

## Epidemiology and risk factors of end stage renal disease in Aswan Governorate, Upper Egypt

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### Abstract

**Background:** end-stage renal disease (ESRD) has become a worldwide health concern. In developed countries, there is electronic data registry, which allows easy statistical analysis and determination of the size of the problem for future plans.

**Aim:** The aim of the study was to assess the prevalence rate, etiology, and risk factors for ESRD in Aswan governorate, Upper Egypt.

**Patients and Methods:** Our study was subjected to patients with end stage renal disease on maintenance hemodialysis. This case controlled longitudinal study was carried on 1000 patients with ESRD in Aswan governorate from June 2017 through June 2018.

**Results:** The etiology of ESRD was unknown in 13.7% of cases, whereas hypertension was responsible in 19.6% of cases, diabetic nephropathy in 19.5% of cases, Obstructive uropathy in 14.5% of cases, Glomerulonephritis in 7.1% of cases, Chronic Pyelonephritis in 5% of cases, Congenital in 4.9% of cases, Analgesic Nephropathy in 4.8% of cases, Pre eclampsia in 3.6% of cases, Poly Cystic Kidney in 3.3% of cases, Gouty Nephropathy in 2.5% of cases and lastly Lupus Nephritis in 1.5% of cases.

**Conclusion:** In Aswan Governorate, the most common cause of ESRD is hypertensive renal disease followed by diabetic nephropathy then Obstructive Uropathy followed by Unknown cause.

**Keywords:** End stage renal disease, Etiology of end stage renal disease

### Introduction:

Chronic Kidney Disease (CKD) refers to a condition in which kidney damage or decreased glomerular filtration rate (GFR) persist for three months or longer. This disease eventually leads to end-stage renal disease (ESRD); ESRD is actually the final stage of CKD<sup>(1)</sup>.

ESRD may be caused by: Diabetes which is the most common cause of ESRD responsible for approximately 44% of all kidney failure cases, Hypertension is the second leading cause accountable for about 28%<sup>(2)</sup>.

In Egyptians governorates, hypertension and diabetes were the most frequent causes of ESRD. In Cairo, the main cause of ESRD was hypertension (29.7%) followed by diabetes (12.5%); In Canal governorates, hypertension was the main cause of ESRD (27.3%), followed by diabetes (10.7%); and in the Minia governorate, hypertension (20%) was followed by diabetes (8%) as the main causes of ESRD<sup>(3)</sup>.

Progression of CKD is associated with a number of serious complications including increased incidence of cardiovascular disease,

anemia, metabolic bone disease and hyperlipidemia<sup>(4)</sup>.

Renal replacement therapy (RRT), through either dialysis or renal transplantation, is a lifesaving yet high-cost treatment for people with end-stage kidney disease<sup>(5)</sup>.

Costs for dialysis and renal transplantation are still unaffordable for most patients with ESRD. Since the cost burden has significantly increased, nephrology services should be changed from curative medicine to preventive medicine. Currently, the Egyptian Ministry of Health plans to have a detection and prevention program for chronic kidney disease<sup>(6)</sup>.

The presence of CKD worsens the prognosis of many non-renal diseases, in particular, CKD has been recognized as a major cardiovascular risk factor<sup>(7)</sup>.

Worldwide, the prevalence of end stage renal disease differs greatly. In Europe, the prevalence has increased from 760 pmp in 2004 to 899 pmp in 2008<sup>(8)</sup>.

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 25518 , however, the last statistics was performed in 2004, with a prevalence of 483 pmp<sup>(9)</sup>.

**Aim of the work:**

The aim of the study is to assess the prevalence rate, etiology, and risk factors for end stage renal disease (ESRD) in Aswan governorate, upper Egypt.

**Patients and Methods**

This study was consisted of 1000 patients with ESRD on regular haemodialysis; we exclude patients with acute renal failure and CKD patients not on regular haemodialysis. **The study was approved by the Ethics Board of Al-Azhar University.**

**All studied individuals were subjected to:**

- 1- Full medical history include: Age, Sex, BMI, and risk factors (Diabetes, Hypertension, Chronic glomerulonephritis, chronic pyelonephritis, Urinary tract obstruction, polycystic kidney disease, and auto immune disease).
- 2- Clinical examination.
- 3- Investigations include: CBC & Serum urea, creatinine and uric acid & Serum calcium and phosphorus & Serum albumin &ESR &ECG & Pelvi-abdominal ultrasound & Hepatitis marker and HIV &Urine analysis.

