Epidemiological Study of End Stage Renal Disease at Ain Shams University Hospital. A Five Year Retrospective Study

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Abstract: ***Introduction*;** End stage renal disease (ESRD) has become a worldwide health concern. In developing countries, accurate data registry about epidemiology of dialysis patients which allows easy statistical analysis and determination of the size of the problem for future plans, are lacking. ***The aim of this work*** was to study the incidence rate, clinical, laboratory and demographic data of all patients diagnosed as having ESRD & the incidence rate of its different causes in Cairo, Egypt. ***Patients & methodology;*** Data of 1600 patients were collected retrospectively from the registered data of the nephrology department of Ain Shams University adult hospital, over a period of five years. ***Results;*** demographic data showed that the mean age of ESRD patients was 52.5±15.3 years, females were 51.3%, with 70% coming from urban areas, 11.9% had a positive family history of chronic kidney disease, 22% were smokers & 2.3% were chronic analgesic abusers. As regards the co-morbid conditions, (54.7%) were hypertensives, (34.3%)were diabetics, (7.9%) had chronic liver disease, Systemic Lupus Erythematosus was found in (3.4%).The two main causes of ESRD were hypertensive nephrosclerosis (27%) and diabetic nephropathy (24.6%), whereas (16.6%) had ESRD of unknown etiology. The incident rate of new patients starting dialysis treatment at Ain Shams University hospital between January 2005 and December 2009 was increasing from 257 patients/year in 2005 to 381 patients/year in 2009. The mean age of ESRD patients was increasing, from 51.7±15.6 years in 2005 to 53 ± 15.7 years in 2009. The incidence of hypertensive nephrosclerosis and chronic pyelonephritis decreased from 2005 to 2009, while the incidence of diabetic nephropathy, lupus nephritis increased with a highly significant statistical difference. Positive HCV Ab was found in (25.8%) of patients, being more common in males & in patients coming from urban areas with a highly significant statistical difference. Ultra-sonography showed bilateral shrunken kidney in (45.7%) followed by normal sized kidney in (35.6%), stones ± hydronephrosis (10.1%). Hypertensive nephrosclerosis was the main cause of ESRD in cases of bilateral shrunken kidney, diabetic nephropathy in normal sized kidney (52.6%), and polycystic kidney disease in cases of enlarged kidney (86.3%).**Conclusion:-** Hypertensive nephrosclerosis and diabetic nephropathy were the main causes of ESRD in Ain Shams University hospital. The incidence of new patients starting dialysis was increasing through the study years, with a decrease in the incidence of hypertensive nephrosclerosis, chronic pyelonephritis and analgesic nephropathy and an increase in the incidence of diabetic nephropathy and lupus nephritis.

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Keywords: Epidemiology, ESRD, Egypt, nephropathy, lupus nephritis, HCV.

1. Introduction

End stage renal disease (ESRD) has become a worldwide health concern. In developing countries, accurate data registry about epidemiology of dialysis patients which allows easy statistical analysis and determination of the size of the problem for future planes, are lacking.

The aim of this work was to study the clinical, laboratory and demographic data of all patients diagnosed as ESRD at Ain Shams University hospital**.**

2. Patients and methodology

A) Patients:-

All patients diagnosed as having ESRD at Ain Shams University adult hospital between January 2005 and December 2009 were included in this study.

B) Methods:-

Data were collected from the hospital renal unit registry including:

- Full history including age, sex, residence, special habits of medical importance, co-morbid conditions and family history.
- Pelvi-abdominal ultrasonographic findings.
- Serum creatinine & blood urea nitrogen at onset of dialysis.
- Hbs Ag, HCV Ab & HIV Ab at onset of dialysis.
- Modality of renal replacement therapy used at onset of dialysis.
- Presumed cause of ESRD diagnosed based on specific criteria for each one;

Hypertensive nephrosclerosis was diagnosed when there was progressive renal failure in a patient with

long-standing hypertension, moderate proteinuria, and no evidence suggesting an alternative diagnosis. [1]

Diabetic nephropathy when long history of diabetes mellitus (usually more than 10 years), persistent proteinuria, presence of diabetic retinopathy, normal sized kidney on ultrasound and absence of any other kidney or renal tract disease.[2]

Obstructive uropathy: made on imaging studies including pelvi-abdominal ultrasound, spiral CT scan & dynamic renal scan. [3]

Chronic glomerulonephritis: based on the presence of history & laboratory evidence of microscopic hematuria, proteinuria associated with hypertension, and kidney biopsy.[4]

Chronic pyelonephritis based on history of recurrent urinary tract infection, urine analysis & imaging studies such as ultrasound or CT scanning showing pelviureteric dilatation and reduced renal size. [5]

Polycystic kidney disease: Diagnosis is obtained by ultrasound imaging of kidney cysts, ultrasound imaging of cysts in other organs and family history.[6]

Analgesic nephropathy: Diagnosis suggested by patients who admitted long-term analgesic abuse confirmed sometimes with relative accuracy by papillary calcifications on CT imaging. [7]

Lupus nephritis: when there was a history or laboratory data suggestive of SLE disease with kidney affection (red cell casts and proteinuria) or renal biopsy proven. [8]

Interstitial nephritis: It was characterized by polyurea, nocturea, eosinophiluria, proteiuria, microscopic hematuria and sterile pyuria & confirmed in some cases with renal biopsy.[9]

Renal amyloidosis: confirmed by renal biopsy.[10]

Myeloma kidney: confirmed by the presence of an M-component in serum and/or urine plus clonal plasma cells in the bone marrow and/or a documented clonal plasmacytoma[11]. **Gouty nephritis:** diagnosed by history of gout, elevated serum & urinary uric acid +/- history of uric acid stones.[12] **Ischemic nephropathy:** Old age with extrarenal atherosclerosis with asymmetrical kidney size +/- renal angiography for atherosclerotic renal artery stenosis[13].

