Prevalence and Risk Factors of Diabetes Mellitus (I & II) in a Sample of Adults Population of Al-Khobar City, Saudi Arabia, within 2010-2011

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BACKGROUND: The prevalence of DM in the Saudi Eastern Province in 2005 (30 and above age-group) was 17.2%. Further and recent studies are needed. **Objective:** This study aimed to estimate the prevalence and suggest possible risk factors of diabetes and their significant relationships in our city, *Al-Khobar City*, *(a population of 578,500 according to 2010 Saudi CDSI survey*) which considered one of the most urban-Industrial city with high Per capita income. **Methodology:** A cross-sectional community-based survey, among individuals of both sexes, aged 15 years and above was conducted during 2010-2011, in two places, Dhahran Mall, and King Fahad University Hospital. The study was carried out on 1552 Subjects (1206 Saudis', 346 non-Saudis', 879 males, 673 females), using their direct acceptance to participate of a quota of 2300 visitors. Data was collected by a personal face-to-face interview taking a short history and filling the check list for sociodemographic data, followed by estimation of random capillary blood glucose using a portable glucometer, and blood pressure using a manual sphygmomanometer. Our Standards were the WHO definition of high blood pressure, hyperglycemia, and BMI. A Numerical descriptive analysis of frequencies and cross-tabulation was done by using SPSS. **Results:** The mean of overall prevalence of self-reported DM was: 18.9% (20.1% within the hospital sample and 17.7 within the mall sample). Prevalence of high RBS was 21.5% (5.1% of them were not a self-reported DM). Self-reported hyperlipidemia, and smoking were; 22.3%, and 15.7% respectively. Factors like; Age > 45 years, BMI $\geq$ 24.9kg/m$^{(2)}$, high blood pressure, Hyperlipidemia, Family history, and Low activity level were significantly associated with the presence of diabetes. Of all diabetic patients; 31.6% had 5 risk factors of DM, and 26.3% had 4 risk factors. **Conclusion:** The overall Prevalence of DM in this Eastern Saudi population is18.9%(4.6 type 1, and 14.3% type 2) that needs further evaluation and investigations with better tools, design, and sample size to overcome the disadvantages of this study. Health education Programs about DM risk factors and preventive measures are needed, since there is a high incidence of Adjustable risk factors and strong relation to the development and control of diabetes disease.

1. Introduction:

Diabetes mellitus (DM) is one of the most common chronic illnesses worldwide. *Wild S RG et al* estimated the global prevalence of diabetes for all age-groups to be 2.8% on 2000, and projected prevalence of 4.4% in 2030.[1] Diabetes is a major form of the non-communicable diseases, which causes 60% of all death globally, and 80% of these are in low and middle-income countries.[2] Importantly, the morbidity of DM in low and middle income countries will occur at lower ages than in high income countries.[2] Saudi Arabia, a country undergoing a rapid epidemiologic transition,[3,4] is witnessing a steady increase in the prevalence of DM [3,5,6,7] with the most recent estimate of prevalence being as high as 23.7% among adult citizens[3]. The accumulating evidence suggests that DM is a potentially preventable disease if its risk factors are identified early and avoided. Lifestyle interventions (e.g. physical activity, weight loss) have proven to be more effective than medicine in preventing or delaying the onset of DM in persons at high risk of developing the disease.[4] However, transferring such evidence into an effective community intervention program requires an understanding of the specific needs of these communities before introducing any kind of intervention.[11,12,13] In Eastern province of Saudi Arabia in particular, prevalence of DM in 2005 (30 and above age-group) was 17.2 %.[14] In this study, we aimed to assess the prevalence and risk factors of diabetes mellitus in Eastern Province, *Al Khobar City in particular,* on 2010, and the relation between them.
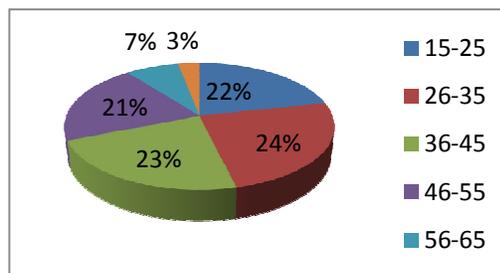
2. Subjects and Methods:

A cross-sectional community-based survey, among individuals of both sexes, aged 15 years and above was carried out in December 2010, in Dhahran mall and November 2011, in King Fhad University Hospital, Al-Khobar City. The Campaign was targeting the visitors for this most popular Public place in Al-Khobar city, which is Dhahran Mall, and one of the largest governmental hospitals, King Fhad University Hospital. Thousands of people gather in both places every day, especially at the Weekends, *Thursday-Friday in Saudi Arabia*, and they are from different Economic-Educational-Health classes, age groups, and both genders. The campaign place contained multi corners for welcoming, educational, materials, interviews, and screening purposes. A scientific committee.