**Statistic analysis:**

Study design: Cross Sectional Study. Data were analyzed by Microsoft office (Excel) and statistical package for social science. Parametric data will be expressed as mean ± SD and non parametric data were expressed as number and percentage of the total.

a- Descriptive statistics:

- 1) Mean.
- 2) Standard deviation (SD).
- 3) Minimum and maximum values.

b- Analytical statistics

Using p value to compare tow independent means taking into consideration that: P value = level of significance. P > 0.05= non significant & P<0.05= significant & P < 0.01= highly significant. Parametric data was expressed as mean ± SD and non parametric data was expressed as number and percentages of the total.

**Results**

This study was conducted on 1000 patients with ESRD on regular haemodialysis in Aswan governorate, Upper Egypt. They were 605 males and 395 females .Their ages ranged from 7 to 85 years with mean ±SD of (50.38±14.41) years. Their BMI ranged from 11.11 to 39 with mean ±SD of (22.93 ± 5.06)%.

**Table (1):** Mean ±SD of demographic data of all studied groups

Demographic data	Mean ±SD
Age (Range) Year	50.38±14.41 (7 – 85 )
Sex Male/Female % (No.)	60.5 /39.5 (605/395)
BMI (Range)	22.93 ± 5.06 ( 11.11 – 39 )

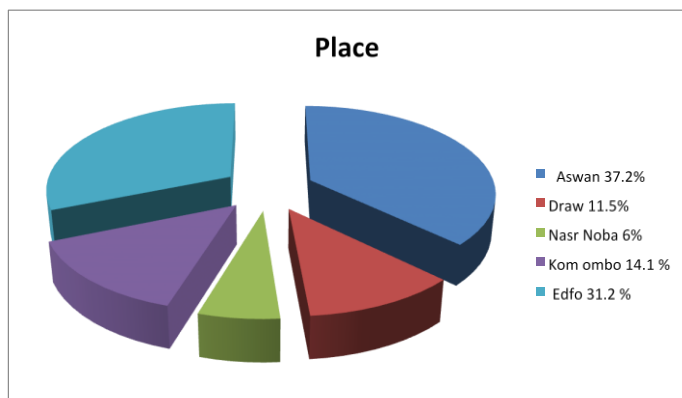
**BMI:** body mass index                      **SD:** standard deviation

Table (1) show demographic data of all patients, the age ranged between 7 to 85 years with mean ± SD of (50.38±14.41) years, they were 605 male (60.5%) and 395 female (39.5%), their BMI ranged from (11.11 – 39) with mean ± SD (22.93 ± 5.06).

**Table (2):** Numbers and percentage of cases according to place:

Place	Number	Percentage (%)
Aswan	372	37.2
Draw	115	11.5
Nasr Noba	60	6
Komombo	141	14.1
Edfo	312	31.2
<b>Total</b>	1000	100

Table (2) shows the distribution of the studied sample regarding the location. The highest percentage was at Aswan city center (37.2%) with 372 case & followed by Edfo center (31.2%) with 312 case & then Komombo center ( 14.1% ) with 141 case & then Draw center ( 11.5 % ) with 115 case &the lowest percentage was in Nasr Noba center ( 6 % ) with 60 case .

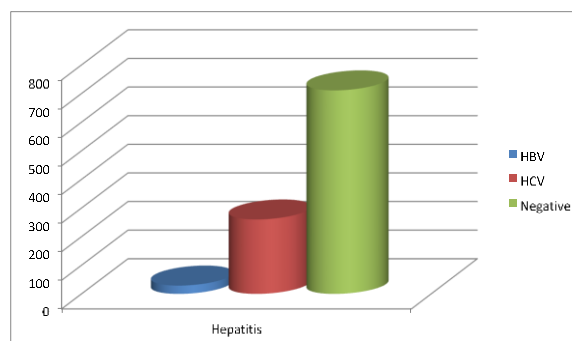


**Figure (1):** Distribution of all cases place

**Table (3):** Incidence of HCV&HBV in ESRD patients

Hepatitis	Number	Percentage (%)
HBV	29	2.9
HCV	260	26
Negative	711	71.1
Total	1000	100

This table show the Percentage of HCV & HBV in all studied patient and demonstrate that HCV& HBV appears in 260& 29 patient with a percentage of ( 26% ) & ( 2.9% ) respectively , while there's 711 patient with a percentage of ( 71.1 % ) are negative ( don't have HCV or HBV ) of the total 1000 studied patient.



