

Chapter 6

Diabetes and Kidney Disease in Alberta



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DIABETES AND KIDNEY DISEASE IN ALBERTA

KEY MESSAGES

- The annual growth rate of end-stage renal disease in the diabetes population is more than double that of the non-diabetes population over the past decade.
- The proportion of patients with end-stage renal disease and diabetes has increased from 31% to 46% over the past decade.
- Steady incidence rates suggest the risk of end-stage renal disease is not increasing but the increasing number of people with diabetes is driving the increased prevalence of end-stage renal disease.
- The fraction of people with diabetes receiving a kidney transplant has increased from 25% in 1995 to 32% in 2005.

BACKGROUND

One of the most serious consequences of diabetes mellitus (DM) is renal or kidney disease, also known as diabetic nephropathy. This frequently progresses to end-stage renal disease (ESRD), a state where life-sustaining treatment of ongoing dialysis therapy (either hemodialysis or peritoneal dialysis) or kidney transplantation is necessary. Patients with DM are at an increased risk of developing ESRD, up to 13 times greater than those without DM.⁽¹⁾

ESRD patients on dialysis have a very poor quality of life⁽²⁻⁵⁾ and high mortality rates, with 5-year survival rates of less than 30%,⁽²⁾ worse than many commonly occurring malignancies.⁽⁶⁾ While kidney transplantation is the preferred treatment, the limited availability of organs has led to very long waiting list times.

Those with diabetes and ESRD have even poorer health outcomes than non-DM patients receiving dialysis. In addition to reporting a much lower quality of life,⁽⁷⁾ persons with diabetes have significantly higher mortality. In Canada, the percentage of hemodialysis patients alive after three years was only 51% for those with DM, compared with 60% for those without DM.⁽⁸⁾ Finally, patients with ESRD and DM tend to have more comorbid illnesses, such as cardiovascular and peripheral vascular disease, which may preclude treatment with kidney transplantation.

Provision of care to the ESRD population is associated with consumption of significant amounts of health care resources. In developed nations, it is estimated that ESRD affects only 0.07% of the population, but consumes 2-3% of health care budgets.⁽⁹⁻¹²⁾

On a national level, the number of prevalent ESRD patients in Canada continues to grow at 6 to 13% per annum,^(8,9,13) a rate which would be expected to result in a doubling of the ESRD population every 5-8 years. A significant contributor to the growth in ESRD patients is due to increased numbers of persons with DM. The fraction of persons who develop ESRD due to DM in Canada has increased from 25% to 34% from 1993 to 2002.⁽⁸⁾

Our objective was to describe the epidemiology of ESRD and kidney transplantation in Alberta from 1996 to 2005 with specific emphasis on patients with DM.

METHODS

Data from Alberta Health and Wellness (AHW), which provides health care insurance to all permanent residents of Alberta (including First Nations people), was utilized for this analysis. This administrative dataset captures demographic information, outpatient and inpatient encounters, and physician billing claims. All adult patients aged 20 or greater were included in these analyses.

Physician billing claim codes specific for the delivery of maintenance dialysis therapy over the study period (1996-2005) were used to identify dialysis patients (see Appendix). The patient population of interest were those receiving chronic dialysis, defined as having at least two dialysis billing codes in ≥ 90 days. The start date of dialysis was defined by the date of the earliest dialysis billing claim.

New or incident dialysis patients for a given year were defined if they met the above criteria, and if their start date of dialysis occurred in that year, without having been a dialysis case in the previous year. A person identified as an incident dialysis patient in a given year would be classified as a prevalent dialysis patient in subsequent years if additional dialysis billing claims occurred in these years. Due to changes in billing codes and practices during the time frame of this analysis, the type and location of dialysis modality was not assessed.

Kidney transplantation was identified by physician claims for the surgical procedure of kidney transplantation (see Appendix).

Persons with diabetes were identified as described in the Methods chapter. DM and ESRD status of individuals were determined for each year, then incidence and prevalence rates of ESRD were calculated for persons with and without DM for each year. Age-specific rates for ESRD and kidney transplantation are also reported.