Statistical methodology:

The statistical package of social signs (SPSS, version 17) and Microsoft Excel to perform the analysis were used. Quantitative data were expressed as mean + standard deviation while categorical data were expressed as a number and percentage with a *p*-value (unequal variances) <0.05 being statistically significant.

3.Results

Demographic data showed that the mean age of ESRD patients was 52.5±15.3 years, females were 51.3%, with 70% coming from urban areas, 11.9% had a positive family history of chronic kidney disease, 22% were smokers & 2.3% were chronic analgesic abusers.

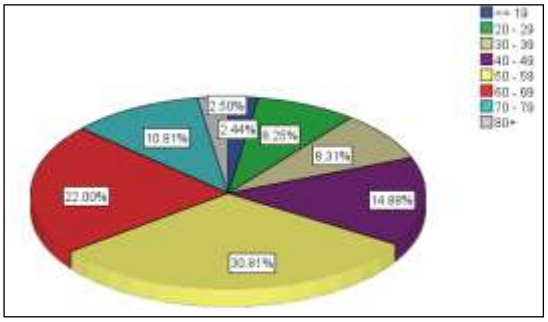

Figure (1) Age classification of the studied group:

As regards the co-morbid conditions, (54.7%) were hypertensives, (34.3%)were diabetics, (7.9%) had chronic liver disease, (5.4%) were known to have a cardiac disease, Systemic Lupus Erythematosus was found in (3.4%) and (24.8%) had no co-morbidities at time of diagnosis of ESRD.

Table (1) Socio-demographic characteristics of the studied group:

		No.	Percent(%)
Sex	Male	780	48.7%
	Female	820	51.3%
Age (years)	Mean ± SD	52.5±15.3	
	Min.	15	
	Max.	88	
Residence	Urban	1128	70.5 %
	Rural	472	29.5 %
Family history of chronic kidney disease	Positive	191	11.9 %
	Negative	1409	88.1 %
Special habits	No special habits	1205	75.3 %
	Smoking	353	22 %
	Chronic analgesic intake	37	2.3 %
	Drug addiction	4	0.3 %
	Alcohol	1	0.1 %

Table (2) Co-morbidities of the studied group:

	Frequency	Percent (%)
No comorbidities	397	24.8 %
Hypertension	876	54.7 %
Diabetes Mellitus	549	34.3 %
Chronic liver disease	126	7.9 %
Cardiac disease	87	5.4 %
SLE	54	3.4 %
Cancer bladder	14	0.8 %
Monoclonal gammopathies	13	0.8 %
Gout	5	0.4 %
Renal cell carcinoma	4	0.2 %
Others	55	3.1 %

Other co-morbidities were (n= 55, 3.1%) as follows: osteoarthritis (n=14, 0.8%), chronic obstructive pulmonary disease (n=14, 0.8%), peptic ulcer (n=7, 0.4%), bilharziasis (n=7, 0.4%), epilepsy (n=4, 0.2%), leukemia (n=3, 0.2%), hypothyroidism (n=2, 0.1%), tuberculosis (n=2, 0.1%) and thalasemia (n=2, 0.1%).

The main two causes of ESRD were hypertensive nephrosclerosis (27%) and diabetic nephropathy (24.6%), other causes were obstructive uropathy (9.9%), chronic glomerulonephritis (7.2%), chronic pyelonephritis (3.6%), lupus nephritis (3.4%), polycystic kidney disease (2.8%) and analgesic nephropathy in (1.9%) whereas (16.6%) had ESRD of unknown etiology.

Table (3) Causes of ESRD among the studied group:

	Frequency	Percent %
Hypertensive nephrosclerosis	432	27.0%
Diabetic nephropathy	393	24.6%
Unknown etiology	266	16.6%
Obstructive uropathy	159	9.9%
Chronic glomerulonephritis	115	7.2%
Chronic pyelonephritis	58	3.6%
Lupus nephritis	55	3.4%
Polycystic kidney disease	44	2.8%
Analgesic nephropathy	30	1.9%
Ischemic nephropathy	13	0.8%
Renal Amyloidosis	9	0.5%
Myeloma kidney	7	0.4%
Others	19	1.2%
Total	**1600**	**100 %**

