

Epidemiology of End Stage Renal Disease Patients on Regular Hemodialysis in El-Beheira Governorate, Egypt

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ABSTRACT

Background: End Stage Renal Disease (ESRD) is associated with severe morbidity, mortality, high cost for management and different impacts on general health and patient wellbeing. Total number of ESRD patients requiring renal replacement therapy has been growing drastically.

Objective: the aim of the present work was to study the epidemiology of End Stage Renal Disease in one of the Egyptian areas in El Beheira Governorate, for getting some data about the distribution and most common causes of this disease. Identifying major risk factors on the onset of ESRD is an important part in preventing the development of ESRD. **Patients and Methods:** a cross-sectional study was conducted at dialysis centers in El Beheira Governorate, Egypt, by using questionnaire and direct interviewing technique with ESRD patients, in addition to using medical records for our data collections to identify major risk factors leading to ESRD.

Results: The prevalence of ESRD patients on regular hemodialysis in El Beheira Governorate, Egypt, was 571 pmp (0.057%). The causes of ESRD in the present study were hypertension (31.7%), diabetes mellitus (18.0%), obstructive nephropathy (10.8%), glomerulonephritis (4.5%), urinary tract infection (3.9%), Autosomal Dominant Polycystic Kidney Disease (ADPKD) (2.9%), unknown (21.6%) and other causes such interstitial nephritis (1.9%) and Systemic lupus erythematosus (1.5%).

Conclusion: It could be concluded that increase public awareness about kidney problems and also increase awareness among primary health care physician about the early detection and prevention of Chronic Kidney Disease (CKD) will help to identify a probable correctable cause and to prevent progression to CKD.

Keywords: Epidemiology of End Stage Renal Disease, Patients on Regular Hemodialysis, El Beheira Governorate, Egypt.

INTRODUCTION

End-stage renal disease (ESRD) is increasing worldwide. Renal replacement therapy (RRT) and kidney transplantation are increasing the burden on health systems. This condition is particularly serious in developing countries where health resources are inadequate⁽¹⁾.

Chronic kidney disease (CKD) is a progressive loss in renal function over a period of months or years. All individuals with glomerular filtration rate less than 60 mL/min/1.73 m² for 3 months or more are classified as having chronic kidney disease⁽²⁾.

Worldwide, the number of patients receiving RRT is estimated at more than 1.4 million, with the annual incident rate growing to 8%⁽³⁾.

ESRD has many causes that vary from one patient to another. The key risk factors for chronic kidney disease (CKD) are the increasing age of the population, diabetes mellitus and hypertension and medications, such as the use of analgesics regularly over long durations of time resulting in analgesic nephropathy and kidney damage. Polycystic kidney disease is an example of a hereditary cause of CKD⁽⁴⁾. In many Arab countries, obstructive uropathy constitutes a major cause of ESRD (40%). The two most common underlying causes are renal calculi and schistosomiasis. In many developing countries, chronic glomerulonephritis is often caused by infections and infestations, and is a leading cause of CKD⁽⁵⁾.

The body of evidence for other modifiable risk factors such as lifestyle factors is growing as some

studies suggest that tobacco use is positively associated with CKD⁽⁶⁾. Also, obesity seems to be an important and potentially preventable risk factor for chronic renal failure⁽⁷⁾.

ESRD is one of the main health problems in Egypt. Hemodialysis represents the main mode for treatment of CKD stage 5⁽⁸⁾.

According to 9th Annual Report of The Egyptian Renal Registry provided by Egyptian Society of Nephrology and Transplantation (ESNT), prevalence of ESRD in Egypt raised to 483 patients per million. Mean age is about 49.8 ± 19 years. Males represented 55.2 % while females were about 44.8 %. Only about 4 % of patients are HBV positive while HCV positive patients are about 52.1%⁽⁹⁾.