FINDINGS

Incidence

The age and sex-adjusted rate of ESRD per 100,000 persons was relatively stable for persons with and without DM over the decade of observation. The rate of developing ESRD for those with DM has been 11 to 15 times higher compared to those without DM (Figure 6.1).

The number of all incident ESRD cases per year increased from 313 to 497 over ten years (Figure 6.2), with an average annual growth of 5.8%. Over the same time frame, the average annual ESRD growth for persons with DM was 9.4%, compared with 3.7% for those without DM. In 1996, 35% of all the incident ESRD cases had DM. This figure increased to nearly 50% in 2005 (Figure 6.3).

For the year 2005, the 50-64 and 65-74 age groups contributed the most number of new patients (Figure 6.4). These two age groups also had the highest number of patients with DM, outnumbering new patients with ESRD without DM. The greatest average annual growth rate over the ten year period of observation was in patients with DM in the three oldest age groups, with growth rates of 2 to 4 fold greater than those without DM (Figure 6.5).

Figure 6.1 Age and Sex-Adjusted ESRD Incidence Rates, 1996-2005

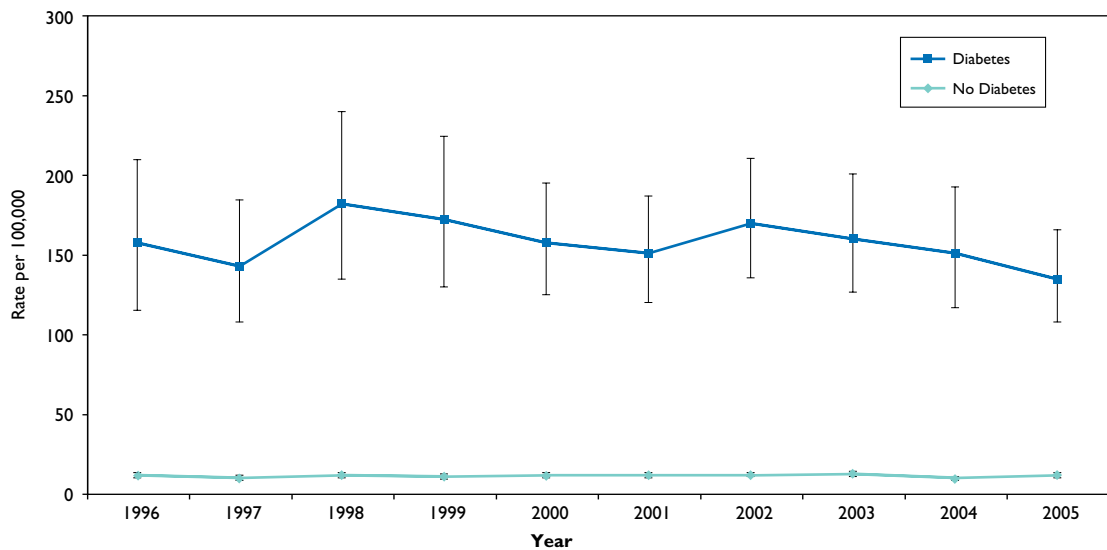


Figure 6.2 Incident ESRD Cases, 1996-2005

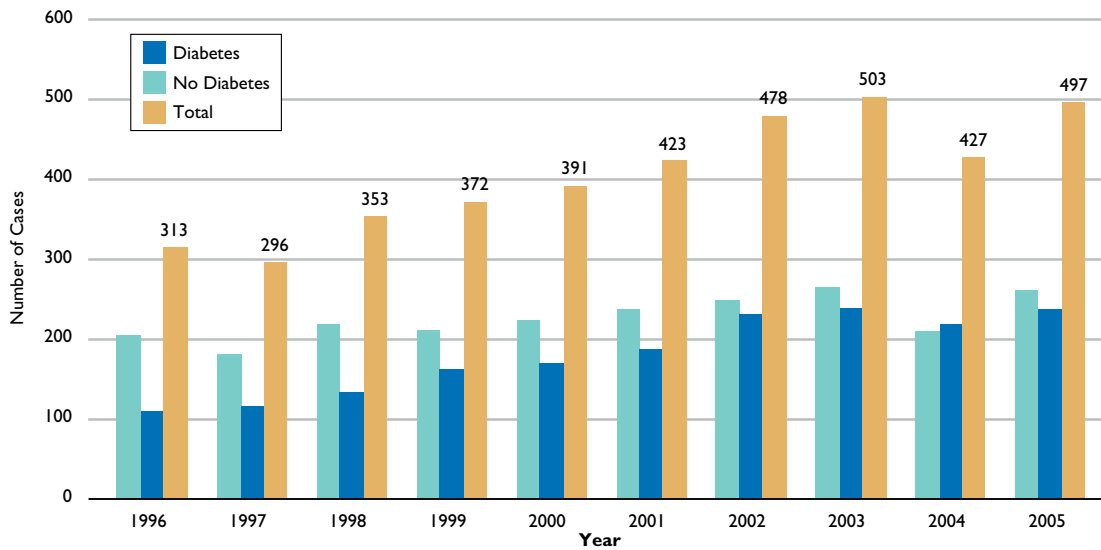


Figure 6.3 Incident ESRD Cases, 1996-2005

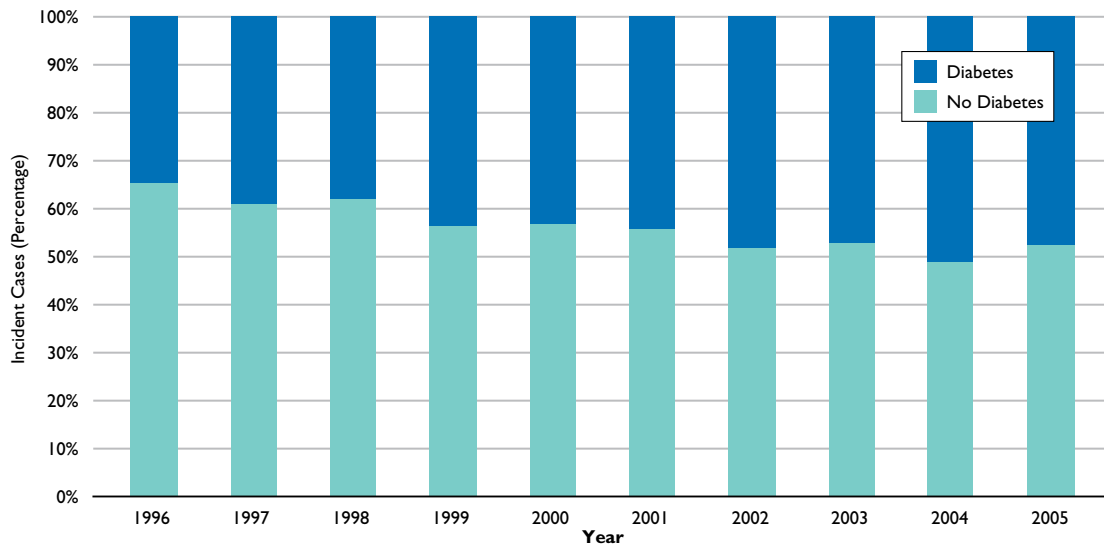


Figure 6.4 Age-Specific Incident ESRD Cases, 2005

