PREVALENCE OF NON-INSULIN DEPENDENT DIABETES MELLITUS IN URBAN AREAS OF EASTERN NEPAL: A HOSPITAL BASED STUDY

P Karki[1], N Baral[2], M Lamsal[2], S Rijal[1], BC Koner[2], S Dhungel[2] and S Koirala[1]

Departments of [1]Medicine and [2]Biochemistry,
BP Koirala Institute of Health Sciences, Dharan, Nepal

Abstract. Non-insulin dependent diabetes mellitus (NIDDM), which affects millions of people throughout the world, is a widely prevalent chronic debilitating disease that causes short term and long term complications. It is a problem in a developing country like Nepal, where there has been no report of prevalence. Hence this study was undertaken to investigate the prevalence of NIDDM among urban patients attending the outpatient clinic of BP Koirala Institute of Health Sciences (BPKIHS) hospital, and coming from the eastern part of Nepal. A sample of 1,840 subjects was incorporated in the study during a period of one year. WHO diagnostic criteria (1985) were followed to establish the diagnosis of NIDDM. The prevalence of diabetes was 6.3% (1.63% previous and 4.67% new) which is relatively high in comparison to many other countries. The prevalence of NIDDM in females was relatively lower (5.75%) than in males (6.73%). The prevalence showed an increasing trend with increasing age. The high incidence (new cases) of NIDDM in Nepal as found in the study may be due to lack of public awareness regarding the problem and poor medical services in the country.

INTRODUCTION

Diabetes mellitus is one of the most common endocrine disorders in all populations and all age groups. There is rising prevalence of the disease in the developing countries - which was rarer before - with industrialization, socio-economic development, urbanization and changing life style (Zimmet, 1992; WHO, 1998).

Prevalence of diabetes mellitus was found to vary from zero in a highland population of Papua New Guinea that has retained its traditional life style to 25% in the population of Pima Indians. In some developing countries, the prevalence of diabetes mellitus is lower in men than in women but in others, the sex ratio is reversed. In the United States of America, the ratio are equal for both sexes. Within the same ethnic group, urban residents and migrants to urban areas have higher prevalence of diabetes mellitus than their rural counterparts (Chea and Yeo, 1983; Cruz Vidal *et al*, 1979; Zimmet *et al*, 1979).

Non-insulin dependent diabetes mellitus (NIDDM) is more prevalent than insulin dependent diabetes mellitus (IDDM) and constitutes nearly 90% of cases among the diabetics (Foster, 1994). There has been no systematic countrywide epidemiological study and surveillance mechanism for the detection of diabetic cases in Nepal. At present, those individuals who present themselves to the hospitals, health posts or private clinics can only be recorded, rendering it difficult to determine the true prevalence. There is no indexed literature available to date to show the prevalence of NIDDM in Nepal. Thus the present study was conducted to provide preliminary population based data on the magnitude of the problem of NIDDM in Nepal. It was done on an urban population at the hospital of BP Koirala Institute of Health Sciences (BPKIHS), Dharan.

Correspondence: Dr Nirmal Baral, Department of Biochemistry, BP Kiorala Institute of Health Sciences, Dharan, Nepal.
Fax: 00977-25-20251; E-mail: nirmalbaral@hotmail.com

MATERIALS AND METHODS

Study population

This study was a hospital-based population survey carried out in BP Koirala Institute of Health Sciences, Dharan, over a period of 1 year from 28th October 1997 to 27th October 1998. 1,840 patients attending the outpatient clinic of BPKIHS from urban areas of eastern Nepal, who were more than 30 years of age irrespective of their sexes and underlying diseases, were included in the study. Informed consent was obtained from each patient.

Pregnant women were excluded from the study. The study was approved by the research and ethical committee of the institute.

Plasma glucose estimation

Fasting blood samples were drawn at 8.00-9.00 hour by trained medical technicians by venipuncture. Face to face interview regarding morbidity data was conducted by trained enumerators. The age, sex, clinical manifestations and plasma glucose concentration were recorded in a standard proforma. Fasting and 2 hours post load blood samples were collected by venipuncture in vials containing sodium fluoride and potassium oxalate. Plasma was separated by centrifugation and kept frozen (-20ºC) until analysis. Plasma glucose concentration was determined by the glucose oxidase/peroxidase method (Glucose GOD/POD kit, E Merck India Ltd, Mumbai) using Vitalab-selectra-2 autoanalyser (Merck, Germany).

