Epidemiology of Chronic Renal Failure in Arar, KSA, 1436

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Abstract: A number of risk factors are associated with increasing prevalence of chronic end stage kidney disease with disease progression in many patients. Therefore, this study aimed at providing epidemiological data on the risk factors of chronic renal failure in Arar city, Kingdom of Saudi Arabia (KSA). **Objectives:** The objective of this study was to determine the risk factors for chronic renal failure in Arar City, the capital of the Northern Border area of Saudi Arabia. **Methodology:** The study is a case control (retrospective) study, Participants were the patients with End-stage renal disease (ESRD) on regular hemodialysis in the hemodialysis center of Arar central Hospital during 1436. Data were collected from the patients of chronic renal failure on hemodialysis (they were 69 patients) by personal interviews and filling of a questionnaire which includes the questions that guide us to the needed data. Data were also collected from the same number of matched age, sex and residence control group. Data were obtained after applying for ethical approval from the Ministry of Health & General Directorate of Health Affairs in the city. **Results:** largest number of them (27.5%) aged 50 and more years, 5.8% of cases were under 10 years and 11.6% of them from (10-20) years. Females are more than males (52.2% Vs 47.8%). Diabetes mellitus was common among cases 44.9% compared to control group (27.5%) (Odds ratio was 2.14). 56.5% of cases and 17.4% of controls were hypertensive (Odds ratio was 6.17), chronic glomerulonephritis was found in 65.2% of cases and in only 4.3% of controls (odds ratio was 41.25), repeated attacks of urinary tract infection (UTI) was found in 34.8% of cases and in 23.2% of controls (odds ratio was 1.76), congenital anomalies of urinary system were found in 5.8% of cases, recurrent urinary stones were found in 4.3% of cases and in 11.6% of controls (odds ratio was 0.34). About half (47.8%) of cases and only 4.3% of controls showed frequent administration of analgesics (odds ratio was 20.16). No urinary tract tumors found in cases or controls. 59.4% of cases have duration of dialysis for less than 4 years, while 13.0% of them on dialysis for 12 years and more.
Conclusion: This study was an effort to highlight the main risk factors that lead to ESRD. Identifying these major risk factors is an important part in preventing complications of developing ESRD. This study found that the main risk factors that lead to ESRD in Arar, KSA were chronic disease such as diabetes mellitus, hypertension, chronic glomerulonephritis, repeated attacks of urinary tract infection and frequent administration of analgesics.
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Key words: Chronic renal failure, ESRD, Hemodialysis, Risk factors.

1. Introduction:

ESRD has emerged as an important public health issue worldwide, because of the marked increase in its incidence and prevalence[1]. Despite the great progress in diagnosis of end-stage renal disease (ESRD) and the delivery of renal replacement therapy (RRT) the number of patients with chronic renal failure is increasing both nationally[2], and internationally[3]. End-stage chronic renal disease (ESRD) is a significant problem in Saudi Arabia. In 1986, the prevalence of ESRD was 139 per million people[4]. The number of patients receiving hemodialysis therapy in Saudi Arabia has increased by approximately 10 to 15-fold since 1983, with an estimated annual increase of approximately 8.6%[5]. The risk factors for chronic kidney disease (CKD) are