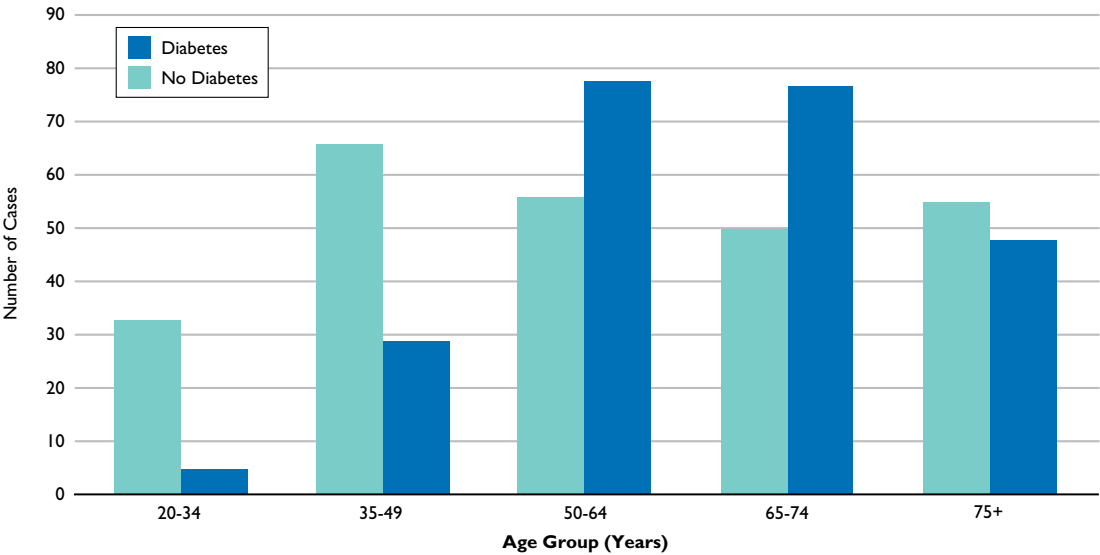
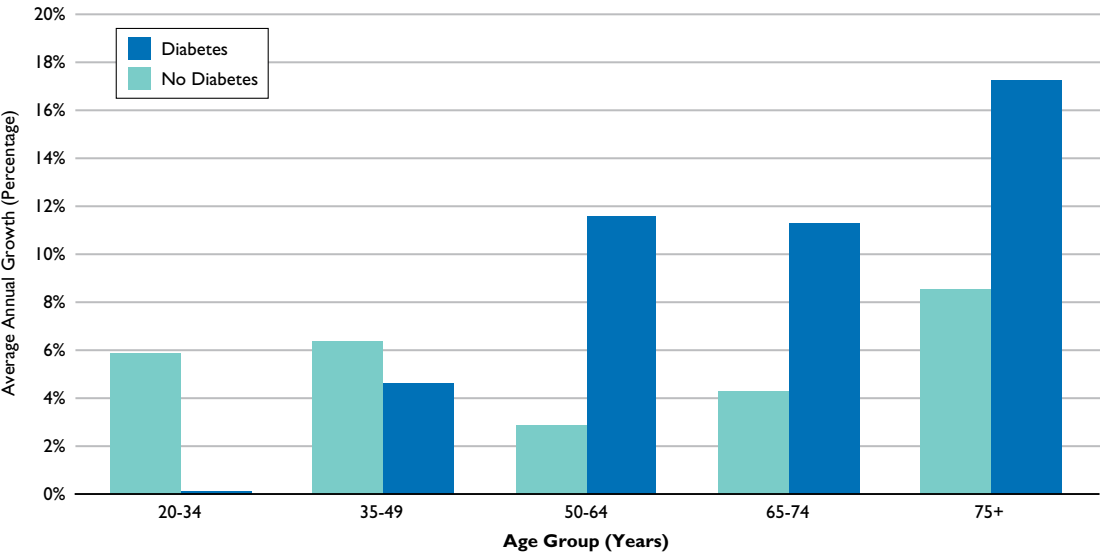


Figure 6.5 Average Annual Growth of Incident ESRD Cases, 1996-2005



Prevalence

The age and sex-adjusted rate per 100,000 persons with ESRD requiring dialysis was 10 to 12 times higher for patients with DM compared with those without DM from the years 1996 to 2005 (Figure 6.6). The number of patients with ESRD on dialysis increased from 910 to 1834 from 1996 to 2005, with an annual average growth of 8.1% (Figure 6.7). The average annual growth rate for persons with DM and ESRD was 13.0%, compared with 5.2% of those with ESRD without DM. The proportion of patients with ESRD and DM has increased from 31% to 46% over the period of observation (Figure 6.8).

