AJMS
(An US National Library of Medicine enlisted journal)
Al Ameen J Med Sci (2011)4(1):38-44
ISSN 0974-1143

ORIGINAL ARTICLE

Prevalence of Diabetes Mellitus and Its Associated Risk Factors in Age Group of 20 Years and Above in Kashmir, India

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Abstract: *Objective:* Objective of our study was to assess the prevalence and risk factors for diabetes mellitus in the age group of 20 years and above in one of the semi-urban areas of Kashmir. *Methods:* A cross sectional study was carried out in Hazratbal, an administrative block of central Kashmir. A total of 1040 subjects (500 males and 540 females) aged ≥ 20 years were screened for Diabetes Mellitus. Body mass index, waist to hip ratio, personal history and family history were recorded at baseline through pretested questionnaire. After an overweight fast, blood samples were drawn for determination of fasting plasma glucose. In the case fasting plasma glucose ≥ 126mg/dL, a second determination was performed one week later. Diagnosis of diabetes mellitus was based on the American Diabetes Association criteria 2004. The statistical analysis of the data was performed by using statistical package SPSS version 10.0. *Results:* The prevalence of diabetes mellitus was 6.05%, with known diabetes mellitus being 4.03% of the study population and undiagnosed diabetes mellitus being 2.02% subjects. Significant difference was detected between males and females (3.6% vs 8.3%, p <0.05). There was also significant increase in the prevalence of diabetes mellitus with increasing age (age 20-40 years: 3.02% vs > 60 years 16.66%, P<0.05). Furthermore prevalence of obesity (body mass index > 25 Kg/m^2) was 36.82 % more so central obesity, & family history were significantly associated with the presence of diabetes mellitus, p<0.001. *Conclusion:* The prevalence of diabetes mellitus is showing a rising trend in Kashmir valley, life style changes and aggressive control of the risk factors are urgently needed to tame this trend.

Key words: Body mass, Diabetes Mellitus, Glucose, Kashmir, Obesity, Population risk, Prevalence

Introduction

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia. Depending on the etiology of the DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization, and increased glucose production [1]. It is estimated that 20% of global burden of DM resides in South East Asia Region (SEAR) area, is likely to triple by 2025 increasing from present estimates of about 30 million to 80 million [2]. In observational [3] and intervention studies [4-5] obesity and physical inactivity

represent the most important modifiable risk factors for DM. Indeed, in subjects with pre-diabetes [4-5], lifestyle intervention significantly and cost effectively reduced the incidence of DM, thus justifying the implementation of population based strategies for identifying and treating high-risk individuals. DM is one of the foremost preventable non-communicable diseases, so strategies formulated based on the risk factors can be helpful to curb the rising trend of DM. However, risk factors for DM depend on the regional and ethnic background [6] and this forms the basis of the formulation of this study to determine the prevalence of the DM and the risk factors there off in this part of the Indian subcontinent.

Materials and Methods

This cross sectional study was conducted in one of the administrative blocks of central Kashmir (Hazratbal) comprising of semi urban population. The study population included subjects in the age group 20 years and above irrespective of gender (excluding pregnant females). A multistage sampling procedure was adopted for the survey. A list of villages and wards were framed and randomization was done in such a manner as to include 10% villages. Ten percent of all the households in the selected villages were visited. From the selected households the prevalence of Diabetes (known and unknown) and its associated risk factors was estimated. The selected households were visited and after socializing with the head of household, the purpose of visit was explained to him. He was requested to motivate the other members of the house who constitute the study subjects (all males and non-pregnant females 20 years and above) to participate in the study. A pretested questionnaire was used which registered their name, age, sex, actual residence, presence of disease and age at diagnosis, family history of diabetes, dietary history, drug history, obstetric history (females), history of any other disease. Subsequently subjects were invited to the health centre in the morning after an overnight fast of at least 8 hours to screen for undiagnosed Diabetes. The individuals were subjected to anthropometric data assessment (height, weight, waist and hip circumference), physical activity, socioeconomic status (SES), smoking and alcohol intake, were obtained using a standardized questionnaire by a structured interview. Blood samples were drawn for the determination of plasma glucose. In the case of fasting plasma glucose (FPG) > 126mg /dL a second determination was performed one week later. In addition, subjects with previous history or who were taking oral hypoglycemic agents or insulin were considered to have DM. Subjects with known diabetes were not tested for FPG. The body mass index (BMI) was calculated using the formula weight (Kg) / height (m^2). Waist and hip were measured using standard techniques and the mean of two measurements was taken for calculating the waist-hip ratio (WHR). Blood pressure was recorded in the sitting position in the right arm to the nearest 2 mm Hg with a mercury sphygmomanometer. Two readings were taken 5 minutes apart and the mean of the two was taken as the blood pressure.

