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End-Stage Renal Disease in the Gaza Strip and its Relationship to Risk Factors

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Abstract

End Stage Renal Disease (ESRD) is an important cause of morbidity and mortality globally. Understanding the risk factors of ESRD can help identify preventive strategies. This study aimed to determine the risk factors of ESRD among patients undergoing hemodialysis in the governmental hospitals in Gaza Strip. Retrospective-hospital based-case control study was conducted on patients with ESRD, at Ministry of Health Hospitals at the time of study in 2014 (N=264), proportional stratified random sample used for sample selection (n=132) cases matched with sex, age, and locality to 132 control were chosen. Data was collected using a questionnaire including socio-demographic, medical history, and life style and additional data were obtained from medical record. The results showed that the most common risk factors associated with ESRD were hypertension (42.4% versus 20.5%) and diabetes mellitus (28% versus 16.7%). Kidney stone (21.2% versus 4.5%), urinary tract infection (65.9% versus 27.3%) and glomerulonephritis (19.7% versus 6.1%) follow it. For medications analgesic drug formed among cases and controls (22% versus 9.1%). For smoking it was (47.7% versus 23.5%), obesity (41.7% versus 34.1%), anxiety (17.4% versus 6.1%). For low activity (48.5% versus 28%), primary educational level (95.1% versus 39.4%), low household income (76.5% versus 59.1%), family history (70.5% versus 47.7%). A multiple logistic regression controlling for age, gender, and location showed that significant predictors of ESRD were hypertension, glomerulonephritis, and obesity. In conclusion, the study suggests that most of the identified risk factors are preventable by easy ways as screening of highly risk people and encourage health life style.

Keywords: End-stage renal disease; Risk factors; Haemodialysis; Gaza str

Introduction

End Stage Renal Disease (ESRD) is one of the serious kidney diseases that affect the body system [1]. It is a major health burden because not only it is progressive and irreversible, but also the patient with ESRD is increasing dramatically in the past few decades [2,3], in addition to diabetes mellitus and hypertension which consider as major risk factors to develop the disease [4]. The increasing of ESRD can lead to premature morbidity, mortality and lower quality of life.

ESRD occurs when both kidneys are no longer capable of working at the level of what is needed till it reaches the point where renal function fewer than 10% of standard [5]. It is a long-term problem caused by damage of both kidneys. The damage is usually irreversible and can lead to ill health [6]. It is a fatal condition unless supported by some form of dialysis, or kidney transplantation [7].

The situation is particularly serious in developing countries where smoking and other cardiovascular risk factors are increasing clearly [8,9] and health information and health resource are limited. Palestine one of these countries will face the complications of this problem in the future, where the burden of this disease expected to exhaust its medical and financial system. The awareness of the risk factors of ESRD helps in developing programs and plan preventive measure for the community [10].

The current study aimed to characterize ESRD population in the Gaza strip and identify socio-demographic (e.g. age, sex), life style (e.g. smoking, physical activity) or comorbid disease (e.g. hypertension, diabetes) risk factors relevant to this population, in order to inform suggestions for strategies to reduce morbidity and mortality of patients.

Research Methods

Design and setting

This was quantitative designs hospital based - case-control study of ESRD patients at hospital in Gaza Strip. We collected data on eligible patients (n=132) who were on hemodialysis at the time of study in 4-dialysis centers. Data collection was carried out between July 2014 and September 2014. Three months were spent at each of the 4-dialysis centers. Each patient was personally interviewed in the dialysis center using a structured questionnaire prepared by the researcher. The questionnaire collected comprehensive data related to ESRD patients. Relevant data for the present study included variables such as age and gender, living area, marital status, monthly income, diabetes mellitus, cardiovascular disease, family history of chronic disease and kidney stone, in addition to date of life style history as smoking, water, obesity and physical activity pattern.

Sample

The researcher used Epidemiological Information. Program to calculate the sample size at 95% CI with power 80% and based on-one-to one case to control ratio. The total number of proportional stratified random samples is composed of 196 subjects. To overcome non-respondents, the researcher decided to take 264 persons, divided into 132 cases and 132 controls. A total of 264 cases and controls agreed to participate in this study.

