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Prevalence of Diabetes and its Risk Factors in Urban Setting of Kandahar City, Afghanistan-2015

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ABSTRACT:-Background: National statistics are lacking while prevalence of diabetes is increasing in Afghanistan. Thus, we assessed the prevalence of diabetes and evaluated the relationship of diabetes with its main risk factors in urban citizens in Kandahar city, Afghanistan.

Methods and Materials: Using WHO stepwise approach a total of 1165 men and women aged between 25 and 70 years were enrolled in the study using a multi-cluster sampling method in Kandahar city in October-November, 2015. Data were collected using a structured questionnaire for assessing non-communicable diseases and their risk factors. Fasting venous blood sample was collected to assess the lipid profile and fasting blood sugar. Anthropometric measurements of the participants were also taken. Data was analyzed using SPSS version 20. A hierarchical logistic regression analysis was applied in two steps using the enter method to examine the associations between related risk factors and diabetes.

Results: The crude prevalence of diabetes to be 22.4%. Out of all respondents 597 (51.2%) were females and 568 (48.8%) males with a mean age of 38.3±11.2 years. Around two thirds (73.2%) were illiterates and (79.3%) were married. 9.7% were smokers and (16.3%) were mouth snuff users. Sixty percent of respondents ate fruits less than 3 days per week and 60% ate vegetables three days or more per week. Almost 6% of subjects practiced vigorous physical activity and 21.3% reported doing moderate physical activity. At multivariate level factors such as age, moderate physical activity, residential life, BMI, level of triglyceride, low density lipoprotein, diet in term of taking vegetables, chicken and rice and finally high blood pressure had independent significant association with diabetes.

Conclusion: This study found high prevalence of diabetes in the surveyed population which requires serious attention. Focusing on factors age, physical activity, dietary habits, blood lipids, obesity and blood pressure could contribute in lowering the level of diabetes in urban setting of Kandahar city.

Keywords: *Prevalence, Diabetes; Risk Factors, Kandahar, Afghanistan*

I. INTRODUCTION

Diabetes mellitus (DM) is growing worldwide and has reached epidemic level in many developing and most developed countries [1, 2]. It is characterized by high levels of glucose in the blood as a result of too little insulin, resistance to insulin, or both [3]. Being a public health problem, DM has significant impact on health, quality of life and healthcare system [4]. The global prevalence of diabetes for all ages was 2.8% in 2000 and is projected to grow to 4.4% in 2030. The global number of people with diabetes is expected to become more than double from 171 million in 2000 to 366 million in 2030 [5]. According to a study of diabetes in Kuwait, the crude prevalence of total diabetes was 21.4% and almost one-fifth of the cases were previously undiagnosed [6]. This is consistent with 16% and 24%prevalence of diabetes in neighbouring countries of Saudi Arabia [7].Based on the third Iranian national surveillance the prevalence of diabetes was 8.7% [8]. Likewise, Pakistan will have an estimated 14.5 million citizens with diabetes by 2025 [9]. Literature shows the main factors such as age, sex, diet, physical activity, smoking habits, obesity, hypertension, life style choices, alcohol drinking, ethnicity, residential area and other factors are associated with diabetes mellitus. For example in the United States, the prevalence of diabetes was twice as high among Mexican-Americans as among non-Hispanic whites [10]. According to a study in Oman, the overall prevalence of diabetes was 11.6% with significant differences related to residence, marital status, educational level, smoking, obesity, cholesterol level, and systolic blood pressure [11]. In Thailand, DM was associated with old age, obesity, waist to hip ratio, hypertension, cholesterol, and creatinine level in plasma [12]. In Greek the prevalence of diabetes was 15.5% in women and 20.1% in men [13]. Among Korean adults high SES, higher level of education and higher income were significantly associated with a lower likelihood of having these diabetes and hypertension [14]. Likewise, the prevalence of abnormal glucose tolerance was significantly greater in people having sedentary physical activity (33.84%) as compared to people having heavy physical activity (11.53%) [15]. Lastly, the results of a national surveillance study in Iran showed the prevalence of diabetes was higher among older age groups, females, and urban dwellers [16].