The aim of the present work was to study the epidemiology of End Stage Renal Disease in one of the Egyptian areas in El Beheira Governorate, and from this study we can get some data about the distribution and most common causes of this disease. Identifying major risk factors on the onset of ESRD is an important part in preventing the development of ESRD.

PATIENTS AND METHODS

This cross-sectional study was conducted at dialysis centers in El Beheira Governorate, Egypt, by using questionnaire and direct interviewing technique with ESRD patients, in addition to using medical records for our data collections.

Approval of the ethical committee and El Beheira Governorate health affairs and a written informed consent from all the subjects were obtained. This study was conducted between April 2018 to September 2018.

The total population of El Beheira governorate was about 6376326 out of them 3641 had end stage renal disease on regular hemodialysis at dialysis centers.

Inclusion criteria:

ESRD patients maintained on regular hemodialysis at dialysis centers of El Beheira Governorate, Egypt.

Exclusion criteria: Patients with:

- Acute renal failure.
- Stage 1-4 CKD patient under conservative treatment.
- Age under 16 years.

Instrumentation:

After conducting an extensive literature review on major risk factors of ESRD, data were collected via complementary questionnaire developed in native language of respondents (Arabic) that organized into four parts.

- **The first part** of the questionnaire included the objectives and the importance of the study.
- **The second part** included background information (Gender, Age, place of living, Smoking, Weight and Height). Body Mass Index (BMI) was calculated by person's weight in kilograms divided by height in meters squared ($BMI = \text{kg}/\text{m}^2$).
- **The third part** was devised to collect information about the patient's family history, (diabetes mellitus, hypertension, cardiovascular diseases, kidney diseases and ESRD).
- **The fourth part** collected information about patient's medical history (diabetes mellitus, Hypertension, Congenital abnormality, Kidney stone, Urinary tract infection, and Analgesic drug abuse). Renal biopsy was reviewed if available to know the possible etiology.

Field of Work:

Face to face interviews using a structured questionnaire have been conducted to patients at the hemodialysis units. The questionnaire collected comprehensive data on a wide range of issues related to risk factor of ESRD. We performed two to three visits per week to each center, and in each visit a direct interview was performed which took about 20 min for each patient.

Study questionnaire:

A questionnaire on the risk factor which lead to onset of End Stage Renal Disease. This study was designed to determine the risk factor which lead to

the development of kidney disease and access to the final stage that require dialysis, with the knowledge that this information will be used for the purposes of scientific research and will be treated strictly confidential, so your cooperation with us in completing this questionnaire will be appreciated.

Serial number ----- Date -----

Date start dialysis ----- The patient's medical file

The duration of dialysis (months) -----

Personal data:

1- Sex: _ Male _ Female

2- Date of Birth: Day ----- Month -----
Year -----

3- work: -----

4 - Place of residence: -----

5 - Are you a smoker?

No_ Yes_ * If the answer is yes

- at any age started smoking: -----

6 - the patient's weight at the start of dialysis: -----
-- patient's medical file

7 - The length of the patient at the start of dialysis: -
----- - patient's medical file

Family medical history:

8 - Is one of your family (father, mother, brother, sister) suffers from a disease?

* diabetes mellitus: No_ Yes_

* hypertension: No_ Yes_

* cardiovascular disease: No_ Yes_

* Kidney disease: No_ Yes_

* End Stage Renal failure: No_ Yes

Medical history of the patient:

9 - Do you suffer from diabetes mellitus before onset of End Stage Renal disease?

No_ Yes_ * If the answer is yes

- which type of diabetes affects the patient's: -----

- the date of diabetes onset: -----

- The type of treatment are taken: -----

10- Do you suffer from hypertension before onset of End Stage Renal disease?

No_ Yes_ * If the answer is yes

- the date of hypertension onset : -----

- The type of treatment are taken: -----

11 - Do you suffer from congenital defects in the kidney and urinary tract before onset of End Stage Renal Disease?

No_ Yes_ * If the answer is yes

- the type of congenital defects () the patient's medical file

12 - Do you suffer from kidney stones and urinary tract before onset of End Stage Renal Disease?

