patients, but even those who had not undergone surgery showed similar improvement in β-cell function (Fig. 2). Improved nutrition could also contribute to the improvement in β-cell function. Eight IDDM subjects, as a group, failed to show significant improvement in β-cell function 1 yr after diagnosis. It appears that the improvement in β-cell function in FCPD persists for long periods, possibly because β-cells are not primarily affected. Ramachandran et al. (9) have demonstrated an increase in insulin-receptor affinity in FCPD subjects after metabolic control. Improved β-cell function and insulin-receptor affinity could contribute to the reduced insulin requirements in these subjects, similar to the honeymoon phase in IDDM subjects.

It will be of interest to study β-cell function repeatedly in FCPD subjects to establish the natural history over a longer period.

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Occurrence of Diabetes Mellitus After Gestational Diabetes Mellitus in Trinidad

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We undertook this study to determine the incidence of diabetes mellitus (DM) and impaired glucose tolerance (IGT) after gestational diabetes mellitus (GDM). It is a follow-up study of a consecutive sample of women with GDM in a tertiary care center in Trinidad, West Indies. The cohort was a consecutive sample of 157 women with GDM who delivered in the hospital between June 1981 and December 1984. Of these, a volunteer sample of 60 women (38%) consented to participate 3.5–6.5 yr later. The two groups were remarkably similar in ethnic composition, mean age at index delivery, marital status, and family history of DM. Interviews revealed that 26 women (43%) had already developed DM for which they were receiving treatment. The remaining 34 women (57%) were given a 2-h 75-g oral glucose tolerance test, and fasting and half-hourly venous blood samples were obtained and analyzed for plasma glucose. Based on accepted diagnostic criteria, 11 (32%) of 34 had DM, 10 (29%) had IGT, and 13 (38%) had normal glucose tolerance. A total of 37 (62%) of 60 women had developed DM, and another 10 (17%) had IGT in the intervening 3.5–6.5 yr. The results support findings that GDM is associated with an increased risk of mothers developing DM in later life. *Diabetes Care* 13:527–29, 1990

There is evidence that gestational diabetes mellitus (GDM) is a risk factor in the subsequent development of diabetes mellitus (DM) (1–3). Few studies on GDM or glucose tolerance tests in pregnancy have been reported from developing nations (4). It is therefore of particular interest to report this follow-up study to determine the frequency of DM in nonpregnant women who had had GDM 3.5–6.5 yr earlier.

RESEARCH DESIGN AND METHODS

In a previous study, GDM was diagnosed in accordance with the World Health Organization diagnostic criteria for DM in a consecutive sample of 142 pregnant women from June 1981 to December 1984 (5,6). All the subjects had normal glucose tolerance when given an oral glucose tolerance test (OGTT) 6–8 wk postpartum. In an additional 15 pregnant women who had been diagnosed as having DM, the final diagnosis was changed

to GDM on the basis of a follow-up OGTT. Thus, 157 pregnant women with GDM comprised the original group. Letters requesting attendance at the Mount Hope Women's Hospital were sent to 148 of these women (9 were known to have migrated). Sixty-seven (43%) of the original group consented to participate in the study, were interviewed, and gave information on their current and past medical history, especially in relation to the presence of DM. A date to return for an OGTT was given to all women who had not developed DM. Seven of the 67 subjects failed to appear for their OGTT despite reminders.

The 60 respondents were requested to fast 10–16 h overnight before the test. A fasting venous blood sample was taken, and 75 g of glucose in a volume of 250–300 ml was given orally. Venous blood samples were obtained at 0.5, 1.0, 1.5, and 2.0 h after the glucose load. Plasma was separated, and glucose was determined at the Nutrition Laboratory, Trinidad, within 24 h. A glucose oxidase–peroxidase procedure was used on a Somogyi-Nelson protein-free supernatant. All subjects were informed of their results, and those with abnormal glucose tolerance were referred to a hospital consultant for further care and management. Published diagnostic criteria for defining DM and impaired glucose tolerance (IGT) were used (3,6). Maternal age was calculated as the age of the mother at the birth of the index baby.

RESULTS

The follow-up group was 38% (60 of 157) of the original group. The two groups were very similar in ethnic composition, marital status, mean age at index pregnancy, and immediate family history of DM (Table 1). In the period between the index birth and the interview, 26 (43%) of the 60 women had developed DM and were receiving treatment. Seventeen women were receiving chlorpropamide (Diabinese), 4 were receiving gliclazide (Diamicron), 2 were receiving insulin, and 1 each were receiving Diabinese plus metformin (Glucophage), glyburide (Daonil), and Glucophage. In none of these women was an OGTT performed. Of the remaining 34 women whose glucose tolerance status was hitherto unknown (57%), 11 (32%) were diagnosed as having DM, 10 (29%) had IGT, and 13 (38%) had normal glucose tolerance after OGTT. Therefore, of the 60 women in the follow-up group, 37 (62%) had developed DM, 10 (17%) had IGT, and 13 (22%) had normal glucose tolerance. The percentage who subsequently developed DM was highest among Blacks (67%), then among East Indians (63%), and lowest among the mixed ethnic group (50%). In the follow-up group, the average length of the follow-up period, i.e., the interval between the index birth or termination of pregnancy and the interview, was 59.2 ± 11.0 mo (mean ± SD) and was similar for those with DM (59.5 ± 10.6), IGT (60.3 ± 11.7), and normal glucose tolerance (57.4 ± 12.2). Examination of the interval between the index birth and diagnosis of DM revealed that half of the women had developed DM 5 yr after the index pregnancy.