Also in Iran among 25–64 year-olds in 2005 was 7.7% with differentiation of 8.3% in females and 7.1% in males [17]. In China, the prevalence of diabetes in 35–74 year-olds was 5.5%, with differentiation of 5.8% in females and 5.2% in males [18]. In a study conducted in Punjab Province, Pakistan, the prevalence of diabetes was 12.14% in males and 9.83% in females. Risk factors such as central obesity, hypertension and family history of the disease, were strongly associated with diabetes [19]. In Afghanistan, presently, there are no provincial statistics to describe the prevalence and risk factors of diabetes and due to years of war and conflict, few studies have been conducted. Based on a World Health Organization (WHO) estimates, in 2000 there were 468,000 people with diabetes in Afghanistan. This number is expected to rise to 1,403,000 in 2030, representing nearly a threefold increase when compared to 2000 [20]. The prevalence of Diabetes among population of 20-79 years have been estimated for Afghanistan in which according to adjustment of national population the prevalence is 6.6% and 7% for 2010 and 2030, however after the world population adjustment the prevalence for 2010 is estimated 8.6% and for 2030 it is projected to be 9.9% [21]. In addition according to published studies the prevalence of diabetes was 13.2% in Kabul (age group of ≥40 years) [22] and 11.8% in Jalalabad city [23]. Besides, a recent study in Hirat city reported that the prevalence of raised blood sugar was 9.9% [24]. To fill the gap of information we aimed to assess the prevalence of diabetes and examine the associations between different risk factors and diabetes in Kandahar urban citizens, Afghanistan.

II. METHODS AND MATERIALS

The study was a cross sectional survey by design and the target population were all residents 25-70 years old living in urban areas of Kandahar city. Ethical approval was obtained from Ministry of Public Health Institutional Review Board (IRB). Temporary residents (resident < 6 months) and those living in institutionalized settings or insecure areas were excluded. We used the WHO STEP-wise tool [25] which included demographic, behavioral and biochemical domains. Due to the unavailability of previous estimates of risk factor prevalence in this city we assumed the highest prevalence or sample size calculation (50%), 95% confidence interval (CI) and margin of error of 5%. From this we estimated 385 subjects to be included in the survey. Taking into consideration the proportion of other risk factors in similar settings, the number of subjects was increased to 600. Finally, after taking into account the design effect two of cluster sampling the final sample size was increased to 1200 for the city, which was reasonable for achieving the study objectives with limited resources and funding support. The Expanded Programme for Immunization (EPI) list of the clusters was used due to its reliability in Ministry of Public Health. As sampling strategy initially we got the list of all existed EPI clusters which included village/area name, population, and number of households per cluster. In the first stage of cluster sampling we randomly selected 7 clusters of EPI using random number of excel sheet. In the second stage from each selected Cluster we randomly selected the five areas (called Area/*Guzar*). Later the wholes sample of households distributed among selected area according to the proportion to the size of household number in each cluster / areas. Finally, the number of households in each area divided by the sample size assigned for each areas, it enabled us to select household systematically. Very participants gave written informed consent, after being explained the study objectives and procedures. Subjects were visited at home by interviewers and data on demographic, socio-demographic, lifestyle, and behaviors were collected. This was followed by anthropometric measurements taken by trained healthcare staff of institute of health science. Height and weight were measured using portable electronic weighing scale and measuring inflexible bars. Waist circumference (WC) was measured at the midpoint between the lower part of the lowest rib and the highest point of the hip on the mid-axillary line and blood pressure measured with a calibrated sphygmomanometer. The average of three measurements, with intervals of 5 minutes, was considered for analysis [8]. Finally, blood samples were collected for biochemical data. Samples were transported in cool boxes (2-8°*C*) from field to public health Laboratory on the day of sample collection where it was processed and serum was separated and shipped to Central Public Health Laboratory (CPHL) in Kabul. Using Cry-vials the samples were coded. On arrival in CPHL all serum samples were stored at -80°C until biochemical test conducted. Altogether 1165 samples were tested for biochemical measurement of triglyceride, cholesterol, and glucose beyond 12 samples which were poor and discarded.Diabetes Mellitus (DM) was defined as either having a diagnosis of diseases or receiving a prescription for anti-diabetic drugs. New diabetes was considered, if fasting plasma glucose (FPG) level was ≥ 126 mg/dl. Central obesity was defined as WC ≥ 80 cm in females and ≥ 94 cm in males. Dyslipidemia was defined according to the criteria by the National Cholesterol Education Program-Third Adult Treatment Panel as total cholesterol levels ≥ 190 mg/dl, TG ≥150 mg/dl and high density lipoprotein (HDL) < 40mg/dl in males and HDL <50 mg/dl in females [26]. A Body Mass Index (BMI) of ≥30 kg/m2 was considered as obese, 25–30 kg/m2 as overweight and 18.5–25 kg/m2 as normal weight [27]. Systolic blood pressure ≥140 mmHg and diastolic pressure ≥90 mmHg were considered as hypertensive [28].Data were analyzed using the Statistical Package for Social Science software (SPSS Version 20.0). At first we used univariate analysis for differences in proportions of categorical variables between two groups. A hierarchical logistic regression analysis was applied in two steps using the Enter method. Variables found to be associated with diabetes in the