Established the detailed procedures for the campaign, including the standards for running the campaign, validation of instruments and health education materials to be used, staff training, financial supervision and data processing and entry. Data was collected by a personal, face-to-face interview taking a short history and filling the check list, followed by estimation of capillary blood glucose (CBG) using a portable glucometer, and Blood Pressure using a manual sphygmomanometer. Our Standards for blood sugar was (62-144 mg/dl.), high blood pressure if $\geq$ 140/90 mmHg, and WHO classification for BMI. Participants were asked if they had been previously diagnosed with DM (self-reported). Statistical analysis: Was performed by using the Statistical Package for Social Sciences (SPSS) version 16.

3. Results:

Of 2300 check-in papers, only 1552 (67.5%) subjects respond & agreed to participate in the screening corner, *mostly males*, the others either refusing or didn't complete the screening because they are worry to diagnose with diabetes , and no one of them knew about the study before. So the study was carried out on 1552 Subjects (1206 Saudis', 346 non-Saudis', and 879 males, 673 females), using their direct acceptance to participate of a quota of 2300 visitors. A total of 307 (183 male, 124 female) subjects had Self-reported diabetes 19.8% in both samples (20.6% within males, 18.7% within females, and 17.6% Saudi, 27.5% non-Saudi). About, 327 subjects were hyperglycemic 19.6% (8.9% of them were not a known case of diabetes). Additionally, 63.2% of the Self-reported diabetes were hyperglycemic (random blood sugar$\geq$140), and 43.8% of them were Self-reported hyperlipidemia. The mean age

for the self-reported diabetes was (45.7) about 64% of which belonged to 46-55 year age-groups.

Approximately, the overall prevalence of family history for DM was 71%. Factors of high blood pressure, BMI $\geq$ 24.9kg/m^2 (Weight in Kilograms / (Height in Meters x Height in Meters)) , age > 45 years, hyperlipidemia, family history, and low activity level were positively associated with the presence of diabetes Total prevalence of diabetes , hyperglycemia and high BP with BMI

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Total prevalence of diabetes , hyperglycemia and high BP with BMI

MI	lf-reported D			ood pressure	perglycemia
	ɔ	ːs	̄	age ˢ2	
nderweight	.9	.0	.0	.0	ɔ
ɔrmal	.3	̊	.0	.4	.1
verweight	.2	.8	.4	.1	.3
ɔese	.7	.3	.5	.5	.0
orbid Obese	.2	.2	.0	.8	.7
ɔtal	.9	.1	.5	.7	.5

Cross relation of smoking v.s. diabetes and hyperlipidemia

		Diabetic			Hyperlipidemia	
noker or ɔn-smoker	ɔ	ːs	ɔtal	ɔ	ːs	ɔtal
No count	4	4	28	2	6	28
% Within diabetic, perlipidemia	.7	.0	.4	.9	.9	.4
Yes count	4		9	7		9
% Within diabetic, perlipidemia	.3	.0	.6	.1	.1	.6
ɔtal	86	9	37	39	8	37

4. Discussion:

The high prevalence of DM, hyperglycemia, obesity, hypertension, dyslipidemia, tobacco use in this study for this population, calls for an action plan to prevent and control these risk factors. Our findings were Similar to other previous studies [4, 6, 14] Distribution of patents with controlled and uncontrolled glycaemia by health sectors (districts) of the Eastern province

ealth sector	).	ntrolled ycaemia		icontrolled ycaemia		value
		).		).		
ımmam	58	69	.5	89	.5	.001
าobar	55	35	.4	20	.6	
ıtef	10	71	.6	93	.4	
ısTanura	2	4	.0	8	.0	
วaig	0	1	.6	9	.4	

The means of overall Self-reported diabetes prevalence in our study was 18.9% *(in 15-85 age-group)*. This was comparable to the prevalence on 2005 (30 and above age-group) which was 17.2% in Al-Baghli Et al study [14], and this percentage consider high. The lake of Knowledge about diabetes risk factors and preventive measures is of course should be behind this, and play a rule in these high ratios of diabetes and risk factors. Previous Study in Al-Khobar area for Aljoudi Et al[3], revealed that; Fewer than 50% of participants knew about DM risk factors and preventive measures. In other study done on between 2004-2005 for Al-Baghli Et al[14], only 33.8% of diabetes patients were achieving their glycaemic control target (fasting or random capillary blood glucose < 130 mg/dL or < 180 mg/dL respectively). In contrast to our findings, 63.2% of the Self-reported diabetes was hyperglycemic, not achieving their glycemic control, and 43.8% of them were Self-reported hyperlipidemia. Multiple logistic regression analysis showed that higher age, current smoking and lower level of physical activity were significantly associated with uncontrolled DM. Hypertension was positively associated with glycemic control. The importance of glycemic control in the management of DM has been highlighted by the Diabetes Control and Complications Trial [15], which found an approximately 50% to 70% reduction in the risk for retinopathy, nephropathy and neuropathy when there was intensive therapy for type 1 DM. Similar dramatic reductions in the risk of microvascular complications in type 2 DM were found in the United Kingdom, Prospective Diabetes Study[16]. In Al-Baghli Et al[14] study on 2005 only one-third of diabetic patients achieved the recommended glycemic level and less than one-quarter of them