Kidney transplantation

Kidney transplantation was more common in patients aged 64 or less (Figure 6.9). The fraction of persons with DM receiving a kidney transplant has increased from 25% in 1995 to 32% in 2005 (Figure 6.10).

Figure 6.6 Age and Sex-Adjusted ESRD Prevalence Rates, 1996-2005

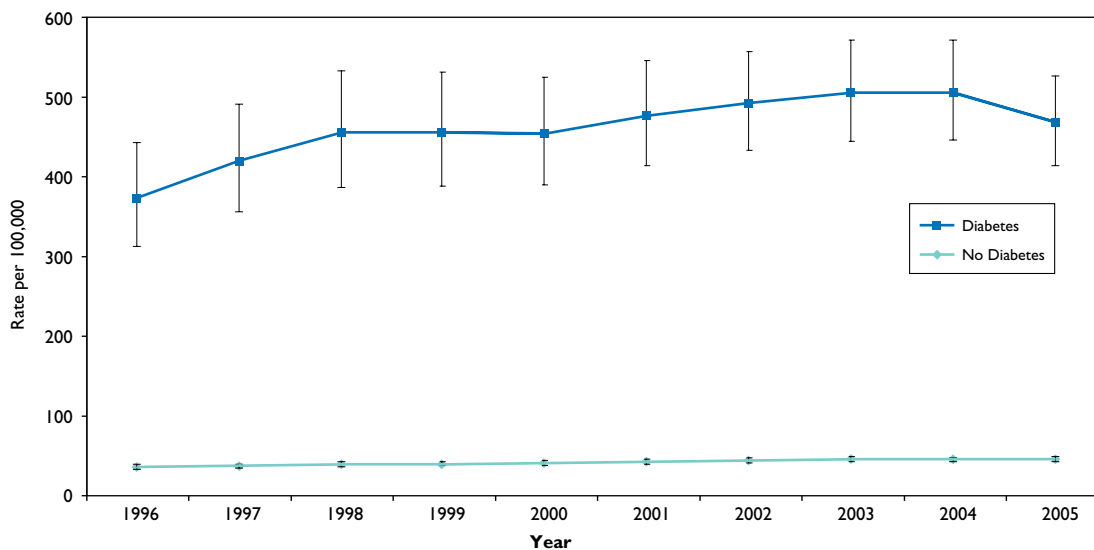


Figure 6.7 Prevalent ESRD Cases, 1996-2005

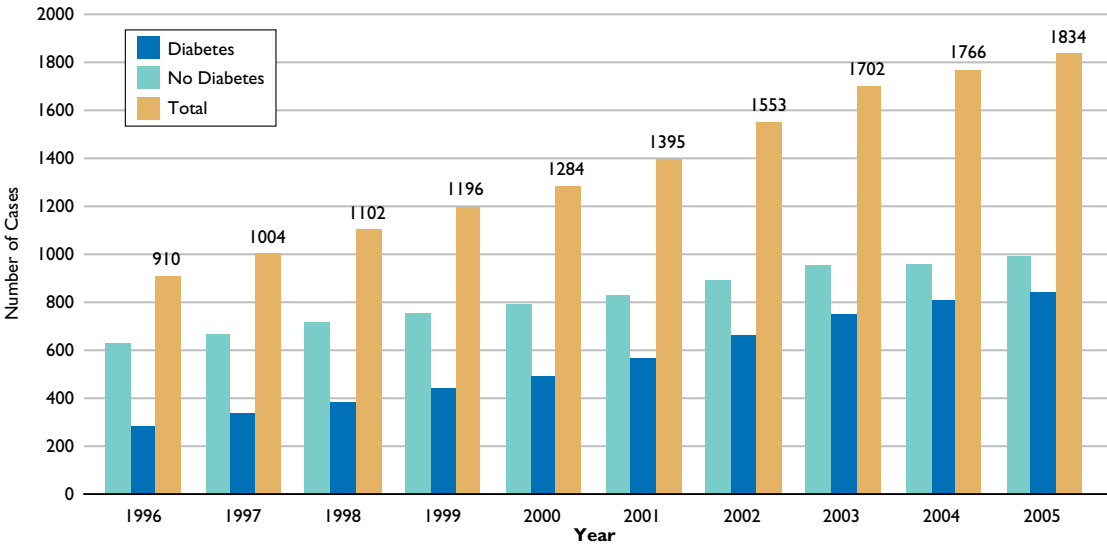


Figure 6.8 Prevalent ESRD Cases, 1996-2005

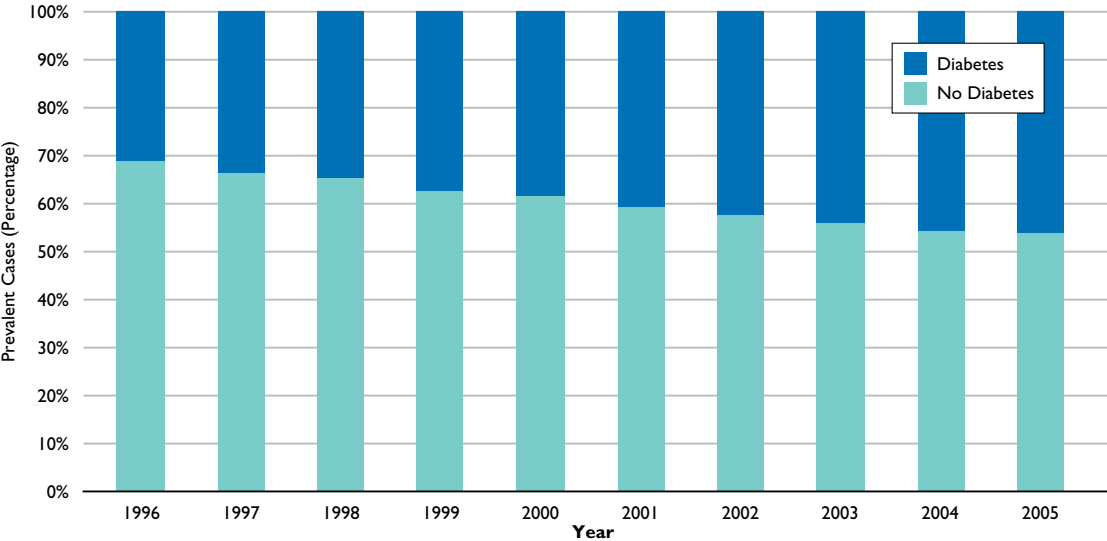


Figure 6.9 Age-Specific Kidney Transplantation Cases, 2005

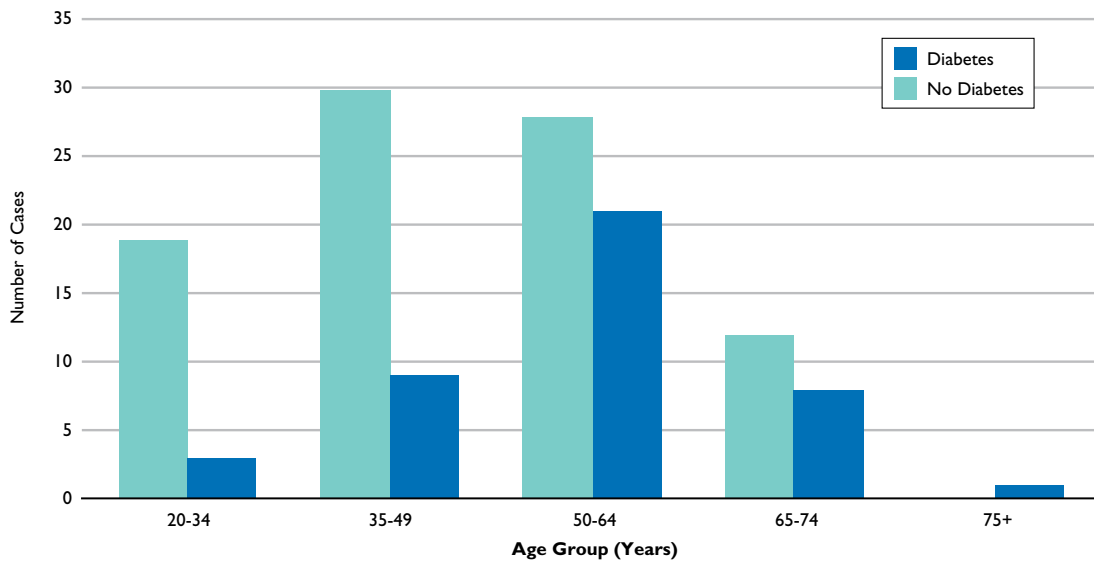
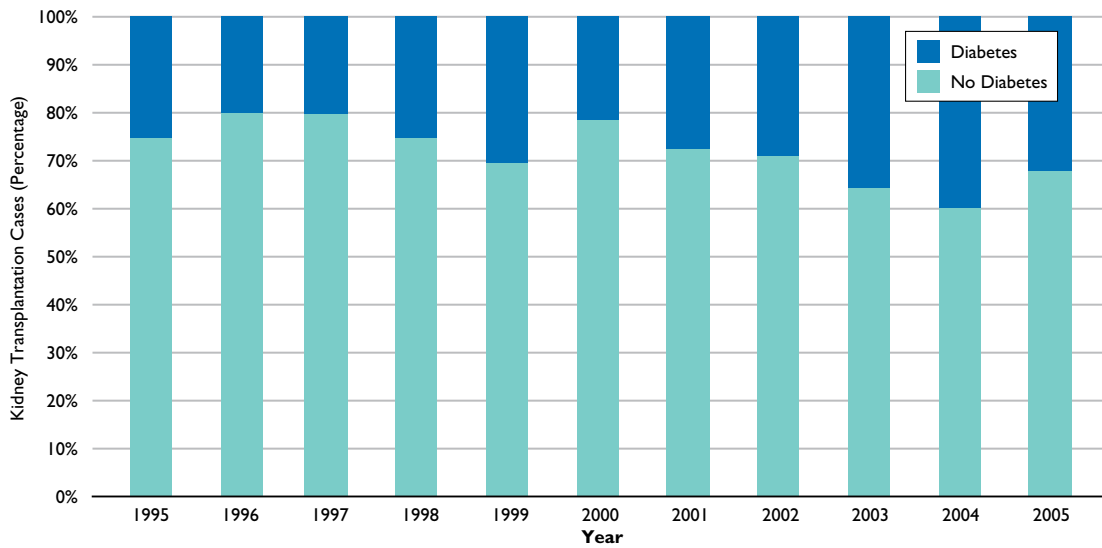


Figure 6.10 Kidney Transplantation Cases, 1995-2005



DISCUSSION

