioeconomic status of the patients has indirectly substantiated the view that the disease is more common among economically better placed citizens. There has been total disparity between the family income and the incidence of diabetes (Fig. 9).
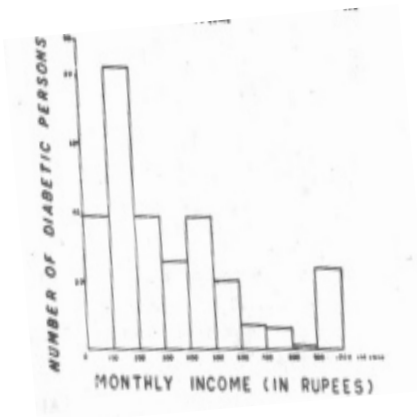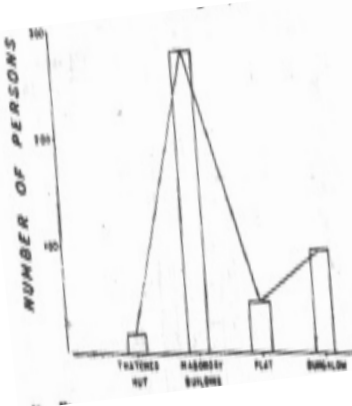
Dwelling Houses. Diet and Occupation of diabetes.

Diabetes is found in all classes of people and in all occupations but the incidence is higher among businessmen and executives than labourers and manual workers (Fig. 10).

367 persons were vegetarians and 128 took mixed diet. There seems to be no relation between the type of diet and severity of illness. The dietetic history in terms or total calories and the type of food,
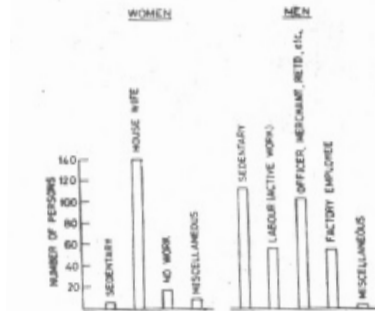

Fig. 10

Sex-occupation distribution of diabetic persons.

namely, carbohydrate and proteins was erratic and unreliable. Any attempt t6 classify the type of food habit proved to be hopeless.

Symptoms and signs :

Polyuria and polydipsia were seen in 40 and 32 per cent in known diabetics and 30 and 22 per cent in newly detected cases respectively. Large number of newly detected diabetics were asymptomatic or had either ignored or attributed their complaints to causes other than diabetes mellitus. 42.5 per cent of the total diabetics were found to have evidence of complications attributable to diabetes (Table 7). Many patients had more than one complication.

179 (35.24 per cent) persons had visual disturbances either due to refractory error, e.g., as a result of cataract or due to diabetic retinopathy (Table 8). The latter was observed in 99 (19.49 per cent) persons. Ten per cent of the diabetics showed abnormal neurological signs. Greater the glucose intolerance the more marked were the retinal changes and neuritis.

TABLE 7

Symptoms on enquiry	Known Diabetics	Detected Diabetics
	Per cent	Per cent
Increased thirst and Urination	40.26	32.68
Increased appetite	32.34	21.95
Diarrhoea	25.74	2.44
Constipation	20.46	2.93
General weakness	66.10	27.32
Numbness and burning Feet and hands	18.81	9.27
Poor vision	52.48	9.76
Joint Pains	9.90	5.85

TABLE 8

PHYSICAL SIGNS

| Sl. No.	Physical Signs	Per cent
1	Clinically detectable abnormal signs	42.50
2.	Eye Complications ..	35.24
3.	Neurological Signs ..	10.60
4.	Infection of foot and interdigital Clefts ..	36.00
5.	Vascular disturbances ..	33.00
6.	Hepatic enlargement ..	12.00
7.	Albuminuria ..	2.00
8.	Obvious renal damage ..	5.00
9.	Pulmonary tuberculosis ..	4.00
10.	Degenerative arthritis ..	11.00

Follow Up of 586 diabetic persons emerged from the detection survey of 1967-68 at the end of eight and ten years :

Eight years later i.e., in 1976 and again at the end of ten years, *i.e.,* in 1978 the original group of 586 patients were invited 10 report for G.T.T., detailed examination and special investigations by the author.