No_ Yes_

13 - Do you suffer from recurrent infections in the kidneys and urinary tract before onset of End Stage Renal Disease?

No_ Yes_ * If the answer is yes

- type of infections () the patient's medical file

14 - Do you got the End Stage Renal Disease suddenly?

No_ Yes_

15 - Do you got the End Stage Renal Disease gradually?

No_ Yes_

16 - Do you got a rise in blood urea and serum creatinine gradually?

No_ Yes_

17 - Do you take analgesic drug frequently?

No_ Yes_ * If the answer is yes

- type of medication intake () the patient's medical file

-The length of time the drug intake ()

18 - Did End Stage Renal Disease occur due to a hereditary disease?

No_ Yes_ * If the answer is yes

- type of disease () the patient's medical file

19 - Did End Stage Renal Disease as a result of other diseases?

No_ Yes_ * If the answer is yes

- type of disease () the patient's medical file

20 - Did End Stage Renal Disease as a result of an incident involving a patient?

No_ Yes_

21- The length of time on conservative treatment: --

Thank you for your cooperation

Data management and statistical analysis:

Data were collected, coded, revised and entered to the Statistical Package for Social Science (IBM SPSS) version 20. The data were presented as number and percentages for the qualitative data, mean, standard deviations and ranges for the quantitative data with parametric distribution and median with inter quartile range (IQR) for the quantitative data with non parametric distribution. *Chi-square test* was used in the comparison between two groups with qualitative data and *Fisher exact test* was used instead of the Chi-square test when the expected count in any cell found less than 5. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

P > 0.05: Non significant (NS)

P < 0.05: Significant (S)

P < 0.01: Highly significant (HS)

RESULTS

Table (1) shows that about (21.0%) of the ESRD patients were from Damanhour, (6.6%) were from Itay El Baroud, (6.5%) were from Com Hamada, (4.8%) were from Housh Eissa, (7.4%) were from Abou Homs, (13.9%) were from Kafr El Dawar, (5.0%) were from Rashid, (0.9%) were from Wadi Natrun, (7.7%) were from Delengat, (5.1%) were from Abou El Matamir, (3.4%) were from Mahmoudiyah, (1.6%) were from Arab Nubaria, (5.4%) were from Rahmaniyah, (3.6%) were from Badr, (3.0%) were from Shubrakhit and (4.1%) of ESRD patients were from Adco.

Table (1): Distribution of ESRD patients in cities of EL-Beheira Governorate:

City	No.	%
Damanhour	763	21.0%
Itay El Baroud	241	6.6%
Com Hamada	238	6.5%
Housh Eissa	176	4.8%
Abou Homs	270	7.4%
Kafr El Dawar	505	13.9%
Rashid	183	5.0%
Wadi Natrun	32	0.9%
Delengat	280	7.7%
Abou El Matamir	186	5.1%
Mahmoudiyah	124	3.4%
Arab Nubaria	59	1.6%
Rahmaniyah	195	5.4%
Badr	130	3.6%
Shubrakhit	110	3.0%
Adco	149	4.1%

Table (2) shows that 39.6% of patients were females and 60.4% were males. The mean of age were 52.80 ± 13.82 with range from 16 to 90 years. The mean of height were 166.26 ± 7.99 with range from 146 to 186 cm. The mean of weight were 75.63 ± 16.39 with range from 40 to 130 kg. The mean of duration of HD were 4.80 ± 4.33 with range from 0.25 to 21 years.

Table (2): Demographic data of patients:

		No.	%
Gender	Female	1442	39.6%
	Male	2199	60.4%
Age (years)	Mean \pm SD	52.80 ± 13.82	
	Range	16 – 90	
Height (cm)	Mean \pm SD	166.26 ± 7.99	
	Range	146-186	
Weight (kg)	Mean \pm SD	75.63 ± 16.39	
	Range	40-130	
Duration of HD (years)	Mean \pm SD	4.80 ± 4.33	
	Range	0.25-21	

Table (3) shows that 94.9% had AVF, 3.2 had temporally catheters, 1.5% had permicath catheters, and 0.5% had AVG.