Definitions and diagnostic criteria: Diabetes was diagnosed based on drug treatment for diabetes (insulin or oral hypoglycemic agents) and/or criteria laid by the ADA in 2004 i.e. fasting plasma glucose (FPG) 126 mg/dl or 2 hr post-glucose value

200 mg/dl. Impaired glucose tolerance (IGT) was diagnosed if FPG was <126 mg/dl and 2 hr post- glucose value (140 mg/dl and <200 mg/dl) [7].

Family history of diabetes was considered as positive if either or both the parents had diabetes. Physical activity level was graded as light, moderate and heavy based on a physical activity questionnaire, which included job-related and leisure time activities and specific questions on exercise. The monthly income of the family was recorded which was the combined income of the husband and wife taken as a single unit. Obesity and abdominal obesity was defined using the revised criteria for Asian Indians: [8] underweight: BMI < 18 .5 Kg/m^2, normal range: BMI 18.5 -22.9 Kg/m^2, overweight: at risk: BMI 23 - 24.9 Kg/m^2, obese I: BMI 25 - 29.9 Kg/m^2, obese II : BMI $\geq$ 30 Kg/m^2 for both males and females. Abdominal obesity- waist hip ratio of 0.9 in males and 0.85 in females [9] and waist circumference $\geq$ 90 cm for males and $\geq$ 80 cm for females [10]. The statistical analysis of the data was performed by using statistical package SPSS version 10.0 (statistical package for social sciences version 10.0) Chicago, U.S.A for windows.

Results

Table-1: Prevalence of diabetes mellitus according to age and sex.

Age group (years)	No. Patients/Population (%)		Total No. Patients/ Population (%)
	Male	Female	
20-40	4/195 (2.05)	8/202 (3.96)	12/397(3.02)
41-60	9/254(3.54)	21/263 (7.98)	30/517(5.80)
>60	5/51(9.80)	16/75(21.33)	21/126(16.66)

Data Concerning the prevalence of diabetes according to age and sex are presented in Table 1. The total prevalence of diabetes was 6.05% significantly different between sexes (8.3 % females and 3.6 % males), among whom 4.03% of subjects had known diabetes while 2.02% had previously undiagnosed (Table 2). The prevalence of diabetes increased significantly with advancing age (Table 3). Indeed there was almost three times increase in the prevalence of diabetes after the age of 60 years (5.80% vs. 16.66 %, for 40-60 vs > 60 years). The prevalence of obesity in the entire study population was 52.2% significantly increased in patients with diabetes 7.31% vs 14.37% (Table 2). Further more central obesity was observed in 44% again more commonly in patients with diabetes. Finally family history of diabetes was detected in 6.92% being more common in patients with diabetes (15.27 % vs 5.37 %).

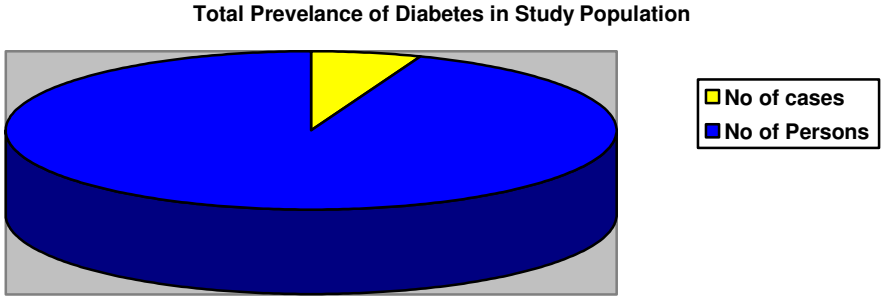

Table-2: Distributions of Cases.