Results :

At the end of eight years among the original 586 patients, no information was available in 294 cases (124 had emigrated, and 170 were untraceable). Of the remaining 292 patients in whom the information was available 91 had died, 60 refused to undergo tests and 141 persons were retested (Fig. 14A). The extent to which the follow up was complete and the failure to repeat the test are shown in Fig. 15. The age group at the time of first test of those who were retested are also given here. There were considerable variations with the age of numbers in each category of the original and these variations are reflected in the retested population.

At the end of ten years, *i.e.,* in the year 1978 among the original 586 patients, 206 were untraceable,
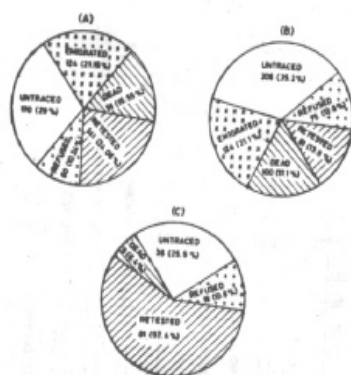
A. Fate of 586 patients at the end of 8 years (1976)

B. Fate of 586 patients at the end of 10 years (1978)

C. Fate of 141 retested subjects during 1976-78.

124 had emigrated, 100 had died, 75 refused (to be retested) and the test was repeated in 81 cases (Fig. 14B and C). The results of the retested population were almost similar to that obtained at the end of eight year.

Table 9 shows the deaths in each category during follow-up after eight years by age at the time of first test. It is impossible to tabulate overall deaths for the whole period because of the unknown fate of patients who had emigrated or were untraceable. The number of expected deaths for persons of the same age and sex at the end of eight years are also being calculated. The mortality rates among those with florid diabetes were higher. The evidence that

TABLE 9

ASSOCIATION BETWEEN AGE AND CATEGORY OF DIABETES

Category at First test G.T.T.	0-45 Yrs.	Expected deaths	50-69 Yrs.	Expected deaths	70 Yrs. and above	Expected deaths	Total
Florid (a)	16	11.40	38	37.54	7	12.06	61
Diabetes	0	4.30	18	14.15	5	4.55	23
Normal	1	0.93	0	3.08	4	0.99	5
Miscellaneous	0	0.37	0	1.23	2	0.40	2
TOTAL	17	–	56	–	18	–	91

$X^2 = 29.6136$; highly significant ($P = 0.001$).

mortality was not excessive in the G.T.T. diabetes over the years suggests that. treatment is indicated in. the hope of preventing conversion of these cases to florid diabetes.

At the end of ten years among the 100 recorded deaths the situation has not changed significantly (Table 10)

from that of eight years follow-up (Table 9).

Table 11 shows duration of diabetes and causes of death at the end of ten years follow-up. Majority of deaths had occured before the end of 6 years after the initial detection of the illness. There were less number of deaths in women than men.

TABLE 10

AGE SPECIFIC DEATHS (1968-1978)

Category at first test	0-49 Yrs.	50-69 Yrs.	70 Yrs. and above	Total
Florid (a)	17	44	8	69
G.T.T.				
Diabetes	–	18	6	24
Normal		1	4	5
Miscellaneous	–	–	2	2
TOTAL	**18**	**62**	**20**	**100**

TABLE 11
ASSOCIATION BETWEEN DURATION OF DIABETES AND CAUSES OF DEATHS

	Duration of diabetes						
Cause of death	0-3 Yrs.		4-6 Yrs		7Yrs and above		Total
	M	F	M	F	M	F	
Myocardial infarction	21	6	10	5	13	7	62
	(27)		(15)		(20)		
Other compli cations (vascular)	7	—	4	—	2	3	16
	(7)		(4)		(5)		
Cause not known or unrelated	5	5	—	1	9	2	22
	(10)		(1)		(11)		
TOTAL	33	11	14	6	24	12	100

$X^2=4.925$; 'significant' (P=0.30).

The major cause of death was myocardial infarction (62 per cent). Patients with florid G .T.T. diabetes contributed to high figure of mortality in all age groups (Table12).

