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Brief Communications

Prevalence of Diabetes Mellitus in Southern Brazil: a population-based study

ABSTRACT

OBJECTIVE: To compare the prevalence of Diabetes Mellitus among the adult population of an urban area, according to self-reported diabetes and fasting glucose test results.

METHODS: We carried out a population-based cross-sectional study of 1,968 subjects aged 20-69 years, living in the urban area of the city of Pelotas, Southern Brazil, in the year 2000. Sample size was calculated at 1,800 subjects. We visited the households of 40 randomly selected census sectors. We administered a standardized questionnaire to all subjects, which included questions on the presence of "blood sugar" and on medical confirmation in case of positive responses. A subsample of 367 participants was selected to donate blood samples for laboratory tests, including fasting blood glucose. We adopted as cutoff points for the detection of diabetes levels of 126 mg/dl and 140 mg/dl. Results are shown as frequencies and their respective 95% confidence intervals.

RESULTS: Of the subjects interviewed, 110 (5.6%; 95% CI: 4.6-6.6) referred the presence of Diabetes Mellitus diagnosed by a physician. In the subsample of 367 subjects who underwent blood testing, the prevalence of self-referred, physician-confirmed diabetes mellitus was 7.1% (95% CI: 4.5-9.7).

CONCLUSIONS: The prevalence estimates found in the present study are compatible with those obtained in other national surveys. Population-based studies are rare Brazil, and may contribute to the planning of health care policies.

KEYWORDS: Diabetes Mellitus, epidemiology. Diabetes Mellitus, prevalence. Cross-sectional studies. Epidemiology.

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INTRODUCTION

The management of the increasing burden of non-transmissible chronic diseases will require changes in the profile and complexity of healthcare services. One of these changes will be the use of epidemiological methods for the planning, organization, and execution of health-related activities.

Diabetes Mellitus stands out as one of the most important non-transmissible chronic diseases worldwide. The prevalence of Diabetes Mellitus is estimated at around 8% in the Brazilian population between 30 and 69 years, and half of these individuals are unaware of their condition.[2]

Contributing the relevance of the disease, mortality analyses show increased Diabetes Mellitus mortality after age 50 years. Furthermore, studies have shown that diabetes mortality is underestimated when underlying causes of death are analyzed.

Therefore, estimating prevalence is an important step in fighting this disease. The present study is thus aimed at estimating the prevalence of diabetes mellitus in the adult population of an urban area, and at comparing self-referred information with laboratory evaluation of fasting blood glucose using different cutoff points.

METHODS

We carried out a population-based cross-sectional study of the adult population (20-69 years) of the urban area of the city of Pelotas, Southern Brazil in the year 2000.

Sample size was estimated based on the prevalences of the different outcomes investigated by the study. For sample size calculation, we assumed 80% power and 5% significance level for exposures ranging from 25% to 75%, with a prevalence ratio of 1.6. We added 10% to the final sample size to compensate for possible losses and refusals and 15% for confounder control, leading to a final sample size of 1,800 subjects. Subject inclusion was carried out by household visits to 40 randomly selected census sectors. Thirty households in each of the 40 sectors were visited at random, and persons living in these households were interviewed. Of the 1,200 expected families, 1,145 were found (95.4%), and, of these, 57 (4.7%) were excluded for being composed only of persons outside the predefined age range. Another 55 families (4.5%) were classified as losses or refusals. We thus identified 2,177 persons, of which 209 were considered as losses or refusals, totaling 1,968 subjects included in the analysis.

A standardized, pre-coded questionnaire was administered to all subjects included in the study. The questionnaire included items on the presence of "blood sugar" and, when subjects answered positively, on whether the disease had been confirmed by a physician. A subsample of participants was referred to a laboratory for blood tests, including fasting blood glucose. Due to limited resource availability, sample collection was limited to 450 subjects, of which 83 did not show up for testing, corresponding to an 18.4% loss.

We adopted as the cutoff point for diabetes fasting blood glucose levels ≥ 126 mg/dl[4] or ≥ 140 mg/dl.[5] The first cutoff point corresponds to the level at which fasting blood glucose should be repeated for confirmation of diagnosis. Blood glucose values ≥ 140 mg/ml alone are sufficient for the confirmation of diabetes according to World Health Organization criteria.