increasing in the Saudi population. Consequently, the incidence and prevalence of ESRD have increased substantially in Saudi Arabia over the past three decades[6]. Many studies have shown that a long duration of pre-ESRD Nephrology care, which is the period between the first time the patient has been seen by a nephrologist and the first dialysis[5], has a significant effect on the quality of life and survival rate in patients with ESRD before and after receiving renal replacement therapy (RRT)[7]. ESRD has many causes that vary from one patient to another. The key risk factors for chronic kidney disease are the increasing age of the population, diabetes mellitus II and hypertension**.** The most common causes include the following, Uncontrolled hypertension can damage the kidneys over time; glomerulonephritis is the inflammation and damage of the filtration system of the kidney and can cause kidney failure. Polycystic kidney disease is an example of a hereditary cause of chronic kidney disease where both kidneys have multiple cysts, Medications such as the use of some analgesics regularly over long durations of time can cause analgesic nephropathy and kidney damage, Atherosclerosis leading to ischemic nephropathy, can cause kidney damage, and obstruction of the urinary tract by stones or cancer or enlargement of the prostate and then strictures may cause kidney damage[8]. Diabetes mellitus type I and type II because diabetic nephropathy, that leads to kidney failure. Diabetes is the largest single cause of ESRD in the United Kingdom, accounting for 30– 40% of all cases[9]. Obese American people have up to a seven times greater risk of kidney failure than non-obese people, suggesting that obesity should be considered a risk factor for ESRD[10].

The treatment alternatives for ESRD include hemodialysis, peritoneal dialysis, and kidney transplantation. Kidney transplantation is the surgical procedure of placing a fully functioning kidney into a person with ESRD. This procedure is usually an elective one, performed in patients who have undergone careful preoperative assessment and preparation the transplanted kidney may originate from a deceased donor or from a related or unrelated person[11]. Dialysis is the most common treatment for End Stage kidney failure, replacing the impaired filtering ability of the kidneys. Eventually, most patients with End Stage kidney failure require a kidney transplant. Dialysis is a procedure that is performed routinely on persons who suffer from acute or chronic renal failure, or who have ESRD[12].

The process involves removing waste substances and fluid from the blood that are normally eliminated by the kidneys. Dialysis may also be used for individuals who have been exposed to or ingested toxic substances to prevent renal failure from occurring[13]. There are two ways to perform dialysis; peritoneal dialysis and hemodialysis. The latter can be performed at home or in a dialysis center or hospital by trained healthcare professionals[12]. ESRD in Europe ranged 110 person per million population, Netherlands 192 person per million population. Higher incidence rates were recorded in the same year in countries outside Europe, such as the USA (>300 person per million population) and Japan (200 person per million population)[14]. The reported annual incidence of patients with ESRD varies widely, from as low as 4 person per million population in Bolivia. Higher numbers 254 persons per million populations in Puerto Rico. Incidence rates of 52 person per million populations and 200 persons per million populations were reported in Turkey and Egypt, respectively[14]. A cross sectional study conducted in the Caribbean showed that Hypertension, chronic Glomerulonephritis and diabetes mellitus were the common causes of ESRD[15].

Another cross sectional study conducted in Saudi Arabia to determine the epidemiology and causes of ESRD. Results showed that dialysis patients increase in the KSA. Patients' average age was 55 years. Main causes of ESRD include diabetic nephropathy (28%), hypertension (24%), unknown (23%) and obstructive uropathy (8%)[5].

2. Rationale

Rationale ESRD is a common health problem in KSA. It is rapidly increasing among Saudi Arabians. Moreover, ESRD is considered to be a burden on the health system in Arar, there is no studies that aim at identifying the main risk factors that lead to the onset of ESRD in Arar. Since we are medical health workers, we saw the necessity of conducting a study that could give a vivid idea of the main risk factors that lead to the onset of ESRD in Arar city, Northern Saudi Arabia.

3. Study Objectives:

The objective of this study was to determine the risk factors for chronic renal failure in Arar City, the capital of the northern border area of Saudi Arabia.

4. Study sitting:

The present study was conducted in Arar. Arar is the regional headquarters of the Northern Border Province of Saudi Arabia.

5. Methodology:

Type of the study: The study is a case control (retrospective) study.