Data collection

The patients were interviewed by researcher to collect data related to socio-economic demographic variables such as age and gender, living area, marital status, monthly income, and other variables such as family history of chronic disease, diabetes mellitus, cardiovascular disease and kidney stone, in addition to date of life style history as smoking, water, obesity and physical activity pattern. Anthropometric measurements (weight and height), are essential as basic descriptive information in this study for calculating body mass index to all subjects for assessing the relationship between body mass index and developing ESRD. Body weight measured by Dual-Reading-Beam-Scale, accurate to 160 kg with subjects standing in the center of the platform, wearing only light clothes, weight distributed evenly to both feet and shoes off. The scale placed on a hard-floor surface and calibration should occur at the beginning and end of each examining subject. Height measured using Dual-Reading-Beam-Scale with subject stand with his heels together and the weight evenly distributed between both feet. BMI calculated as body weight (kg) divided by squaring the height (m^2).

Data management and statistical analysis

The quantitative data were analyzed using Statistical Package for Social Sciences (SPSS) program version 19.0. The analyses of data to be conducted were reviewing the filled questionnaire, coding the questions, data entry, defining and coding the variables, and data cleaning. Frequency tables of all the variables and cross tabulation of the results were done. Differences between means were analyzed using independent sample t-test, Odds ratio, 95% confidence interval, and chi-square test is statistical tool of measurement of association. A p-value ≤ 0.05 is considered statistically significant. Logistic regression used to control for a confounder.

Ethical and administrative considerations

An academic Approval was obtained from School of Public Health at Al-Quds University, and an ethical approval was obtained from Helsinki Committee in Gaza to carry out the study. An administrative approval was obtained from Ministry of Health—Gaza to conduct the study at four hospitals. Every participant was provided with a full explanatory form attached to questionnaire included the purpose of the study, assurance about the confidentiality of the information, the instructions how to respond to the questionnaire, and a statement indicating that the participation is voluntary. Honesty was maintained during reporting and analysis of the data with respect to confidentiality and respecting of results.

Results

Socio-demographic characteristics

Table 1 shows that the prevalence of males among the cases was 56.8% and 38.6% of them were in the age range 45-60 years. The highest prevalence was found in Gaza city (28.6%) and the lowest percentage was in Mid-zone (15.2%). This distribution is corresponding to the population differences in the Governorates, where one-third of the population is living in Gaza city.

Variables	Cases		Controls		OR (95% CI)	P value
	No.	%	No.	%		
Gender					*	*
Male	75	56.8	75	56.8		
Female	57	43.2	57	43.2		
Age (years)					*	*
<45	45	34.1	45	34.1		
45-60	51	38.6	51	38.6		
>60	36	27.3	36	27.3		
Address					*	*
North	22	16.7	22	16.7		
Gaza	38	28.8	38	28.8		
Mid-Zone	20	15.2	20	15.2		
Khanyounis	27	20.5	27	20.5		
Rafah	25	18.9	25	18.9		

Citizenship						0.05
Citizen	54	40.9	67	50.8	0.67 (0.41-1.09)	
Refugee	78	59.1	65	49.2		
Marital status						0.653
Single	30	22.7	27	20.5	1.14 (0.63-2.05)	
Married	102	77.3	105	79.5		
Educational level						0.001
Primary	78	59.1	52	39.4	3.64 (1.70-8.00)	
Secondary	40	30.3	46	34.8	2.11 (0.94-4.87)	
University	14	14	34	25.8	1 [#]	
Past occupation						
Employed	70	53	54	40.9	1.63 (1.00-2.65)	0.047
Unemployed	62	47	78	59.1		
Household income (NIS)						0.001
<1700	101	76.5	78	59.1	0.65 (0.34-1.23)	
1700-2200	9	6.8	28	21.2	2.63 (1.02-6.74)	
>2200	22	16.7	26	19.7	1 [#]	

Table 1: Socio-demographic characteristics of the study participants. * Matched variables, #: Referenced factor.

