

# Risk Factors Of Type-2 Diabetes In South-Eastern Anatolia Of Turkey

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## Abstract

The aim of this study was to determine risk factors of type 2 diabetes mellitus (DM) (sex, age, hypertension, residence area, education, and smoking) among inhabitants in southeast region of Turkey.

A community based, cross-sectional study was performed in nine provinces of Southeast Turkey in 2001. The representative sample size was calculated with population proportional sampling method.

A total of 2,062 people aged over 30-years included in the study. The overall prevalence of diabetes was 4.17% in this population. In univariate analyses, hypertension, residence, smoking and age groups were found as the risk factors for type 2 DM. In multivariate analyses, the women had 2.99 (95% CI 1.64-5.45,  $p=0.0001$ ) times higher risk for type 2 DM. Hypertension increased the risk of type 2 DM as 2.05 (95% CI 1.20-3.48,  $p=0.081$ ) times. DM was found to be 4.29 (95% CI 1.96-9.40,  $p=0.0001$ ) times more prevalent among ages between 50-59 and 6.16 (95% CI 2.89-13.12,  $p=0.0001$ ) times among ages 60 and over. Living in urban areas increased the risk of type 2 DM as 1.77 (95% CI 1.10-2.85,  $p=0.019$ ) times. Smoking habit did not effect the risk of type 2 DM (OR: 1.14 95 % CI 0.61-2.16,  $p=0.68$ ).

In conclusion, our study suggests that DM is an important public health problem in means of its frequency in the community above 30 years of age in our population. Additionally, we also found that female gender, living in urban area; hypertension and aging were independent risk factors of DM. These high risk groups must have priorities in development of DM prevention and control programs.

## INTRODUCTION

Diabetes is a chronic, non-communicable disease, which can be seen among all ages in public with various complications. It can damage various organs especially when it is not cured and can decrease significantly the quality of life, and has high treatment costs. In the world, in 1997, there were 119,2 million people suffered from type 2 diabetes mellitus (DM) and this amount is expected to increase to 212,9 million in 2011 respectively (1). This number is expected to reach 300 million at 2025 with a higher incidence in developing countries (2). This occasion can be called as diabetes epidemic.

Several complex and interrelated factors are at work in bringing about the rise in type 2 DM prevalence. Type 2 DM is most common among the elderly in the developed

countries, while in the developing world the prevalence rates are increasing particularly quickly among comparatively young and productive populations. Furthermore, traditional lifestyles and dietary patterns giving way to a sedentary lifestyle and a high-fat diet are important risk factors. The high obesity prevalence is an important risk factor for DM (3).

The Prevalence studies are important to determine the burden of the diseases and to define the priorities. The health planners and policy maker should benefit these kinds of studies. Interceptive studies should be planned according to risk groups and in Southeast Turkey there is no favourable study defining the risk groups. The aim of this study was to determine the prevalence and risk factors of type 2 DM in Southeast Turkey. This study examined the mediators and

moderators of potential relationships of diabetes with social and demographic characteristics.

### **METHODS**

The study was conducted between May and November 2001 in South-eastern region of Turkey. The South-eastern part of Turkey is a large region with relatively insufficient health facilities, involving 9 provinces; Adiyaman, Batman, Diyarbakir, Gaziantep, Kilis, Mardin, Siirt, Sanliurfa, Sirnak.

### **SAMPLE SELECTION**

The data for this study were collected in the course of the Southeast Anatolian Development Project (SEDAP). This project was supported by the (Southeast Anatolian Development Project). Regional Development Management of the Republic of Turkey was conducted by a consortium consisting of the Turkish Parasitology Association, Gaziantep University, Dicle University and Harran University. In this project, the data were collected on public health issues and problems of the southeast region in 2001. In this study, the findings were evaluated for prevalence and risk factors of type 2 DM.

The population of these nine provinces was 6,128,923 (4). In order to investigate the prevalence of diabetes mellitus in this population, an optimum sample size representative of both rural and urban areas of the region was determined as being 6,900 [  $d=0.03$ ,  $p=0.04$  (the prevalence of the least parasite)  $\pm=0.01$  ]. Since the prevalence of type 2 DM was more frequent at the age of 30 and over < 30 year population were excluded from the study. An optimum sample size representing both rural and urban areas of the region was chosen by the State Institute of Statistics by a sampling method proportional to size. Total 2,062 people were included into the study.

A standard questionnaire was designed by Departments of Public Health of Dicle and Gaziantep Universities. The questionnaire included epidemiological features and possible risk factors of type 2 DM (residence area (urban vs. rural), sex, age, smoking, education, and blood pressure). A team was formed and trained for data collection in every province. A public health specialist headed each team. These teams visited households and filled in the questionnaires during face-to-face interviews.

