BANTAO Journal 2018; 16(1): 14-20

BJ

BANTAO Journal

Original article

Sociodemographic Determinants of Kidney Disease in Egyptian Tertiary Health Center

Ahmed Yamany Ali[1] ,Sahier Omar Elkhashab[2] and Mohammed Mohamed Abdel Razik[3]

[1]Lecturer of Internal Medicine, [2]Assistant Professor of Internal Medicine, [3]Lecturer of Community, Cairo University, Egypt

Abstract

Introduction. Chronic kidney disease (CKD) is increasingly recognized as a public health problem, and is linked to the risk of development of cardiovascular disease (CVD) with their accompanying morbidity, mortality and increased healthcare costs. The study aims to outline a planned control strategy for renal diseases.

Methods. This study was conducted among CKD Egyptian patients (n=556) in the nephrology outpatient clinic of Kasr Al Ainy hospital. Personal and family socio-demographic characteristics, present history, habitual drug intake, family history of kidney diseases, laboratory findings and pattern of care in the outpatient clinic were obtained.

Results. Among the participants, diabetes mellitus (DM) and hypertension were the most common causes of CKD (56% and 40%) respectively. Older age and male sex are associated with low estimated glomerular filtration rate (eGER) (P <0.001). Patients with middle and high sociodemographic status were significantly associated with higher eGFR than those with low sociodemographic status (P <0.001).

Conclusions. Old age, female gender, illiteracy and low sociodemographic status were significantly associated with low eGFR. On the other hand, smoking, habitual intake of analgesics, residential exposure to chemicals, family history of CKD and lack of compliance for regular follow up were not significantly associated with low eGFR in Egyptian CKD patients.

Key words: chronic kidney disease-diabetes mellitus-illiteracy-morbidity-socio-demographic status

Introduction

Chronic kidney disease (CKD) is one of the most widespread non-communicable disease (NCD). CKD is consistently associated with enormous medical, social, and financial burdens for individuals, their families, and national health systems [1]

CKD definition encompasses all grades of reduced renal function associated with poor outcomes, repeated hospitalization, and increased risk of morbidities as anemia and cardiovascular complication and mortality [2].

The epidemiological pattern of chronic kidney disease widely differs among the societies, however it is not well established due to the lack of national renal registries and sufficient representing data specifically in developing countries and eventually in Egypt [3].

CKD prevalence in US escalates with age (4% at age 29-39 y; 47% at age >70 y), more in blacks [4] while in the Australian AusDiab kidney study, the prevalence of impaired GFR was 11.2% and increased with aging (from 0.01% in the 25 to 44 y age group to 54.8% in patients with age >65 y) [5].

The Fogarty International Center (FIC) of U.S. has reported that the global burden of renal disease confers to ~830 000 demises per year and 18 867 000 disability-adjusted life years (DALY) [6] and this rank of high mortality and disability is similar across World Bank regions, particularly East Asian and Pacific regions [7].

Aside the well-recognized etiological factors of developing CKD such as diabetes, hypertension and glomerular disorders, there are the socio-demographic aspects (age, sex, education and occupation), thus assessing these aspects are of the utmost importance.

No adequate data on the different clinical patterns of renal disorders in Egyptian populations are present owing to the scarcity of research, sparsity of renal regional registries, medical records and filing systems inadequacy. An Egyptian study has concluded that CKD and acute kidney injury were the dominant causes of hospital admission. Sepsis, hyperkalemia, and HTN are common risk factors of mortality in Egyptian patients with kidney disease [8].

The aim of the study was to outline the sociodemographic profile, highlighting the various pattern of renal diseases among attendants to outpatient clinics of Kasr Al Ainy hospital and to determine the potential risk factors and related outcomes for planned control strategy.

Correspondence to: Ahmed Yamany Ali, Lecturer of Internal Medicine, Cairo University, Egypt, Madina monoura street, ard ellawaa, Giza, Egypt; Phone: +0201110006233; Fax: +20 26 28 884; E-mail: HYPERLINK "mailto:themythaysa@kasralainy.edu.eg"themythaysa@eg.edu.alainykasr

Materials and methods

Study design and sampling

This is descriptive cross-sectional study. A purposive nonprobability sample was taken consecutively from chronic renal disease patients who attend the nephrology out-patient clinic of Cairo University Hospital. The study was carried out from January 2016 to April 2017. The total number of the participants was 556 patients. Post-transplant patients and those who were clinically unstable and mentally non cooperative (demented) were excluded from the study.