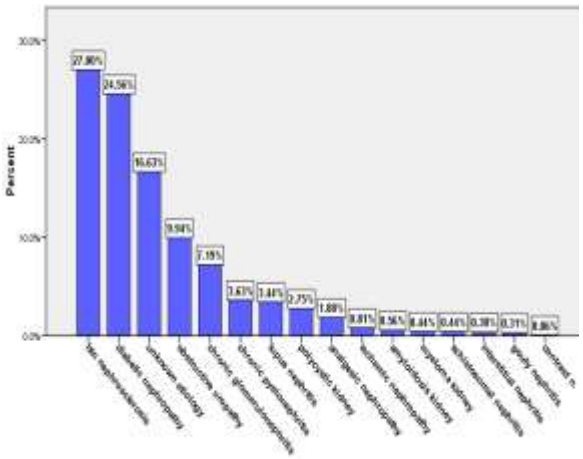

Figure (2) Causes of ESRD among the studied group:

Certain etiologies were more common in females, as hypertensive nephrosclerosis (27.3%), diabetic nephropathy (30.7%) and lupus nephritis (5.6%) while other causes were more common in males, as obstructive uropathy (14.8%), chronic glomerulonephritis (8.3%).

Table (4) Causes of ESRD according to the gender:

Causes	Male n (%)	Female n (%)	Total n (%)	Chi square test	P value
Hypertensive nephrosclerosis	208 (26.7%)	224 (27.3%)	432 (27%)	0.09	0.77 NS
Diabetic nephropathy	141 (18.1%)	252 (30.7%)	393 (24.6%)	34.55	<0.001 HS
Unknown etiology	151 (19.4%)	115 (14%)	266 (16.6%)	8.21	0.004 HS
Obstructive uropathy	115 (14.8%)	44 (5.4%)	159 (9.9%)	39.28	<0.001 HS
Chronic glomerulonephritis	65 (8.3%)	50 (6.1%)	115 (7.2%)	2.99	0.08 NS
Chronic pyelonephritis	26 (3.3%)	32 (3.9%)	58 (3.6%)	0.37	0.54 NS
Lupus nephritis	9 (1.2%)	46 (5.6%)	55 (3.4%)	23.91	<0.001 HS
Polycystic kidney	24 (3.1%)	20 (2.4%)	44 (2.8%)	0.61	0.44 NS
Analgesic nephropathy	13 (1.7%)	17 (2.1%)	30 (1.9%)	0.36	0.55 NS
Ischemic nephropathy	4 (0.5%)	9 (1.1%)	13 (0.8%)	1.70	0.19 NS
Renal amyloidosis	6 (0.8%)	3 (0.4%)	9 0.6%)	1.17	0.28 NS
Myeloma kidney	5 (0.6%)	2 (0.2%)	7 (0.4%)	1.45	0.23 NS
Others	13 (1.7%)	6 (0.8%)	19 (1.2%)	2.98	0.08 NS
Total	**780 (100%)**	**820 (100%)**	**1600(100%)**		

In the age groups < 19 years and 20-29 years, unknown etiology was the main cause of ESRD; (51.3%) and (27.3%) respectively. In the age groups 30-39 years, 40-49 years and 70-79 years hypertensive

nephrosclerosis was the main cause of ESRD (26.3%), (32.8%) and (38.2%) respectively. In the age groups 50-59 years, 60-69 years and more than 80 years diabetic nephropathy was the main cause of ESRD (34.1%), (33%) and (25%) respectively. As regards other etiologies; obstructive uropathy was more common in the age group <19 years (12.8%), chronic glomerulonephritis, chronic pyelonephritis, lupus nephritis were more common in the age group 20-29 years (19.7%), (6.1%) and(20.5%) respectively, and finally, analgesic nephropathy was more common in the age group 50-59 years (3.2%).

Table (5) The causes of ESRD within age groups:

Causes	Total number and percentage of cases in different age groups (Years)								
	< 19	**20–29**	**30–39**	**40-49**	**50-59**	**60-69**	**70-79**	**>80**	**Total**
Unknown etiology	20(51.3%)	36(27.3%)	30(22.6%)	36(15.1%)	69 (14%)	36(10.2%)	32(18.5%)	7(17.5%)	266(16.6%)
Hypertensive nephrosclerosis	0	11(8.3%)	35(26.3%)	78(32.8%)	129(26.2%)	104(29.5%)	66(38.2%)	9(22.5%)	432 (27%)
Diabetic nephropathy	3 (7.7%)	8 (6.1%)	5 (3.8%)	50 (21%)	168(34.1%)	116 (33%)	33(19.1%)	10 (25%)	393(24.6%)
Obstructive uropathy	5 (12.8%)	6 (4.5%)	8 (6%)	30(12.6%)	41(8.3%)	44 (12.5%)	21(12.1%)	4(10%)	159 (9.9%)
Chronic glomerulonephritis	6 (15.4%)	26(19.7%)	18(13.5%)	12(5%)	24 (4.9%)	15 (4.3%)	10 (5.8%)	4 (10%)	115 (7.2%)
Chronic pyelonephritis	1(2.6%)	8 (6.1%)	3 (2.3%)	7 (2.9%)	18 (3.7%)	12 (3.4%)	8 (4.6%)	1 (2.5%)	58 (3.6%)
Lupus nephritis	4 (10.3%)	27(20.5%)	15(11.3%)	8 (3.4%)	1 (0.2%)	0	0	0	55 (3.4%)
Polycystic kidney	0	1(0.8%)	3(2.3%)	6 (2.5%)	20 (4.1%)	10 (2.8%)	2 (1.2%)	2 (5%)	44 (2.8%)
Analgesic nephropathy	0	2 (1.5%)	1(0.8%)	4(1.7%)	16(3.2%)	6 (1.7%)	0	1(2.5%)	30(1.9%)
Ischemic nephropathy	0	3 (2.3%)	6(4.5%)	2(0.8%)	1(0.2%)	0	0	1(2.5%)	13(0.8%)
Renal amyloidosis	0	2(1.5%)	4(3%)	1(0.4%)	0	2(0.6%)	0	0	9(0.6%)
Myeloma kidney	0	1 (0.8%)	1(0.8%)	1(0.4%)	1(0.2%)	2(0.6%)	0	1(2.5%)	7(0.4%)
Others	0	1(0.8%)	4(3.1%)	3(1.2%)	5(1%)	5(1.5%)	1(0.6%)	0	19(1.2%)
Total	39	132	133	238	493	352	173	40	1600

