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# Relation of type 2 diabetes mellitus with gender, education, and marital status in an Iranian urban population

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## Abstract

***Background:*** Type 2 diabetes mellitus is one of the most important cardiovascular risk factors. Objectives: This study was performed to assess the relationship of diabetes with gender, education, and marital status in an Iranian urban population.

***Methods:*** A total of 892 men and women aged 30-85 were recruited using a cluster-stratified sampling method from an urban population. Using a questionnaire, demographical data including gender, education, and marital status were collected. A blood sample after fasting for at least eight hours was collected from each subject. Associations of type 2 diabetes mellitus and studied variables were tested for significance.

***Results:*** The prevalence of diabetes mellitus was 11.6%; 11.1% in men and 12.1% in women with no significant difference between them. Diabetes mellitus was most prevalent in the oldest age (age more than 60 years, 22.9%) and low education groups (17.9%, $P < 0.001$). Marital status was not significantly related to diabetes mellitus ($P= 0.37$).

***Conclusion:*** The prevalence of diabetes mellitus is related to education within the Iranian population. Thus preventive strategies should be based on the affective factors.

**Keywords**: Diabetes mellitus, Education, Marital status, Gender

## Introduction

Type 2 diabetes mellitus (DM) is one of the most common chronic diseases in the world. The prevalence of DM is growing due to life style changes and health status improvements (1) . It is estimated that about 300 million subjects will have this condition by 2025 (2). In 2007, 240 million people in the world suffered from DM (3). It is estimated that more than 70% of all diabetic patients in the world live in developing countries (4). The prevalence of DM was 15.6% in Syria in 2006 (5), 13.14% in Pakistan in 2008 (6), and 6.1% in the Asian Indian population (7). The prevalence of type 2 DM ranges from 2.6% to 15.1% in the Asia-Pacific region (8) and 3.5% to 13.1% in subjects aged 30 or older in Iran (9). In the national survey of risk factors for non-communicable diseases of Iran, the prevalence of DM in the population aged 25-64 was 7.7% (10).

The relationship between socioeconomic status (SES) and disease was obvious, with SES inversely related to the prevalence of DM (11-13). One important factor of SES is education. A marked difference in the risk of DM was associated with education (14-16), although in some studies, and association between DM and education was not identified (17-18). Presently, the relationship between the prevalence of DM and marital status is controversial (17). However, few studies have examined the relationship of previously diagnosed

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DM (PDM) and newly diagnosed DM (NDM) with education and marital status. A significant inverse correlation between educational level and NDM has been reported in Korean women (18); however, no significant association was observed between DM and gender, marital status, or education in Iranian women (17). The aim of this study was to assess the association of DM (newly and previously diagnosed) with gender, education, and marital status in south Iran.

## Materials and Methods

As a part of a survey of ischemic heart disease, using a multistage sampling method, 1000 subjects (538 women and 462 men, aged 30–85) were recruited in Jahrom, Fars province, south Iran. Jahrom includes 10 urban health centers. Subjects were selected randomly from each center.

Informed consent was obtained from all participants before they enrolled in the study.

Data on demographical and biochemical measures were completed for 892 subjects. One hundred forty subjects (15.7%) were prediabetic, thus 752 persons used for the analyses are presented in this report.

Data collected included age, sex, education, and marital status. Subjects were classified into subgroups according to the level of formal education received; low (primary school or lower), medium (secondary to diploma), and high (college) education. Marital status was classified into two groups; married, and other (singled, divorced, or widowed).

Blood samples were obtained in the morning after an 8-10 hour overnight fast at the Paymaniah hospital, and assayed for serum glucose using standard techniques.

According to the criteria of the American Diabetes Association (19), a fasting blood sugar (FBS) < 100 mg/dl was considered as normal; values between 100 and 126 mg/dl, and those ≥ 126 mg/dl were considered as impaired fasting glucose (IFG) and DM, respectively. DM was divided to two groups, NDM (subjects with no histories of DM or no use of hypoglycemic agents) and PDM (subjects with histories of diabetes mellitus or use of hypoglycemic agents).

Statistics were analyzed using the Statistical Package for Social Sciences version 11.5. Qualitative data was analyzed using the chi-square method. Associations between DM and variables (age, sex, education and marital status) were analyzed using binary logistic regression. Differences were considered significant at $P<0.05$.

## Results

The overall prevalence of DM was 11.6% (Table 1); 11.1% in men and 12.1% in women, with no significant difference between the sexes ($p>0.05$). The prevalence of NDM was 2% in men and 2.3% in women.

There was association between age group and prevalence of DM (Table 1). The prevalence of DM increased with advancing age from 4% in subjects 30-39 to 22.9% in subjects ≥ 60 ($p<0.001$). Also, the prevalence of PDM increased from 3.1% in subjects 30-39 to 20.9% in the ≥ 60 age groups ($p<0.001$), but there was no statistical difference between age groups and prevalence of NDM.

The association of education with DM was inverse and statistically significant (Table 1). The prevalence of DM was highest in the low educational group at 17.9% ($p<0.001$), followed by the medium (6.8%) and high educational groups (6.5%). The prevalence of PDM was high in the low education group ($p<0.001$), but not significant for NDM.

Although there are no significant differences in the prevalence of DM among married and other subjects, the differences are slightly more noticeable in other subjects (15.9% vs. 11.1%; $p=0.373$).

The prevalence of PDM and NDM was not associated with marital status.

