Contributors

A Pardanani and A Tefferi participated in all aspects of the study, including design of the study protocol; data collection, analysis, and interpretation; and preparation of the first and final drafts of the manuscript. M Elliott collected clinical data for one patient. C-Y Li reviewed bone-marrow histology for all patients. T Reeder isolated DNA from study samples and screened ckit exons 11–12 and 17 for known mutations. E J Baxter and N C P Cross screened all coding exons of ckit and *PDGFRB* genes for pathogenic mutations, analysed and interpreted these data, and helped write the manuscript.

Conflict of interest statement

None declared.

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Rising prevalence of diabetes: evidence from a Danish pharmaco-epidemiological database.

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The prevalence of diabetes has increased worldwide. We have undertaken an epidemiological analysis of drug-treated diabetes in a well defined community. We present estimates of prevalence, incidence, and mortality of patients with such diabetes during 1993–99, based on data for all 470 000 people living in the county of Fyn, Denmark. Although prevalence increased (odds ratio: female, 1·026 [95% CI 1·020–1·032]; male, 1·041 [1·036–1·047]), mortality in those treated declined (rate ratio: female, 0·976 [95% CI 0·952–1·001]; male, 0·966 [0·943–0·990]). We did not identify a clear trend for incidence. Future research into the causes of rising diabetes prevalence should take this fall in mortality into account to avoid incorrect conclusions about the relation between western lifestyle and the growing number of diabetics.

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The prevalence of diabetes increases with age and reaches about 10% by age 60 years in most populations.[1] Prevalence has risen in all age groups during the past 20 years. WHO has estimated that the number of diabetics worldwide will double within the next 20 years, from about 150 million in 2000 to about 300 million in 2025.[2] In this population-based study, we present estimates of not only prevalence but also incidence, and mortality of pharmacologically treated diabetes. Our aim is to provide an epidemiological analysis of drug-treated diabetes in a well defined community and thus contribute to a better understanding of the reported increase in diabetes prevalence.

Data were obtained from the Odense Pharmaco-Epidemiologic Database, which contains information about all redemptions of subsidised and prescribed drugs at community pharmacies since 1992, in the county of Fyn, Denmark, for a population of about 470 000.[3] All drugs are coded according to the Anatomical Therapeutical Chemical classification system.[4] Antidiabetic drugs are denoted by the first three characters A10: insulin is denoted by A10A and oral antidiabetics by A10B. The civil registration number was used as a unique person identifier, and was supplemented with birth date, sex, date of migration, and date of death for all people resident in Fyn from Jan 1, 1992, to Dec 31, 1999.

We defined treatment status on the basis of the previous year's record of antidiabetic drug dispensing—ie, when a patient had at least one prescription in the previous year, the person was judged to be in treatment at the beginning of the following year. The choice of a 1-year run-in period was based on clinical judgment.

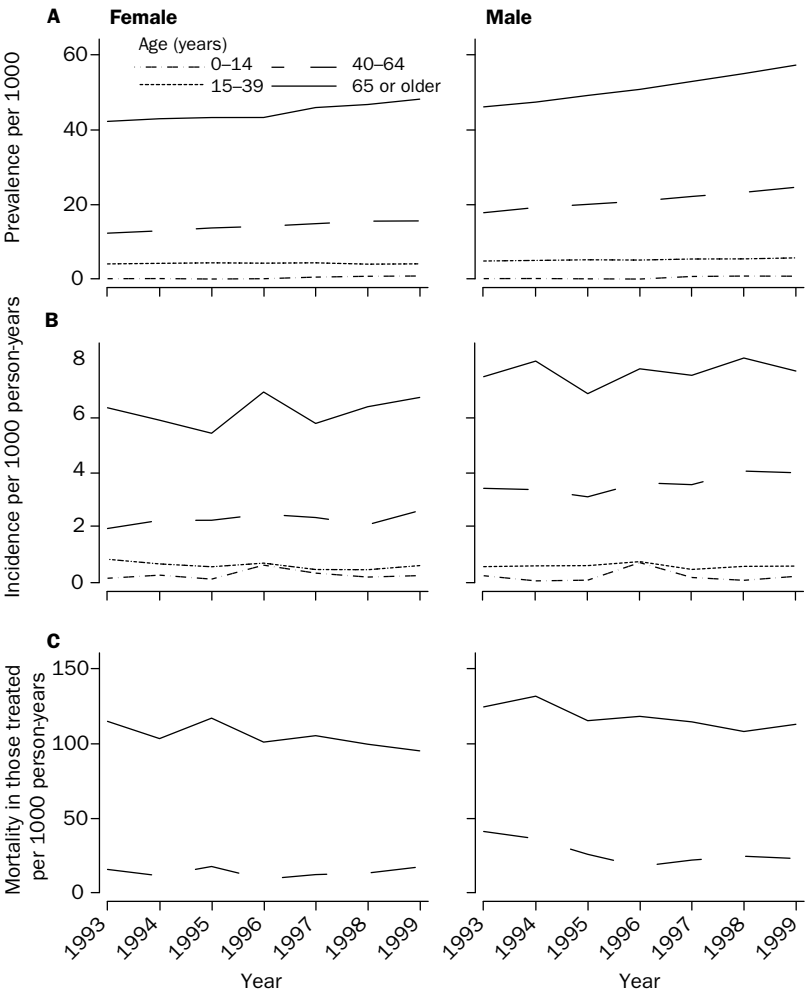
Using this definition, we calculated point prevalence of use of antidiabetic medications for Jan 1 of every year during 1993–99. For those judged to be untreated at the start of the year, we calculated incidence on the basis of numbers of patients who initiated treatment within the calendar year, ie, redeemed a prescription for an antidiabetic drug. Mortality rates in patients treated with antidiabetics were calculated on the basis of deaths of patients who were in treatment at the beginning of the year. We compared mortality rates in those who were treated with rates for those who were untreated. However, in calculation of incidence in this way, some individuals might have been counted more than once, if they had gaps of more than 1 year between successive redemption of prescriptions.

