Diabetic nephropathy as a cause of end-stage renal disease in Egypt: a six-year study

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اعتلال الكلية السكّري كأحد أسباب المراحل المتأخرة من المرض الكلوي في مصر: دراسة لمدة ست سنوات

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الخلاصة: درس الباحثون معدلات انتشار اعتلال الكلية السكّري كأحد أسباب المراحل المتأخرة من المرض الكلوي في مصر، في دراسات مستعرضة صغيرة، وكانت النتائج متعارضة، مما استدعى دراسة واسعة المجال. وقد أجرى الباحثون هذه الدراسة المتعدِّدة المستعرضة على مدى ست سنوات. واختيرَتْ عينة من المرضى في المراحل المتأخرة من المرض الكلوي، المسجَّلين في نظام البيانات الكلوية المصري، وتم تقييمهم خلال المدّة 1996-2001 من حيث معدل انتشار اعتلال الكلية السكّري. وقد ازداد معدل الانتشار تدريجياً من 8.9٪ عام 1996 حتى 14.5٪ عام 2001. وكان العمر الوسطي للمرضى المصابين باعتلال الكلية السكّري أعلى بكثير منه في المصابين بالمراحل المتأخرة من المرض الكلوي بسبب آخر. أما معدل الوفيات فقد كان أعلى بشكل واضح لدى السكّريِّين المصابين بالمراحل المتأخرة من المرض الكلوي.

ABSTRACT The prevalence of diabetic nephropathy as a cause of end-stage renal disease (ESRD) in Egypt has been examined in small cross-sectional studies, with conflicting results. The need for a large-scale study prompted us to perform this 6-year multiple cross-sectional study. A sample of ESRD patients enrolled in the Egyptian renal data system was evaluated during the period 1996–2001 for the prevalence of diabetic nephropathy. Prevalence gradually increased from 8.9% in 1996, to 14.5% in 2001. The mean age of patients with diabetic nephropathy was significantly higher than that of patients with ESRD from other causes. Mortality was also significantly higher in diabetic patients with ESRD.

La néphropathie diabétique comme cause de l'insuffisance rénale terminale en Égypte : étude sur six ans

RÉSUMÉ La prévalence de la néphropathie diabétique comme cause de l'insuffisance rénale terminale en Égypte a été examinée dans de petites études transversales, donnant des résultats contradictoires. Le besoin d'une étude à grande échelle nous a incités à réaliser une étude transversale multiple sur six ans. Un échantillon de patients souffrant d'insuffisance rénale terminale enregistrés dans le système égyptien de données rénales a fait l'objet d'une évaluation pendant la période 1996-2001 pour la prévalence des néphropathies diabétiques. La prévalence a augmenté progressivement, passant de 8,9 % en 1996 à 14,5 % en 2001. L'âge moyen des patients souffrant de néphropathie diabétique était significativement plus élevé que celui des patients souffrant d'insuffisance rénale terminale due à d'autres causes. La mortalité était aussi significativement plus élevée chez les diabétiques ayant une insuffisance rénale terminale.

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Introduction

Egypt, a developing country in North Africa, had a population of approximately 68 million in 2001. The estimated number of dialysis patients in Egypt in that year was 25 518 [*1*]

Diabetic nephropathy is rapidly becoming the leading cause of end-stage renal disease (ESRD), particularly in the industrialized countries of the world [*2*]. Ethnic and racial origin play an important role, resulting in increased prevalence rates of diabetic nephropathy in certain regions [*3*].

In many studies from Western European countries as well as many other regions of the world, diabetic nephropathy has been reported as the main cause of ESRD. Variable incidence and prevalence rates have been reported in Eastern Europe. Table 1 gives a summary of reported prevalence of this condition in a number of countries. Data from 12 countries in the Asian Pacific region, including Australia and New Zealand, showed an increase in both incidence and prevalence between 1998 and 2000 [*4*].

The prevalence of diabetic nephropathy as a cause of ESRD in Egypt has previously been examined in 2 small cross-sectional studies with conflicting results [*22*,*23*]. Other reports on prevalence of diabetic nephropathy also produced the following widely divergent figures: 8.4% [*11*], 13.7% [*24*], 20.1% [*12*] and 8.9% [*25*]. These marked differences in the reported prevalence rates may reflect the effect of urbanization.

The need for a large-scale study has prompted us to carry out this 6-year, multiple, cross-sectional study. The aim of our study was to critically evaluate the prevalence of diabetic nephropathy as a cause of ESRD in Egypt.