Data coding and entry was carried out twice, using Epi Info software, in order to prevent consistency errors. Data analysis was performed using SPSS, Stata, and Excel software for the calculation of 95% confidence intervals. Since the present study was based on a cluster sample, we calculated the design effect for the variable considered as an outcome (self-referred physician confirmed diabetes mellitus). Since the calculated effect was close to 1.0, it was not considered in subsequent analyses.

The project was approved by the Research Ethics Committee of the *Faculdade de Medicina da Universidade Federal de Pelotas*.

RESULTS

Of the subjects interviewed, 110 (5.6%; 95% CI: 4.6-6.6) referred the presence of physician-diagnosed diabetes mellitus (Table).

Table - Prevalence of Diabetes Mellitus, according to different diagnostic criteria. Pelotas, Brazil, 2000.

Characteristic	Total N	Subjects with positive outcome	Prevalence (95% IC)
Self-referred, physician confirmed	1,968	110	5.6 (4.6 to 6.6)
Self-referred, physician confirmed	367	26	7.1 (4.5 to 9.7)
Self-referred, physician confirmed or blood glucose ≥126 mg	367	38	10.3 (7.2 to 13.4)
Self-referred, physician confirmed or blood glucose ≥140 mg	367	33	9.0 (6.0 to 11.9)

Regarding the distribution of socioeconomic and demographic variables, we found that, in both samples analyzed, there was a predominance of women, approximately 70% of subjects were under 49 years of age, and over 70% of subjects had family incomes below three minimum wages. Estimates, expressed as confidence intervals, show that proportions in terms of sex, age, and family income in the total sample and in the subsample were similar.

Among subsample subjects who underwent laboratory evaluation, 26 (7.1%; 95% CI: 4.5-9.7) referred physician-confirmed diabetes mellitus (Table).

We found 12 subjects (3.3%) in this sample who did not report diabetes but who showed blood glucose ≥126 mg/dl. Thus, the prevalence of self-referred physician-diagnosed diabetes or blood glucose ≥126 mg/dl in the subsample was 10.3% (95% CI: 7.2-13.4) (Table).

Using as a cutoff point glucose levels ≥140 mg/dl, we found seven subjects (2.1%) who were unaware of the disease. The prevalence of self-referred physician-diagnosed diabetes or glucose ≥140 mg/dl was thus 9.0% (95% CI: 6.0-11.9) (Table).

DISCUSSION

The major limitation of the present study was the diagnostic criterion employed. We carried out only a single fasting blood glucose measurement, and did not investigate symptoms and signs of the disease.[4] As this was a cross-sectional study, the repetition of the blood test would incur in financial and logistic problems that could have prevented the study from being carried out. Furthermore, losses amounted to 18.4% with a single blood collection, and this proportion would probably have been even higher if additional collections were carried out.

On the other hand, population-based studies are rare in Brazil. The cross sectional study included 1,968

subjects, and sample distribution in terms of sex and age was similar to that found for the city of Pelotas in the populational census, discarding the possibility of selection bias. The subsample was also similar to the total study population in terms of age, sex, and income. Self-referred information, both for diabetes and for the confirmation of the disease by a physician, have traditionally been used as criteria for detecting the disease.[3] In the present study, participants who referred the disease, but whose blood glucose levels were below 126 mg/dl or 140 mg/dl were considered as with diabetes, potentially compensated at the time of the blood test. Among subjects who referred physician-confirmed diabetes, 16 (61.5%) showed blood glucose <126 mg/dl, and were considered as compensated.

Even without using the definition criteria for the diagnosis of diabetes, the prevalence of Diabetes Mellitus found in the present study is similar to that reported in other surveys.[1,2]

There was no difference in terms of prevalence of Diabetes Mellitus between the subsample and the general sample, as shown by the confidence intervals of the subsample. However, when adding blood glucose levels ≥126 mg/dl to our outcome measure, we found an increase of approximately 50% in disease prevalence, whereas if the ≥140 mg/dl was used, prevalence increased by about 25%.

However, the prevalence of reported diabetes plus that of blood glucose ≥126 mg/dl was 84% greater than that found in the 1,968-sample subject sample, and the confidence intervals obtained confirm this difference.

We emphasize the fact that knowledge of the approximate prevalence of diabetes mellitus is an important subsidy for healthcare policy making, since it allows for a better planning of disease-related activities, such as the calculation of the demand for appointments, laboratory tests, and medication, as well as the evaluation of current activities.

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