Cancer incidence and mortality among 457,473 persons with type 2 diabetes compared to 2,287,365 matched controls in Sweden: an observational study

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BACKGROUND AND AIMS

Studies suggest an increased risk for certain cancer types for type 2 diabetes (T2DM) and that these patients have an increased mortality from cancer. However, many of the studies in this area are limited by potential bias.

Improved survival for diabetes patients, especially from cardiovascular diseases, has led to a diversification of diabetes complications, including cancers.

Therefore, we set out to evaluate the incidence of all cancer and site-specific cancer, along with time-trends in cancer incidence as well as post-cancer mortality, among patients with T2DM compared to matched controls. We also evaluated trends in causes of death for T2DM in recent years, specifically in order to investigate if there had been an increase in death from cancer.

METHODS

We included patients defined by the epidemiologic definition as T2DM in the Swedish National Diabetes Register between 1998 through 2012 and followed them through 2014. Each person with T2DM was matched to 5 controls based on age, sex and county. The cohort included 457,473 persons with diabetes and 2,287,365 matched controls. All individuals were followed until a site-specific cancer occurrence, death or end of follow-up, whichever came first. Incidence, trends in incidence and post-cancer mortality for cancer were estimated with Cox regression and standardized incidence rates.

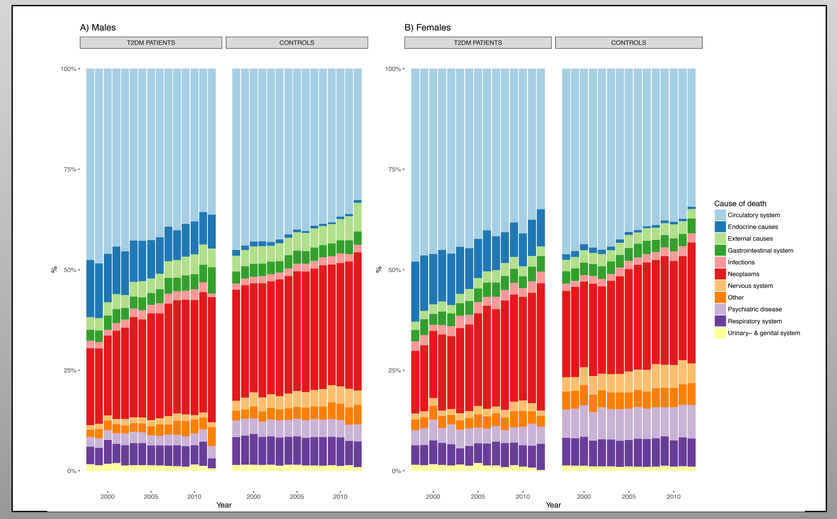
RESULTS

T2DM had a slightly increased risk for all cancer, HR 1.1 (95% CI, 1.09 to 1.12). For the most common cancer sites we observed the following for incidence rates: Increased risk for breast cancer, HR 1.05 (95% CI, 1.01 to 1.09) and colorectal cancer, HR 1.20 (95% CI, 1.16 to 1.23), decreased risk for prostate cancer, HR 0.82 (95% CI, 0.80 to 0.83), and risk of lung cancer, HR 1.01 (95% CI, 0.97 to 1.05) for T2DM compared to controls. Of these four cancer sites only lung cancer showed a significant difference in change of risk over time, with a 30% greater increase in incidence over a 10 year period for T2DM compared to controls.

For post-cancer mortality we observed the following: Increased mortality after diagnosis of prostate cancer, HR 1.29 (95% CI, 1.25 to 1.35), breast cancer, HR 1.25 (95% CI, 1.18 to 1.33) and colorectal cancer HR 1.09 (95% CI, 1.05 to 1.13) in T2DM compared to controls. There was not a significant difference in post-cancer mortality between the groups for lung cancer, HR 1.02 (95% CI, 0.98 to 1.06).