univariate analysis were included in multiple logistic regression models [29]. The p-values for entry and removal variables in the stepwise logistic regression model were 0.05 and 0.1, respectively. For logistic regression analysis this study employed an odds ratio (OR) and 95% confidence intervals. A p-value of <0.05 was considered to be significant.

III. RESULTS

Totally the number of records cleaned for analysis was 1165 (96.9%) and out of them females constituted just above half 597 (51.2%) with overall mean age of 38.3±11.2 years. Most of the study participants were married (79.3%), illiteracy rate was 73.2% and 88.5% of women were at home doing housework. About one tenth (9.7%) were smokers and 16.3% were snuffers. Forty percent ate fruits and 59.7%% ate vegetables ≥ 3 days per week. Thirty three percent of respondents reported to use liquid oil for cooking in their kitchen while 37% used solid ghee and 29.7% used both with no difference. Almost ten percent (9.5%) of the respondents practiced vigorous physical activity and 21.3% of subjects reported doing moderate physical activity. Approximately half (56.3%) of the respondents reported reclining of ≥ 3 hours per day. About 16% of study respondents were obese and (55.5%) were suffering from central obesity. Only about 38.6% were at low and/or normal range of blood pressure while 29.1% were pre-hypertensive and 32.3% were hypertensive. Approximately one fourth (22.4%) recorded as raised blood sugar. In addition the data shows that 3% were diagnosed whereas 19.4% was undiagnosed diabetes (table 1). After statistical analysis odds of having diabetes was 2.11 (95%CI: 1.44 – 3.09) times significantly higher in age group of 45-54 years as compare to 25-34 age categories. Females had significantly 1.42 (95%CI: 1.07-1.88) times more odds of diabetes in comparison to males. Likewise as compare to unmarried the married category had 1.84 times (95%CI: 1.06 – 3.10) of statistically higher odds of having diabetes. There was statistically significant association between moderate physical activity and being diabetes. We found a significant association between levels of taking vegetables (OR=0.56 95%CI: 0.42 – 0.74) and rice (OR=2.53 95%CI: 1.87 – 3.42) per week and developing of diabetes mellitus. Moreover Central obesity (OR=2.16, 95%CI: 1.59 – 2.94), high blood pressure (OR=1.60, 95%CI: 1.20 – 2.14), level of triglycerides (OR=1.59, 95%CI: 1.13 – 1.99) and low density lipoprotein (OR=0.56, 95%CI: 0.42 – 0.74) had significant association with diabetes respectively (table 2). We could not found significant association of job categories, income level, education, strong physical activity, taking fruits and red meats, total cholesterol and high density lipoprotein, kitchen oil with diabetes at this level of analysis.