The prevalence of ESRD was higher in low educational level with 59.1% among cases and only 39.4% among controls. The difference between low and high education is statistically significant with OR=3.64 (1.70-8.00). Employed subject was 53% among cases and 40.9% among controls with OR=1.630 (1.002-2.654). The burden of end-stage renal disease was insignificantly lower among single subjects OR=1.143 (0.635-2.057). The present study showed highest risk of end-stage renal disease among subjects with highest poverty rate with 76.5% among cases compared to 59.1% among controls with statistical significant differences OR=2.632 (1.026-6.749).

Medical history

Table 2 shows that the prevalence of CVD and diabetes mellitus among end-stage renal disease was higher (51.5-28.0% respectively) than among controls and the association reaches statistically significant level (OR=4.13 versus 1.94). Hypertension represents the most CVD (42.4%) compared to controls (20.5%). This association reaches statistically significant level (OR=0.67). Type II diabetes was the prominent among cases than type I (26.5%) and (18.9%) treated with insulin for more than ten years.

The prevalence of lung diseases among end-stage renal disease was higher (13.6-2.3% respectively) than among controls and the association reach statistically significant level (OR=6.78). Most of them suffer from bronchitis (9.1%). For kidney diseases, end-stage renal disease was significantly higher in subjects with kidney stones (OR=5.65), urinary tract infection (OR=5.15), and glomerulonephritis (OR=3.80). Regarding analgesic drug, the prevalence among cases was higher than controls (22.0 versus 9.1%). and the association reach statistically significant level (OR=2.18). The prevalence of positive family history among end-stage renal disease was higher (70.5-47.7% respectively) than among controls and the association reach statistically significant level (OR=2.52), most of them have family history to DM (25%), followed by HTN (14.3%), end-stage renal disease (6.1%).

Variables	**Cases**		**Controls**		**OR (95% CI)**	**P value**
	No.	%	No.	%		
CVA						0
Yes	68	51.5	27	20.5	4.13(2.40-7.11)	
No	64	48.5	105	79.5		
Type of CVA						0.02

HTN	56	42.4	27	20.5	0.67 (0.58-0.78)	
Non-HTN	12	9.1	0	0		
DM						0.027
Yes	37	28	22	16.7	1.94 (1.07-3.53)	
No	95	72	110	83.3		
Lung diseases						0
Yes	18	13.6	3	2.3	6.78 (1.94-23.6)	
No	114	86.4	129	97.7		
Kidney stones						0
Yes	28	21.2	6	4.5	5.65 (2.25-14.1)	
No	104	78.8	126	95.5		
Urinary Tract Infection						0
Yes	87	65.9	36	27.3	5.15 (3.04-8.72)	
No	45	34.1	96	72.7		
Glomerulonephritis						0
Yes	26	19.7	8	6.1	3.80 (1.56-9.59)	
No	106	80.3	124	93.3		
Analgesic drug						0.003
Yes	29	22	12	9.1	2.18 (1.36-5.79)	
No	103	78	120	90.9		
Family history						0
Positive	93	70.5	63	47.7	2.52 (1.52-4.17)	
Negative	39	30.5	69	52.3		

Table 2: Medical history among the study participants.

Life style factors

ESRD was significantly higher in subjects who were smoking, former smoking, obese, exposed to psychological troubles and physically inactive persons. Low activity is much higher among cases (48.5%) compared to controls (28%). This association reached statistically significant level. End-stage renal disease is positively associated with the current smoking status where the prevalence of current smoking among cases (17.5%) was higher compared to controls (8.4%). ESRD patients who former smoking was much two time among cases than controls (30.3%-15.1% respectively) and reach positively significant level (OR=2.43). There was negative association between exposed to other form of smoking and end-stage renal disease occurrence, which the prevalence among controls was higher than cases (67.5% versus 52.2%). Concerning body mass index, the prevalence was significantly higher in cases than controls (OR=1.60), and with psychological troubles (OR=4.03).