The participants were the patients with ESRD on regular hemodialysis in the hemodialysis center of the Arar central Hospital during 1436, which is the only center in Arar city. Data were collected from the patients of chronic renal failure on hemodialysis (they were 69 patients) by personal interviews and filling of a questionnaire which includes the questions that

guide us to the needed data. Data was also collected from the same number of matched age, sex and residence control group. Data was obtained after applying for ethical approval from the Ministry of Health & General Directorate of Health Affairs in the city. Data were collected by personal interviews and filling of a questionnaire which includes the questions that guide us to the needed data such as socio-demographic information, family history of chronic kidney disease or renal failure, diabetes mellitus, hypertension, chronic glomerulonephritis, renal stone, recurrent attacks of sever urinary tract infection (UTI), history of urinary tract (UT) operations, congenital anomalies of urinary system, history of urinary stones and history of frequent administration of analgesics. Same data were also collected from the same number of matched age, sex and residence control group.

6. Ethical considerations:

This study has been reviewed and approved by the Research Ethics Committee of Faculty of Medicine, Northern Border University. The aim of the study was explained to all participants before filling the questionnaire to gain their confidence and the trust. Written consent was obtained from all participants before filling the questionnaire and after discussing the objective with them. Confidentiality and privacy were considered during interviewing for all participants, the topic of this study did not touch the ethical, moral, traditional, cultural and religious issue of all participants. No names were recorded on the questionnaires and all questionnaires were kept safely.

7. Statistical analysis:

Collected data were coded and analyzed using the Statistical Package for Social Sciences (SPSS) version 15. [16] Chi Squared test was used as a test of significance, differences were considered significant at $P<0.05$.

8. Study limitations:

Shortage in the number of dialysis machines leads to interviewed patients till late-afternoon.

9. Results:

Table (1) shows the socio-demographic characteristics of studied renal dialysis cases and control group, from the table it is clear that: the largest number of them (27.5%) aged 50 years and more, 5.8% of cases were under 10 years, 11.6% of them from aged 10-20 years, 14.5% aged 20-30 years, and 23.2% aged 30-40 years. Females are more than males (52.2% Vs 47.8%) and odds ratio of considering female sex as a risk factor was 2.49. 34.8% were single and 69.6% were not working and employed patients constitute 11.6% only. 20.3% of them had completed university education and 17.4% illiterate. Regarding the family income range, all of patients related to families with (mean ± SD) monthly income of 5000.52±2000.32SAR, and the control group were related to families with (mean ± SD) monthly income of 8400.9±5600.8SAR.

Table (1): Socio-demographic characteristics of studied renal dialysis cases and control group in Arar city, 1436

Demography	Characteristic	Cases (n=69)		Control (n=69)		Odds Ratio	P value
		No	%	No	%		
Age Group in Years	Less than 10 years	4	5.8	3	4.3	NA*	0.727
	10 -	8	11.6	7	10.1		
	20 -	10	14.5	13	18.8		
	30 -	16	23.2	22	31.9		
	40 -	12	17.4	24	34.8		
	50 and more	19	27.5	3	4.3		
	Mean ± SD	39.0±16.8		36.8±14.96		NA*	0.414
Sex	Female	36	52.2	35	50.7	1.02	0.9
	Male	33	47.8	34	49.3		
Marital Status	Married	27	39.1	39	56.5	NA*	0.156
	Single	24	34.8	19	27.5		
	Divorced	7	10.1	6	8.7		
	Widowed	11	15.9	5	7.2		
Occupation	Unemployed	48	69.6	12	17.4	NA*	0.000
	Employed	8	11.6	37	53.6		
	Retired	8	11.6	6	8.7		
	Student	5	7.2	14	20.3		
Educational Status	Illiterate	12	17.4	7	10.1	NA*	0.004
	Primary	8	11.6	12	17.4		
	Preparatory	18	26.1	3	4.3		
	Secondary	17	24.6	8	11.6		
	University and more	14	20.3	9	13.0		
Mean ± SD of income / month		5000.52±2000.32		8400.9±5600.8		NA*	0.000

* Not Applicable

Table (2) shows diabetes mellitus and hypertension in studied cases and control; the table revealed that diabetes mellitus was common among cases 44.9% compared to control group 27.5%. Odds ratio was 2.14, so DM considered a risk factor for renal failure. 74.2% of diabetic cases treated with insulin, while only 47.4% of diabetic controls were treated with insulin and the rest treated with tablets. 39 (56.5%) of cases and 12 (17.4%) of controls were hypertensive (odds ratio was 6.17), and 28.2% of cases had hypertension for 12 years or more.