The study protocol conformed to the ethical guidelines of 1975 the Helsinki declaration and was approved by the Medical Research Committee in the Internal Medicine Department at Faculty of Medicine Cairo University. Informed consents were obtained from all enrolled participants

Data Collection Tools

An interviewing questionnaire (to overcome the illiteracy of patients) was designed to collect data from renal patients about demographic characteristics, cause of renal failure, habitual analgesic intake and family history. A pilot study was done on 30 patients to check the validity and clarity of the structured questionnaire. Most of the questions were close ended and were precoded prior to data collection to facilitate data entry and analysis.

The questionnaire included questions about the following data.

1. Personal and family socio-demographic characteristics: e.g. age, sex, occupation, educational status residence, smoking [For calculating Cigarettes life quarters, we multiply the number of cigarettes smoked per day by number of years of smoking by 365 (days of the year) to get the whole number of cigarettes smoked all through life then divide the patients according to smoking habit into 4 categories [never smoked, extreme low (<25^{th} percentiles), middle (25^{th}-75^{th} percentiles) and extreme high (>75^{th} percentiles)].
2. The sociodemographic status was classified into 3 classes as high, middle and low. Crowdedness index is evaluated according to the number of individuals per room, the score ranges from 1 to 5 the higher score (5) means <1 /per room, while the score weighs 1 means ≥4 / per room [9]
3. Present history: including diseases and conditions affecting kidney functions e.g. hypertension, diabetes, etc.
4. Habitual drug intake.
5. Family history of kidney diseases, hypertension, diabetes, similar renal disease.
6. Laboratory findings (hemoglobin and serum creatinine levels).
7. Estimation of GFR by using Modification of Diet in Renal Disease (MDRD) Study equation [10] eGFR (mL/min/1.73 m^2)= 175 x (Serum creatinine in mg)$^{-1.154}$ x (Age)$^{-0.203}$ x (0.742 if female) x (1.212 if African American).

According to the eGFR, the patients were classified into diseases stages to present the severity and affection of renal function as follows:

Stage 1 (eGFR>90): Normal kidney function but urine findings or structural abnormalities or genetic trait
Stage 2 (eGFR 60-90)
Stage 3 (eGFR 30-60)
Stage 4 (eGFR 30-15)
Stage 5 (eGFR <15) either on dialysis or not.

Data management and Statistical analysis

All collected questionnaires were checked for completeness and consistency. Pre-coded data were entered in the computer using "Microsoft Office Excel Software" program for Windows. Data was then transferred to the Statistical Package of Social Science Software program, version 15 (SPSS) to be statistically analyzed. Data were summarized using mean and standard deviation for quantitative variables and percentage for qualitative variables. Comparison between groups was done using independent samples t-test and analysis of variants (ANOVA) for quantitative data, chi square test for qualitative variables, P values equal to or less than 0.05 were considered statistically significant.

Results

This study involved 556 chronic kidney disease patients with an age range from 15 years to 85 years and mean age of 43±11. There were 307 males (55.3%) with an age range (15-85) and mean 45.4±12 and 249 females (44.7%) of age range (17-75), mean = 45±13. The e GFR by MDRD ranged from 9.3 to 42.34 ml/min/1.73m^2 with mean value of 20.3±5.58 ml/min/ 1.73m^2. The mean level of Hb was 9.9±2.2 gm/dl and serum albumin 3.7±0.4 gm/dl. BMI was 23.5±3.1 kg/m^2.

The socio-demographic data were summarized in Table 1.

Table 1. Socio-demographic, medical and laboratory parameters among the studied patients

Variables		Frequency	Percentage %
Age(years)	(below) 30	102	18.3
	30-	163	29.3
	40-	174	31.3
	50-	104	18.7

