Prevalence of diabetes in a rural area of central India

P. R. Kokiwar, Sunil Gupta*, P. M. Durge

Department of PSM, Indira Gandhi Medical College, Nagpur, *Sunil's Diabetes Care n' Research Centre Pvt. Ltd., Nagpur, India

OBJECTIVE: To determine the prevalence of diabetes and abnormal glucose tolerance and to study the association of various factors with abnormal glucose tolerance (AGT) in a rural area of Nagpur district. **METHODOLOGY** Nine hundred twenty-four subjects aged ≥30 years were selected by systematic random sampling of houses. All subjects were interviewed using a standardized pro forma, and all were screened by 75 gm 'oral glucose tolerance' test based on WHO criteria. Specific prevalence rates for various factors were determined. Chi-square test was used for statistical analysis. **RESULTS:** Thirty-four (3.67%) subjects were observed to be diabetic, 55 (5.96%) had impaired glucose tolerance, 33 (3.57%) had impaired fasting glycemia (IFG). A total of 122 (13.20%) were observed to have AGT. Prevalence of AGT was significantly greater in people having sedentary physical activity (33.84%) as compared to people having heavy physical activity (11.53%). Prevalence was high in those belonging to upper socioeconomic classes (23.68%) as compared to people belonging to lower socioeconomic classes (8.96%), in those consuming alcohol (22.29%) as compared to nonalcoholics (11.46%), in those having BMI ≥25 kg/m^2 (27.47%) as compared to those having BMI <25 kg/m^2 (9.7%), in people having family history of diabetes (46.93%) as compared to those with no such history (11.31%). **CONCLUSIONS:** In this study, there was high prevalence of diabetes (3.67%) as compared to that in the WHO report (2.4%) for rural India. AGT was more prevalent among males, physically inactive persons, upper socioeconomic class, alcohol consumers, obese persons and those having family history of diabetes.

KEY WORDS: Diabetes in rural area, diabetes prevalence

Correspondence to **Dr. Sunil Gupta,** Sunil's Diabetes Care n' Research Centre Pvt. Ltd., Nagpur, India.
E-mail: drsgupta_ngp@sancharnet.in

The World Health Organization (WHO) has recently acknowledged that India has the maximum number of diabetic patients than does any given country (around 35 million).[1] This is projected to increase to 57 million by the year 2025. India is thus the 'Diabetic Capital of the World.'[2]

Since 1975, there is a steady increase in the prevalence of diabetes mellitus in rural dwellers of India. The prevalence has increased from 0.6% in 1975 to 2.4% in 1995.[3] Diabetes is a disease of insidious onset, and the symptoms when they eventually appear do not warrant immediate attention. WHO expert committee on diabetes has issued a clarion call to workers around the world to carry out epidemiological survey of diabetes with a view to identify, before it is too late, the cultural, social and other factors which may contribute to diabetes. Population survey is the best means to detect large numbers of hitherto undiagnosed diabetics, as well as to create awareness regarding the disease among the masses.[4] It is also possible to identify the high-risk group by simple parameters such as anthropometry, presence of family history of diabetes and assessment of the physical activity.[1] So using WHO diagnostic criteria for diagnosis of diabetes, a community-based cross-sectional study was carried out to determine the prevalence of diabetes and its associated factors.

Methodology

This study was a community-based cross-sectional study carried out in Raipura village of Nagpur district in north-east Maharashtra. Raipura village is 20 km from Nagpur and is a rural field practice area of Indira Gandhi Medical College, Nagpur. WHO reported a 2.4% prevalence of diabetes in rural population of India.[3] Based on this, sample size was calculated.[5] Based on health survey register of PHC-Hingna, it was observed that there were totally 1,610 houses in Raipura village. Only those houses

that were having at least one or more persons of age 30 years and above were numbered serially. The total number of such houses was 1,357. Systematic random sampling of these houses was done and 641 houses were surveyed, in which 1,238 adults aged ≥30 years were present. Out of these, 924 were actually examined (response rate 74.6%).

A field team consisting of a doctor, a social worker and a technician visited the village for the interview and screening program. After establishing a good rapport and consent, complete details were recorded during the interview session in the standardized pro forma. Next day early in the morning, subjects were screened for fasting and post-glucose blood glucose as recommended by WHO. After taking early morning fasting sample, they were given 75 gm of anhydrous glucose in 200 ml of water to drink in 5 min. Exactly after 2 h, the post-glucose sample was taken. Results were analyzed as per WHO criteria.[6]

Statistical analysis

All data were computerized. Significance of inter-group differences was estimated by Chi-square test. A '*P*' value of <0.05 was considered significant.

Results

Of the 1,238 eligible adults, we could examine 924 (response rate 74.6%). This included 445 males and 479 females. Of these 924 subjects, 336 (36.36%) were in the age group of 30–39 years and 46 (4.99%) in the age group of ≥70 years. Prevalence of various types of 'abnormal glucose tolerance' is shown in Figure 1.

