Prevalence of Diabetes and Hypertension in a Rural Population of Bangladesh

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OBJECTIVE — To determine the prevalence of non-insulin-dependent diabetes mellitus (NIDDM), impaired glucose tolerance (IGT), and hypertension in a rural community of Bangladesh.

RESEARCH DESIGN AND METHODS — A cluster sampling of 1,005 subjects >15 years of age in the rural community of Dohar was investigated. Capillary blood glucose of fasting and 2 h after 75 g oral glucose (2hBG) were estimated. World Health Organization criteria were used for diagnosis of NIDDM and IGT. Blood pressure, height, and weight were also measured.

RESULTS — The crude prevalence of NIDDM was 2.1% (men 3.1, women 1.3%) and IGT was 13.3% (men 14.4, women 12.4%). Age-adjusted (30–64 years of age) prevalence was 2.23% (95% confidence interval [CI] 1.01–3.45) for NIDDM and 15.67% (95% CI 12.59–18.75) for IGT. Prevalence of hypertension with systolic blood pressure (sBP) ≥140 mmHg was 10.5% and with diastolic blood pressure (dBP) >90 mmHg was 9.0%. Increased age was the risk factor for NIDDM, IGT, and hypertension; whereas increased BMI showed inconsistent association with them. Relative risk for sBP with higher BMI (<22.0 vs. ≥22.1) was 1.94 with CI 1.55–2.43 and for dBP it was 2.2 with CI 1.40–3.46. Correlation of sBP was significant with age, BMI, and 2hBG. Similar correlation was also observed with dBP.

CONCLUSIONS — High prevalences of NIDDM, IGT, and hypertension were observed among rural subjects. Increased age was shown to be an important risk factor for all these disorders, whereas BMI-associated risk was significant with NIDDM and hypertension but not with IGT.

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Received for publication 13 July 1994 and accepted in revised form 17 November 1994.

BMI, body mass index; CI, confidence interval; dBP, diastolic blood pressure; IGT, impaired glucose tolerance; NIDDM, non-insulin-dependent diabetes mellitus; OR, odds ratio; sBP, systolic blood pressure; 2hBG, blood glucose 2 h after 75 g oral glucose; WHO, World Health Organization.

Despite the need for estimation of prevalence of noncommunicable diseases like diabetes and hypertension in the country of Bangladesh as a whole and for identifying the population at risk, there has been no nationwide epidemiological study except a few small surveys on diabetes (1–3). The accelerated rate of registration of diabetic and hypertensive subjects in the referral centers indicates that the prevalence of these diseases in the country is not insignificant. These subjects are referred mostly from urban areas, although 87% of the total population lives in rural areas. This study is designed to determine the prevalence of diabetes and hypertension in a rural community of Bangladesh.

RESEARCH DESIGN AND METHODS

— A cluster sample of five villages of a rural population of Bangladesh in Dohar Thana was studied. This area is situated 40 km southwest of Dhaka city. About 68.1% households were involved in agrarian work, of whom 39.2% were self-employed and 28.9% were day laborers. Almost 10% of households maintained their livelihood by fishing and weaving and the rest (~20%) by business and other occupations (4). All the subjects >15 years of age (n = 1,434) were enlisted, among whom 1,005 (450 men, 555 women) were investigated. The rest either were nonresponders or were excluded due to acute illness, such as fever or diarrhea, or taking any medication, including contraceptives. Pregnant women (n = 47), known diabetic subjects (3 men and 1 women), and known hypertensive subjects (8 men and 3 women) were examined separately on a subsequent occasion with appropriate preparation. Capillary blood glucose after overnight fast and 2 h after a 75-g glucose drink (2hBG) were estimated. World Health Organization criteria were used for diagnosis of NIDDM and IGT (5). Hemoglucotest strips and Reflolux, a reflectance photometer (Boehringer Mannheim, Mannheim, Germany), were

Table 1—*Age-specific and age-adjusted prevalence of IGT and NIDDM*

	Prevalence (%)										
	Age-group (years)									Age-adjusted (years)	
	15–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65+	30–64	95% CI
IGT											
M	3.11	1.56	1.11	1.56	0.44	0.89	1.11	1.11	3.56	15.53	10.61–20.45
W	1.26	1.08	1.62	1.44	1.98	0.90	0.72	1.44	1.98	15.50	11.56–19.44
M+W	2.09	1.29	1.39	1.49	1.29	0.90	0.90	1.29	2.69	15.67	12.59–18.75
NIDDM											
M	0.44	0.22	0.44	0.22	—	0.22	0.44	0.44	0.67	3.52	1.19–5.85
W	—	—	0.18	0.36	—	0.18	—	—	0.54	1.13	0.03–2.23
M+W	0.20	0.10	0.30	0.30	—	0.20	0.20	0.20	0.60	2.23	1.01–3.45

used. Blood pressure was measured thrice in sitting position after 15 min rest and the mean was taken in all cases.

Statistical analysis

Age-adjusted prevalence was calculated on the basis of the truncated age range of 30–64 years (6). The associations between variables were tested by the χ^2 test and correlation coefficient (r). For relative risk, odds ratios (ORs) with 95% confidence intervals (CIs) were calculated, using as a reference the population which showed least prevalence (7). The variables were compared by Student's t test.