### **STATISTICAL ANALYSIS**

The variables were analyzed in two steps. Statistical analysis of univariate categorical data was performed using the chi-

square test and the analysis of ordinal changer, like age groups, was performed with Chi square for linear trend test (5), then the variables were analyzed with logistic regression analyses(6) to assess the risk factors for diabetes using Epi Info version 2000. Odds ratios (OR) and 95% confidence intervals (CI) were calculated. A p value of < 0.05 was considered statistically significant.

### **VARIABLES**

#### **DEPENDENT VARIABLE**

Type 2 DM: The ones diagnosed previously as diabetes by doctors were considered as diabetes.

#### **INDEPENDENT VARIABLES**

Residence: Areas with population less than 20.000 was considered rural, and more than 20.000 was considered urban.

Sex: Determined as male and female.

Age was categorized into the following groups: 30-39 years, 40-49 years, 50-59 years, and 60 years and over.

Smoking: Grouped as following: 1) Daily smoker: smoking at least one cigarette per day 2) Ex-smoker: previously was smoker, but not now and 3) Never smoked: never smoked cigarette.

Education: Analyzed into three groups as non-educated, primary and middle school, high school and university.

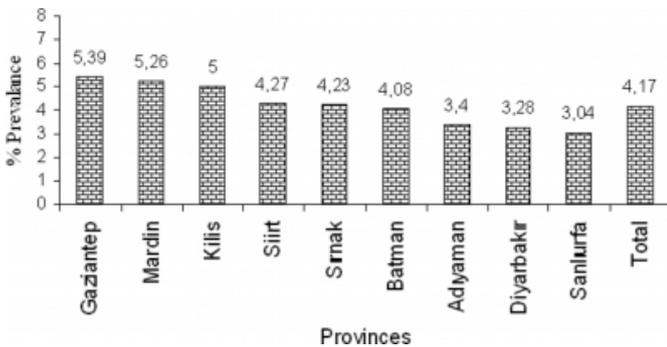
Blood Pressure: Diagnosed previously as hypertensive was considered as hypertensive and the rest normotensive.

### **RESULTS**

There were 2,062 persons over age 30 participated in the study, of whom 50.6% were females, 49.4 % males, and 56.2 % from urban areas and 43.8% from rural areas. Prevalence of DM was found to be 4.17% for the whole region. The prevalence of DM according to 9 cities in the region is shown in Fig 1. According to this, Gaziantep had the highest prevalence with 5.39 %, followed by Mardin with 5.26%. The lowest prevalence of DM was observed in Sanliurfa with 3.04%.

Figure 1

Figure 1: Type 2 DM prevalence in southeast Anatolia provinces



The prevalence of type 2 DM according to some variables is shown in table 1. It was 6.04% in females, and 2.26% in males (p=0.0001); as shown in the table the prevalence of DM was gradually increasing as the age groups increased.

Figure 2

Table 1: The Prevalence of type 2 DM according to sex, residence, age groups, smoking, education status and blood pressure.

		Diabetics	Total	Odds ratio	P value
		%	n	(95% CIs)	
Sex	Female	6.04	1043	2,07(1,30-3,33)	0.0001
	Male	2.26	1019	1	
Residence	Urban	4.87	1211	1,51(0,93-2,47)	0.057
	Rural	3.17	851	1	
Age	30-39	1.28	780	1	0.0001
	40-49	5.03	537	4,25(1,95-9,47)	
	50-59	5.59	376	4,78(2,12-11,00)	
	60 +	7.59	369	6,80(3,12-15,15)	
Smoking	Daily smoker	2.67	675	0,52(0,30-1,92)	0.057
	Ex-smoker	5.23	172	1,09(0,49-2,32)	
	Never	4.86	1215	1	
Education	No education	4.96	1250	1,53(0,58-4,40)	0.08
	Primary and middle	2.87	663	0,85(0,29-2,63)	
	High school and university	3.36	149	1	
Blood Pressure	Hypertensive	11.50	200	4,12(2,41-7,00)	0.0001
	Normotensive	3.38	1862	1	
<b>Total</b>		<b>4.17</b>	<b>2062</b>		

Prevalence of type 2 DM was 4.87% in urban and 3.17% in rural (p=0.057). The prevalence was 1.28% in 30-39 years age group, 5.03% in 40-49, 5.59% in 50-59 and 7.59% over 60 years; the prevalence of type 2 DM increased by the increases at ages (p=0.0001).

Type 2 DM was 4.86% in non-smokers, 5.23% in ex-smokers, and 2.67 % in daily smokers (p=0.057). The prevalence of type 2 DM was 4.96% in illiterate persons 2.87% among people who graduated from primary or secondary schools and 3.36% among those who graduated from high school or university (p= 0.08). The known prevalence of type 2 DM for hypertensive and normotensive was found to be 11.50% and 3.38% respectively.