had blood pressure control. Data from the National Health and Nutrition Examination Survey in 1999–2000 showed that 35.8% of diabetics had achieved their glycemic target, and 35.8% had achieved the target blood pressure of < 130/80 mmHg[17], which are better rates of control than in Al-Baghli et al study[14], this could be related to the inclusion of younger subjects (20 years and above) than in their study of over 30-year-olds[14]. In one older Retrospective study in Al-Khobar Government Hospital[18] reviewing all diabetic patient files registered in PHC centers in the Al- Khobar area from May 2000 to October 2001, Of the 382 diabetic patients followed in PHC, 88.7% were type 2 diabetics, and according to WHO classification of obesity, 0.7% were underweight. Only 21.8% of type 2 diabetic patients were in their ideal range of body weight. While 31.2% were overweight (BMI in the range of 25.0-29.9 kg/m^2), 39.9% of the type 2 diabetic patients were found to be obese (BMI= 30 - 39.9 kg / m^2), and 6.3% had morbid obesity (BMI > 40 kg / m^2) [18]. See tables (II,III,IV,V, and VI) for our study. Another comparison of the BMI in our population with different populations can be shown in the following chart. In comparison with Al-Turki Et al [19] (Table 2), 16.9% of the Eastern Province Saudi population was smoker (28.7% among men and 4.5% among women), and 17.1% of Al-Khobar community was smoker (30.6% among men and 1.0% among women), our findings revealed that Warns us about the accelerating incidence of smoking tobacco between both genders. In Conclusion of Al-Baghli Et al[14], Community screening campaigns for diabetes mellitus and hypertension is extremely efficient in identifying undiagnosed diabetic and hypertensive individuals, Also our screening campaign was of extreme important to give some Preliminary information and statistical data identifying risk factors, and hyperglycemia, for that reason we recommend more organized, generalized, better designed, & longitudinal screening campaigns. Also in Al-Baghli Et al[14], 21% of the sample was positive hypertensive from previous history or screening. After confirmation, the prevalence of hypertension dropped to 15.6%, pre Hypertension was 3.7%, whereas the Prevalence of undiagnosed hypertension was 2.8%. Comparing to our study, of the whole 1337 subjects, 39% were having high BP, but we weren't able to give a diagnosis for hypertension due to the nature of our screening space that lacks the clinical criteria for diagnosis. Another Alarming study in Saudi Arabia for Al-Nozha Et al [4], said that; " Interestingly, despite the readily available access to healthcare facilities in

KSA, a large number of diabetics representing 27.9% (n=1116) were unaware of having DM. Previous

Being overweight but not obese was 31.55% in women and 41.91% in men. Obese and overweight women and men were significantly more likely to be between 40–49 years of age. Although physical activity was low in all especially women, obese women were significantly less likely to be engaged in any physical activity. Obese and overweight men were more likely to be non-smokers [20]. This was in-direction with our study findings. Obesity has been seen as a prime risk factor for the development of hypertension[21]. Our data shows that high blood pressure was significantly associated with obesity among Saudi men and women. A previous community based survey found that obesity was more prevalent in hypertensive subjects [22].

5. Limitations:

Although this study had its benefits and strengths as a Preliminary and recent Survey, there were some limitations. First we need to expand this study and increase the comprehensiveness with more multi places. Second negative point that, we were depending on the self-reporting of the disease as previous diagnosis. Also, there was no ability for confirmation of the disease either clinically or through records, and we did involve neither the Economic-Educational levels, nor the marital status in our study for investigation. The Last but not least, the study was approved by the research ethics committee at the departments of; Family and Community Medicine, Internal Medicine at University of Dammam, and permission to conduct the study was granted by the Campaign partner "Saudi Diabetes and Endocrine Association". The manuscript has been read and approved by all authors, data collectors, participants, and Institutes.