Table (3) revealed that chronic **glomerulonephritis** was found in 65.2% of cases and in only 4.3% of controls (odds ratio was 41.25), 57.8% of cases of chronic **glomerulonephritis** had the disease for less than 4 years while 15.5% of them had it for 8 years and more, however 82.2% of cases of chronic **glomerulonephritis** receive their treatments regularly. Repeated attacks of UTI were found in 34.8% of cases and in 23.2% of controls (odds ratio was 1.76), 79.2% of cases surfing from repeated attacks of UTI receive treatment every attack. On the other hand, history of UT operations was found in 27.5% of cases and wasn't found at all in controls. The operations were repeated in about a quarter (26.3%) of cases having previous operations. No UT tumors were found in cases or controls.

Table (2): Diabetes mellitus and Hypertension in studied renal dialysis cases and control group in Arar city, 1436

Variable	Characteristic	Cases		Control		Odds Ratio	P - value
		No.	%	No.	%		
Diabetes Mellitus (n=69 in cases and n=69 in control)	No	38	55.1	50	72.5	2.14	0.01
	Yes	31	44.9	19	27.5		
Treatment regularity in diabetic cases (n=31 in cases and n=19 in control)	No	1	3.2	0	0.0	NA*	NA*
	Yes	30	96.8	19	100		
Treatment type in diabetic cases (n=31 in cases and n=19 in control)	Insulin	23	74.2	9	47.4	3.19	0.000
	Tab	8	25.8	10	52.6		
Duration of DM (n=31 in cases and n=19 in control)	<4 Years	3	9.7	8	42.1	NA*	0.001
	4 to 8 Years	9	29	6	31.6		
	>8 Years	19	61.3	5	26.3		
Hypertension (n=69 in cases and n=69 in control)	No	30	43.5	57	82.6	6.17	0.000
	Yes	39	56.5	12	17.4		
Duration of hypertension (n=39 in cases and n=12 in control)	<4 years	12	30.8	3	4.3	NA*	0.052
	4 to 8 Years	10	25.6	4	5.8		
	8 to 12 Years	6	15.4	4	5.8		
	>12 Years	11	28.2	1	1.4		
Treatment regularity (n=39 in cases and n=12 in control)	Yes	39	100	12	100	NA*	NA*
	No	0	0	0	0	NA*	NA*

* Not applicable

Table (3): Chronic glomerulonephritis, repeated attacks of UTI, UT tumors and history of UT operations in studied renal dialysis cases and control group in Arar city, 1436

Variable	Characteristic	Cases		Control		Odds Ratio	P value
		No	%	No	%		
Chronic glomerulonephritis (n=69 in cases and n=69 in control)	No	24	34.8	66	95.7	41.25	0.000
	Yes	45	65.2	3	4.3		
Period of chronic glomerulonephritis (n=45 in cases and n=3 in control)	<4 Years	26	57.8	3	100	NA*	0.459
	4 to 8 Years	12	26.7	0	0.0		
	>8 Years	7	15.5	0	0.0		
Treatment regularity in chronic glomerulonephritis cases (n=45 in cases and n=3 in control)	Yes	37	82.2	2	66.4	2.31	0.000
	No	8	17.8	1	33.3		
Repeated attacks of UTI (n=69 in cases and n=69 in control)	No	45	65.2	53	76.8	1.76	0.094
	Yes	24	34.8	16	23.2		
Treatment every attack in UTI cases (n=24 in cases and n=16 in control)	Yes	19	79.2	11	68.2	1.72	0.099
	No	5	20.8	5	31.2		
History of urinary tract operations (n=69 in cases and n=69 in control)	No	50	72.5	69	100	*NA	*NA
	Yes	19	27.5	0	0		
History of repeated urinary tract operations (n=19 in cases and n=0 in control)	Once	14	73.7	69	100	*NA	*NA
	Repeated Operations	5	26.3	0	0		
Urinary Tract tumors	Yes	0	0	0	0	*NA	*NA
	No	69	100.0	69	100.0	*NA	*NA