**Figure (2):** Incidence of HCV&HBV in ESRD patients

**Table (4):** Number and percentage distribution of hepatitis B and C virus infection among the patients of end-stage renal disease (Aswan, Upper Egypt ) (N = 1000)

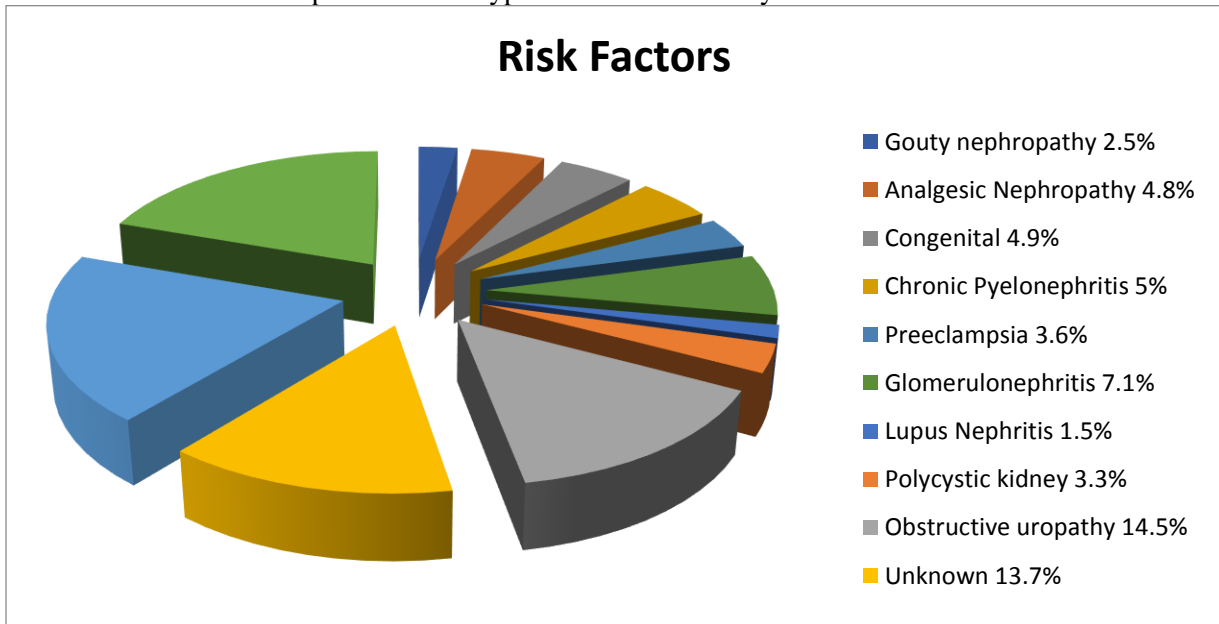
Place	Negative		HCV		HBV		X2	P value
	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)		
Aswan	289	28.9	76	7.6	7	0.7	100.5	<0.001*
Draw	68	6.8	30	3	17	1.7		
Nasr Noba	51	5.1	9	0.9	0	0		
Komombo	79	7.9	62	6.2	0	0		
Edfo	224	22.4	83	8.3	5	0.5		

This table shows the prevalence rate of hepatitis B and C viruses among the ESRD patients studied. There was a highly significant difference between the districts of Aswan governorate in the prevalence rates of hepatitis B and C and negative B and C (P < 0.001). It was found that 26 % of patients had hepatitis C, 2.9 % had hepatitis B, and 71.1 % did not have hepatitis B and C.

Table(5): Risk Factors of ESRD in all Cases

Risk factors	Number	Percentage (%)
Gouty nephropathy	25	2.5
Analgesic Nephropathy	48	4.8
Congenital	49	4.9
Chronic Pyelonephritis	50	5
Preeclampsia	36	3.6
Glomerulonephritis	71	7.1
Lupus Nephritis	15	1.5
Polycystic kidney	33	3.3
Obstructive uropathy	145	14.5
Diabetes Mellitus	195	19.5
Hypertension	196	19.6
Unknown	137	13.7
<b>Total</b>	1000	100

This table show risk factors of ESRD in all studied 1000 patients on regular haemodialysis where the risk factors were hypertensive nephrosclerosis ( 19.6 % ) & diabetic nephropathy ( 19.5% ) & Obstructive Uropathy ( 14.5 % ) & Unknown causes ( 13.7% ) & Glomerulonephritis ( 7.1 % ) & Chronic Pyelonephritis ( 5 % )& Congenital ( 4.9 % ) & Analgesic Nephropathy ( 4.8 % ) & Pre eclampsia ( 3.6 % ) & Poly Cystic Kidney ( 3.3 % ) & Gouty Nephropathy ( 2.5 % ) and lastly Lupus Nephritis by ( 1.5 % ).The main risk factor in all patients were hypertension followed by diabetes mellitus .