	60+	13	2.4
Sex	Male	307	55.3
	Female	249	44.7
BMI*%	<18.5 kg/m2	28	5
	18.5-24.9 kg/m2	389	70%
	>25 kg/m2	139	25
Marital status	Single	52	9.3
	Married	396	71.3
	Widow	96	17.3
	Divorced	11	2
Residential exposure to chemicals	No	428	77
	Yes	127	23
Residency	Rural	393	71%
	Urban	163	29%
Educational status	Illiterate	167	30
	Can read and write	83	15
	Basic education	137	24.7
	Average education	143	25.7
	High education	26	4.7
Social level	Low	273	49
	Middle	140	25.3
	High	143	25.7
Cigarette life categories	Non -smoker	349	62.7
	Extremely low 25%	59	10.7
	Middle 50%	98	17.7
	Extremely high 25%	50	9
Renal disease causes	Diabetes mellitus	313	56.3
	hypertension	222	40.0
	connective tissue disease	101	18.3
	Obstructive uropathy	46	8.3
	UTI	35	6.3
	Gouty nephropathy	32	5.7
	Unknown	48	8.7
NSAIDS$^{\alpha}$ intake	Infrequent (or prescribed by physician)	35	6.3
	Monthly	93	16.7
	weekly	196	35.3
	Daily	232	41.7
Perceived Health Education	Nutritional	526	94.7
	Life style	524	94.3
	Drug	511	92
	Follow up	528	95
	Reg. on follow up	369	66.3
Hospital admission		267	48
+ve consanguinity		239	43
Family history	Hypertension	341	61
	Diabetes Mellitus	343	62
	Connect tissue diseases	35	6.3
	Renal diseases	110	19.7
Referral	From Kasr Al Ainy	161	29
	from other health centers	395	71
CKD$^{\infty}$ Stages	Stage 2	0	0
	Stage3	26	4.7
	Stage4	437	78.6
	Stage5	93	16.7
Dialysis sessions (3/week)	Health insurance	56	10
	State-funded dialysis	500	90%
	Private sector	0	0
Crowdness index	Up2 per room	256	46
	>2 / room	300	54
Family size	1-4 individuals	236	42.4
	>5 individuals	320	57.6
Working	Not working	275	49.5%
	working	225	40.5
	Retired	56	10

*BMI: Body mass index, αNSAIDS: Non steroidal anti-inflammatory drugs, ∝CKD: chronic kidney disease

As regard the morbidities, results of the current study revealed that total numbers of cases were not mutually exclusive due to combination of different diseases in some patients.

The present study found that e-GFR of patients <30 years is significantly higher than that of the other age groups. And significantly higher in males than females with high education and socioeconomic level as shown in Table 2.

Table 2. Statistical comparison of estimated GFR among the studied patients in relation to their demographic characteristics

Risk factors	Frequency	Estimated GFR* Mean ± SD (mL/min/1.73 m^2)	Significant test F ratio	Significant test t-value	P value
Age					
<30*	102	24.74±6.22	11.53		<0.001
30-	163	20.49±4.81			
40-	174	18.86±4.94			S^{α}
50+	117	17.77±4.18			
SEX					
Male	307	23.04±5.42		6.59	<0.001
Female	249	17.73±4.38			S
Educational Level					
Illiterate	167	18.43±5.11	3.44		<0.02
Read and write	83	19.37±5.21			S
Basic education	137	20.49±5.63			
Secondary and higher education**	169	22.15±5.62			
Social level					
Low	273	18.35±4.70	8.07		<0.001
Middle	140	21.08±5.02			S
High	143	22.40±6.35			

*GFR : Glomerular filtration rate, αS : Significant

Table 3. The association between the different etiologies of CKD and the sociodemographic parameters

Variables		Hypertensive nephropathy	Diabetic nephropathy	Connective tissue disease related nephropathy	Obstructive uropathy	Infective nephropathy	Gout	Unknown etiology
Age	X^2	35.66	11.04	10.66	6.86	12.29	6.15	16.13
	p-value	< 0.001(HS)	0.05(S)	0.05(S)	>0.05	>0.05	>0.05	< 0.001(HS)
Sex	X^2	0.13	1.14	15.60	0.95	0.95	0.18	0.82
	p-value	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
Social level	X^2	2.08	1.63	9.75	7.22	4.18	2.15	0.11
	p-value	>0.05	>0.05	0.008(S)	0.04(S)	>0.05	>0.05	>0.05
Smoking	X^2	9.35	8.18	13.56	0.89	3.96	3.93	5.15
	p-value	0.03(s)	0.04(S)	0.004(S)	0.83	0.27	0.27	0.16
Drug intake	X^2	2.27	1.61	33.18	5.24	0.35	1.7	8.17
	p-value	0.52	0.66	<0.001(HS)	0.75	0.23	0.64	0.04(S)
Residential exposure to chemicals	X^2	1.64	0.01	0.70	0.39	1.44	7.42	0.52
	p-value	>0.05	>0.05	>0.05	>0.05	>0.05	0.006(S)	>0.05
Consanguinity	X^2	0.81	0.86	0.01	0.92	1.63	0.75	2.33
	p-value	>0.05	>0.05	>0.05	>0.05	>0.05	0.002	>0.05
Family history of renal diseases	X^2	0.00	0.74	3.47	5.80	8.07	6.82	0.98
	p-value	>0.05	>0.05	< 0.001(HS)	>0.05	0.01(s)	0.01(S)	>0.05
Crowdness index	X^2	0.77	0.35	0.39	0.53	0.74	0.1	0.17
	p-value	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
Working	X^2	0.02	0.86	0.16	0.2	0.63	0.88	0.24
	p-value	0.05(S)	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

There is no statistically significant difference among the studied patients regarding their smoking habits, habitual drug (analgesics) intake, residential exposure to chemicals, presence of family history of renal diseases or compliance of the patients regarding periodic follow-up.

