

## **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 health issue worldwide. There is electronic data registry in developed countries, which allows for quick statistical analysis and assessment of the issue size for future planning.

**Objective:** The aim of the study was to assess the prevalence rate, etiology, and risk factors for end stage renal disease (ESRD) in Aswan governorate, Upper Egypt, during the period from June 2017 to June 2018.

**Patients and methods:** Our study was subjected to Patients with end stage renal disease on maintenance hemodialysis. This cross sectional study was carried on 1000 patients with ESRD in Aswan governorate from June 2017 to June 2018

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

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

**Keywords:** End stage renal disease, end stage renal disease etiology

### **INTRODUCTION**

Chronic Kidney Disease (CKD) refers to a disorder in which kidney damage or reduced glomerular filtration rate (GFR) occurs for three months or longer, this disease ultimately progresses to end-stage renal disease (ESRD), ESRD is in reality the final stage of CKD <sup>(1)</sup>.

End Stage Renal Disease (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>.

Hypertension and diabetes were the most common causes of ESRD in Egyptian governorates. Hypertension (29.7%) followed by diabetes (12.5%) was the main cause of ESRD in Cairo; hypertension was the main

cause of ESRD in Canal Governorates (27.3%), followed by diabetes (10.7%); and hypertension was (20%) followed by diabetes (8%) as the main cause of ESRD in El-Minya Governorate <sup>(3)</sup>.

CKD development is associated with a variety of serious complications including increased cardiovascular disease occurrence, anemia, metabolic bone disorder, and hyperlipidemia <sup>(4)</sup>.

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

The cost of renal transplantation is still unaffordable for most ESRD patients. Nephrology services should be changed from curative medicine to preventive medicine,

since the cost burden has increased significantly. A program for the identification and prevention of chronic kidney disease is currently being planned by the Egyptian Health Ministry<sup>(6)</sup>. The involvement of CKD exacerbates the prognosis of other non-renal disorders, CKD has been identified as a significant risk factor for cardiovascular disease<sup>(7)</sup>.

The prevalence of end-stage renal disease varies widely around the world. The prevalence in Europe rose from 760 patients per million (pmp) populations in 2004 to 899 pmps in 2008<sup>(8)</sup>.

Egypt, a North African developing nation, had a total population of 68 million in 2001. Throughout that year, the total number of dialysis patients throughout Egypt was 25518, although the last figures were carried out in 2004, with a prevalence of 483 pmp<sup>(9)</sup>.

#### **AIM OF THE WORK:**

Our study aimed to assess the prevalence rate, etiology, and risk factors for end-stage renal disease (ESRD) in Upper Egypt's Aswan Governorate during the period from June 2017 to June 2018.

#### **PATIENTS AND METHODS:**

This study was consist of 1000 patients with ESRD on regular hemodialysis, we exclude patients with acute renal failure and CKD patients not in regular hemodialysis

#### **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, 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.

#### **Statistical analysis:**

Study design: our study was Cross Sectional Study. Data will be analyzed by Microsoft office (Excel) and statistical package for social science. Parametric data will be expressed as mean +- SD and non-parametric data will be 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  $\pm$  SD and non-parametric data was expressed as number and percentages of the total.

#### **Ethical Statement:**

We confirm that this study is consistent with international ethical standards and the applicable local regulatory guidelines. The study has no physical, psychological, social, legal, economic or other expected risks to the study participants. Participants in the study were informed of objectives, methods, risks and benefits. A written informed consent has been obtained from every qualifying patient in the study. Our study was conducted in accordance with the Declaration of Helsinki for studies on human subjects. It was approved by institutional review board of The Faculty of Medicine, Aswan University.

**RESULTS**

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

**Table (1):** Mean  $\pm$ SD of demographic data of all studied groups.

| Demographic data | Mean $\pm$ SD                 |
|------------------|-------------------------------|
| Age \Y           | 50.38 $\pm$ 14.41 (7 – 85)    |
| Sex ♂ /♀ %       | 60.5 /39.5 (605/395)          |
| BMI %            | 22.93 $\pm$ 5.06 (11.11 – 39) |

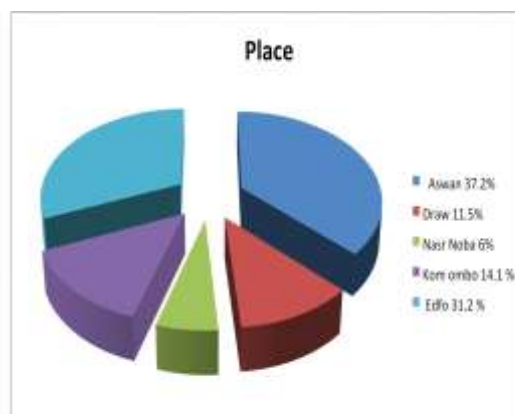
BMI :body mass index SD : standard deviation

This table show demographic data of all patients, the age ranged between 7 to 85 years with mean  $\pm$  SD of (50.38 $\pm$ 14.41) years., they were 605 male (60.5%) and 395 female (39.5%), their BMI ranged from (11.11 – 39%) with mean  $\pm$  SD (22.93  $\pm$  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              |
| Kom ombo  | 141    | 14.1           |
| Edfo      | 312    | 31.2           |
| Total     | 1000   | 100            |

This table show 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 Kom Ombo 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.