Table 1 **Reported prevalence of diabetic nephropathy as a cause of renal disease for various parts of the world**

Location	End-stage renal disease Prevalence of diabetic nephropathy (%)	Reference No.
United States of America	~ 50	5
Western Europe	Leading cause	6
Japan	Leading cause	7
France	Leading cause	8
Germany	21	9
Norway	10% of the incident RRT population	10
Egypt	8.4	11
Egypt	20.1	12
	Primary renal disease	
Yugoslavia	7	13
Czech Republic	25.0	14
Slovakia	17.9	14
Poland	10.3	15
South America	16.0	16
Puerto Rico	51.2	16
Asian Pacific region including Australia and New Zealand	17.3	4
China	4.7	17
Taiwan	24.8	18
Saudi Arabia	27.9	19
Tunisia	11.4	20
Kuwait	21.2	21

RRT = renal replacement therapy.

Methods

A sample of patients with ESRD enrolled in the Egyptian renal data system was evaluated during the period 1996–2001 for the

prevalence of diabetic nephropathy. Centre and patient questionnaires were sent to all identified dialysis centres (370 centres). All responding centres and all patients reported from these centres were included in the study. The number of patients evaluated was 4905 in 1996, 3013 in 1997, 1754 in 1998, 1616 in 1999, 2150 in 2000 and 3172 in 2001. Requested data included number of patients, age, sex, renal biopsy results, cause of ESRD, and cause of death.

Criteria used for diagnosing diabetic nephropathy included:

- long duration of diabetes before onset of chronic renal failure (usually more than 10 years)
- normal sized kidneys by ultrasound
- presence of diabetic retinopathy by fundus examination
- absence of haematuria or red blood cell casts in urine
- proteinuria still present when the patient has already started dialysis.

The data collected were processed using an IBM-compatible PC and *SPSS*, version 6.1 for statistical analysis.

Results

The prevalence of diabetic nephropathy among ESRD patients in Egypt increased from 8.9% in 1996 to 14.5% in 2001 (Figure 1).

The main causes of ESRD in Egypt other than diabetic nephropathy included hypertensive kidney disease, chronic glomerulonephritis, undetermined etiology, reflux and chronic pyelonephritis, schistosomal obstructive uropathy and schistosomal nephritis (Table 2).

The mean age of patients with diabetic nephropathy was higher than that of patients having other causes of ESRD in the years we studied (Table 3). Mortality among diabetic patients with ESRD was higher than in patients with ESRD from other causes (Figure 2).

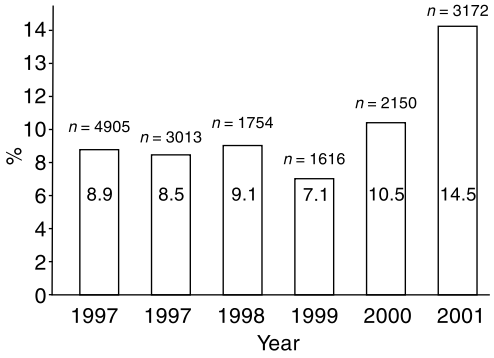

Figure 1 **Prevalence of diabetic nephropathy among Egyptian patients with end-stage renal disease, 1996–2001**

Discussion

The prevalence of diabetes in adults worldwide was estimated to be 4.0% in 1995 and is predicted to rise to 5.4% by the year 2025. It is higher in industrialized than in developing countries. The number of adults with diabetes in the world is forecast to rise from 135 million in 1995 to 300 million in the year 2025. Most of this increase will occur in developing countries [*26*].

A series of surveys of diabetes mellitus have been performed in Egypt using World Health Organization criteria for diagnosis and classification. Average prevalence for people above the age of 10 years was 4.3%, with distinct geographical differences: 5.7% in urban areas, 4.1% in rural agricultural areas, and 1.5% in rural desert areas. In some remote villages, diabetes was almost completely absent [*22*]. A more recent study in Egypt revealed that the prevalence of diabetes in rural areas was

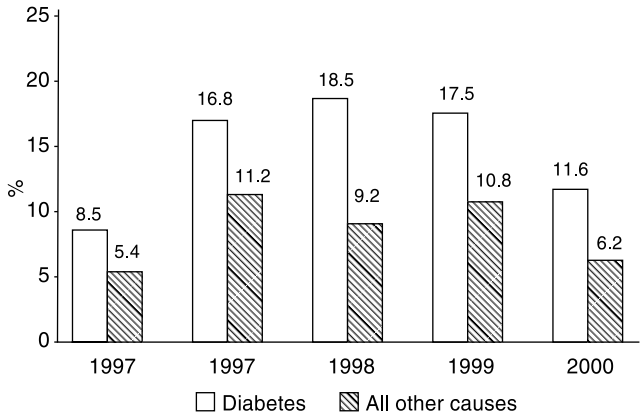

Figure 2 **Cause of mortality among diabetic and non-diabetic Egyptian patients with end-stage renal disease**

4.9%, increasing to 13.5% in lower socioeconomic urban areas and 20% in higher socioeconomic urban areas [*23*].