TABLE 12

CAUSES OF DEATH IN DIFFERENT CATEGORIES AND AGE GROUPS (1968-78)

		Age group								
		0-49 Yrs.		50-69 Yrs.		70 Yrs. and above		Total		
Cause	Category	M	F	M	F	M	F	M	F	
Myocardial infarction	Florid	5	2	16	13	2	2	23	17	40
	G.T.T. (b)	—	—	6	1	3	—	9	1	10
	G.T.T. (c)	1	—	7	—	4	—	12	—	12
Other compli cations	Florid	3	2	3	1	2	—	8	3	11
	G.T.T. (b)	—	—	1	—	1	—	3	—	2
	G.T.T. (c)	—	—	1	—	2	—	3	—	3
Cause not 18	Florid		2	1	7	5	3	—	12	6
	G.T.T. (b)	—	—	—	—	—	—	—	—	—
	G.T.T. (c)	1	1	1	—	1	—	3	1	4
TOTAL		12	6	42	20	18	2	72	28	100

Association of high blood pressure has significantly improved the mortality rate particularly due to myocardial infarction (Table 13). Association of high blood pressure has significantly improved Vascular complications like stroke, gangrene, etc., contributed to 16 per cent of deaths and in another 22 per cent the cause of death was either unrelated (like accident) or not known (Table 11).

TABLE 13

ASSOCIATION BETWEEN BLOOD PRESSURE AND CAUSES OF DEATH

	B. P. Category			
	Normal		Abnormal	
Death category	(<140/90 mm. Hg)		(>140/90 mm. Hg)	Total
	M	F	M	F	62
Myocardial infarction	18 (27)	9	26 (35)	9	62
Other Complications	7 (10)	3	5 (6)	1	16
Cause not known	6 (9)	3	9 (13)	4	22
TOTAL	31	15	40	14	100

X2=2.438; 'significant' (P=0.30).

Change of Category :

At the end of eight years, among the original 61 florid G.T.T. diabetes, 65.6 per cent remained as florid; 8.2 per cent were converted into G.T.T.(b); 18.01 per cent to G. T. T. (c); 1.63 per cent to renal glycosuria and 6.56 per cent as normal respectively. Among the G. T. T. diabetes, 52.38 per cent of the original were converted to florid diabetes; and 14.29 per cent to normal G.T.T. An interesting observation was that 13.33 per cent of the original 15 normal G.T.T. became florid G.T .T. ; 46.66 per cent had moved from normal to G.T.T. diabetes. The follow-up of 81 cases who were available for retesting at the end of ten years, showed significant variations in G.T.T. curves from the original ones and cases moved freely from one category to the other (Fig. 16). Various permutations of categories between the durations of eight years and ten year follow-up and eighth to tenth year follow-up appeared rather more complex. Apart from the shifts of category which might accompany ageing over eight or ten period, these results are explained by day to day variability of the G.T.T. and differences in

TABLE 14

CHANGE OF CATEGORY ON RETESTING (1968-1976).

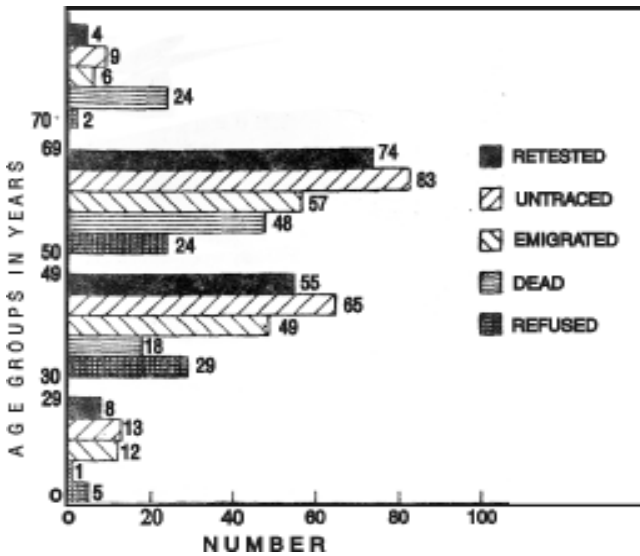| First test category	Total	Normal	Florid (a)	GTT (b)	GTT (c)	Renal	Misc. B	Misc. C	Unclasified
Normal	15 (100)	5 (33.333)	2 (13.33)	2 (13.33)	5 (33.33)	1 (6.68)	—	—	—
Florid (a) ..	61 (100)	4 (6.56)	40 (65.6)	5 (8.2)	11 (18.01)	1 (1.63)	—	—	—
GTT (b) ..	21 (100)	3 (14.29)	11 (52.38)	3 (14.29)	4 (19.04)	—	—	—	—
GTT (c) ..	44 (100)	7 (15.90)	50 (45.45)	2 (4.35)	9 (20.47)	1 (2.27)	2 (4.45)	1 (2.27)	2 (4.45)
TOTAL ..	141	19	73	12	29	3	2	1	2

Note : Figures in parenthesis denote percentage.