Table (3): Distribution of vascular access among studied patients:

		No.	%
Vascular access	AVF	3454	94.9%
	AVG	18	0.5%
	Permicath	55	1.5%
	Temporally cath	114	3.2%

Table (4) shows that 18% had diabetes mellitus, 31.7% had hypertension, 10.8% had obstructive nephropathy, 4.5% had glomerulonephritis, 3.9% had urinary tract infection, 2.9% had ADPKD and 21.6% of patients reached ESRD with unknown etiology.

Table (4): Main causes of ESRD among studied patients:

		No.	%
Main cause of ESRD	UTI	139	3.9%
	DM	655	18.0%
	GN	165	4.5%
	Gout	23	0.6%
	Hereditary	67	1.8%
	HTN	1155	31.7%
	Interstitial	69	1.9%
	Obstructive	392	10.8%
	Polycystic	104	2.9%
	Reflux	31	0.9%
	SLE	56	1.5%
	Unknown	785	21.6%

GN = glomerulonephritis, DM = diabetes mellitus, Interstitial = interstitial nephritis, HTN = hypertension, Obstructive = obstructive nephropathy, Polycystic = ADPKD, UTI = urinary tract infection, SLE = systemic lupus erythematous, stones = renal stones, Reflux = reflux nephropathy.

Table (5) shows that there was statistically significant increase in males in comparison to females regarding smoking.

Table (5): Comparison between sex as regards smoking among studied patients:

		Female		Male		Chi square test	
		No.	%	No.	%	X ²	P value
Smoking	No	1439	99.80%	1988	90.40%	138.726	0.001
	Yes	3	0.20%	211	9.60%		

Table (6) shows that there was statistically significant difference between males and females regarding age.

Table (6): Comparison between sex as regards age among studied patients:

		Female		Male		Chi square test	
		No.	%	No.	%	X ²	P value
Age	<30	117	8.1%	119	5.4%	22.752	<0.001
	31-40	169	11.7%	335	15.2%		
	41-50	296	20.5%	402	18.3%		
	51-60	420	29.1%	617	28.1%		
	61-70	314	21.8%	536	24.4%		
	>70	126	8.7%	190	8.6%		

Table (7) shows that there was statistically significant difference between males and females regarding the main cause of ESRD.

Table (7): Comparison between sex as regards main cause of ESRD:

		Female		Male		Chi square test	
		No.	%	No.	%	X ²	P value
Main cause of ESRD	UTI	54	3.70%	85	3.90%	113.475	0.001
	DM	298	20.70%	357	16.20%		
	GN	72	5.00%	93	4.20%		
	Gout	2	0.10%	21	1.00%		
	Hereditary	28	1.90%	39	1.80%		
	HTN	427	29.60%	728	33.10%		
	Interstitial	21	1.50%	48	2.20%		
	Obstructive	116	8.00%	276	12.60%		
	Polycystic	34	2.40%	70	3.20%		
	Reflux	7	0.50%	24	1.10%		
	SLE	50	3.50%	6	0.30%		
	Unknown	333	23.10%	452	20.60%		

DISCUSSION

Patient registry and a statistical evaluation of patients with ESRD is useful to clarify the characteristics of ESRD patients and dialysis therapy, as well as the complications or results based on scientific evidence, to improve the quality of dialysis therapy and provide information for a future health plan ⁽¹⁰⁾.

The present work demonstrated that the prevalence of ESRD increases with aging, particularly after fiftieth and also showed that the prevalence of ESRD increased in men more than in women. In this study, the sample consisted of 60.4%

males, and 39.6 % females. The mean age of patients was 52.80 ± 13.82 years.