Over the past decade, the number of patients with DM who developed ESRD annually, or who are currently receiving dialysis therapy in a given year, have increased at an alarming rate in Alberta. Patients with DM now account for almost half of the new and existing patients on dialysis, a grave concern given the poor outcomes commonly seen for these patients.

The relative stability of incidence and prevalence rates when adjusted for age and sex suggest that this growth trend may not be due to a higher risk of developing ESRD in patients with DM, but instead may indicate that the number of persons with DM is increasing, which is supported by other data in this Atlas (see Epidemiological Trends chapter).

The age groups 50 years and older have the highest number of patients with incident ESRD and DM; the greatest growth in incident ESRD is seen in those over the age of 75. To some extent this may be due to improvements in dialysis technology, such that patients with a heavy burden of disease (such as the elderly with DM) may now be candidates for dialysis, or that people with DM live longer and thus have a greater likelihood of developing ESRD. However, the shift in the Alberta demographic distribution resulted in a higher proportion of older people whose risk of developing DM is probably a much more important factor, especially over the past 5 years.

Therapy exists for patients with kidney complications of diabetes to delay or prevent the progression to ESRD. While it is encouraging that the age and sex-adjusted rates of new cases of ESRD in those with DM appears to be trending downward, increasing the use of proven prevention efforts remain an important goal.