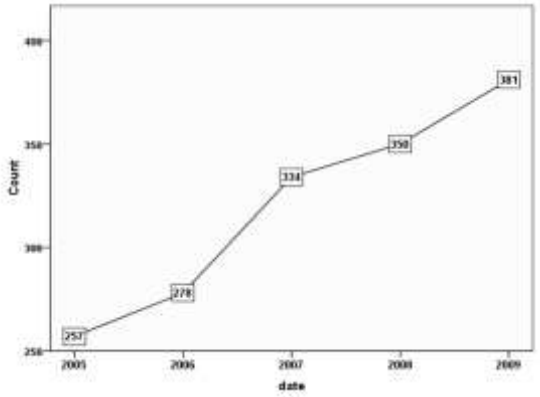

Figure (3) Trend in the number of new patients starting dialysis treatment at Ain Shams University hospital between January 2005 and December 2009:

The trend in the number of new patients starting dialysis treatment at Ain Shams University hospital between January 2005 and December 2009 was increasing from 257 patients in 2005 to 381 patients in 2009.

Renal replacement therapy:

The modalities of renal replacement therapy received while inpatients and at first time of dialysis were hemodialysis in 1491 patients (93.2%), peritoneal dialysis in 86 patients (5.4%) & both hemodialysis and peritoneal dialysis in 23 patients (1.4%). ***(Table 18)***

Table (6) Renal replacement therapy modalities of the studied group:

Modality	No. of patients	Percentage (%)
Hemodialysis	1491	93.2 %
Peritoneal dialysis	86	5.4 %
Both HD & PD	23	1.4 %

The trend in the mean age of ESRD patients in this study was increasing, from 51.7±15.6 years in 2005 to 53 ± 15.7 years in 2009.

Table (7) Trend in the mean age of ESRD patients among the studied group between January 2005 and December 2009:

	Date (Years)					
	2005	**2006**	**2007**	**2008**	**2009**	**Total**
Mean age (years)	51.74	51.64	52.69	53.09	53.01	52.52
±Std. Deviation	15.638	14.956	15.028	15.352	15.743	15.351

The trend of the prevalence of etiology of ESRD of the studied group between January 2005 and December 2009 detected a decrease in the prevalence of hypertensive nephrosclerosis from (33.9%) in 2005 to (25.7%) in 2009 and chronic pyelonephritis from (4.7%) in 2005 to (3.1%) in 2009, while the prevalence of diabetic nephropathy increased from (21.8%) in 2005 to (26.5%) in 2009, unknown etiology increased from (10.1%) in 2005 to (19.9%) in 2009 and lupus nephritis increased from (2.7%) in 2005 to (3.4%) in 2009, with a highly significant statistical difference**.**

Table (8) Trend in the prevalence of etiology of ESRD among the studied group:

	Number & percentage						
Causes	**2005**	**2006**	**2007**	**2008**	**2009**	***P* value**	**Significance**
Unknown etiology	26(10.1%)	39(14.0%)	59(17.7%)	66(18.9%)	76(19.9%)	0.000	**HS**
Hypertensive nephrosclerosis	87 33.9%	68 24.5%	93 27.8%	86 24.6%	98 25.7%	0.000	**HS**
Diabetic nephropathy	56 21.8%	70 25.2%	81 24.3%	85 24.3%	101 26.5%	0.000	**HS**
Obstructive uropathy	24 9.3%	30 10.8%	35 10.5%	35 10%	35 9.2%	0.000	**HS**
Chronic glomerulonephritis	20 7.8%	24 8.6%	19 5.7%	23 6.6%	29 7.6%	0.000	**HS**
Chronic pyelonephritis	12 4.7%	9 3.2%	9 2.7%	16 4.6%	12 3.1%	0.000	**HS**
Lupus nephritis	7(2.7%)	13(4.7%)	13(3.9%)	13(3.7%)	9(2.4%)	0.001	**HS**
Polycystic kidney	7(2.7%)	9(3.2%)	10(3%)	12(3.4%)	6(1.6%)	0.002	**HS**
Analgesic nephropathy	7 2.7%	5 1.8%	4 1.2%	6 1.7%	8 2.1%	0.001	**HS**
Ischemic nephropathy	3 1.2%	4 1.4%	3 0.9%	2 0.6%	1 0.3%	0.227	NS
Renal amyloidosis	0	6(2.2%)	2(0.6%)	0	1(0.3%)	0.000	**HS**
Myeloma kidney	2(0.8%)	0	1(0.3%)	1(0.3%)	3(0.8%)	0.047	NS
Others	6(2.4%)	1(0.4%)	5(1.5%)	5(1.5%)	2(6%)	0.000	**HS**
Total	257	278	334	350	381		