The current study stated that the government funded 90% of our patients for the treatment.

The association between the different etiologies of CKD and the sociodemographic parameters showed that age and smoking are associated with hypertensive and diabetic nephropathy, whilst connective tissue disease related nephropathy is significantly related to age, drug intake, history of familial renal disease as shown in table 3.

The current results found that there was an inverse significant correlation between hemoglobin level versus age, creatinine, (r-value :-0.507, -0.558) respectively with p-value (<0.01, <0.01) respectively using Pearson calculation, moreover hemoglobin was negatively correlated to smoking, hypertension duration and connective tissue disease related nephropathy duration (correlation coefficient = -0.396, -0.251 and -0.449) respectively, with p-value (< 0.001, 0.001 and 0.009) respectively using Spearman's Correlations.

On the other side creatinine level was positively related to smoking, DM duration, hypertension duration and connective tissue diseases duration (correlation coefficient = 0.298, 0.198, 0.348 and 0.420) respectively, with p-value (0.001, 0.002, <0.001 and 0.015) respectively using Spearman's Correlations.

About 72.2% of connective tissue disease related nephropathy patients had CKD stage 5 while 27.8 % had CKD stage 3 and 4 (X^2 =5.27 and p-value < 0.02). About 58.3% of total gouty nephropathy were at CKD stage 5 with 41.7% were at stage 3 and 4 (X^2 =4.08 and p-value <0.05). There is no statistically significant association among the studied patients between CKD stages and diabetes mellitus, hypertension, obstructive uropathy or urinary tract infections.

Discussion

Old age, female gender, illiteracy and low social level are significantly associated with low GFR as shown by the current study results, however smoking, habitual intake of analgesics, residential exposure to chemicals, family history of CKD and lack of compliance for regular follow up are not significantly associated with low GFR.

Based on the fact, of increasing the prevalence of renal disease and being a medical, social, and economic problem, the current study was carried out aiming at exploring the sociodemographic pattern of kidney diseases among attendants to Kasr Al Ainy nephrology outpatient clinic as a provisional guideline for priority setting and research concerning this national problem.

The current study revealed a predominance of male affection (55.7% versus 44.3%) and this is matched with American [11] and Spanish [12] cohorts. African studies done in Nigeria [13] and Ghana [14] had reported male preponderance (65.3% vs 34.7%) and (55% vs 45%) respectively. The mean age of Egyptian patients was 43±11. The majority of patients were less than 60 years (77%) while above 60 years represent about (2.4%). Increased prevalence of CKD in young males is likely explained by increased estimates of smoking and hypertension as risk factors of CKD among them.

Diabetes and hypertension affect large scale of Egyptian populations particularly adult age group [15] and these diseases are the main territories of renal impairment and end stage renal disease [16]. Our study revealed that patients with diabetic nephropathy were (56.3%) followed by hypertensive nephropathy (40%) whilst the idiopathic, urinary tract infection and gouty nephropathy the least common causes (8.7%. 6.3% and 5.7%) respectively. This pattern is found to be in agreement with the pattern observed in USA as diabetes mellitus or hypertension are responsible for more than 70% of cases of late-stage (stage 5) CKD in Americans and 15% of patients have other or unknown causes [17]. Also, In the Delhi study, 63% of the CKD were due to diabetes and hypertension [12], as well as Nichola had found the higher proportion of CKD patients were either diabetic or hypertensive, along with our data [18] a study had been done on Egyptian elderly kidney patients at Ain Shams University and showed CKD of unknown origin in (13.1%) while diabetic nephropathy patients represented (28.2%) and hypertensive nephropathy (25.5%) [19].

The majority of participants were of rural residency (71%) and lower frequency of urban participants (29%) and this may be attributed to poor health access in the rural area and financial factors.