By binary logistic regression, the oldest age groups had the highest odds-ratio (OR= 7.78, 95% CI: 3.17–19.09, $p<0.001$) in subjects with PDM compared to subjects with normal FBS (Table 2). Moreover, a significantly increased risk of PDM was found with lower educational level, with OR of 2.87 (95% CI: 1.08–7.63, $p=0.034$). There is no significant association of NDM with studied variables in subjects with normal FBS. Compared to subjects in the high education group, subjects in the low education group had a 6.23-fold greater (CI 95%: 1.21-31.92, $p= 0.028$) risk of PDM than NDM.

## Discussion

In our study, although the prevalence of DM was higher in females than males, the difference was not significant. This may be because of less physical activities in women than men. Some studies found a

relationship between DM and gender (20-21), however, data from other studies agree with our finding (17, 22).

Regarding age, a significant difference was observed in the prevalence of DM between the oldest age group and other related categories. Other studies have also indicated that the prevalence DM increases with age (17, 23).

Low educational level correlated with PDM and DM in this study, which is consistent with other studies (24-25). In the Women's Health Study, low education was associated with an increased risk for type 2 DM (16). Fisher-Hoch et al. reported that the prevalence of undiagnosed DM was inversely related to socioeconomic status (26); however, other researchers found no association between education and DM (17, 27).Rathman et al. reported no difference in the prevalence of NDM in either men or women of any educational level (18).

In this study, no significant difference was observed in the prevalence of DM, PDM, and DM between the married and other subgroups. Another study reported a similar result (17); however, some findings suggested that single, divorced, and widowed statuses are significantly associated with DM (28-29).

The multivariate analysis indicates that the prevalence of PDM is related to age. This finding is consistent with previous studies (29-31).

Also, PDM was higher in the lower education groups than in the highest education group. The inverse correlation of DM with education was observed in previous studies (32-34), but other studies reported opposite results (17-18). Also in an ELSA study, education was not significantly related to DM after adjustment for all covariates (35).

This study is limited by the cross-sectional nature of the data, which provides no indication of the direction of effect or causality. Also, only some variables were analyzed. Longitudinal studies would complement the present study to determine causality and directional effect of the factors.

## Acknoledgements

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| **Total** | **No: 752** | **Normal FBS** | | **PDM** | | **NDM** | |
|---|---|---|---|---|---|---|---|
| | | Number | % | Number | % | Number | % |
| | | 648 | 72.7 | 85 | 9.5 | 19 | 2.1 |
| **Age groups (years)** | 30-39 | 207 | 90.3 | 7 | 3.1 | 2 | 0.9 |
| | 40-49 | 195 | 75.6 | 10 | 3.9 | 7 | 2.7 |
| | 50-60 | 140 | 67 | 27 | 12.9 | 6 | 2.9 |
| | ≥60 | 106 | 54.1 | 41 | 20.9 | 4 | 2 |
| **Sex** | Male | 289 | 71.4 | 37 | 9.1 | 8 | 2 |
| | Female | 359 | 73.7 | 48 | 9.8 | 11 | 2.3 |
| **Education** | Low | 256 | 64.5 | 62 | 15.6 | 9 | 2.3 |
| | Medium | 274 | 77.2 | 18 | 5.1 | 6 | 1.7 |
| | High | 118 | 84.2 | 5 | 3.6 | 4 | 2.9 |
| **Marital status** | Married | 584 | 73.2 | 72 | 9 | 17 | 2.1 |
| | Other | 64 | 68.1 | 13 | 13.8 | 2 | 2.1 |

**Table 1:** Prevalence of previously and newly diagnosed diabetes mellitus (PDM and NDM) according to age, education, and marital status by sex. (FBS: Fasting Blood Sugar, No: Number, NDM: Newly diagnosed Diabetes Mellitus, PDM: Previously diagnosed Diabetes Mellitus).

| | | Normal FBS * PDM | | | Normal FBS * NDM | | | NDM * PDM | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | OR | CI 95% | p | OR | CI 95% | p | OR | CI 95% | p |
| **Age group (year)** | 30-39 | 1 | | | 1 | | | 1 | | |
| | 40-49 | 1.44 | 0.53-3.86 | 0.471 | 3.71 | 0.76-18.1 | 0.104 | 0.49 | 0.07-3.23 | 0.464 |
| | 50-59 | 4.59 | 1.90-11.08 | 0.001 | 4.43 | 0.88-22.29 | 0.071 | 1.44 | 0.23-9.01 | 0.696 |
| | ≥60 | 7.78 | 3.17-19.09 | <0.001 | 3.9 | 0.7-21.67 | 0.119 | 3.73 | 0.5-27.7 | 0.198 |
| **Education** | High | 1 | | | 1 | | | 1 | | |
| | Medium | 1.71 | 0.61-4.81 | 0.305 | 0.61 | 0.16-2.23 | 0.455 | 4.53 | 0.71-28.67 | 0.108 |
| | Low | 2.87 | 1.08-7.63 | 0.034 | 0.76 | 0.2-2.82 | 0.684 | 6.23 | 1.21-31.92 | 0.028 |

**Table 2:** ORs (95% CI) for prevalence of newly and previously diagnosed diabetes by binary logistic regression. (Variables entered on step 1: Age, sex, education, and marital status. CI: Confidence Interval, FBS: Fasting Blood Sugar, NDM: Newly diagnosed Diabetes Mellitus, OR: Odds Ratio, PDM: Previously diagnosed Diabetes Mellitus)

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