Alternatively, we could have used a cumulative prevalence definition based on the accumulated information in the database and not just the previous year. This method would, however, have introduced time-dependent misclassification, which would severely bias any analysis of trends in prevalence, incidence, and mortality with time.

Treatment	Sex	Prevalence (95% CI)	Incidence (95% CI)	Mortality in those treated (95% CI)	Relative mortality (95% CI)
All antidiabetics	Female	1·026 (1·020–1·032)	1·010 (0·993–1·027)	0·976 (0·952–1·001)	0·983 (0·958–1·009)
	Male	1·041 (1·036–1·047)	1·015 (1·000–1·031)	0·966 (0·943–0·990)	0·979 (0·954–1·004)
Insulin	Female	1·024 (1·016–1·033)	0·980 (0·954–1·006)	0·966 (0·927–1·007)	0·973 (0·933–1·014)
	Male	1·046 (1·038–1·054)	0·997 (0·973–1·022)	0·971 (0·932–1·012)	0·985 (0·945–1·027)
Oral antidiabetics	Female	1·028 (1·019–1·037)	1·033 (1·014–1·051)	0·979 (0·950–1·010)	0·986 (0·956–1·017)
	Male	1·037 (1·029–1·046)	1·037 (1·020–1·055)	0·962 (0·933–0·990)	0·974 (0·945–1·003)

For prevalence, trend estimate is odds-ratio based on logistic regression, whereas other estimates are rate-ratios based on Poisson regression.

Estimated yearly trends for different categories of antidiabetic drugs



Prevalence (A), incidence (B), and mortality (C) for drug-treated diabetes stratified by sex and age

In the subanalyses of insulin and oral antidiabetic drugs, only redemptions of the specific medication type were included—for example, when the analysis was restricted to insulin, all redemptions of prescriptions for oral antidiabetic agents were ignored. The figure shows rates of prevalence, incidence, and mortality in treated patients. Prevalence increased strikingly for both sexes. For incidence, no systematic pattern is seen, but mortality decreased.

To determine estimates of annual trends we did regression analysis using categories of year and age (with cutoff points at 20 years, 30 years, and every 10 years until 90 years) as covariates stratified by sex. The table shows the estimated trends in prevalence, incidence, and mortality. We noted an increase in prevalence, nearly constant incidence, and a reduction in mortality. Mortality also decreased relative to an overall decreasing trend in mortality in the general population. Summarising the evidence for both sexes, we recorded an overall p value of 0·034 for a decreasing trend in relative mortality.

In the subanalyses of insulin and oral antidiabetic agents, we note that the overall rise in incidence is due to an increasing incidence of use of oral antidiabetic medications. The trends in prevalence and mortality in users of insulin and oral antidiabetic medications, respectively, are similar to the overall trends. Furthermore, we studied the incidence of insulin use in those who used either oral antidiabetics alone, or no antidiabetic, in the run-in period. In non-users of oral antidiabetic agents, there was a significant reduction (rate ratio 0·953, 95% CI 0·928–0·978), whereas there was a slight, non-significant, increase in incidence of insulin use among users of oral antidiabetic agents (1·002, 0·975–1·029). This finding, together with the overall increase in the incidence of oral antidiabetic use, probably indicates a trend toward an earlier diagnosis of diabetics that needed treatment with oral antidiabetics only.

Irrespective of the increase or decrease in incidence, the associated prevalences rose at a nearly identical rate, indicating that the increase in prevalence is largely the result of incidence in absolute numbers being higher than mortality in treated diabetics, rather than as a result of rising incidence. Although our data do not allow a firm conclusion as to why prevalence is rising, we believe that the decrease in mortality should be taken into account. Otherwise, incorrect conclusions could be drawn about the relation between the western lifestyle and the rising number of diabetics.

Our results for prevalence and incidence fit well with estimates from an analysis of the nationwide prescription database by the Danish Medicines Agency in 1994–97.[5] Since our results are for only pharmacologically-treated diabetes, they should be confirmed with data from databases that allow access to individual diagnoses.

Contributors

H Støvring had the original idea for the study, did all analyses, and drafted the original and revised manuscripts, except the introduction. M Andersen provided access to data, and H Beck-Nielsen and A Green drafted the introduction. All authors contributed to the planning of analyses and interpretation of data and commented on drafts of the manuscript.

Conflict of interest statement

None declared.

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