Variables	**Cases**		**Controls**		**OR (95% CI)**	**P value**
	No.	**%**	**No.**	**%**		
Current smoking						0.027
Yes	23	17.5	11	8.4		
No	109	82.5	121	91.6		

Former smoker						0.003
Yes	40	30.3	20	15.1	2.43 (1.33-4.45)	
No	92	69.7	112	84.2		
Exposed to other smokes						0
Yes	69	52.2	101	76.5	0.33 (0.19-0.56)	
No	63	47.8	31	23.5		
BMI level						0
BMI ≥ 30 kg/m	69	52.3	23	47.4	1.60 (4.21-13.7)	
BMI ≤ 30 kg/m	43	17.5	109	82.5		
Physical activity level						
Physically	33	25	36	27.3	11	
Sedentary	10	7.6	4	3	0.36 (0.10-1.28)	0.111
Low active	64	48.5	37	28	0.53 (0.28-0.98)	0.045
Very active	25	18.9	55	41.7	2.01 (1.03-3.93)	0.04
Psychological troubles						0
Yes	45	34.1	15	11.4	4.03 (2.11-7.70)	
No	65.9	65.9	117	88.6		

Table 3: Life style factors among the study participants.

Logistic regression

Variables	B	S.E	Wald	Sig.	Exp(B)	95% C.I for OR	
						Lower	Upper
CVA	3.75	0.83	20.14	0	42.5	8.26	218.5
Glomerulonephritis	3.26	0.89	13.28	0	26.19	4.52	151.5
BMI group	1.83	0.46	8.87	0.003	3.99	1.6	9.944
Physical inactivity	0.44	0.27	2.57	0.109	1.56	0.9	2.692
Smoking group	0.41	0.35	1.35	0.24	1.51	0.75	3.033
Past occupation	0.19	0.3	0.42	0.51	1.21	0.67	2.208
Education	0.44	0.49	0.82	0.36	1.56	0.59	4.089
Constant	-20.1	4.02	25.08	0			

Table 4: Logistic regression for ESRD risk factors.

Table 4 demonstrates logistic regression analysis for the ESRD risk factors. Significant ESRD predictors as revealed by multivariate logistic regression analysis included CVD, glomerulonephritis, and high BMI remained associated with ESRD, and reached statistically significant level. The association between ESRD and physical inactivity, smoking group, past occupations, and educational group did not reach statistically significant level.

Discussion

The study result revealed that the prevalence of ESRD was higher in men than women, this result matched with national and international studies showed that men had significantly higher rate of end-stage renal disease compared with women [11-15]. In contrast to this, women seem to develop end-stage renal disease most often than men [16]. It also revealed that age group between 45-60 years is a higher

risk for developing end-stage renal disease; this finding coincident with other studies showed that the prevalence of chronic renal disease increases with age [13,17-19]. Most of end-stage renal disease patient is refugees and settle in Gaza city, this settle is corresponding to the population differences in the Governorates, where Gaza city is the highest population density with average 13.2% of the total population [20] and 67% of them are refugees [21]. The researchers concluded that being refugees could be increased the risk of end-stage renal disease. This may be due to siege; bad socioeconomic, epidemiological transitions in Palestine, as well as transitions in food consumption patterns and lifestyle have aggravated the burden of poverty-related diseases, as people are suffering from emerging epidemics of NCDs. The prevalence of end-stage renal disease was higher in low educational level; this result corresponded with other studies showed low educational level considered a risk for chronic kidney diseases [22,23]. The present study showed highest risk of ESRD among subjects who lived under poverty line with significant relationship between renal disease and subject's monthly income; these results reflect a poor economic situation was higher among cases, this significant may related to other factors affect it, for example, Palestine is usually unstable because of policies of closure and siege and shelling and destruction perpetrated by Israel. Unstable economic situation, limited income, and lack of unemployment opportunities, all of these reasons lead to drop in standard living and increased poverty, which has a negative effect on health [24]. This statement agrees with study result that confirms low household income is a risk factor for developing ESRD. Another study agrees this statement, for example, Ward, performed studies to examine the association between socioeconomic status with increased risk of ESRD due to diabetes and access to care in California, reported that there is a strong association between the incidence of ESRD related to diabetes and access to care [25]. Other studies confirm that positive relation between living in low socioeconomic status and severity of chronic renal disease [17,26]. This study found statistical significant association between occupation, primary educational level, low income, and citizenship subjects tended to have significantly higher end-stage renal disease prevalence.