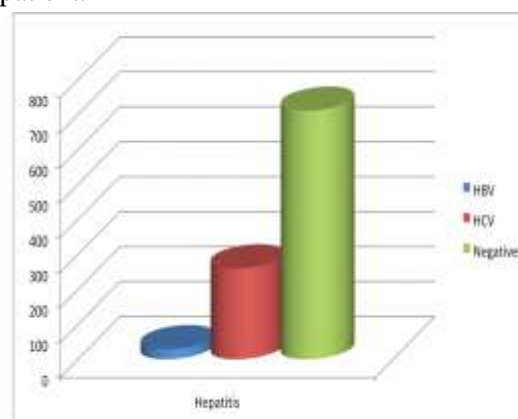


**Figure (1):** Distribution of all cases place.

**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 percentage of (26%) & (2.9%) respectively, while there's 711 patient with 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              |       |         |
| Kom Ombo  | 79       | 7.9            | 62     | 6.2            | 0      | 0              |       |         |
| Edfo      | 224      | 22.4           | 83     | 8.3            | 5      | 0.5            |       |         |

This table illustrates the prevalence rate of hepatitis B and C viruses among the patients studied with ESRD. There was a very significant difference in prevalence rates of hepatitis B and C and negative rates of B and C ( $P < 0.001$ ) between the districts of Aswan governorate. It was found that 26% of patients had hepatitis C, 2.9% had hepatitis B and 71.1% had neither hepatitis B nor hepatitis 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>           | <b>1000</b> | <b>100</b>     |

This table show risk factors of ESRD in all studied 1000 patients on regular hemodialysis 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 %), Preeclampsia (3.6 %), Poly Cystic Kidney (3.3 %), Gouty Nephropathy (2.5 %) and lastly lupus nephritis was (1.5 %). The main risk factor in all patients were hypertension followed by diabetes mellitus.

**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 hemodialysis patients in each city, as follow:

In Aswan city center, hypertensive nephrosclerosis was (22.85%) followed by Diabetic Nephropathy (22.58 %) then Unknown causes (10.48%). In Draw Center, diabetic nephropathy and hypertensive nephrosclerosis were (19.13 %) then unknown causes (16.5 %). In Nasr Noba Center, diabetic nephropathy was (31.67 %) followed by hypertensive nephrosclerosis (25 %) then obstructive uropathy (11.67 %). In Kom Ombo Center, hypertensive nephrosclerosis was (19.86 %) followed by diabetic nephropathy (19.15 %) then obstructive uropathy (17.73 %). In Edfo Center, obstructive uropathy was (20.19 %) followed by Unknown causes (16.67 %) then hypertensive nephropathy (14.74 %)

## DISCUSSION:

Chronic renal disease is an epidemiologically, socially and economically affected public health problem. In developed countries, there is electronic data registry which enables easy statistical analysis and determination of the problem size for future plans. There is no comprehensive record in developed countries and only a few comprehensive on dialysis-patient epidemiology is available. The findings of this study found that the prevalence of ESRD handled in males was almost double that of females (60.5 vs. 39.5 per cent). This male predominance among the ESRD population, almost a global phenomenon, is poorly explained, with males accounting for 56 percent in the United States (USRDS)<sup>(10)</sup> and 54.5 percent in the KSA (Kingdom of Saudi Arabia) according to United States Renal Data

System (USRDS)<sup>(11)</sup>. The mean age in this sample was  $50.38 \pm 14.41$  years. Egypt's median age increased from 45.6 years in 1996 to 49.8 years in 2008<sup>(9)</sup>. Increasing mean age of ESRD patients reflects improvement in health care, but we are still away from developed countries as the mean age in the U.S. was 61.1 years, according to USRDS<sup>(10)</sup> and the median age in the U.K. was 65.9<sup>(12)</sup>.

Hypertension in around 19.6 per cent of the causes of treated ESRD in the Aswan Governorate region was the etiology of treated ESRD in the current report. Hypertension in Sudan was responsible for around 26% of the causes of ESRD being treated<sup>(13)</sup>.