Fig. 15

Fate of 586 subjects in different age-groups at the end of 8 years (1976).

technique. The Most important issue from the original survey was the significance of minor abnormalities shown by the G.T.T. which have converted into florid diabetic states in a period of eight to ten years.

The standard glucose tolerance test is arduous for the subjects tested and for the laboratory staff who carry out the test. (Diabetes Survey Working Party, 1970). For this reason some workers have relied on results of a single blood glucose examination 2-hours after a test dose of glucose for the diagnosis of diabetes. We all agree that a person is not diabetic when this figure is below 120 mg/100 ml; a person is definitely diabetic when the number goes above 199 mg/100 ml. Therefore following the experience of Diabetes Survey Working Party (1970), an attempt has been made to find out a blood glucose level between 120 mg and 200 mg which would give the best predictive division between those likely to be normal and those likely to be diabetic (Table 15).

TABLE 15

PREDICTIVE VALUE OF A SINGLE BLOOD GLUCOSE READING

Category	Predictive value in
	mg. per 100 ml.
Florid (a)	141± 9.6
G.T.T. (b)	123± 11.4
G.T.T. (c)	136±14.6
Misc.	144±2.7

Predictive valve of all = 142. 19±12.23 mg. categories combined per 100 ml.

138 mg. per 100 ml.
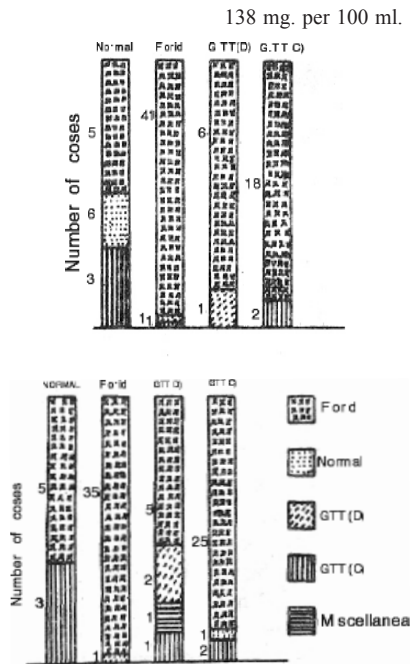
The original categories were set aside and the results of 141 G.T.T.'s (number retested at the end of eight years), were recorded in three groups. (i) 2-hour blood glucose level below 130 mg/100 ml blood,· (ii) 12-hour blood glucose level between 120 and 199 mg/100 ml; and (iii) 2-hour blood glucose level over 200 mg/ 100 ml. The figure 142 ± 12.23 (i.e., 138 mg/100 ml) emerged as the best for the purpose. Hence the blood glucose level 2-hour after 50 g. oral glucose load (1) below 120 mg/100 ml are probably normal, (2) 130 to 199 mg/100 ml a high risk of florid diabetes, (3) over 200 mg/100 ml definitely an established diabetes. A full G.T.T. is however superior to a single reading.
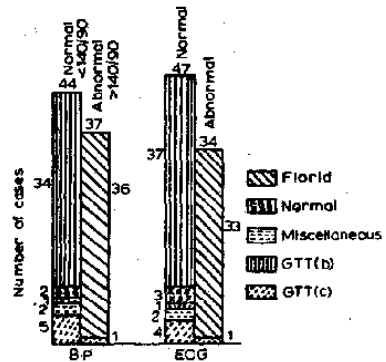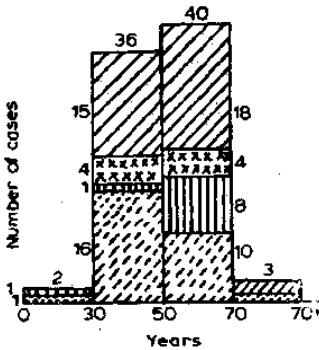
Ischaemic Heart Disease :

Among the 141 retested at the end of eight year follow-up period, 42 (29.8 per cent) persons showed evidence of ischaemic heart disease. There were 31 (22.7 per cent) males and 11 (7.1 per cent) females. A majority (26 patients) of these belonged to florid category (Table 16).