Study Subjects	Number	Percentage.
Total No. of Subjects	1040	100.00
Known Diabetics	42	4.03
New Cases	21	2.02
Total	63	6.05

Table: 3 Baseline characteristics of diabetic and non-diabetic subjects

Characteristics	DM	Non-Diabetics	p-value
Male (n=500)	18 (3.6%)	482(96.4%)	0.0013
Female (n=540)	45 (8.3%)	495(91.6%)	
Family history of DM	11(17.4%)	61(6.2%)	0.0006
Hypertension	16(25.3%)	172(17.6%)	0.1192
Physical activity			0.010
Light	41	507	
Moderate	20	403	
Heavy	2	130	
BMI (Kg/ m2)			0.0000
<18.5	-	46 (0.04%)	
18.5-22.9	-	204 (19.61%)	
23-24.9	12 (4.85%)	235 (23.75%)	
25-29.9	28 (7.31%)	355 (36.82%)	
> 30	23 (14.37%)	137 (15.38%)	
Smoking			
Current Smoker	22 (8.03%)	273 (26.25%)	
Non –Smoker.	41 (5.6%)	725 (69.71%)	
Ex .Smoker	-	42 (4.03%s)	

Table :4 Waist Hip-ratio of diabetic with regards Sex and BMI

Sex	Male Mean ±S.D	Female Mean ±S.D	T-value	P-Value.
Waist/Hip	0.93± 0.07	0.86± 0.10	2.28	0.037
BMI	21.10 +2.15	22.84 + 2.40	2.57	0.018

Discussion

The overall prevalence of Diabetes in our study population was 6.05%, out of which 4.03% were known diabetic and 2.02% undiagnosed diabetic subjects. This is higher than earlier studies from same area by Bhat NA et al [11] and Zargar AH et al [12], in which prevalence was 2.02% and 1.89% respectively. This difference could be explained, because of increasing stress in valley due to turmoil, change in life style, and age composition of the selected population of earlier studies. In the study done by Zargar et al, chosen population was males and non-pregnant female adults ≥ 40 years old revealed that, a) 1.89 % (1.98% males and 1.77% females) had diagnosed DM, b)

4.25% had undiagnosed DM. In another study from Rancho Bernado, CA over all prevalence of DM by history was 4.68% (males had 6.05% and females had 3.35%). Similarly Harris et al estimated the prevalence of DM to the tone of 3.4% in the population of aged 20-74 years [13]. The present study revealed that the prevalence of DM increases with age. In the target population of 20 years and above , the prevalence of DM increased with age from 3.02% in 20-40 year old through 5.80% in those aged 40-60 years and 16.66% in those aged $\geq$ 60 years. This is quite consistent with the studies done out side the Indian subcontinent like in USA,[13] Denmark [14] and Hong Kong,[15] which probably is due to less work, less exercise, impairment in carbohydrate intolerance and improved life expectancy. Hence age is considered most consistent risk factor world over for rise in DM prevalence.

Majority of epidemiological studies show male predominance among diabetics [13, 16-17]. Indian surveys show a similar trend both within the country and abroad [18-19]. But in the present study females had higher prevalence of DM (8.3%) as compared to males (3.06%). The age wise prevalence of DM was also seen more in females than their male counterparts (Table 1). Since females in this part of Indian subcontinent are sedentary house wives, have less outdoor activities, along with traditional less active life styles, hence tend to be more obese which could explain the increased prevalence of DM in them as compared to men [20]. Evidences both from prospective and cross-sectional studies suggest obesity to be strongly linked to Diabetes [13, 21]. Indeed in our study, BMI, (>25kg/m^2: Index of adiposity) was associated with at least doubling the risk for the presence of DM. Furthermore, WHR an index of central obesity was significantly associated with increase in prevalence of DM, which in conformity with the study of Ohlson et al [22], who demonstrated that high waist to hip ratio is a predictor of DM. In the present study the subjects with DM had increased body mass index and waist to hip ratio compared to non-diabetics, where female diabetics had statistically significant more BMI and WHR. In our study, family history of diabetes mellitus was associated with increased risk for DM, which supports the role of heritability as has long been known in Diabetes [23-24]. Subjects with family history had 2-3 times higher risk of developing diabetes. It has been shown that subjects with family history of diabetes develop diabetes earlier compared to subjects without family history. An earlier study in South African Indians has also shown an association between type-2 DM and family history of diabetes. Present study revealed that, less physical activity was significantly associated with increased risk for DM, those subjects who performed moderate to light grade physical activity were having DM as compared to those who performed heavy physical activity $p<0.01$.

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