Low socioeconomic strata and denial of education are believed to have a surrogate impact in perceiving renal diseases, growing the CKD epidemic, aside the inability to attain adequate health care resulting in to increase the burden of CKD complications. Thus, socioeconomic and educational disadvantaged subjects are vulnerable to renal disease.

Herein, there is trend towards the illiteracy (30%) whilst highly-educated subjects are the least percent (4.7 %), approximately 50% of the studied population are classified socio-economically low. It was found to be in agreement with Sweden study which demonstrated that low socio-economic status is associated with an increased risk of CKD [20].

A high crowdedness index was observed in (54%) patients in accordance with the family size (≥5) represent (57.4%),

Most of our patients had perceived health education data regarding the nutrient, life style, and drugs but may be

poorly accomplished. Thereby the main issue of health education is to apply the perceived information.

The current study reported that unemployment proportion was high (49.5%). Unemployment has a financial impact with poor adherence to medications. Loss of employment may be a sequence of the renal disease progression and the resulting asthenia and fatigability.

Our results described that low socioeconomic, high odds of unemployment and inadequate education were associated with advanced CKD stages (4 and 5) (95.3%); and this is common in the developing countries as demonstrated by many cohorts [21].

CKD has adverse financial effect on individuals, their families and consequentially on their societies; it is like crisis that diffuses globally [21]. About 60% of the study patients receive their therapy and dialysis sessions through a channel of government-funded treatment, which presents a heavy economic burden upon the state, decreasing the health quality services.

In the current study, the CKD `1 was not associated with smoking habit, habitual drug (analgesics) intake, residential exposure to chemicals, presence of family history of renal diseases or compliance of the patients regarding periodic follow-up.

Physical and medical complications of renal disease were widely varied [22] Anemia- associated chronic illness was encountered in our study as the mean hemoglobin level was 9.9 ±2.2 gs/dl and its frequency was (75%). Low hemoglobin level is linked to cardiovascular events, increased frequency and duration of hospital admission and poor quality of life.

Regarding eGFR, it was found that the eGFR was significantly lower among old age group. Similar findings were found by Cirillo revealing inverse significant association between age and estimated GFR [23]. The same findings were observed in the study of Ain Shams University [19]. As observed in USA, the prevalence of impaired GFR (<60 mL/min/1.73m^2) was more common in adults ≥ 60 years of age (0.6% at age 20–39 years; 4.4% at age 40–59 years; 28.1% at age 60 years or older in 2003–2006) [24]. The prevalence of impaired GFR increased with increasing age [25].

Females were significantly associated with low estimated GFR. It was found to be in contrary with El Salvador study which revealed that a significant association between male sex and kidney damage [26]. It might be explained by certain socio-demographic criteria as Egyptian females are most commonly overburdened with other medical conditions and more exposed to NSAID.

Moreover, in this study, it was found that patients having connective tissue diseases and gout are significantly (P <0.05) more susceptible for impending dialysis stage (eGFR <15 ml/min/1.73 m^2). The current study findings could be explained by delayed diagnosis of patients suffering from connective tissue diseases and gout who deal with analgesics primarily for long time before specialist consultation thus lead to delay in diagnosis and more kidney damage.

We should mention some points of limitations first, the small sample size, secondly, the study encounters certain spectrum of Egyptian population who attend the Kasr Al Ainy only not addressing the different classes.

We recommended ascertaining the establishment of a health facility based screening system for early detection of renal dysfunction, tracing them, improvement of the facilities for CKD and ESRD management and building up a national adequate center for medical records under the supervision of the Ministry of Health and Epidemiology surveillance institutes and finally providing an integrated preventive controlling programs.

Acknowledgement. We would like to thank Kasr Al Ainy hospital employees for their assistance and guidance in this research. We also thank our patients for their willing participation in our research.

Conflict of interest statement. None declared.