This study also revealed that, 68% of ESRD patients have history of CVD; Hypertension considered the main risk factor that represents 42.4% of the cases. Average duration of CVD in years among cases was higher than among controls (13.7-8.4 respectively); this means that uncontrolled blood pressure seriously increased the risk of developing end-stage renal disease. The study results agreed with previous studies that hypertension considered a risk factor leads to end-stage renal disease. Abumwais revealed that the three most common causes of chronic kidney disease were diabetes, hypertension and glomerulonephritis (33.32%, 16.7% and 13.1%) respectively [27]. Basheer demonstrated that diabetes, hypertension, cardiovascular disease, recurrent taken analgesic drug and urinary tract infection are major risk factors that significantly associated with the onset of the ESRD [28]. Additionally, Elsharif, M. and Elsharif, E, reported that hypertension and obstructive nephropathy are the leading causes of end-stage renal disease in Gazira state [12]. Moreover, Sweileh, et al. conducted study in A-Watani governmental medical center; show that hypertension and diabetes were the most common causes of the end-stage renal disease [29]. Although, Domrongkitchaiporn et al. shows that HTN was the most important independent risk factor for future development of kidney disease [30]. Similarly, Hsu, et al. concluded that the risk of end-stage renal disease is increased even with relative modest elevations of blood pressure [31]. Finally, many studies informed that hypertension is a risk factor for chronic kidney disease [32-35]. In contrast to that, Fesler et al. informed association between hypertension and chronic kidney disease did not reach statistical significance [36] and Bakris and Ritz, indicated that hypertension is the second most common cause of end-stage renal disease [37]. The study also, identified common risk factors in this study was diabetes mellitus with prevalence was 28% among cases. This funding agreed with the results that diabetes mellitus is a risk factor. Abumwais, revealed that the three most common causes of CRF were diabetes mellitus, hypertension and glomerulonephritis (33.32%, 16.7% and 13.1%) respectively [27]. Although, a retrospective cohort study conducted in A-Watani governmental medical center in Palestine; show that hypertension and diabetes mellitus were the most common causes of the ESRD [29]. Additionally, Shaheen and Al-Khader, detailed that diabetes mellitus is still the most common cause of ESRD in Egypt, Kuwait, Lebanon and Saudi Arabia [38]. Similarly, Malekmakan, et al, stated that the risk factors of chronic renal disease according to the age, hypertension (30.5%) and diabetes mellitus (30.1%) were the most common causes of end-stage renal disease [4]. Another study agrees with this result, conducted at a Mostafa Khomini hospital in Iran, showed that the prevalence of chronic renal disease is higher in Iran and the most common risk factor is diabetes mellitus 26.85% [13]. In Jordan, a study conducted by Abdullah, et al., confirms that diabetes mellitus was the major leading cause of end-stage renal disease 29.2% of cases [39]. In contrast to study positive association, Chadban et al. conducted a large cross-sectional Australian cohort study, stated that there is no association between diabetes mellitus and the presence of chronic kidney diseases [35]. This study identified another risk factor was lung diseases which found positive history of lung disease among end-stage renal disease 13.6%. After searching in the literature and references, only study found dating to 1977 corresponded with study result entitled an investigation of renal function in chronic bronchitis. Showed a abnormalities of glomerular filtration rate and of water handling has been found in chronic bronchitis clients but not in lack of oxygen controls [40]. Additionally, the study found kidney stone is play as risk factor in developing end-stage renal disease. This result agree with international studies that found that nephrolithiasis is still another risk factor that develop end-stage renal disease [41,42].

There is positive association between subject's history of glomerulonephritis and the occurrence of end-stage renal disease. This finding is agreement with other national and international studies, that found urinary tract infection and glomerulonephritis are major risk factors that significantly associated with the onset of ESRD [4,11,12,27,28,32,39]. Family history considered as another risk factor for developing ESRD, this study agreement with statement and correspondent with other studies. Correspondent with McClellan, et al. reported that the high-risk population who the first- or second-degree family members of patients with end-stage renal disease, who are two to three times as likely to have incident end-stage renal disease, have high rates of impaired kidney function and undetected and uncontrolled high blood pressure, and are more likely to be obese [43]. Additionally, as a population – based telephone survey conducted in the southeastern state of 402 residents showed that a family history of ESRD was reported by 3.7% of respondents and that black residents were six times more likely to develop family history-end-stage renal disease compared with white individuals [44]. The prevalence of taking an analgesic drug 20.5% among cases take diclofen while 1.5% takes Trufen was higher and association reaches significant level. This result is consistent with literature. Perneger et al. confirmed that frequently taken analgesic drugs (acetaminophen or none steroidal Anti-

inflammatory Drugs) have an increased risk of ESRD, aspirin is excluded from this study [45].

