Incidence of end-stage renal disease in patients with type 1 diabetes was 7.8% at 30 years after diagnosis

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Clinical impact ratings: GIM/FP/GP ★★★★☆☆ Endocrinology ★★★☆☆☆ Nephrology ★★★★★☆

QUESTION

In patients with type 1 diabetes diagnosed before 30 years of age, what is the long-term prognosis for developing end-stage renal disease (ESRD) and death?

METHODS

Design: Inception cohort followed for median 16.7 years (range 0 to 37 y).

Setting: Finland.

Patients: 20 005 patients < 30 years of age at diagnosis of type 1 diabetes (use of insulin for ≥ 1 y) in 1965 to 1999, who were identified from the Finnish Diabetes Register.

Prognostic factors: Sex, age at diagnosis, and time period of diagnosis.

Outcomes: ESRD (requiring dialysis or kidney transplant) and all-cause mortality, ascertained by database linkage with the Finnish Registry for Kidney Diseases and the Population Register Centre in Finland, respectively.

MAIN RESULTS

During 346 851 person-years of follow-up, 632 patients developed ESRD and 1417 patients died. The cumulative incidences of ESRD were 2.2% (95% CI 1.9 to 2.5) after 20 years and 7.8% (CI 7.1 to 8.5) after 30 years; risks were similar in men and women (Table). Risk for ESRD was lowest in patients diagnosed before 5 years of age (30-y risk 3.3%, CI 1.7 to 4.9) and those diagnosed since 1980 (Table). Cumulative mortality was 6.8% (CI 6.3 to 7.2) after 20 years and 15% (CI 14 to 16) after 30 years. Risk for death was higher in patients who had developed ESRD than in those who had not (relative risk 13, CI 11 to 15, adjusted for age, sex, and time period). Risk for death was higher in men than in women, increased with age at diagnosis, and decreased with recency of diagnosis (Table).

CONCLUSIONS

In patients with type 1 diabetes diagnosed before 30 years of age, risk for end-stage renal disease was 2.2% 20 years after diagnosis. Risk was similar for men and women, and lowest in patients diagnosed before 5 years of age. Risk for death was 6.8% 20 years after diagnosis and was lower in women and in patients diagnosed at a younger age.

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Association between prognostic factors and end-stage renal disease (ESRD) or all-cause mortality in patients with type 1 diabetes at median 17 years after diagnosis*

Prognostic factors (reference group)	Comparison groups	Relative risk (95% CI)	
		ESRD	Mortality
Sex (female)	male	1.1 (0.96 to 1.3)	1.7 (1.5 to 1.9)
Age at diagnosis (y) (0 to 4 y)	5 to 9	2.7 (1.8 to 4.1)	1.8 (1.3 to 2.4)
	10 to 14	3.3 (2.3 to 4.9)	2.3 (1.8 to 3.1)
	15 to 19	2.6 (1.7 to 3.9)	2.9 (2.2 to 3.8)
	20 to 24	2.5 (1.6 to 3.8)	4.9 (3.7 to 6.5)
	25 to 29	2.8 (1.8 to 4.4)	7.4 (5.6 to 9.8)
Time period of diagnosis (1965 to 1969)	1970 to 1974	0.78 (0.64 to 0.94)	0.63 (0.55 to 0.72)
	1975 to 1979	0.72 (0.57 to 0.90)	0.52 (0.44 to 0.61)
	1980 to 1999	0.47 (0.34 to 0.65)	0.41 (0.35 to 0.48)

*CI defined in Glossary. Relative risks were adjusted for other explanatory variables.

COMMENTARY

This important study by Finne and colleagues describes the natural history of incident patients with type 1 diabetes for > 30 years. While one could assume that the availability of new treatment approaches would improve the long-term prognosis of patients with diabetes over time, this study is the first to suggest it. Patients who were diagnosed with type 1 diabetes 40 years ago seem to have had an increased risk for ESRD in each 5-year period after diagnosis compared with patients diagnosed more recently (e.g., incidence at 16 to 20 y after diagnosis was approximately 4.2 per 1000 person-y for those diagnosed in 1965 to 1969 compared with 2.5 per 1000 person-y for those diagnosed in 1980 to 1999). However, this trend was not tested statistically. Because the length of follow-up differed for each vintage cohort and the rates of death and ESRD were not constant across the follow-up periods (rather, they increased exponentially with longer periods of follow-up), comparisons of these outcomes among vintage cohorts are difficult to interpret, even when the analysis is adjusted for other explanatory variables.

Accepting that the prognosis of type 1 diabetes is indeed improving with time, the study of Finne and colleagues does not provide evidence on which interventions contributed to the decline in risk: introduction of disposable syringes in the early 1970s, development and increased availability of more sophisticated home glucose monitoring devices, introduction of newer insulin preparations, or the recent evidence on strict glucose control regimens and the effectiveness of angiotensin-converting enzyme inhibitors (1, 2).

3 important caveats need to be considered from this study. First, the associations are probably underestimates, as there has been a trend toward initiation of renal replacement therapy at earlier stages of preterminal kidney failure. Second, Finland, which has a high incidence of type 1 diabetes, has put considerable effort into providing universal health care and insulin at no cost to patients, which may render the generalizability of these findings to other countries uncertain. Finally, it is unclear whether similar trends toward improved outcomes have occurred in type 2 diabetes.

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