Figure(3): Risk Factors of ESRD in all Cases

Table (6): Risk factors of ESRD in each city

	Aswan		Draw		Nasr Noba		Kom ombo		Edfo		P value
	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	
Gouty nephropathy	11	2.95	5	4.35	0	0	4	2.84	5	1.6	0.351
Analgesic Nephropathy	22	5.9	7	6.09	4	6.67	2	1.42	13	4.17	0.155
Congenital	16	4.3	5	4.35	3	5	11	7.8	14	4.49	0.562
Chronic Pyelonephritis	16	4.3	5	4.35	0	0	4	2.84	25	8.01	0.031
Preeclampsia	10	2.7	2	1.74	0	0	10	7.09	14	4.49	0.056
Glomerulonephritis	30	8.1	10	8.7	2	3.33	5	3.54	24	7.69	0.27
Lupus Nephritis	6	1.6	4	3.48	1	1.66	1	0.71	3	0.96	0.346
Polycystic kidney	17	4.57	0	0	3	5	3	2.13	10	3.21	0.082
Obstructive uropathy	36	9.67	14	12.18	7	11.67	25	17.73	63	20.19	0.002
Diabetes Mellitus	84	22.58	22	19.13	19	31.67	27	19.15	43	13.78	0.006
Hypertension	85	22.85	22	19.13	15	25	28	19.86	46	14.74	0.081
Unknown	39	10.48	19	16.5	6	10	21	14.89	52	16.67	0.125
Total	372	100	115	100	60	100	141	100	312	100	

This table shows risk factors of ESRD among haemodialysis patients in each city, as follow:

In Aswan city center, hypertensive nephrosclerosis (22.85%) followed by Diabetic Nephropathy (22.58%) then Unknown causes (10.48%).

In Draw Center, Diabetic Nephropathy and Hypertensive nephrosclerosis the same with (19.13%) then Unknown causes (16.5%).

In Nasr Noba Center, Diabetic Nephropathy (31.67%) followed by Hypertensive Nephrosclerosis (25%) then Obstructive Uropathy (11.67%).

In Komombo Center, Hypertensive Nephrosclerosis (19.86%) followed by Diabetic Nephropathy (19.15%) then Obstructive Uropathy (17.73%).

In Edfo Center, Obstructive Uropathy (20.19%) followed by Unknown causes (16.67%) then Hypertensive nephropathy (14.74%).

### Discussion

Chronic renal disease is a public health problem with epidemiological, social, and economic implications. In developed countries there is electronic data registry which allows easy statistical analysis and determination of the size of the problem for future plans. In developing countries there is no data registry and only few

data were available about epidemiology of dialysis patients<sup>(10)</sup>.

The results of the present study showed that the prevalence of treated ESRD in males was almost twice that of females (60.5% vs 39.5%). This male predominance among the ESRD population, almost a global phenomenon, is poorly explained, with males constituting 56% according to **US (United States) Renal Data System (USRDS)**<sup>(10)</sup> in the US, and 54.5% in the KSA (Kingdom of Saudi Arabia)<sup>(11)</sup>.

In the present study the mean age was  $50.38 \pm 14.41$  years. The mean age in Egypt increased from 45.6 years in 1996 to 49.8 years in 2008(9). Increasing mean age of ESRD patients reflects the improvement of health care however we still away from developed countries as mean age in United State was 61.1 years according to **USRDS**<sup>(10)</sup> and median age in United Kingdom (UK) was 65.9 years<sup>(12)</sup>.

Etiology of treated ESRD in the current study was hypertension in about 19.6% of the causes of treated ESRD in the area of Aswan Governorate. In Sudan, hypertension was responsible for about 26% of the causes of treated ESRD<sup>(13)</sup>. Similarly, hypertension was the cause of treated ESRD in 28% of ESRD cases in the US according to **USRDS**<sup>(10)</sup>. In Iran, the most common cause of treated ESRD among HD

patients was hypertension (30.5%)<sup>(14)</sup>, but this is likely an overestimate as the diagnosis of hypertensive nephrosclerosis is difficult to ascertain even in patients with long-standing hypertension. Such patients may have had secondary hypertension due to undiagnosed kidney disease.

Hypertension was the cause of kidney failure in 21% of patients on renal replacement therapy (RRT) in the South African registry<sup>(15)</sup>. Hypertension is responsible for 20% of the causes of treated ESRD in El-Minia Governorate in Egypt, and in El- Menofia governorate, Egypt, the main known cause of ESRD was hypertension (34.8 %) followed by diabetes (16.6 %)<sup>(3)</sup>. A similarly wide variation is noted in the reported rates of hypertension as the primary cause of ESRD patients in the US and UK (28% and 5.8%, respectively), this according to **UK Renal Registry**<sup>(16)</sup> and **USRDS**<sup>(10)</sup>.