As regard their viral markers, positive HCV Ab was found in (25.8%) of patients, positive HBV Ag was found in (0.7%) of patients and positive HIV only in (0.1%) of patients, with a highly significant statistical difference (*p value = 0.000*) in the occurrence of HCV in males (57.5%) compared to females (42.5%) and a highly significant statistical difference *(p value= 0.001)* between urban and rural areas (64.3%) and (35.7%) respectively.

Table (10) Viral markers of the studied group at time of presentation:

		No.	**Percent (%)**
HCV Ab	Negative	1188	74.3 %
	Positive	412	25.8 %
HBS Ag	Negative	1589	99.3 %
	Positive	11	0.7 %
HIV	Negative	1599	99.9 %
	Positive	1	0.1 %

Table (11) Comparison between gender and residence as regard HCV Ab status:

			HCV Ab		*P* value	Sig.
			Negative (n=1188)	**Positive (n=412)**		
Gender	Male	N.	542	237	0.000	HS
		%	45.6%	57.5%		
	Female	N.	646	175		
		%	54.4%	42.5%		
Residence	Urban	N.	863	265	0.001	HS
		%	72.6%	64.3%		
	Rural	N.	325	147		
		%	27.4%	35.7%		
		%	16.0%	0.0%		

Table (12) Ultrasonographic findings among the studied group:

Kidney U/S	**Frequency**	**Percentage**
Bilateral shrunken kidney	731	45.7 %
Normal sized kidney	570	35.6 %
Stones ± Hydronephrosis	162	10.1 %
Unilateral shrunken kidney	81	5.1 %
Enlarged kidney	51	3.2 %
Unilateral absent kidney	5	0.3 %
Total	1600	100 %

Ultra-sonographic data of the studied group revealed the predominance of bilateral shrunken kidney (45.7%) followed by normal sized kidney (35.6%), stones ± hydronephrosis (10.1%), unilateral shrunken kidney (5.1%), enlarged kidneys in (3.2%) and unilateral congenitally absent kidney in (0.3%).

Hypertensive nephrosclerosis was the main cause of ESRD in cases of bilateral shrunken kidney and unilateral shrunken kidney (46.5%) and (35.8%) respectively, diabetic nephropathy was the main cause of ESRD in patients with normal sized kidney (52.6%), and polycystic kidney disease was the main cause of ESRD in cases of enlarged kidney (86.3%).

Table (13) Causes of ESRD in different ultrasonographic findings of the studied group:

	Number & percent					
Kidney U/S	Bilateral shrunken	Normal sized	Enlarged	Unilateral shrunken	Stones ± Hydronephrosis	Unilateral absent
Hypertensive nephrosclerosis (n=432)	340(46.5%)	56 (9.8%)	0	29 (35.8%)	7 (4.3%)	0
Diabetic nephropathy (n=393)	67 (9.2%)	300 (52.6%)	2 (3.9%)	18 (22.2%)	6 (3.7%)	0
Unknown etiology (n=266)	161 (22%)	79 (13.8%)	0	16 (19.8%)	6 (3.7%)	4 (80%)
Obstructive uropathy (n=159)	20 (2.7%)	13 (2.3%)	0	5 (6.2%)	121 (74.7%)	0
Chronic glomerulonephritis (n=115)	63 (8.6%)	39 (6.8%)	0	5 (6.2%)	8 (4.9%)	0
Chronic pyelonephritis (n=58)	28 (3.8%)	13 (2.3%)	0	4 (4.9%)	13 (8%)	0
Lupus nephritis (n=55)	20 (2.7%)	33(5.7%)	0	2 (2.5%)	0	0
Polycystic kidney (n=44)	0	0	44(86.3%)	0	0	0
Analgesic nephropathy (n=30)	17 (2.3%)	11 (1.9%)	0	1 (1.2%)	0	1 (20%)
Ischemic nephropathy (n=13)	2 (0.3%)	11 (1.9%)	0	0	0	0
Renal amyloidosis (n=9)	0	4 (0.7%)	5 (9.8%)	0	0	0
Myeloma kidney (n=7)	3 (0.4%)	4 (0.7%)	0	0	0	0
Others (n=19)	10 (1.4%)	7 (1.2%)	0	1 (1.2%)	1 (0.6%)	0
Total	**731**	**570**	**51**	**81**	**39**	**5**

4.Discussion

The incidence of ESRD requiring renal replacement therapy is steadily increasing and poses a tremendous burden on health care budget even in developed countries[14].Worldwide, according to USRDS the highest prevalence of ESRD was found in Taiwan by 2447 per million population (pmp) and the lowest prevalence was in Philippines (110 pmp), in United States it was 1811 pmp[15], in Europe it was 889 pmp[16].