At multivariable level we run binary logistic regression to control the confounding factors and identify the independent association of factors and diabetes. At this level as a whole factors such as age, moderate physical activity, residential life, BMI, level of triglyceride and low density lipoprotein, diet in term of taking vegetables, chicken and rice and finally high blood pressure had independent association with diabetes (table 3).

IV. DISCUSSION

This study found a very high prevalence of diabetes (22.4%) in Kandahar city as compare to other cities in the country [22-24]. Even that is higher than estimation for general population [21] and close to Kuwait and Saudi Arabia [6-7]. It require very serious attention to conduct analytical study to establish the causal factors. Older age groups had high prevalence of diabetes while the sex was not significantly and independently associated with diabetes. According to other studies diabetes mellitus was most prevalent among the older age groups [22-23, 30-31]. The higher prevalence among older age groups could be due to less physical activity at higher age groups as well as genetic makeup. In this study logistic regression analysis showed that moderate physical activity and reclining type of lifestyle were associated with increased risk of diabetes. Dietary habit in terms of frequency of taking vegetables, chicken and rice were associated with developing diabetes. These findings are supported and reported by other studies within Afghanistan and out of the country [22-23, 30-32]. Body mass index, abdominal obesity, high blood pressure and levels of triglycerides and low density lipoprotein were associated with diabetes at both univariate and multivariate level. Such findings are reported by other studies in the world as well [22-23, 33-35]. The strengths of our study is being first study to show the prevalence of diabetes in this southern city of the country. It could contribute to formulation of some practical strategies for control and prevention of diabetes in urban setting of this province. It will encourage policy makers to think over a national survey to identify the burden of this problems. The sample size of 1165 is considered to be sufficient enough for identifying the burden in this urban setting. However our major limitation is not carrying out glucose tolerance test and our findings relied on one time fasting plasma glucose test. In addition due to financial constraints and security we were not able to list all households ahead of survey and exclude some portion of the city from sampling frame.

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Table 1: Frequency distribution of demographic, socioeconomic and behavioral characteristics of the study participants, Kandahar city (N=1165)

Variables	**Categories**	**Total**	
		N	**%**
Age			
	25-34	520	44.6
	35-44	323	27.7
	45-54	188	16.1
	55+	134	11.5
Level of Education			
	Illiterate	840	73.2
	Literate	308	26.9
Marital Status			
	Single	120	10.3
	Married	922	79.3
	Widow/Widower	75	6.4
Work Status			
	Official Employees	125	13.8
	Private Business	110	12.1
	Worker/Farmer	130	14.3

	Jobless	92	10.2
	Housework	414	45.7
	Unable to work	35	3.9
Cigarette Smoking Status			
	No	1052	90.3
	Yes	113	9.7
Mouth Snuff Status			
	No	973	83.7
	Yes	189	16.3
Fruit serving (days per week)			
	< 3	683	59.7
	≥ 3	462	40.3
Vegetables serving (days per week)			
	< 3	469	40.3
	≥ 3	695	59.7
Vigorous Physical Activity			
	No	1094	94.1
	Yes	68	5.9
Moderate Physical Activity			
	No	914	78.7
	Yes	247	21.3
Basic Mass index (in kg/m square)			
	Underweight	57	4.9
	Normal weight	522	44.8
	Overweight	400	34.3
	Obesity	186	16
Central Obesity			
	No	482	44.5
	Yes	600	55.5

Table 2: Bivariate analysis of demographic, socio-economic and behavioral factors and Diabetes among study participants in Kandahar Afghanistan