While use of administrative data provides a population-based method of obtaining disease trends, it also has limitations. Given our definition of chronic dialysis, patients with ESRD who die within 90 days of initiation of treatment will not be captured. We also identified all patients with ESRD, although DM may not have been the cause of ESRD. Given limitations in data and billing codes, we were unable to look at home-based compared to in-hospital dialysis. In this initial surveillance of DM and ESRD, we did not assess ESRD-related mortality; this will be included in future versions of the **Alberta Diabetes Atlas**.

While the fraction of persons with DM receiving a kidney transplant has increased over the last decade, it does not appear to have kept pace with the increase of ESRD incidence in patients with DM. This may be due to various factors including decreased eligibility for kidney transplantation due to concomitant comorbid illness or advanced age, and the greater risk of mortality while patients are on the transplant wait list. More research is needed to confirm these speculations.

In light of poor patient outcomes, high health care costs and continued growth in patient numbers, kidney disease due to diabetes is an emerging public health issue in Canada and worldwide. Continued efforts to identify patients at risk and institute therapy to slow the progression of diabetic nephropathy to ESRD is warranted to attenuate the impact of this complication.

References

1. Brancati FL,Whelton PK, Randall BL, Neaton JD, Stamler J, Klag MJ. Risk of end-stage renal disease in diabetes mellitus: a prospective cohort study of men screened for MRFIT. Multiple Risk Factor Intervention Trial. *JAMA* 1997;278:2069-2074.
2. USRDS: the United States Renal Data System. *Am J Kidney Dis.* 2003;42:1-230.
3. Fukuhara S, Lopes AA, Bragg-Gresham JL, et al. Health-related quality of life among dialysis patients on three continents: the Dialysis Outcomes and Practice Patterns Study. *Kidney Int.* 2003;64:1903-1910.
4. Gokal R. Quality of life in patients undergoing renal replacement therapy. *Kidney Int Suppl.* 1993;40:S23-7.
5. Manns B, Johnson JA, Taub K, Mortis G, Ghali WA, Donaldson C. Quality of life in patients treated with hemodialysis or peritoneal dialysis: what are the important determinants? *Clin Nephrol.* 2003;60:341-351.
6. Kiberd BA, Clase CM. Cumulative risk for developing end-stage renal disease in the US population. *J Am Soc Nephrol.* 2002;13:1635-1644.
7. Parsons DS, Harris DC. A review of quality of life in chronic renal failure. *Pharmacoeconomics* 1997;12:140-160.
8. Canadian Organ Replacement Register. Preliminary Report for Dialysis and Transplantation 2002. Canadian Institute for Health Information. 2003
9. Alberta Health and Wellness, Province Wide Services Working Group. 2003 Province Wide Services Annual Report on Activities and Outcomes. 2004; July (Accessed June 2005)
10. Garella S. The costs of dialysis in the USA. *Nephrol Dial Transplant.* 1997;12 Suppl 1:10-21.
11. Tomson CR. Recent advances: nephrology. *BMJ.* 2000;320:98-101.
12. Mallick NP. The costs of renal services in Britain. *Nephrol Dial Transplant.* 1997;12 Suppl 1:25-28.
13. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases B, MD. U.S. Renal Data System, USRDS 2002 Annual Data Report: Atlas of End-Stage Renal Disease in the United States, 2002

APPENDIX

Alberta Physician Claims Data

Procedure	Code	Description
Peritoneal dialysis	13.99C	Assessment and management of an unstable patient with acute/chronic renal failure treated by peritoneal dialysis
	13.99D	Assessment and management of a stable patient with chronic renal failure treated by peritoneal dialysis
Hemodialysis	13.99A	Hemodialysis treatment, unstable patient
	13.99B	Hemodialysis treatment, stable patient
Home based or satellite therapy	13.99O	Management of dialysis patients on home dialysis or receiving treatment in a remote hemodialysis unit (per week)
Kidney Transplantation	67.59A	Renal transplant (homo, hetero, auto)