* Not applicable

Table (4): Congenital anomalies of urinary system, urinary Stones and excess administration of analgesics in studied renal dialysis cases and control group in Arar city, 1436

Variable	Characteristic	Cases		Control		Odds Ratio	P Value
		No	%	No	%		
Congenital anomalies of urinary system (n=69 incases and n=69 in control)	No	65	94.2	69	100.0	*NA	*NA
	Yes	4	5.8	0	0.0		
Type of Congenital anomalies (n=4 incases and n=0 in control)	Ureteric stenosis	2	50	0	0.0	*NA	*NA
	Solitary kidney	2	50	0	0.0		
Recurrent urinary tract stones (n=69 incases and n=69 in control)	No	66	95.7	61	88.4	0.34	0.104
	Yes	3	4.3	8	11.6		
History of frequent administration of Analgesics (n=69 incases and n=69 in control)	No	36	52.2	66	95.7	20.16	0.000
	Yes	33	47.8	3	4.3		
Cause of frequent administration of Analgesics (n=33 incases and n=3 in control)	Chronic Arthritis	7	21.2	1	33.3	*NA	0.000
	Headache	11	33.3	1	33.3		
	Both arthritis and headache	15	45.5	1	33.3		

*Not applicable

Table (5): Duration of dialysis, compliance with medications and feeding instructions in studied dialysis cases in Arar city, 1436

Variable	Characteristic	Cases (n=69)	
		No.	%
Duration of Dialysis	Less than 4 years	41	59.4
	4 to 8 years	12	17.4
	8 to 12 years	7	10.1
	12 years and more	9	13.0
Compliance with doctors' instructions about medications	Yes	66	95.7
	Sometimes	3	4.3
Compliance with feeding instructions	Yes	49	71.0
	Sometimes	20	28.9
Compliance with instruction concerning salting of food	Yes	23	33.3
	Sometimes	38	55.1
	No	8	11.6

* Not applicable

Table (4) revealed that congenital anomalies of urinary system were found in 4 (5.8%) of cases, 50.0% of cases of congenital anomalies had ureteric stenosis while 50.0% of them had Solitary kidney. Recurrent urinary stones were found in 3 (4.3%) of cases and in 8 (11.6%) of controls (Odds Ratio was 0.34), so falsely it seems a protective not risk factor. About half (47.8%) of cases and only 4.3% of controls showed frequent administration of analgesics (Odds Ratio was 20.16), 45.5% of them administer it for treatment of arthritis and headache.

Table (5) shows that 41 (59.4%) of cases have duration of dialysis for less than 4 years, while 13.0% of them on dialysis for 12 years and more. About all, 95.7% of cases comply with doctors' instructions about medications, but 49 (71.0%) only comply with feeding instructions and only a third of them (33.3%) comply with instruction concerning salting of food while 1.6% don't follow these instructions.

10. Discussion:

The development of CKD prevention and control strategies is a key factor for reducing the burden of the disease. Identifying individual risk factors and at-risk populations are potential targets for a suitable intervention in different populations. This should include active expansion of the existing perception of health care, social and economic risk factors at both the individual and the community level. The present study was conducted in Arar city. Arar is the regional headquarters of the northern border province of Saudi Arabia. It has a watering station and a power station. It engages in a wide range of agricultural activities including the production of dates and the managing of livestock (camels, goats and sheep). Arar is the crossing point for many of the Iraqi pilgrims entering the Kingdom to perform Hajj. Arar city population is about 164,823[17 & 18].