The definition of non-insulin dependent diabetes mellitus (NIDDM) was adopted from the World Health Organization definition (1985) with the following modifications. Subjects with a medical history of diabetes, diagnosed previously and getting treatment were considered diabetic irrespective of their present plasma glucose concentration. For subjects without a history of diabetes, one fasting plasma glucose (FPG) level more than 7.8 mM was considered diabetic and FPG levels less than 5.6 mM were considered non-diabetic. Subjects with FPG levels between 5.6 and 7.8 mM received an oral glucose tolerance test (OGTT). Fasting venous blood was drawn from these subjects before giving an oral glucose load (75 g of dextrose monohydrate dissolved in 300 ml water). A second venous blood sample was drawn 2 hours later. Subjects were considered diabetic if FPG was more than 7.8 mM and/or the 2 hour post load plasma glucose was greater than 11.1 mM. Otherwise, subjects were considered non-diabetic. The subjects with FPG less than 7.8 mM but 2 hours after-load blood plasma glucose between 7.8 and 11.1 mM were considered to have impaired glucose tolerance (IGT).

RESULTS

A total of 1,840 subjects (1,040 men and 800 women) of different age groups had FPG data. The male: female ratio was 1.3:1. Table 1 shows

Table1
Prevalence of diabetes by age and sex.

Age	Diabetes in men					Diabetes in women					Total diabetes				
(Year)	Screened	Previous cases	New cases	Total cases	Prevalence (%)	Screened	Previous cases	New cases	Total cases	Prevalence (%)	Screened	Previous cases	New cases	Total cases	Prevalence (%)
30- 39	384	2	10	12	3.12	220	4	6	10	4.54	604	6	16	22	3.64
40- 49	358	4	14	18	5.05	308	2	6	8	2.59	664	6	20	26	3.91
50- 59	264	10	24	34	12.87	242	4	20	24	9.91	506	14	44	58	11.46
60+	36	2	4	6	16.16	30	2	2	4	13.33	66	4	6	10	15.15
Total	1,040	18	52	70	6.73	800	12	34	46	5.75	1,840	30	86	116	6.30

Table 2
OGTT Positive rate for patients with borderline FPG OF 5.6-7.8 mM.

FPG mM (mg/dl)	OGTT tested	Positive OGTT found		Negative OGTT found			
	n	Diabetic	Rate (%)	IGT	Rate (%)	Normal OGTT	Rate (%)
5.55-5.77 (100-104)	100	2	2	21	21	77	77
5.83-6.05 (105-109)	46	0	0	16	34.78	30	65.22
6.11-6.33 (110-114)	38	2	5.26	20	52.63	16	42.10
6.38-6.60 (115-119)	38	2	5.26	18	47.37	18	47.37
6.66-6.88 (120-124)	56	2	3.57	20	35.71	34	60.71
6.94-7.16 (125-129)	18	4	22.22	10	55.55	4	22.22
7.22-7.44 (130-134)	26	4	15.38	16	61.54	6	23.08
7.49-7.71 (135-139)	18	2	11.11	7	38.89	9	50.00
Total	340	18	5.29	128	37.65	194	57.06

the prevalence of diabetes by age and sex. A total of 116 diabetic cases (30 previous and 86 new) were found among the 1,840 subjects studied. The prevalence rate was 6.3% (1.63% previous and 4.67% new). The prevalence of newly and previously diagnosed diabetes increased significantly with age. The prevalence of NIDDM in males (6.73%) was slightly greater than in females (5.75%).

Among the 1,840 subjects studied, 30 had been previously diagnosed as NIDDM, 68 had FPG greater than 7.8 mM, 1402 had FPG less than 5.6 mM and 340 had FPG between 5.6 and 7.8 mM. Of the 340 eligible subjects for OGTT (FPG between 5.6 and 7.8 mM), 18 (5.29%, approximately 1% of total population screened) cases of diabetes were found and 128 (37.65%, 7% of total population screened) subjects were IGT (Table 2).