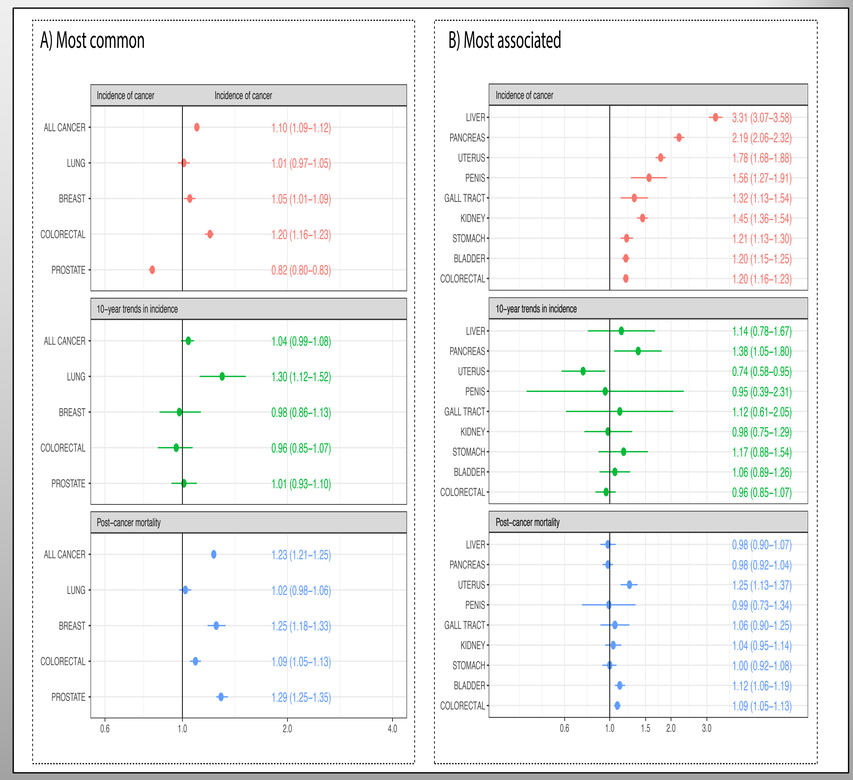
The cancer types that T2DM was most associated with an increase in risk were the following: Liver HR 3.31 (3.07 to 3.58), pancreas HR 2.19 (2.06 to 2.32) corpus uterus HR 1.78 (1.68 to 1.88), penis HR 1.56 (1.27 to 1.91), kidney HR 1.45 (1.36 to 1.54), gallbladder and bile ducts HR 1.32 (1.13 to 1.54), stomach HR 1.21 (1.13 to 1.30) and bladder HR 1.20 (1.15 to 1.25). Of these sites, only pancreas cancer and corpus uterus cancer showed a significant difference in change of risk over time, with a 38% greater increase in incidence over a 10-year period for pancreas cancer and a 26% greater decrease for corpus uterus cancer for T2DM as compared to controls.

Patients with T2DM died primarily from cardiovascular and endocrine causes in the early years. In the final years, however, these two causes of death comprised less than 50% of all causes of death. Cancer mortality increased markedly. It increased by 103% for females with T2DM in the years 1998-2012 while increasing by 40% for the matched controls. Death from cancer increased by 62% for males with T2DM while increasing only by 24% for matched controls. The other causes of death did not display any material trend over time.



CONCLUSION

Patients with T2DM have an increased risk of all cancers and certain cancer types as well as lower post-cancer survival compared to controls. Changes in cancer incidence over time were virtually the same in patients with diabetes compared to controls, with the exception of pancreas, uterus and lung cancer. Our data strongly suggest we are in the midst of an epidemiological shift from cardiovascular mortality to cancer mortality. Globally, around 500 million individuals live with diabetes, and so our observations of a 10% greater risk of developing cancer and a lower chance of surviving cancer are notable. Broad and large-scale efforts are warranted to develop predictors of cancer in order to help develop better preventative information and to mitigate the impending burden of disease.



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