6. Acknowledgements:

7. References:

1. Wild S RG, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care2004;27:1047-53.
2. Organization WH. The Global Burden of Disease 2004 Update. Geneva: World Health Organization2008.
3. Aljoudi AS TA. Knowledge of diabetes risk factors and preventive measures among attendees of a primary care center in eastern Saudi Arabia. Ann Saudi Med;29(1):15-9.
4. Al-Nozha MM A-MM, Al-Mazrou YY, Al-Harthi SS, Arafah MR, Khalil MZ, Khan NB, Al-Khadra A, Al-Marzouki K, Nouh MS, Abdullah M, Attas O, Al-Shahid MS, Al-MobeireekA. Diabetes mellitus in Saudi Arabia. Saudi Med J2004;25(11):1603-10.
5. Elhadd T A-AA, Alzahrani A. Epidemiology, clinical and complications profile of diabetes in Saudi Arabia: a review. Ann Saudi Med. 2007;27(4):241-50.
6. El-Hazmi M WA. A comparative study of hyperglycemia in different five regions of Saudi Arabia. Ann Saudi Med. 1989;9:435-38.
7. AL-Nuaim A A-RK, Al-Mazrou Y, Al-Attas O.S., Al-Dagheri N, khoja. T. Population-based epidemiological study on charcateristics of risk tactors of hypercholesterolemia in Saudi Arabia. Int J Cardiol1997;b:31-47-54.
8. 10 T. Prevalence of diabetes (20-79 age group). International Diabetes Federation 2007.
9. Yamaoka K TT. Efficacy of lifestyle education to prevent type 2 diabetes. Diabetes Care2005;28(11):2780-86.
10. Lindström J LA, Mannelin M, Rastas M, Salminen V, Eriksson J, Uusitupa M, Tuoomilehto J. Finnish Diabetes Prevention Study Group. The Finnish Diabetes Prevention Study (DPS). Lifestyle intervention and 3-year results on diet and physical activity. . Diabetes Care2003;26:3230-36.
11. Program TDP. The Diabetes Prevention Program (DPP). Description of lifestyle intervention. Diabetes Care2002;25:2165-71.
12. Gillies C AK, Lambert P, Cooper N, Sutton A, Hsu R, Khunti K. Pharmacological and lifestyle interventions to prevent or delay type 2 diabetes in people with impaired glucose tolerance: systematic review and meta-analysis. BMJ2007;10(334(7588)):299.
13. Bowman B GE, Williams D, Engelgau M, Jack L. Translating the science of primary,

secondary, and tertiary prevention to inform the public health response to diabetes. J Public Health Manag Pract2003;9:S8-S14(suppl).

14. Al-GhamdiA A-TK, Al-Baghli N, El-Zubaier A. A community-based screening campaign for the detection of diabetes mellitus and hypertension in the eastern province, Saudi Arabbia: Methods and participation rates. J Fam Com Med2007;14(3):91-7.

15. Al-Baghli NA, Al-Turki KA, Al-Ghamdi AJ, El-Zubaier AG, Al-Ameer MM, Al-BaghliFA.EastMediterr Health J. 2010 Jun;16(6):621-9.PMID: 20799589

16. Ageel J. Al-Ghamdi M, ABP, Khalid A. Al-Turki, MD. a community-based screening campaign for the detection of diabetes mellitus and hypertension in the eastern province, Saudi Arabia: Methods and participation rates SSFCM 2007;14(3).

17. Group TDCaCTR. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus.New England journal of medicine1993;329:977-86

18. Group UPDSU. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet 1998 (352):837-53.

19. Saydah SH FJ, Cowie CC. Poor control of risk factors for vascular disease among adults with previously diagnosed diabetes. Journal of the American Medical Association2004;291:335-42.

20. *Kholood M. Mugharbel F MAA-M, FFCM*. PREVALENCE OF OBESITY AMONG TYPE 2 DIABETIC PATIENTS IN AL-KHOBAR PRIMARY HEALTH CARE CENTERS.SSFCM2003;10(2).

21. Al-Turki KA A-BN, Al-Ghamdi AJ, El-Zubaier AG, Al-Ghamdi R, Alameer MM. East Mediterr Health J2010 Jun;16(6):671-6 PMID: 20799597

22. Alsaif MA HI, Harris RB, Aloud AA, Lei KY, Al-Attas O.S. Prevalence and risk factors of obesity and overweight in adult Saudi population.FASEB J2001;16:A342.

23. Kunz I SU, Klaus S, Sharma AM. Resting metabolic rate and substrate use in obesity hypertension. Hypertension2000;36:26-32

24. Ajlouni K JH, Batieha A. Obesity in Jordan. International Journal of Obesity & Related Metabolic Disorders. 1998;22:624-8.

12/12/2012