In developing countries the figures vary from less than 100 pmp in sub-Saharan Africa and India to about 400 pmp in Latin America[17]. In Egypt, the prevalence of ESRD increased from 375 pmp in 2001, to 403 pmp in 2003 and then 483 pmp in 2004[18]. The majority of experts agree that 150 per million population is the average incidence of ESRD in developing countrie[17], which is less than in France, England and other developed countries; this may be due to early diagnosis and availability of dialysis in these developed countries.

The current work studied the clinical, laboratory and demographic data of all patients diagnosed as having ESRD at Ain Shams University hospital which is one of the major tertiary care hospitals in Cairo, Egypt, where the department of Internal Medicine consists of 764 beds with a total number of about 42771 admissions per year. Data of 1600 patients were collected retrospectively from the registered data in the nephrology department, over a period of five years, between January 2005 and December 2009. According to the current study, the mean age of new patients starting dialysis was 52.5±15.35 years *(Table 1)*, which has been increased during the period of the study *(Table 7)*, from 51.7±15 years in 2005, to 53±15 years in 2009, while *Afifi*[18] reported that the mean age of ESRD patients in Egypt in 2004 was 48.8 years (which has been increased from 45.6 years in 1996 to 49.8 years in 2008). Increasing the mean age of ESRD patients reflects the improvement of health care, however we are still away from the developed countries as the mean age in the United States was 61.1 years[15], in United Kingdom it was 65.9 years [19] and in France it was 70.4 years[20].

In the current study, ESRD was slightly more common in females (n=820, 51.3%) than males (n=780, 48.7%) *(Table 1)*, while in Japan, *Nakai et al.,*[21] detected male predominance by (64%) Vs (36%) in females. The predominance of female patients is probably due to more life expectancy in females than males, higher prevalence of NIDDM in females and death of diabetic male patients prior to the start of dialysis. [12]

In this study, patients from urban areas were more than rural areas (70.5% Vs 29.5%) *(Table 1)*, while *Yadav et al.*[23] revealed that the patients in rural areas were more common than urban areas (60.8% Vs 39.2%) which may be due to lack of adequate health care in rural areas including delayed referral and presentation for ESRD care. This discrepancy may be due to location of our hospital in an urban area.

In this study, positive family history of chronic kidney disease was present in (n=191, 11.9%) *(Table 1)*, while it was (9.5%) in US[24] and (15.5%) in Poland[13]. These results strongly support the theory that familial predisposition contributes to ESRD development. [25]

In the current study, 353 patients (22%) were smokers *(Table 1)*, while United States Renal Data

System 2009 revealed that smokers were only (6.2%) of dialysis patients in the US. [26]

The incidence of ESRD was increasing between January 2005 and December 2009 (*Figure 3)*, there were 257 patients in 2005, 278 patients in 2006, 334 patients in 2007, 350 patients in 2008 and 381 patients in 2009. Worldwide, the number of ESRD patients treated with renal replacement therapy is rapidly increasing [27], in the UK the incidence of ESRD continues to rise at an approximate rate of 5–8% per year[28]. Increasing in ESRD prevalence is probably due to a rise in the incidence of DM, an aging population, improved survival from other diseases and wider acceptance criteria for renal replacement therapy.

The renal replacement therapy modalities at the start of dialysis in this study were hemodialysis (n=1491, 93.2%) and peritoneal dialysis (n=86, 5.4%) *(Table 6)*, while in China, *Yao et al.,* [29] reported that the percentage of patients on peritoneal dialysis was (18%) and in Latin America it was (23%) [30]. This big difference could be explained by the bad image of peritoneal dialysis in Egypt, as many patients and doctors were only aware of intermittent PD whereby terminal patients were dialyzed two to three times per week for at least 18 hours each time, via rigid and often painful catheters, with most patients eventually dying from peritonitis.

In the current study, hypertension and diabetes were the most common co-morbid conditions in patients with ESRD (54.7%) and (34.3%) respectively *(Table 2)*. In US, *Jay et al.,* [31] reported a prevalence of (72.4%) and (37.4%) for hypertension and diabetes respectively as a co-morbid conditions. These results may imply that patients presenting with symptoms of renal disease are simultaneously screened for and diagnosed with diabetes or hypertension. Chronic liver disease, as a co-morbid condition was present in (n=126, 7.9%), while in Amsterdam, *Jeannette et al* [32] reported that only (0.6%) had chronic liver disease, this is probably due to the higher incidence of HCV infection and schistosomiasis in our country which are predisposing factors for chronic liver disease.

In this study, hypertensive nephrosclerosis was the most common cause of ESRD (n=432, 27%) *(Table 3)*, while it was the second cause of ESRD in the United States (24%) after diabetic nephropathy (36.8%) [27] and less common in Europe accounting for (12%) [33], this may reflect better management of hypertension in these countries. It was more common in the age group 70-79 years (38.2%) (Table 5). It was more common in females (n=224, 27.3%) than males (n=208, 26.7%) (*p value=0.000*) *(Table 4)*. *Doğan et al.,* [34] proved that there is a negative correlation between skeletal muscle mass and both hypertensive nephropathy and retinopathy (females and elderly subjects show a decreased skeletal muscle mass compared to males and younger subjects). There was a decline in the trend of the prevalence of hypertensive nephrosclerosis in this study as it was (33.9%) in 2005 and (25.7%) in 2009 *(p value=0.000) (Table 8)*, this could be explained by better management of hypertension and increasing awareness about the difference between hypertension as a cause and as a co-morbid condition for ESRD.