Diabetic nephropathy is the commonest cause of ESRD in industrialized countries [*26*]. All countries with registries have reported a massive increase in the incidence and prevalence in their dialysis population. This increase is caused by an actual increase in prevalence of diabetes, increasing age of the dialysis population and better survival rates for patients with diabetes, thus allowing more time for diabetic nephropathy to develop [*2*].

In Egypt, the estimated prevalence of ESRD increased from 225 per million pop-

Table 3 **Mean age of diabetic nephropathy patients and patients with end-stage renal disease (ESRD) from other causes**

Year	Diabetic nephropathy		Other causes of ESRD		*P*-value
	Mean age (years)	SD	Mean age (years)	SD	
1996	55.7	9.9	44.6	14.1	> 0.001
1997	54.9	11.4	44.9	16.8	> 0.001
1998	54.2	15.1	45.2	15.3	> 0.001
1999	56.6	11.6	45.4	15.3	> 0.001
2000	56.1	10.9	45.2	15.5	> 0.001
2001	56.5	29.2	46.1	16.1	> 0.001

SD = ***standard deviation.***

Table 3 **Main causes of end-stage renal disease in Egypt other than diabetic nephropathy**

Year	Main causes of end-stage renal disease							
1996	Hypertension: 28.0%	Chronic glomerulonephritis: 16.6%	Undetermined 16.2%	Chronic pyelonephritis: 14.6%	Obstructive uropathy: 9.3%	Diabetic nephropathy: 8.9%	Schistosomal obstructive uropathy: 6.0%
1997	Hypertension: 19.6%	Chronic glomerulonephritis: 13.2%	Undetermined: 12.5%	Chronic pyelonephritis: 10.4%	Diabetic nephropathy: 8.5%	Schistosomal obstructive uropathy: 7.6%	Obstructive uropathy: 7.5%
1998	Undetermined: 22.1%	Hypertension: 21.0%	Chronic glomerulonephritis: 11.0%	Obstructive uropathy: 9.5%	Diabetic nephropathy: 9.1%	Schistosomal obstructive uropathy: 6.7%	Chronic pyelonephritis: 5.5%
1999	Hypertension: 23.6%	Undetermined: 18.4%	Chronic glomerulonephritis: 13.9%	Obstructive uropathy: 9.2%	Chronic pyelonephritis: 7.8%	Diabetic nephropathy: 7.1%	Adult polycystic: 4.3%
2000	Hypertension: 23.5%	Undetermined: 21.8%	Chronic glomerulonephritis: 12.4%	Diabetic nephropathy: 10.5%	Chronic pyelonephritis: 7.4%	Obstructive uropathy: 6.0%	Schistosomal obstructive uropathy: 4.0%
2001	Hypertension: 22.1%	Diabetic nephropathy: 14.5%	Chronic glomerulonephritis: 12.4%	Undetermined: 12.1%	Chronic pyelonephritis: 5.6%	Obstructive uropathy: 5.1%	Schistosomal obstructive uropathy: 4.4%

ulation in 1996 [*25*] to 375 per million in 2001 [*1*]. We found that the prevalence of diabetic nephropathy as a cause of ESRD increased from 8.9% of patients in 1996 to 14.5% in 2001. The mean age of diabetic nephropathy patients was higher than that of patients with ESRD due to other causes for the years studied.

Mortality among diabetic patients with ESRD in Egypt is higher than mortality for all other causes of ESRD which is probably related to the well known cardiovascular complications of diabetes (Figure 2).

Conclusions

Diabetic nephropathy is the commonest cause of ESRD in the industrialized countries. In Egypt, there is a slower increase in the prevalence of ESRD due to diabetic nephropathy, probably because of the higher incidence of infections causing glomerulonephritis, delayed referral to nephrologists and increased mortality among diabetic patients due to cardiovascular disease and strokes before ESRD can develop.

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