These results agree with study performed by **Yu et al.** ⁽¹¹⁾ who reported an increase in prevalence of CRF with ageing. Particularly after (50) years in both genders, and also with other study that was conducted in Japan, showed that males develop ESRD more than females ⁽¹²⁾.

Also, these results go in agreement with the study performed by **Zahran** ⁽¹³⁾, who showed in his study carried out to determine epidemiology of hemodialysis patients in Menofia governorate, where the mean age was 52 years.

In our study, the patients who have a regular habit of smoking composed (5.9%) of study sample, the percentage of male smokers was (4.8%), while female smokers were only (0.1%). These results can be explained that smoking as a habit in Egyptian society is not accepted for females. The study showed that there was no association of smoking on the onset of ESRD.

Study conducted in USA determined that smoking is not significant risk factors for ESRD. However other study conducted in Norway showed that smoking is significantly associated with ESRD ⁽¹⁴⁾.

Other studies conducted in nine centers in Germany, Italy and Austria to assess whether tobacco consumption increases the risk of ESRD showed that in men with inflammatory or non-inflammatory renal disease cigarette smoking significantly increases ESRD were IgA glomerulonephritis (IgA-GN) as a model of inflammatory renal disease and autosomal dominant polycystic kidney disease (ADPKD) as a model of non-inflammatory renal disease ⁽¹⁵⁾.

Such differences between the current study and other studies on the impact of variables of gender and age could be due to genetic or social differences between Egyptian community and other communities.

The causes of ESRD in the present study were hypertension (31.7%), diabetes mellitus (18.0%), obstructive nephropathy (10.8%), glomerulonephritis (4.5%), urinary tract infection (3.9%), ADPKD (2.9%), unknown (21.6%) and other causes such interstitial nephritis (1.9%) and Systemic lupus erythematosus (1.5%).

Hypertension is the major leading cause of ESRD regardless of etiology ⁽¹⁶⁾. The relationship between hypertension and renal damage can be interpreted in both ways; hypertension-associated renal damage would paradoxically originate from renal damage itself or, more precisely, from subtle, focal renovascular damage, where hypertension would be another mere consequence acting as a magnifying amplifier in this closed vicious circle ⁽¹⁷⁾.

This study confirms that there was highly significant effect of diabetes mellitus on onset of ESRD. These results agree with several other studies conducted in several countries that showed highly significant effect of diabetes mellitus on onset of ESRD. The main risk factor for impaired kidney function is diabetes mellitus type II ⁽¹⁸⁾.

In our study, the main known cause of ESRD was hypertension (31.7%) and diabetic nephropathy (18.0%). Both hypertension and diabetes mellitus were main risk factors for increasing incidence of ESRD in black men in USA. Studies showed that (30- 40%) of all patients with diabetes developed

nephropathy, ESRD, and necessitating dialysis or kidney transplantation ⁽¹⁴⁾.

In Egypt, the prevalence of DM as a cause of ESRD was increased from 8.9 % in 1997 to 13.5 % in 2008 still accounting the 2nd cause as hypertension is the main cause with 36.6% ⁽⁸⁾.

In some Egyptian governorates like Cairo, the main cause of ESRD was hypertension with 29.7% followed by DM with 12.5 %, in Canal governorates, hypertension was the main cause of ESRD with 27.3 % followed by DM with 10.7% and in El Minia governorate, the main cause was also hypertension with 20 % followed by DM 8% ⁽¹⁹⁾, in Menofia governorate, the main cause was also Hypertension with 34.8 % followed by DM 16.6% ⁽¹³⁾.

In this study unknown causes constitute 21.6% of all causes of ESRD. Uncertain etiology of ESRD was estimated to be 14.4 % in Iran ⁽²⁰⁾, 14 % in Qatar ⁽²¹⁾, and 19.9 % in Saudi Arabia ⁽²²⁾.

It was estimated to be 27 % in El Minia governorate and 18.1 % in Cairo governorate ⁽¹⁹⁾ and in Menofia governorate it was estimated to be 20.6 % ⁽¹³⁾ and in all Egypt the undetermined etiology was estimated to be 15.2 % ⁽⁸⁾.