In this present study, the prevalence of chronic renal failure in Arar was 4.2 cases/10000 of the population (as the estimated total Arar population was 164,823 in 1436, while the total number of dialysis cases was 69 cases as there is no other renal dialysis center serving Arar population and no referral to dialysis centers of other cities). These results don't agree with the lower numbers—254 person per million population in Puerto Rico and 200 persons per million population which reported in Turkey and Egypt, respectively[14].

In this study, there were more females than males (52.2% vs 47.8%) and the mean age was 39 years. These results don't agree with a study that was conducted in Palestine that showed that the sample consisted of 58.70% males and 41.30% females[19]. In the study conducted in KSA the mean age was 55 years[5]. Also, our results don't agree with studies that were conducted in Iran and Korean that showed that ESRD males develop ESRD more than females[20 & 21].

In the present study, diabetes mellitus was common among cases (44.9%) compared to control group (27.5%) so DM considered a risk factor for renal failure (odds ratio was 2.14 and P = 0.01). These results agree with a study that were conducted in Palestine that showed that 46.4% of ESRD cases had diabetes mellitus[19]. This result don't agree with other study conducted in Jordan that show diabetes mellitus was the leading cause of hemodialysis, 29.2% of cases[22]. This result doesn't agree also with another study conducted in KSA that show diabetic nephropathy was present in 28% in cases of ESRD[5]. In this study, 56.5% of cases and 17.4% of controls were hypertensive (odds ratio was 6.17 and P = 0.000) and 28.2% of hypertensive cases had hypertension for 12 years and more. These results are in accordance with the study that was conducted in Palestine that showed that 50.8% of ESRD cases had hypertension[19]. This result is in accordance also with another study conducted in Kuwait that show hypertension is the fourth most common cause of end-stage renal disease and elevation of the blood pressure is a strong independent risk factor for ESRD[23]. This result also does not agree with studies conducted in KSA that show hypertension was present in 24% in cases of ESRD[5].

The current study, revealed that chronic glomerulonephritis was found in 65.2% of cases and in only 4.3% of controls (odds ratio was 41.25), repeated attacks of UTI was found in 34.8% of cases and in 23.2% of controls (odds ratio was 1.76). These results are in accordance with the study that was conducted in Palestine showed that 25.6% of ESRD cases had a urinary tract infection[19]. Another study conducted in Egypt confirms that there is a significant association between Glomerulonephritis and other urinary tract infection with an incidence of ESRD[24].

In the results of the present study, congenital anomalies of urinary system were found in 5.8% of cases, half of cases of congenital anomalies had ureteric stenosis and the other half had Solitary kidney. This finding is less than the findings of the study that was conducted in Palestine that showed that 11.9% of ESRD cases had a congenital abnormality[19]. In this study, about half (47.8%) of cases and only 4.3% of controls showed frequent administration of analgesics (odds ratio was 20.16). This finding is in accordance with Palestine study which showed that that there is a significant relationship between patients who use analgesic drugs and the onset of ESRD and that regression model can predict 13.2% of all patients who use analgesic drugs are at risk of having ESRD so analgesic drugs have an increased risk of ESRD[19]. Our finding is also in accordance with the findings of a study conducted in the USA confirmed that frequently taken analgesic drugs have an increased risk of ESRD, aspirin is excluded[25].

11. Conclusion:

This study was an effort to highlight the main risk factors that lead to ESRD. Identifying these major risk factors is an important part in preventing complications of developing ESRD. This study found that the main risk factors that lead to ESRD in Arar, KSA were chronic disease such as diabetes mellitus, hypertension, chronic glomerulonephritis, repeated attacks of urinary tract infection and frequent administration of analgesics.

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