Diabetic nephropathy in the current study was the second cause of ESRD (n=393, 24.6%) *(Table 3)*, while it was the first cause of ESRD in US (36.8%)[27], in Singapore (40.7%) [35] and in Qatar (48%)[36], more common in the age group 50-59 years (34.1%) *(Table 5)*. It was more common in females (n=252, 30.7%) than males (n=141, 18.1%) (*p* value=0.000) *(Table 4)*, while in India it was more common in males (22.5%) than females (6.2%)[37], many studies showed that females are more prone to develop diabetic nephropathy than males; may be due to pregnancy and oral contraceptive pills which are associated with worsening of diabetic complications as nephropathy. There was an increase in the trend of the prevalence of diabetic nephropathy in this study, as it was (21.8%) in 2005 then (26.5%) in 2009 (*p* value =0.000) *(Table 8)*, also *Afifi* [18] reported an increase in the prevalence of diabetic nephropathy from 8.9% in 1997 to 13.5% in 2008 and in China *Yao et al.,* [29] reported an increase from 9.9% in 2000 to 17.2% in 2005, this increase is caused by an actual increase in the prevalence of diabetes, increasing age of dialysis population and better survival rates for patients with diabetes thus allowing more time for diabetic nephropathy to develop.

Unknown etiology in this study consumed a significant proportion of causes of ESRD (n=266, 16.6%) *(Table 3)* while it was only (3.7%) in the US[38], this difference may be due to late presentation and decreased awareness about symptoms and signs of chronic kidney disease, or due to environmental factors such as drinking unsafe water and exposure to pesticides. Unknown etiology was more common in males (n=151, 19.4%) than females (n=115, 14%) (*p* value=0.000) *(Table 4)*, while in Japan it was more common in females 10.2% than males 10%[39]. There was an increase in the trend of the prevalence of unknown etiology, it was (10.1%) in 2005 and (19.9%) in 2009 (*p* value =0.000) *(Table 8)*, also in Japan detected an increase in its prevalence during the period 1983-2000.[39] We can attribute this increase to more exposure to environmental pollution and industrial poisoning which need further studies.

Obstructive uropathy in this study was found in (n=159, 9.9%) of patients *(Table 3)* while in US it was (4%) of patients[40], may be due to increased incidence of schistosomiasis and urolithiasis in Egypt. It was more common in males (n=115, 14.8%) than females (n=44, 5.4%) (*p value=0.000*) *(Table 4)*, this may be

due to the high incidence of benign prostatic hyperplasia and cancer prostate. In the age group < 19 years (12.8%) *(Table 5)* may be due to congential urethral stricture, congenital ureteropelvic junction or ureterovesical junction obstruction, vesicoureteral reflux and urolithiasis. Its prevalence was nearly constant during the period of the study, as it was (9.3%) in 2005 and (9.2%) in 2009. *(Table 8)*

Chronic glomerulonephritis in the current study was present in (n=115, 7.2%) of patients *(Table 3)* while it was only (1%) in the United States [25] which reflects the higher prevalence of bacterial, viral and parasitic infection in Egypt. Chronic glomerulonephritis was more predominant in males (n=65, 8.3%%) than females (n=50, 6.1%) (*p value=0.000*) *(Table 4)*, there is a fact that glomerulonephritis seems to happen twice as often in males as in females[41],It was more common in the age group 20-29 years (19.7%) *(Table 5)*;also in Australia the peak incidence was in the age group 20-40 years[3]. This age group is more prone to infectious diseases that are considered as risk factors for chronic glomerulonephritis such as syphilis, typhoid fever, mumps, measles and Henoch-Schönlein purpura. Prevalence of chronic glomerulonephritis was nearly constant during the period of this study as it was (7.8%) in 2005 and (7.6%) in 2009. *(Table 8)*.

Chronic pyelonephritis in the current study was present in (n=58, 3.6%) of patients *(Table 3)*. It was more predominant in females (n=65, 8.3%%) than males (n=50, 6.1%) (*p value=0.000*) *(Table 4)*, also in the US, chronic pyelonephritis was twice as common in females as it was in males[42]. Its prevalence has been decreased during the period of the study as it was (4.7%) in 2005 then (3.1%) in 2009 *(p value =0.000*) *(Table 8)*, this may be due to improvement in the management of conditions that increase the risk of chronic pyelonephritis with repeated urinary tract infections such as diabetes, kidney stones and urinary tract obstruction.

Lupus nephritis was present in (n=55, 3.4%) of patients *(Table 3)*, while in India it was (13.6%)[43]. In this study lupus nephritis was more common in females (n=46, 83,6%) than males (n=9, 16.4%) (*p value=0.000*) *(Table 4)*, this is because the overall prevalence of SLE is higher in females (female-to-male ratio of 9:1). It was more common in the age-group 20-29 years (20.5%) *(Table 5)*. Prevalence of lupus nephritis in this study was variable, in 2005 it was (2.7%), in 2006 (4.7%) and in 2009 it was (2.4%) (*p value =0.001*) *(Table 8)*. In the US, the prevalence of lupus nephritis was rising significantly [44] this means that doctors still not introduce the effective therapy for these patients and unable to prevent ESRD.