References

1. Correa-Rotter R, Cusumano A. Present, Prevention, and Management of Chronic Kidney Disease in Latin America. *Blood Purif* 2008; 26(1): 90-94.
2. Perico N, Remuzzi G. Chronic kidney disease: a research and public health priority. *Nephrol Dial Transplant* 2012; 27(3): iii19-iii26.
3. Barsoum R. Overview: End-Stage Renal Disease in the Developing World. *Artif Organs* 2002; 26(9): 737-746.
4. Saran R, Li Y, Robinson B, *et al*. US Renal Data System 2015 Annual Data Report: Epidemiology of Kidney Disease in the United States. *Am J Kidney Dis* 2016; 1; 67(3): S1-S434.
5. Chadban S, Briganti E, Kerr P, *et al*. Prevalence of Kidney Damage in Australian Adults: The AusDiab Kidney Study. *JASN* 2003; 14(2): S131-S138.
6. Lopez AD, Mathers CD, Ezzati M, *et al*. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet* 2006; 367(9524): 1747-1757.
7. Tangri N. A Predictive Model for Progression of Chronic Kidney Disease to Kidney Failure. *Jama* 2011; 305(15): 1553-1559.
8. Ibrahim S, Fayed A, Belal D. Spectrum of renal diseases among patients admitted to the internal medicine unit through the emergency room and their outcomes: morbidity, mortality, and cost analysis. *J Egypt Soc Nephrol Transplant* 2016; 16(1): 16-20.
9. Fahmy SI, El Sherbinie AF. Determining simple parameters for social classifications for health research. *Bulletin of H.I.P.H.* 1983; 13: 95-107.
10. Stockman JA. A New Equation to Estimate Glomerular Filtration Rate. Vol. 2011, *Yearbook of Pediatrics* 2011; 193-194.
11. Goicoechea M, de Vinuesa SG, Gomez-Campdera F, Luno J. Predictive cardiovascular risk factors in patients with chronic kidney disease (CKD). *Kidney Int* 2005; 67: S35-S38.
12. Agarwal R, Light RP. Determinants and Prognostic Significance of Electrocardiographic Left Ventricular Hypertrophy Criteria in Chronic Kidney Disease. *Clin J Am Soc Nephrol* 2011; 6(3): 528-536.

13. Ulasi I, Ijoma C. The Enormity of Chronic Kidney Disease in Nigeria: The Situation in a Teaching Hospital in South-East Nigeria. *J Trop Med* 2010; 2010: 501957.
14. Amoako YA, Laryea DO, Bedu-Addo G, *et al*. Clinical and demographic characteristics of chronic kidney disease patients in a tertiary facility in Ghana. *Pan Afr Med J* 2014; 18: 274.
15. Hegazi R, El-Gamal M, Abdel-Hady N, Hamdy O. Epidemiology of and Risk Factors for Type 2 Diabetes in Egypt. *Ann Glob Heal* 2015; 81(6): 814-820.
16. Collins AJ, Foley RN, Herzog C, *et al*. United States Renal Data System 2008 Annual Data Report. *Am J Kidney Dis* 2009; 53(1): S1-374.
17. Tonja CD, Tyler W, Suzanne W. Kidney Disease. In: Stephen J, Maxine A 57 (eds) Current Medical Diagnosis and Treatment. *McGraw-Hill Professional, US* 2018; 922-961.
18. Barsoum RS, Francis MR. Spectrum of glomerulonephritis in egypt. *Saudi J Kidney Dis Transpl* 2000; 11: 421-429.
19. Afifi A, Mady G, Ahmad A, *et al*. Pattern of renal diseases among elderly Egyptians patients with acute or chronic renal diseases in Ain Shams University and Nasser Institute Hospitals, Cairo, Egypt. *J Egypt Soc Parasitol* 2005; 35(3): 911-924.
20. Fored M, Ejerblad E, Fryzek J, *et al*. Socio-economic status and chronic renal failure: a population-based case-control study in Sweden. *Nephrol Dial Transplant* 2003; 18(1): 82-88.
21. Arije A. Problems of Hemidialysis in the Management of Chronic Renal Failure in Ibadan. *Arch Ibadan Med* 2005; 2(1): 14-16.
22. Hill NR, Fatoba ST, Oke JL, *et al*. Global Prevalence of Chronic Kidney Disease-A Systematic Review and Meta-Analysis. *PLoS On*. 2016; 11(7): e0158765.
23. Cirillo M, Anastasio P, Natale Gaspare DS. Relationship of gender, age, and body mass index to errors in predicted kidney function. *Nephrol Dial Transplant* 2005; 20: 1791-1798.
24. United States Renal Data System. Chapter 1: CKD in the General Population. USRDS annual data report: Epidemiology of Kidney Disease in the United States. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney. *Diseases* 2017; 1:1-20.
25. Zhang QL, Rothenbacher D. Prevalence of chronic kidney disease in population-based studies: systematic review. *BMC Public Health* 2008; 8: 117.
26. Orantes CM, Herrera R, Almaguer M, *et al*. Chronic kidney disease and associated risk factors in the Bajo Lempa region of El Salvador: Nefrolempa study, 2009. *MEDICC Rev* 2011; 13(4): 14-22.