TABLE 16

ABNORMAL ECG CHANGES IN DIFFERENT AGE GROUPS

Categories	30-49 Yrs.		50-69 Yrs.		70 Yrs. and above		Total
	M	F	M	F	M	F	
Florid (a)	3	2	12	5	2	2	26
G.T.T. (b)	0	–	2	–	1	–	3
G.T.T. (c)	–	–	9	2	2	–	13
TOTAL	3	2	23	7	5	2	42

Table 16 also shows age-sex wise distribution of abnormal ECG changes. 37 out of 42 with abnormal ECG changes are seen between 50 and 70 years. At the end of ten years out of the 81 patients who were available for retesting, 34 (41.9 per cent) showed electrocardiographic

blood pressure and E.C.G. changes in different G.T.T. categories at the end of ten years (1978).

evidence of ischaemic heart disease. Majority (33 per cent) of these belonged to florid G.T.T. category. At the end of ten years 45.7 per cent (37) among the 81 patients had a blood pressure of above 140/90 mm. Hg. All the hypertensive cases except one belonged to the florid G.T.T. category and 50 per cent of these were in the age group of 50 to 70 years (Fig. 17).

Fundal changes :

46. 1 per cent of 141 retested showed evidence of varying degree of diabetic retinal changes. 70 per cent of these had diabetes for a period of 8 to 15 years and 86 per cent of them were beyond the age of 50.

In a collaborative study on diabetes mellitus Ahuja et al, (1978), have reported diabetic retinopathy in 8 per cent, coronary artery insufficiency in 10 per cent and hypertension in 11 per cent of their cases. They have also observed that the prevalence of vascular disease in Indian diabetics was significant and was not related to the accepted risk factors. The experience of the present study gives support to the view (Diabetes Survey Working Party, 1976), that the adults who present which clinical diabetes and various complications must have had their disease in a detectable form for several years.

SUMMARY

In a door to door diabetes survey 40,008 persons were approached. Among these 25,273 persona (63.1 per cent) gave postprandial urine for testing. 870 (3.44 per cent) samples were positive for glucose.

Out of 870 glycosurics 586 who underwent further tests, 508 had abnormal G.T.T.-a prevalence rate of 2.01 per cent (known = 1.2 per cent; detected=0.81 per cent). Prevalence rate of diabetes for the tested population was 1.62 per cent (known = 1.06 per cent;

detected=0.56 per cent). Estimated prevalence for entire population was 1.24 per cent (known=0.67 per cent; detected=0.57 per cent). Fasting blood sugar increases with body weight but 2 hr. blood sugar level is less significant. Both fasting blood sugar and 2 hr. blood sugar increase with age. 93 per cent of diabetics were seen beyond the age of 35 years and 70 per cent in the 5th and 6th decades. Men were more affected than women in all age groups. A family history of diabetes was recorded in 38 per cent; 31 per cent in first rank blood relatives.

Diabetes is compatable with dissimilar G.T.T. curves.

At the end of eight years among the original 586, 91 had died, 294 were untraceable, 60 refused and 141 were retested. At the end of ten years among the original 586, 100 had died, 156 were available and 81 were retested.

Various G.T.T. abnormalities tended to change and most of those who were converted to florid diabetes came from G.T.T. diabetes. The best separation petween diabetic and non-diabetic occured at 142±12.25 mg. glucose per 100 ml. blood 2 hour after 50 oral glucose.

Among retested 37 (45.7 per cent) had associated hypertension, 34 (41. 9 per cent) showed evidence of ischaemic heart disease and majority of these belonged to florid category. Among the recorded deaths the cause of death was myocardial infarction in 62 per cent, other vascular complications in 16 per cent and unrelated in 22 per cent. 82 per cent of deaths were beyond the age of 50 years.

FOLLOW UP OF 586 DIABETIC PERSONS EMERGED FROM THE DETECTION SURVERY OF 1967-78 AT THE END OF FIFTEEN YEARS*

At the end of fifteen years i.e. in the year 1982-83 among the original 586 diabetics (1967-68), no information was available in 324 (223 were untraceable, 101 had migrated) 152 were dead, 46 could not undergo tests and 64 cases were retested.

Among the retested 45.7% had associated hypertension, 41.9% showed evidence of ischaemic heart disease, 46.1% varying degrees of diabetic retinopathy and majority of these belonged to florid category. Among the recorded deaths, the

cause of death was myocardial infarction in 62%; other vascular complications in 16%, unrelated in 22% and 82% of the deaths were beyond the age of 50 years.

Among the retested various G.T.T. abnormalities tended to change and most of those who were converted to florid diabetes came from GTT diabetes.