Study conducted in Egypt showed that hypertension was responsible for (28%) of the cases of renal failure in Egypt. Other significant causes were: chronic glomerulonephritis (16.6%), ESRD of unknown etiology (16.2%), and obstructive nephropathy (9.3%) ⁽⁹⁾.

Glomerulonephritis is a progressive inflammatory disease that leads to the destruction of the glomeruli of the kidney, which gradually results in the loss of kidney function. Due to the gradual progression of the disease, it is usually detected during a routine medical test such as urine test to detect blood and protein but the disease is usually confirmed with a kidney biopsy. As a result, cases may not be detected early, which could lead to complications, including CKD ⁽²³⁾.

This study showed urinary tract infections have strong association on the onset of ESRD. This is due to several factors, notably lack of awareness among the people of the seriousness of kidney infections and urinary tract, as well as the recurrence of inflammation.

In addition, several other studies conducted in different country confirm that, there was a significant association between glomerulonephritis and other urinary tract infections with incident of ESRD ^(24, 25).

Genetic disease participates in total patients with ESRD. Polycystic Kidney Disease is the main genetic disease that causes ESRD with a percent of (2.9%). A study conducted in Egypt showed that

polycystic disease of the kidney was responsible for (4.3%) of the cases of ESRD ⁽²⁶⁾.

In this study, the prevalence of hepatitis C among hemodialysis patients was found to be 26.5 %, and the prevalence of hepatitis B among hemodialysis patients was found to be 0.8 %. The prevalence of hepatitis C in dialysis patients showed wide variations worldwide. It was estimated to be 52.1 in Egypt ⁽⁸⁾, 54.4 % in Syria⁽²⁷⁾, 21 % in Jordan ⁽²⁸⁾, 18.9 % in Saudi Arabia ⁽²⁹⁾, 31.4 % - 51 % in Turkey⁽³⁰⁾, 43 % in Kosovo ⁽³¹⁾, 9.83 % in Japan ⁽³²⁾ and 5.8% in Brazil ⁽³³⁾.

The high prevalence of hepatitis C among hemodialysis patients in El Beheira Governorate, Egypt, could be attributed to the high prevalence of hepatitis C in general population.

In our study, there were a few number of patients were prepared with permanent vascular access when started dialysis reflecting the lack of awareness of treating physician and primary health care physician about the proper time for referral to the nephrologists and may be lack of awareness of some nephrologists about the proper time for preparing patient for renal replacement therapy.

In our study, we found about great percentage of patients discovered their kidney problem when they required dialysis reflecting the lack of awareness of patients for proper time for seeking medical advice and also lack of awareness of primary health care physician about early detection and referral to nephrology specialists to identify a probable correctable cause and to prevent progression of CKD especially for those at high risk to develop CKD.

CONCLUSION

It could be concluded that increase public awareness about kidney problems and also increase awareness among primary health care physician about the early detection and prevention of Chronic Kidney Disease (CKD) will help to identify a probable correctable cause and to prevent progression to CKD.

RECOMMENDATION

- The cost of the advanced renal failure and RRT is enormous therefore, early diagnosis and optimal management of CKD affords many challenges for primary health care in helping to maintain health and quality of life among the population at risk.
- Early referral to nephrologist, more frequent pre ESRD care and routine checkup can decrease the number of patients who progress to ESRD.
- Proper control of hypertension and diabetes mellitus is an effective method to reduce the number of patients with ESRD.

- Proper management of obstructive uropathy and infections e.g. renal stones and pyelonephritis is an effective method to reduce the number of patients with ESRD.
- Proper search for the cause of CKD should be applied to every patient in El Beheira governorate to reduce the number of patients with idiopathic ESRD as its percentage is about 21.6%.
- El Beheira governorate is in need for kidney transplantation program.
- Establishment of unified local electronic data registry for each governorate to constitute the National registry and provide information for a future health plan.

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