RESULTS — The overall prevalences of NIDDM and IGT in subjects >15 years of age were 2.1% (men 3.1, women 1.3%) and 13.3% (men 14.4, women 12.4%), respectively. Age-standardized prevalence of NIDDM for the truncated age range 30–64 years was 2.23%, with 95% CI 1.01–3.45 (men 3.5, women 1.1%) (Table 1). For IGT, it was 15.67% with 95% CI 12.59–18.75. Among the 21 diabetic subjects (14 men, 7 women) of the study population, 17 were newly detected (7 men, 10 women). Of the 28 hypertensive subjects, 11 were known hypertensive and 5 were known to have both hypertension and diabetes. Glucose intolerance (2hBG ≥7.8) showed significant association with increased age (Table 2). The relative risk for NIDDM with increased age (15–29 years vs. ≥45 years) was 8.39 with 95% CI 1.86–37.82; for IGT, it was 4.73 with 95% CI 2.83–7.90. The mean age of hyperglycemic (2hBG ≥7.8) subjects was significantly higher than that of nonhyperglycemic subjects ($P < 0.001$; Table 3). Correlations between age and 2hBG and between age and both sBP and dBP were significant (data not shown). For BMI, the association with glucose intolerance was inconsistent. Subjects with higher BMI (≥22.1 vs. 19.1–22.0) showed increased risk for NIDDM (OR 4.8, 95% CI 1.52–15.49) when compared with those with lower values. However, for IGT this was insignificant (Table 2). Comparison of BMI (mean ± SD) between subjects with and without hyperglycemia showed no significant difference in either sex (Table 3). When height was considered, the women with hyperglycemia had shorter stature than those with euglycemia ($P < 0.003$).

CONCLUSIONS — In this study, higher prevalences of NIDDM (2.1%) and

Table 2—*Distribution of IGT and NIDDM according to age and BMI*

	n	IGT	OR (95% CI)	NIDDM	OR (95% CI)	IGT+NIDDM	χ^2	*P*
Age (years)								
15–29	371	21	1	2	1	23	—	—
30–44	302	42	2.75 (1.59–4.76)	7	3.45 (0.73–16.72)	49	17.5*	<0.001
≥45	332	71	4.73 (2.83–7.90)	12	8.39 (1.86–37.82)	83	7.4†	<0.01
BMI								
≤19.0	359	47	1.12 (0.79–1.86)	6	1.70 (0.48–6.10)	53	—	—
19.1–22.0	407	47	1	4	1	51	3.5‡	>0.05
≥22.1	239	40	1.54 (0.97–2.44)	11	4.8 (1.52–15.49)	51	8.8§	>0.01

*15–29 vs. 30–44 years of age; †30–44 vs. ≥45 years of age; ‡BMI ≤ 19.0 vs. 19.1–22.0; §BMI 19.1–22.0 vs. ≥22.1.

Table 3—*Variables compared between euglycemic and hyperglycemic subjects*

	Men				Women			
	2-hBG (mmol/l)				2-hBG (mmol/l)			
	<7.8	≥7.8	*t*	*P*	<7.8	≥7.8	*t*	*P*
n	371	79	—	—	479	76	—	—
Age (years)	37.4 ± 17.6	47.0 ± 19.0	4.40	0.000	35.5 ± 14.3	47.5 ± 15.6	6.71	0.000
Mean 2hBG (mmol/l)	6.1 ± 0.9	10.2 ± 4.1	17.60	0.000	6.2 ± 0.8	9.6 ± 2.2	22.39	0.000
Weight (kg)	51.4 ± 8.7	53.1 ± 10.3	1.52	0.129	44.9 ± 7.8	44.0 ± 9.1	0.87	0.390
Height (cm)	159.0 ± 7.4	159.2 ± 8.6	0.24	0.808	149.3 ± 6.5	146.9 ± 5.4	2.99	0.003
BMI	20.3 ± 2.8	20.9 ± 3.4	1.73	0.085	20.1 ± 2.8	20.3 ± 3.6	0.60	0.550
sBP (mmHg)	119.4 ± 20.6	125.4 ± 20.2	2.36	0.019	117.1 ± 20.8	128.2 ± 28.6	4.10	0.000
dBP (mmHg)	76.7 ± 12.0	78.6 ± 13.2	1.22	0.223	76.9 ± 12.8	81.4 ± 14.1	2.76	0.006

Data are means ± SD.

IGT (13.3%) were observed compared with previous studies (1–3). This increased prevalence may be attributed to the urbanization and changing lifestyle of rural population. The age-adjusted prevalence was comparable with that of rural Indians for both men and women, though it was much less than that of urban Indians (6). Relative risk for NIDDM and IGT among subjects ≥45 years of age were 8.4 with 95% CI 1.86–37.82 and 4.7 with CI 2.83–7.90, respectively, when compared with the younger age-group (15–29 years). These findings are consistent with other studies (8–10). BMI ≥22.1 was shown to be a risk factor for NIDDM but not for IGT. There was no difference between BMI of hyperglycemic and euglycemic subjects (Table 3). The lowest prevalence of hyperglycemic subjects was observed in the BMI range 19.0–22.1. Higher frequencies of glucose intolerance occurred both above and below this BMI range. This observation may be explained on the basis of glucose intolerance associated with nonobesity or undernutrition, in which the early phase of insulin response is impaired (11). In rural Bangladesh, undernutrition is relatively more prevalent among female than among male subjects during their childhood (4). Short stature of hyperglycemic women indicates that undernutrition either in fetal life or in early childhood might contribute to the glucose intolerance as well as the adult height (12,13). Regarding blood pressure, both sBP and dBP showed significant correlation with 2hBG. This finding is consistent with other findings and may be explained in relation to insulin resistance (14).

This study suggested higher prevalence of NIDDM, IGT, and hypertension in rural subjects compared with past studies. The findings were comparable with other studies on prevalence among Asian populations, which need further epidemiological investigation based on genetic, nutritional, and other environmental factors in a larger sample.

Acknowledgments— Boehringer Mannheim donated the Hemoglucotest test strips free of cost; Glaxo donated 2,000 packets containing 75 g glucose; and BIRDEM provided us with Reflolux and other logistic support.

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