Active smoking divided into two categories as shows above, 30.3% former smoker while 17.4% smoker. The average of cigarette smoking per day among cases was higher than among controls (1.26-1.18 respectively) and the association not reaches statistically significance (p value 0.39). In addition, the average duration of smoking per years among cases was higher than controls (1.18-1.09 respectively) and the association not reaches statistically significance (p value 0.23). This consistent with the studies revealed that cigarette smoking considered a risk factor for developing and progressing of chronic kidney disease in the community [46,47]. Moreover, Yacoub et al., concluded that the risk of chronic renal disease increased significantly with smoking when comparing to non-smoker, and there are no statistically significant difference between former smoker and chronic renal disease and this study found that heavy smoking more than 30 packs in year is an important risk factor for developing chronic renal disease [48]. Moreover, multiple studies have shown that there are significant association between smoking as a modifiable risk factor and renal damage [35]. On the other hand, population base case control study showed that there were strong association between heavy smoking and chronic renal disease [49]. Concerning obesity as risk factor, the study showed that 41.7% of end-stage renal disease was obese, while 34.1% among controls were obese. This reflects the increase of obesity in the Palestinian population as a result of lifestyle shifting toward physical inactivity and increased food consumption. We noted that there were strong association between ESRD and obesity (p value 0.000) indicating that obesity is a risk factor of ESRD. These results agree with international studies that conducted in Japan, California, and Singapore showed that there are strong positive association between body mass index and the risk of developing ESRD [17,50-52]. In contrast to that, cross-sectional Dutch study conducted by Pinto-Sietsma et al. to examine the relation between body weight and fat distribution and micro-albuminuria and increased or decreased filtration in 7,676 subjects without diabetes, reported that body mass index had no effect on the prevalence of chronic kidney disease [53]. For psychological trouble as risk factor, the study showed that 34.1% among cases exposed to psychological trouble comparable with 11.4% among controls. On the other hand, found to be 4.03 with 95% CI (2.11-7.70) statistically significant. Among them; 17.4% facing anxiety followed by depression 14.4%. These results agree with international studies. DiMatteo et al. identify that the two common psychiatric symptoms in medical patients are depression and anxiety; it also associated with deteriorated health status and increased health care utilization [54].. Moreover, Lew and Patel, found that in ESRD population, women are more common and at a higher level than men for expressing psychological problem such as depression, anxiety and personality disorder [55]. Similarly, Kimmel stated that the most prevalent psychiatric problem among patients undergoing hemodialysis is depression [56,57].

Conclusion

ESRD is one of the serious kidney diseases of chronic renal disease that affect the body system. Identification of risk factors for end stage renal disease supports intervention policies to minimize the disease morbidity and mortality. This disease is serious in Palestine, mostly GS and it is apparent as chronic disease, dangerous and leading to death. Chronic diseases are responsible for 81% of the total deaths in Palestine. The general objective of this study is to identify the main risk factors that contribute to the ESRD among hemodialysis patients in GS. This study gets its importance because there is no study examines the risk factors associated with end-stage renal disease in GS. This study might enhance national effort to modify and control of those factors and help in developing preventive promotional and educational health programs. This study result helpful for developing screening programs for people at high risk of renal disease and all patients with diabetes or and have hypertension and people age over 40 years should have regular screening of renal function not only for measuring blood sugar level. Moreover, preventive strategies to integrate health life style into the community approach to primary prevention should start early to change bad habits to good behavior as encourage walking, playing and bicycling, improve physical activity level, and put strict laws by the relevant ministries to prevent smoking in public places and then private places, especially in the home. Additionally, this study might increase awareness about renal disease among the clients with the identified risk factors in order to decrease morbidity and mortality from this disease.

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