Similarly, according to USRDS, hypertension was the cause of treated ESRD in 28 per cent of US ESRD cases<sup>(10)</sup>. In Iran, hypertension (30.5 percent) was the most common cause of treated ESRD among HD

patients<sup>(14)</sup>, but this is possibly an overestimate because it is difficult to assess the diagnosis of hypertensive nephrosclerosis even in patients with longstanding hypertension. These patients may have kidney disease that is undiagnosed and induces secondary hypertension. Hypertension was the cause of kidney failure in South African registry<sup>(15)</sup> in 21 per cent of renal replacement therapy (RRT) patients. Hypertension accounted for 20 per cent of the causes of ESRD diagnosis in El-Minya Governorate in Egypt and the main known cause of ESRD was hypertension (34.8 per cent) followed by diabetes (16.6 per cent) in El-Menoufiya Governorate in Egypt<sup>(3)</sup>. According to USRDS<sup>(10)</sup> and UK Renal Registry<sup>(16)</sup>, the recorded hypertension levels as the primary cause of ESRD patients in the United States and the United Kingdom (28% and 5.8% respectively) are similarly varied. In the current report, diabetic nephropathy accounted for 19.5 percent of ESRD causes, while the prevalence of diabetic nephropathy is estimated at 14-16 percent in South Africa, 23.8 percent in Zambia, 9 percent in Sudan and 6.1 percent in Ethiopia<sup>(15)</sup>. In Egypt, diabetic nephropathy prevalence among patients with ESRD is 14.5 per cent<sup>(9)</sup>. The unknown causes of ESRD constitute 13.7 per cent of all causes of ESRD in the present report. This was projected to be 27 percent in the governorate of El-Minya, 18.1 percent in the governorate of Cairo<sup>(3)</sup>, and was projected to be 15.2 percent over Egypt<sup>(9)</sup>. Chronic glomerulonephritis (GN) was 7.1 percent in our study. In Sudan, GN was the reported cause of treated ESRD in 5.5 percent of the patients<sup>(13)</sup>, 3.9 percent in the US<sup>(10)</sup> while in Kuwait it for accounts 32 percent of causes of ESRD<sup>(17)</sup>. In El-Minya Governorate it accounts for 11 percent of causes of ESRD, 15.8 percent in Cairo Governorate, and 2.5 percent in Canal Governorates<sup>(3)</sup>.

In the current study, obstructive uropathy is responsible for 14.5 percent of ESRD on HD. In many Arab countries,

obstructive uropathy constitutes a major cause (40 percent) of ESRD<sup>(18)</sup>. In El-Minya Governorate<sup>(3)</sup>, chronic pyelonephritis accounts for 5% of ESRD, in agreement with our study which reported the same percent while in the US it accounts for 0.8%<sup>(10)</sup>, indicating the high prevalence of bacterial, viral and parasitic infections such as schistosomiasis in our locality.

According to the USRDS, analgesic nephropathy was seen in just 0.2 percent of patients<sup>(10)</sup> while in the current study it was 4.8 percent; this represents the consciousness of the people themselves in the US regarding the possibility of excessive analgesic consumption. In our study, Polycystic kidneys accounted for 3.3% of ESRD causes; congenital kidney disorders occur in 3.3 per 1000 births (80% due to hydronephrosis)<sup>(18)</sup>. Genetic therapy and premarital screening will prevent polycystic kidney disease.

Our study reported that the prevalence of hepatitis C in HD ESRD patients was found to be 26 per cent. Owing to the high blood transfusion rate in dialysis units, the high prevalence of hepatitis C was reported 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>.

We didn't find a suitable registry system to test our performance. Also, in the registry, we could not find consistent detected data; which is low in different dialysis units; concerning the treatment provided to HD patients with ESRD. There were no results of patient biopsies performed. Indeed, in most dialysis systems, we did not find registers with laboratory results.

#### **CONCLUSION:**

Hypertensive renal disease followed by diabetic nephropathy followed by obstructive uropathy followed by unknown causes is the most common cause of ESRD in Aswan Governorate. Many of Aswan Governorate's hemodialysis units lack a proper registry that could be an interfering factor accounting for

the unknown cause 's high ESRD rate. Which can be explained by environmental factors.

**RECOMMENDATION:**

- To constitute the national registry, we propose a single local electronic data registry for each Egyptian governorate. We recommend to initiate 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 appropriate campaigns for the detection and treatment of diabetes mellitus and hypertension in the community which may be of value in the early detection of hypertensive and diabetic patients, usually diagnosed late after complications.
- Early detection of GN and good diabetes mellitus control should lead to a reduction in the incidence and prevalence of ESRD in the governorate of Aswan.
- CKD services need more efficient prevention, intervention and early detection.
- Early referral can lead to early intervention by nephrologists.
- Kidney biopsy can be useful in some undiagnosed cases and should be performed early before scarring the kidneys.

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