DISCUSSION

Our study showed a relatively high prevalence of diabetes, which reflects on the health impact of this disease among the urban population of eastern Nepal. We selected an urban population for this study, because (a) the prevalence of diabetes is higher in urban areas in developing countries (Chea and Yeo, 1983; Cruz Vidal *et al*, 1979), (b) diabetes and diabetes-related complications comprise to a significant proportion of the patients in and around Dharan utilizing BPKIHS health care resources (BPKIHS record, 1996-97) and (c) the utilization of healthcare resources by most of the rural population in hilly and mountainous areas is so meager that a prevalence rate calculation from a hospital based study will not be a true reflection of magnitude of the problem in this population.

The prevalence rate of 6.3% (1.63% previous and 4.67% new) in this study is higher than those found in many countries (WHO Study Group, 1994; Vannasaeng *et al*, 1986; Chou *et al*, 1994). This prevalence is lower than that of urban India but higher than that of rural India (WHO Study Group, 1994). This probably supports the proposition that the incidence of diabetes depends upon the level of industrialization and urbanization (Zimmet, 1979).

This study on urban subjects may reflect the rural-urban difference in the prevalence rates of

diabetes that has been consistently shown in developing countries. In addition, different diagnostic methods and criteria used in those studies may contribute to various estimates of diabetes prevalence. Most previous population-based surveys measured the post-load plasma glucose value for the detection of this disease. In this study, we used fasting blood glucose because it is more reproducible and it is more convenient to draw a fasting blood sample than 2 hours after glucose load, which we performed for those who fell in the range of suspected impaired glucose tolerance (IGT). This study showed a rising prevalence of diabetes with age in both sexes, reaching the highest rate in the fifth and sixth decades of life. We also found a higher prevalence of diabetes in males than in females, as reported also in other population-based studies in Asia (Chea and Yeo, 1983; Vannasaeng *et al*, 1986; Kiyohara *et al*, 1996). The possible reasons for the low ratio of previous to new diabetes may be the lack of public awareness and medical services in Nepal. This study being hospital based might be affected by selection bias and the conclusions may not apply to the population at large.

To clarify the above issues, field-based countrywide epidemiological studies are necessary to provide realistic data on the magnitude of the problem of diabetes for health care planners and to provide the etiologic basis in this disease in Nepal.

ACKNOWLEDGEMENTS

This study was supported by grants from the Research Committee, BP Koirala Institute of Health Sciences, Dharan, Nepal.

REFERENCES

BPKIHS out patient record. Record Section, BPKIHS, Dharan, Nepal 2054/2055, 1996-97.

Chea JS, Yeo PPB. Prevalence of diabetes in the developing countries of Asia and Africa with special reference to Chinese and Indians. In: Mongolia E, ed. Proceeding of the 11th Congress of the international Diabetes Federation, Amsterdam. *Excerpta Medica* 1983: 123-30.

Chou P, Hsiao KJ, Liao MJ, Tsai ST, Kuo HS. A population survey on the prevalence of diabetes in Kin-Hu, Kin men. *Diabetes Care* 1994; 17: 1055-8.

Cruz Vidal M, Costas R, Garcia-Palmieri MR, *et al*. Factors related to diabetes mellitus in Puerto Rican Men. *Diabetes*, 1979; 28: 300-7.

Foster DW. Diabetes mellitus. In: Issel Bacher KJ, *et al*, eds. Harrison's principles of internal medicine, 13th ed. New York: McGraw-Hill, 1994: 1979-2000.

Kiyohara Y, Fujishima M. Prospective population survey of IGT in a Japanese community, Hisayam. *Nippon Rinsho* 1996; 54: 2755-60.

Vannasaeng S, Viriyavejakul A, Poungvarin N. Prevalence of diabetes mellitus in urban community of Thailand. *J Med Assoc Thai* 1986; 69: 131-7.

WHO Study Group. Geneva: World Health Organisation, *WHO Tech Rep Ser,* 1994; 844.

World health report. Life in the 21st century: A vision for all. WHO, Geneva, 1998: 91.

Zimmet P. Epidemiology of diabetes and its macrovascular manifestation in pacific populations: the medical effect of social progress. *Diabetic Care* 1979; 2: 144-53.

Zimmet P. Challenges in diabetes epidemiology -from west to the rest. *Diabetes Care* 1992; 15: 232-52.

Zimmet P, Faaiuso S, Ainuu J, *et al.* The prevalence of diabetes in the rural and urban Polynesian population of Western Samos. *Diabetes* 1980; 30: 45-51.