In table 2, risk analyses were made for hypertension, residence, smoking habits and age groups with logistic regression model. Women had 2.99 (95 % CI 1.64-5.45, p=0.0001) times higher risk for type 2 DM. Hypertension increased the risk of DM 2.05 (95% CI 1.20-3.48, p=0.081) times. DM was found to be 4.29 (95% CI 1.96-9.40, p=0.0001) times more prevalent among ages between 50-59 and 6.16 (95% CI 2.89-13.12, p=0.0001) times among ages 60 and over. Living in urban areas increased the risk as 1.77 (95 % CI 1.10-2.85, p=0.019) times. Smoking habit did not effect the risk of type 2 DM (OR: 1.14 95 % CI 0.61-2.16, p=0.68).

Figure 3

Table 2: Odds ratios (OR) with 95 % confidence intervals (95 %CI) for type 2 diabetes mellitus with various factors (South Eastern Anatolia, 2001 )

Risk Factors	Crude OR* (95 % CI)	Adjusted OR† (95 % CI)	P value	
Hypertensive	3.71 (2.18-6.29)	2.05 (1.20 - 3.48)	0.008	
Urban residence	1.56 (0.96-2.55)	1.77 (1.10 - 2.85)	0.019	
Smoking	Daily smoker(r)	1	0.36	
	Ex-smoker	2.02 ( 0.82-4.84 )	0.88 (0.46 - 1.65)	0.008
	Never	1.86 (1.06-3.30)	1.58 (0.88 - 3.70)	0.019
Female gender		2.99 (1.64 - 5.45)	0.36	
	30-39(r)	1	0.7	
Age	40-49	4.08 (1.87-9.09)	3.99 (1.90 - 8.37)	0.3
	50-59	4.55 (2.02-10.48)	4.29 (1.96 - 9.40)	0.0001
	+ 60	6.31 (2.91-14.08)	6.16 (2.89 - 13.12)	0.0001

r, reference variable.  
\*Unadjusted odds ratios. † Adjusted to all the variables in the table

DISCUSSION

There are limited numbers of prevalence studies on type 2 DM prevalence in Turkey. This is the first prevalence research for type 2 DM including the whole of South Eastern Anatolia. In the present study previously diagnosed prevalence of type 2-DM for ages 30 and over was 4.17%. In various Turkish studies, the prevalence rate of DM was reported as 4-5.6 % around Kayseri (7, 9), 4.9% in Turkish Diabetes Epidemiology Study (TURDEP) including 15 cities from different regions of Turkey (8). All of the above studies display diabetes prevalence rates similar to our results. The prevalence was predicted to be 4.2% in 2000 around the whole world (10).

The prevalence of diabetes was 6.02% in females and 2.26% in males, in the present study. Similar results were reported in TURDEP study (8), while the situation was different in the study of Öztürk et al from Kayseri (8.8% in males and 4.8% in females). In most developed countries, DM prevalence was confirmed to be more frequent in females than in men (11,12,13). In most developing countries, the reports did not find a significant difference in terms of sex (14, 15).

Like in most developing countries, the prevalence has also been found to be higher in urban areas than in rural areas in this study (8,10, 19, 20). The reason why type 2 DM prevalence was higher in urban than in rural areas may be due to the fact that women living in urban areas in developing countries are more frequently faced to unemployment and have more sedentary lifestyle, when compared to females in rural areas who are often busy at farming and soil.

Similar to many other studies, (7, 8, 16, 17, 18) prevalence increased with age in this study. Prevalence increased from 1.2% among 30-39 age groups to 7.6% for ages 60 and over. Risk analysis has also shown the increase at risk referring to the age interval between 30 and 39 ( $p=0.0001$ ).

Type 2 DM was found to be more frequent among people with hypertension than with normtension. (11.5% vs. 3.38%,  $p=0.0001$ ). According to regression analysis, DM was 2 times higher in hypertensive than in normotensive in this study, similar to some other studies including TURDEP study which reports this ratio to be 1.8 in males and 2.15 in females (7, 8). It is hard to propose a definite causal relationship for DM and hypertension. However, the concomitance of the two clinical disorders is frequently seen, probably because of insulin resistance occurring in both diseases.

There are some limitations in this study, because some information regarding diabetes could not be collected. (E.g. height and weight measurements, haemoglobin A1c, blood lipid levels). For this reason, some other risk factors could not be analyzed such as obesity or history of DM inside the family.

### CONCLUSION

DM is an important public health problem in means of its frequency in population above 30 years of age. In our study, we also found that female gender, living in urban area; hypertension and aging were independent risk factors of DM. These high risk groups must have priorities in development of DM prevention and control programs. Primary, Secondary and tertiary preventions should be included and integrated with other chronic diseases.

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