Diabetic nephropathy was responsible for 19.5% of causes of ESRD in the current study, while the prevalence of diabetic nephropathy is estimated to be 14-16% in South Africa, 23.8% in Zambia, 9% in Sudan, and 6.1% in Ethiopia<sup>(15)</sup>. In Egypt, the prevalence of diabetic nephropathy among ESRD patients is 14.5%<sup>(9)</sup>.

In the present study the unknown cause of ESRD accounts for 13.7% of all causes of ESRD. It was estimated to be 27 % in Minia governorate, 18.1 % in Cairo governorate<sup>(3)</sup>, and all over Egypt it was estimated to be 15.2 %<sup>(9)</sup>.

Chronic glomerulonephritis (GN) was 7.1 % in our study. In Sudan, GN was the reported cause of treated ESRD in 5.5% of the patients<sup>(13)</sup>, 3.9% in the US<sup>(10)</sup> while in Kuwait it for accounts 32 % of causes of ESRD<sup>(17)</sup>. In El-Minia Governorate it accounts for 11% of causes of ESRD, 15.8% in Cairo Governorate, and 2.5% in Canal Governorates<sup>(3)</sup>.

In the current study, obstructive uropathy is responsible for 14.5 % of ESRD on HD. In many Arab countries, obstructive uropathy constitutes a major cause (40%) of ESRD<sup>(18)</sup>.

Chronic pyelonephritis accounts for 5% of ESRD in El-Minia Governorate<sup>(3)</sup>, as in our study it accounts 5 % and in US it accounts 0.8%<sup>(10)</sup>, which reflects the high prevalence of bacterial, viral and parasitic infections such as schistosomiasis in our locality.

In the US, according to the **USRDS**<sup>(10)</sup>, analgesic nephropathy was seen in only 0.2% of patients<sup>(10)</sup> while it was 4.8% in the current study; this reflects awareness of the people themselves in the US about the risk of excessive intake of analgesics.

In the current study, polycystic kidney accounted for 3.3% of causes of ESRD, congenital kidney diseases occur in 3.3 per 1000 births (80% of which are due to hydronephrosis)<sup>(18)</sup>. Polycystic kidney disease can be prevented through genetic counseling and premarital screening.

In this study the prevalence of hepatitis C was found to be 26 % among patients with ESRD on HD. The high prevalence of hepatitis C is due to high rate of blood transfusion in dialysis units and it was estimated to be 52% in Egypt<sup>(9)</sup>, 54.4 % in Syria<sup>(19)</sup>, 21 % in Jordan<sup>(20)</sup>, 18.9 % in Saudi Arabia<sup>(21)</sup>, and 31.4 % - 51 % in Turkey<sup>(22)</sup>.

In evaluation of our result, we didn't find a proper registry system if any. Also, we could not find clear detected data in registry; which is poor in different dialysis units; regarding the care which is given to ESRD patients on HD. No results of biopsies done for patients were found. Also, we could not find registry of laboratory results in most of dialysis units.

### **Conclusion**

In Aswan Governorate, the most common cause of ESRD is hypertensive renal disease followed by diabetic nephropathy then Obstructive Uropathy followed by Unknown cause. Most of hemodialysis units in Aswan Governorate don't have a proper registry which could be an interfering factor accounting for the high rate of ESRD of unknown cause. This can be explained by the presence of environmental factors, undiagnosed chronic hypertension, and chronic GN.

### **Recommendation**

- We recommend a unified local electronic data registry for each governorate in Egypt to constitute the national registry.
- We recommend to initiate a registry system in the units of hemodialysis in Aswan Governorate This will help proper follow up of patients, proper research works and proper preventive programs of ESRD.

- we recommend proper campaign activities for detection and treatment of diabetes mellitus and hypertension in the community which may be of value in early detection of hypertensive and diabetic patients, which are usually diagnosed late after complications are there.
- Early detection of GN and good control of diabetes mellitus should lead to a reduction in the incidence and prevalence of ESRD in Aswan governorate.
- More effective prevention, intervention, and early detection programs for CKD are needed.
- Early referral to nephrologists can lead to an early intervention.
- Kidney biopsy may be useful in some of the undiagnosed cases and should be performed early before kidney scarring.
- A peritoneal dialysis program along with both living and deceased kidney transplant programs are also recommended.

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