Variables	Categories	No-diabetes	Diabetes	Odds Ratio	CI 95% LL	CI 95% UL
Age in years						
	25 - 34	421 (81.7)	94 (18.3)	1	Reference	
	35 - 44	248 (77.5)	72 (22.5)	1.3	0.921	1.835
	45 - 54	127 (67.9)	60 (32.1)	2.116	1.447	3.094
	55 and over	100 (75.2)	33 (24.8)	1.478	0.94	2.324
Gender						
	Female	440 (74.6)	150 (25.4)	1	Reference	

	Male	456 (80.7)	109 (19.3)	0.701	0.53	0.927
Level of education						
	Illiterate	645 (77.5)	187 (22.5)	1	Reference	
	Literate	234 (76.5)	72 (23.5)	1.061	0.778	1.447
Marital Status						
	Single	101 (85.6)	17 (14.4)	1	Reference	
	Married	701 (76.6)	214 (23.4)	1.814	1.061	3.1
Moderate Physical Activity						
	No	727 (80.2)	179 (19.8)	1	Reference	
	Yes	166 (67.8)	79 (32.2)	1.933	1.412	2.646
Fruits serving days per week						
	< 3 days	520 (77)	155 (23)	1	Reference	
	≥ 3 days	358 (77.8)	102 (22.2)	0.956	0.72	1.27
Vegetables serving days per week						
	< 3 days	332 (71.4)	133 (28.6)	1	Reference	
	≥ 3 days	563 (81.7)	126 (18.3)	0.559	0.423	0.738
Taking rice in days per week						
	< 3 days	706 (81.8)	157 (18.2)	1	Reference	
	≥ 3 days	174 (64)	255 (22.5)	2.533	1.873	3.426
General Obesity						
	No	756 (77.8)	216 (22.2)	1	Reference	
	Yes	140 (76.5)	43 (23.5)	1.075	0.74	1.562
Central Obesity						
	No	405 (84.7)	73 (15.3)	1	Reference	
	Yes	428 (71.9)	167 (28.1)	2.165	1.593	2.942
High Blood Pressure						
	No	629 (80.3)	154 (19.7)	1	Reference	
	Yes	267 (71.8)	105 (28.2)	1.606	1.206	2.139
Triglycerides						
	<150 mg/dL	595 (80.3)	146 (19.7)	1	Reference	
	≥150 mg/dL	301 (73.1)	111 (26.9)	1.503	1.132	1.995
Low Density Lipoprotein						
	≥100 mg/dL	410 (72.6)	155 (27.4)	1	Reference	
	<100 mg/dL	483 (82.6)	102 (17.4)	0.559	0.421	0.741

Table 3: Multivariate analysis of risk factors and Diabetes among study participants in Kandahar city Afghanistan

Variables	**Categories**	**B**	**Odds Ratio**	**CI 95% Lower Limit**	**CI 95% Upper Limit**	**P Value**
Age		0.031	1.031	1.016	1.047	< 001
Moderate Physical Activity						

	No		1	Reference		
	Yes	-0.991	0.371	0.251	0.548	< 001
Reclining at home in hours per day						
	No		1	Reference		
	Yes	0.073	1.076	1.008	1.149	< 05
Body Mass Index		0.034	1.035	1.005	1.065	< 05
Central Obesity						
	No		1	Reference		
	Yes	-0.974	0.378	0.258	0.552	< 001
Taking vegetables in days per week		-0.298	0.742	0.669	0.824	< 001
Taking chicken in days per week		-0.539	0.583	0.476	0.715	< 001
Taking rice in days per week		0.266	1.305	1.15	1.481	< 001
Triglyceride						
	<150 mg/dL		1	Reference		
	≥150 mg/dL	-0.517	0.596	0.42	0.847	< 001
LDL						
	<100 mg/dL		1	Reference		
	≥100 mg/dL	0.69	1.994	1.42	2.799	< 001
High Blood Pressure						
	Normal		1	Reference		
	Pre-hypertension	0.422	1.525	1.028	2.263	< 05
	Hypertension	-0.438	0.646	0.402	1.036	< 071