DISCUSSION

The low response rate of 38% was disappointing but not unexpected. Because of the relatively small size of the follow-up group (60 or 38% of the original group), it was vital to ascertain whether they differed in any significant way from the original group. There was a remarkable similarity between the two groups in ethnic composition, marital status, mean maternal age at index delivery, and positive family history of DM in Blacks and East Indians and the two groups as a whole (Table 1). The averages of follow-up periods for those with DM, IGT, and normal glucose tolerance were similar. Thus, the likelihood of any bias due to differing lengths of follow-up periods is minimal. The development of DM in 62% of women with antecedent GDM is high and is similar to findings of previous studies (1,2).

The evidence from our study and others cited herein clearly establishes that GDM is associated with an increased risk of subsequently developing DM in the mother. We suggest the recommendations of the Second International Workshop-Conference on Gestational Diabetes Mellitus should be used as guidelines in the management and follow-up of women with GDM in Trinidad (7).

TABLE 1
Comparison of pregnant women with gestational diabetes mellitus (original group) and women 3.5–6.5 yr later (follow-up group)

	Original group (n = 157)				Follow-up group (n = 60)			
	EI	B	M	Total	EI	B	M	Total
Ethnic composition (%)	43.3	36.9	19.7	100.0	40.0	40.0	20.0	100.0
Married (%)	91.7	65.5	71.0	77.7	91.2	66.7	83.3	80.0
Single (%)	0	5.2	3.2	2.5	0	4.2	0	1.7
Common-law union (%)	8.3	29.3	25.8	19.7	8.8	29.1	16.7	18.3
Mean age (yr)	31.8	32.0	29.3	31.4	33.3	33.2	30.1	32.5
Family history of diabetes mellitus (%)	83.8	55.3	38.7	64.3	87.5	54.2	58.3	68.3

EI, East Indian; B, Black; M, mixed ethnic group.

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Low-Pigment Skin Type and Predisposition for Development of Type I Diabetes

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To ascertain whether skin pigmentation type and sensitivity to ultraviolet (UV) light are associated with susceptibility to type I (insulin-dependent) diabetes, 55 type I diabetic patients were examined, 38 new-onset and 17 long-term cases. They were compared to 72 control subjects of the same geographic region and nationality. To evaluate the individual skin pigmentation type, a standardized questionnaire was developed. Reactivity to UV light was determined by a stepwise-graded UV irradiation. Significantly more diabetic patients in southern Germany had blue eyes than nondiabetic control subjects (55 vs. 26%, $P < 0.01$), and significantly more diabetic patients had a low-pigment eye color (blue or green) than control subjects (66 vs. 38%, $P < 0.01$). In addition, more fair skin color was noted among diabetic versus control subjects (84 vs. 60%, $P < 0.01$). In response to UV irradiation, diabetic patients more often showed an increased UV-light sensitivity than control subjects (83 vs. 23%, $P < 0.001$). The relative risk for susceptibility to type I diabetes in subjects with low-pigment eye color was 3.1, in subjects with fair skin type 3.4, and in subjects with increased UV-light sensitivity 5.8. The highest risk for the development of diabetes was seen in subjects who had low-pigment eye color and/or increased UV-light sensitivity (95 vs. 51%, $P = 0.00002$, odds ratio 17.4). We conclude that a low-pigment skin type may predispose for the development of type I diabetes. *Diabetes Care* 13:529–31, 1990

Major geographic variations in the occurrence of type I (insulin-dependent) diabetes have been recognized with a north to south gradient in diabetic risk (1). However, what causes the extraordinary geographic differences in the distribution of type I diabetes—a host (genetic) factor, an environmental agent (virus, diet), or both—remains unknown. It has been reported that the risk for type I diabetes appears to correlate with average yearly temperature of environment, the distance from the equator, and the ethnicity of the population at risk (1). Therefore, an understanding of the geographic differences will be important to the identification of factors related to the etiology of type I diabetes. Because skin is an important immunological organ responsive to ultraviolet (UV) irradiation and environmental agents, we have begun to evaluate the dermis function of type I diabetes in southern Germany by studying skin pigmentation and reactivity to UV light in association with susceptibility to type I diabetes.

RESEARCH DESIGN AND METHODS

Fifty-five patients with type I diabetes were evaluated for skin pigmentation type, 38 newly diagnosed (group A) and 17 long-term (group B) diabetic patients. Group A was recruited from all new-onset patients hospitalized at the City Hospital Munich-Schwabing from September 1987 to May 1988 (18 females, 20 males; age range 6–28 yr, mean 20 ± 1 yr; diabetes duration 8 ± 5 days). Group B was recruited from diabetic patients who attended our outpatient department from January to February 1988 (9 females, 8 males; age range 17–35 yr, mean 25 ± 2 yr; diabetes duration 7 ± 4 yr). Inclusion criteria for patients and control subjects were German family origin, born in southern Germany, and living in southern Germany for 80% of their lives. Diabetic pa-