Polycystic kidney disease in this study was present in (n=44, 2.8%) of patients *(Table 3)* ,while in Australia it was (6%).[45]It was more common in males (n=24, 3.2%) than females (n=20, 2.4%) (*p value*=0.000) *(Table 4)*, but both sexes have an equal chance of inheriting the disease. It was more common in the age group above 80 years (5%) *(Table 5)* There was a decline in its prevalence as it was (2.7%) in 2005 then (1.6%) in 2009 (*p value =0.002*) *(Table 8)* .

Analgesic nephropathy in this study was present in (n=30, 1.9%) of patients *(Table 3)*, while it was only (0.2%) in the US [38]which reflects the awareness of people in the US about the risk of analgesics abuse and the need for more health education about their risk in Egypt. It was more common in females (n=17, 2.1%) than males (n=13, 1.7%) with a highly significant statistical difference (*p value=0.000*) *(Table 4)*, as more women than men take analgesics because of chronic headache or chronic joint pain. Its prevalence decreased from (2.7%) in 2005 to (2.1%) in 2009 with (*p value =0.001*) *(Table 8)*, this may imply that people in Egypt began to be aware about the risk of chronic analgesic intake.

As regards the most common cause of ESRD in each age group *(Table 5)* we found that, in the age groups < 19 years and 20-29 years, **unknown etiology** was the main cause of ESRD (n=20, 51.3%) and (n=36, 27.3%) respectively, followed by **chronic glomerulonephritis** (n=6, 15.4%) in the age group < 19 years (n=27, 20.5%). This is similar to a study by *Beladi et al.,* [46] which revealed that in patients less than 40 years of age, the most common cause of ESRD was unknown etiology (31%), followed by chronic glomerulonephritis (20.9%). This may be due to congenital structural anomalies including reflux, obstruction, hypoplasia, dysplasia and more liability for infections in younger persons.

In the age groups 30-39, 40-49 and 70-79 years, **hypertensive nephrosclerosis** was the main cause of ESRD (n=35, 26.3%), (n=78, 32.8%) and (n=66, 38.2%) respectively *(Table 5)*, this difference in the age groups reflects the difference in awareness and management of hypertension among people which can expose young individuals to earlier progression of ESRD, while diabetic nephropathy was the main cause of ESRD in the US in the age group 30-39 years [27]. In the age groups 50-59 and 60-69 years and those older than 80 years, **diabetic nephropathy** was the main cause of ESRD (n=168, 34.1%) and (n=116, 33%) respectively.

The prevalence of hepatitis C in this study was (25.8 %) *(Table 9)*, while it was (14.4%) in US[47]. The high prevalence of hepatitis C in Ain Shams University hospital may be attributed to the high prevalence of hepatitis C in general population. It was more common in males (n=237, 57.5%) than females (n= 175, 42.5%) (*p* = 0.000). The majority of patients with positive HCV Ab in this study were from urban areas (70.5%) which may explain the high proportion of hepatitis C in

urban areas than rural areas (n=265, 64.3%) and (n=147, 35.7%) respectively (p = 0.001) *(Table 10).*

Ultra-sonographic data of the studied group *(Table 11)* revealed the predominance of bilateral shrunken kidney (n=731, 45.7%) with hypertensive nephrosclerosis as a main cause (n=340, 46.5%) followed by normal sized kidney (n=570, 35.6%) with diabetic nephropathy as a main cause (n=300, 52.6%), stones ± hydronephrosis (n=162, 10.1%), unilateral shrunken kidney (n=81, 5.1%), mostly associated with hypertensive nephrosclerosis(n=29, 35.8%), enlarged kidney (n=51, 3.2%) (as polycystic kidney disease (n=44, 86.3%) and renal amyloidosis) and unilateral absent kidney in (n=5, 0.3%).

Conclusion:

The results of the present study demonstrated that hypertensive nephrosclerosis and diabetic nephropathy were the main causes of ESRD in Ain Shams University hospital similar to the developed countries, these two diseases together represented (51.6%) of patients. This causative role could be prevented to a great extent by an aggressive approach in controlling blood sugar and blood pressure.

In addition, significant proportion of patients with ESRD in this study was due to unknown etiology (16.6%), may be due to environmental factors such as drinking unsafe water, exposure to pesticides and using herbs for treatment, which deserve more efforts to discover possible causes .

The trend in the number of new patients starting dialysis treatment at Ain Shams University during the period of this study was increasing, probably due to a rise in the incidence of DM, an aging population, improved survival from other diseases and wider acceptance criteria for renal replacement therapy.

There was a decrease in the incidence of hypertensive nephrosclerosis, chronic pyelonephritis and analgesic nephropathy. On the other hand, there was an increase in that of unknown etiology and diabetic nephropathy.

In Egypt, the lack of government financial support has been a major obstacle to long-term successful peritoneal dialysis, also there is a need to improve patients' and doctors' awareness about peritoneal dialysis.

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