Prevalence of AGT was significantly greater amongst people doing sedentary physical activity (33.84%) as compared to people involved in heavy physical activity (11.53%). The association between upper socioeconomic status and AGT was statistically significant. There was significantly greater prevalence of AGT among alcohol consumers (22.29%) as compared to nonconsumers of

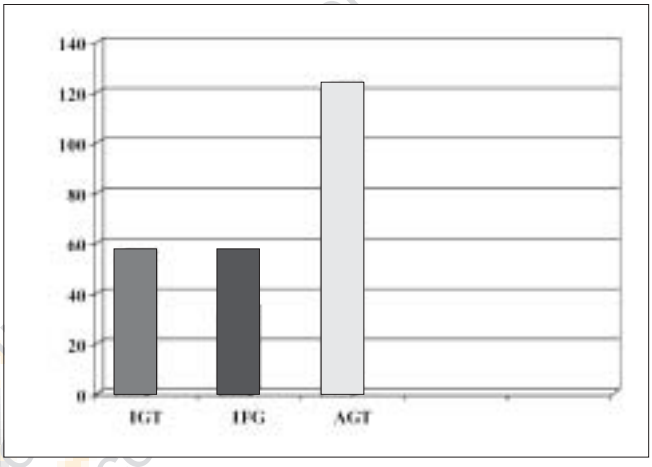

Figure 1: Prevalence of impaired glucose tolerance (IGT), impaired fasting glycemia (IFG) and abnormal glucose tolerance (AGT)

Table 1: Association of risk factors with abnormal glucose tolerance

Factors	Abnormal glucose tolerance (n)	Normal (n)	Chi-square	'*P*' value
Physical activity				
Sedentary	44	86		
Mild	35	280		
Moderate	25	300	58.63	< 0.001
Heavy	18	138		
Socioeconomic status				
Upper	05	04		
Upper middle	17	46		
Lower middle	41	153	45.51	< 0.001
Upper lower	50	514		
Lower	09	85		
Alcohol consumption				
Yes	33	115		
No	89	687	12.71	< 0.001
Body mass index				
Normal	72	670		
Obese (BMI >25 kg/m^2)	50	132	40.26	< 0.001
Family history of diabetes				
Yes	23	26		
No	99	776	51.38	< 0.001

alcohol (11.46%). Prevalence of AGT was significantly ($P < 0.001$) higher among obese (27.47%) persons as compared to non-obese persons (9.7%). Prevalence of AGT was 46.93% among those who had a family history of diabetes and 11.31% among those who had no such family history [Table 1].

Discussion

The prevalence of diabetes varies considerably throughout the world. In different parts of India, the prevalence has been reported to vary between 2.4[3] and 4.9%[7] for rural areas and 3.2[8] and 15.4%[9] for urban areas. But these studies were using different diagnostic criteria, even different from the one suggested by WHO. We used the diagnostic procedure and criteria as suggested by WHO. When compared to other rural studies in India using WHO criteria, we found a lower prevalence of diabetes (3.67%) – which is also lower as compared to that reported by Zargar in Kashmir valley, viz., 4.25%;[10] and by Patadin in rural south India, viz., 4.9%.[7] However, both of these investigators had studied the age group of ≥40 years. Other studies carried out in rural areas of India have reported a low prevalence – Gupta *et al.*, 1.3%;[1] Ramachandran *et al.*, 2.4%;[1] Ramankutty *et al.*, 2.5%[1] – as compared to our finding. M. A. Sayeed *et al.*[11] found a prevalence of 4.3% in rural Bangladesh, but they used the 1997 American Diabetes Association diagnostic criteria.

Sadikot *et al.*[12] carried out a multistage and multicentric study in 37 rural areas of India in adults aged ≥25 years using the WHO criteria. They found the prevalence of diabetes and IGT to be 2.7 and 3.7% respectively.

Reporting of different percentages of prevalence from different studies is probably due to (a) selection of different age groups (b) utilizing different diagnostic criteria (c) cultural factors determining physical activity of individuals in different geographic areas.

Our study shows that upper socioeconomic class, family history of diabetes, reduced physical activity, increased BMI were important predictors of diabetes. Similar findings are also reported by all authors mentioned above, though there are differences in the percentages of prevalence of diabetes reported with the associated of risk factors.

References

1. Ramchandran A. Epidemiology of diabetes in India - Three decades of research. J Assoc Physicians India 2005;53:34-8.
2. Premlatha G, Shanthi Rani CS, Deepa E, *et al*. Prevalence of Diabetic complications in south Indians. Novo Nordisk Diabetic Update. 2000. p. 59-62.
3. Park K. Diabetes, Park's textbook of preventive and social medicine. 16th ed. 2000. p. 292-5.
4. Tripathy BB, Kar BC, Panda NC, Pairah N, Tej SC. Population survey for detection of frank and latent diabetes in one part of Cuttack, Orissa. J Indian Med Assoc 1970;54:55-61.
5. Luwanga SK, Lemeshow S. Sample size determination in Health Studies. WHO: 1991. p. 25.
6. World Health Organization, Diabetes Mellitus Technical Report Series No. 727, 1985.
7. Patadin S, Bots ML, Abel R, Valkenburg HA. Impaired glucose tolerance and diabetes mellitus in a rural population in South India. Diabetes Res Clin Pract 1994;24:47-53.
8. Dontoolwar SP. A study of prevalence of diabetes mellitus in working women of banking sector, Thesis submitted to Nagpur university for M.D. (PSM), 1998.
9. Thimmayamma BV, Rao P. Diet survey methods, National Institute of Nutrition, Indian Council of Medical Research: Hyderabad.
10. Zargar AH, Khan AK, Soodi SR, Laway BA, Wani AI, Bashir MI, *et al*. Prevalence of type-2 diabetes mellitus and impaired glucose tolerance in Kashmir valley of Indian subcontinent. Diabetes Res Clin Pract 2000;47:135-46.
11. Sayeed MA, Mahtab H, Khanam PA, *et al*. Diabetes and impaired fasting glycemia in a rural population of Bangladesh. Available from: http//www.care.diabetesjournal.org.
12. Sadikot SM, Nigam A, Das S, Bajaj S, Zargar AH, Prasannakumar KM, *et al*. The burden of diabetes and impaired glucose tolerance in India using the WHO 1999 criteria: Prevalence of diabetes in India study (PODIS). Diabetes Res Clin Pract 2004;66:301-7.

Source of Support: Nil, **Conflict of Interest:** None declared.