CHRONIC KIDNEY DISEASE IN SAUDI ARABIA: A NURSING PERSPECTIVE

Hayfa H. Almutary (1)
Ann Bonner (2)
Clint Douglas (3)

(1) Hayfa Almutary, BN, RN, MN., PhD Candidate
Lecturer, King Abdulaziz University, Saudi Arabia.
School of Nursing
Queensland University of Technology, Australia
(2) Ann Bonner, PhD, MA, B.App.Sc(Nurs), RN, MRCNA
Professor of Nursing, School of Nursing
Queensland University of Technology, Australia
(3) Clint Douglas, RN, PhD
Lecturer, School of Nursing,
Queensland University of Technology, Australia

Correspondence:
Hayfa Almutary, BN, RN, MN., PhD Candidate
Lecturer, King Abdulaziz University, Saudi Arabia.
School of Nursing
Queensland University of Technology
Victoria Park Rd
Kelvin Grove, QLD 4059
Australia
Telephone: +61(7) 3138 0572
Email: hayfa.almutary@student.qut.edu.au

Abstract

Chronic kidney disease (CKD) is a major health problem in Saudi Arabia. The number of people requiring kidney replacement therapy in Saudi Arabia is growing, which poses challenges for health professionals and increases the burden on the health care system. However, there is a paucity of nursing literature about CKD in the Middle Eastern region, including Saudi Arabia. The purpose of this review is to describe the epidemiology, risk factors, treatment modalities and the implications for nursing practice of CKD in Saudi Arabia. Improving nurses' knowledge and awareness about CKD and the risk factors in Saudi Arabia will help them to determine high risk groups and provide early management to delay progression of the disease.

Key words: Chronic kidney disease, end stage kidney disease; kidney replacement therapy, nursing, risk factors, Saudi Arabia.

Introduction

Chronic kidney disease (CKD) refers to any alteration in the kidneys which persists for three months or more resulting in any degree of kidney damage and/or decline in kidney function, regardless of the diagnosis of disease (Kidney Disease: Improving Global Outcomes [KDIGO] CKD Work Group, 2013). There are five stages of CKD which are determined by the glomerular filtration rate (see Table 1). End stage kidney disease (ESKD), stage 5 CKD, is the most serious form of CKD because the kidneys are unable to perform most of their functions sufficiently to effectively maintain homeostasis (National Institute for Health & Clinical Excellence (NICE), 2008).

CKD has become a major health problem in Saudi Arabia in recent decades (Al-Sayyari & Shaheen, 2011) due to several factors which have contributed to the increased prevalence of this disease. Nurses are well positioned in a variety of healthcare settings to identify individuals at high risk and provide early management to delay the progression of CKD. The purpose of this review is to inform nurses about the current evidence about the risk factors for CKD, strategies to prevent it and the current treatment modalities of CKD in Saudi Arabia.

Chronic Kidney Disease in Saudi Arabia

The number of people in each stage of CKD is unknown in Saudi Arabia, and this is similar to most other countries. In some Western countries 10-12% of the population are estimated to have CKD, making it one of the most prevalent chronic diseases (Australian Institute of Health and Welfare [AIHW], 2009; National Institute of Diabetes and Digestive and Kidney Disease, 2011; Nugent, Fathima, Feigl, & Chyung, 2011). It is difficult to determine the

Stage	GFR (mL/min/1.73m2)	Description
1	≥90	Normal or increased GFR, with other evidence of kidney damage
2	60-89	Mild decrease in GFR, with other evidence of kidney damage.
3a	45-59	Moderate decrease in GFR, with or without other evidence of kidney damage.
3b	30-44	
4	15-29	Marked decrease in GFR, with or without other evidence of kidney damage.
5	<15	Kidney failure

Abbreviations: GFR, glomerular filtration rate

Table 1: Stages of Chronic Kidney Disease

Non-modifiable Factors	Modifiable Factors	Biomedical Factors	
		Non-communicable disease	Infectious disease
family history & genetics	smoking	diabetes	malaria
increasing age	lack of exercise	hypertension	hepatitis B
history of kidney disease kidney injury	poor nutrition	dyslipidaemia obesity	schistosomiasis

Table 2: Risk Factors of Chronic Kidney Disease

number of people who suffer from CKD for each stage, especially as the early stages of CKD (1-3) are largely asymptomatic and people may not be diagnosed until ESKD has occurred (Assady, Ramadan, & Rubinger, 2011; James, Hemmelgarn, & Tonelli, 2010; Muneer, Al Nusairat, & Kabir, 2004). We do, however, know about ESKD as data is collected by a national registry (Saudi Centre for Organ Transplantation [SCOT]). The SCOT provides valuable information about the number of people with ESKD who have started kidney replacement therapy (KRT) such as haemodialysis, peritoneal dialysis or who have received a kidney transplant. However, the number of people with earlier stages of CKD far exceeds the number of the people who have progressed to ESKD (Hsu, 2011).

The incidence and prevalence of ESKD has been rapidly increasing among the Saudi population in the last three decades (Al-Sayyari & Shaheen, 2011; Alghythan & Alsaeed, 2012). Over the last 15 years, the prevalence of KRT has increased from 401 Per Million Population (PMP) in 1995 to 770 PMP in 2010 (SCOT, 2010). The latest data shows that there are 13,356 patients receiving dialysis, and this number is increasing annually by approximately 8% (SCOT, 2011). According to the SCOT forecast, by 2015 the number of people receiving dialysis treatment will exceed 15,000 (SCOT, 2010). This indicates that Saudi Arabia faces many challenges owing to increased demands for KRT and the considerable morbidity associated with ESKD.

There is a growing prevalence of ESKD in all regions of Saudi Arabia (SCOT, 2008, 2010), yet the prevalence is higher in the Western region of Saudi Arabia when compared to the other regions (SCOT, 2010; Souqiyyeh, Al-Attar, Zakaria, & Shaheen, 2001). It is well known that the Western region of Saudi Arabia is a multicultural area with various ethnicities (because of pilgrims to Mecca) who have settled there (Federal Research Division, 2003; Jalalah, 2009). Since ethnic and genetic factors are responsible for certain renal diseases (Assady, et al., 2011; Karkar, 2011; Mohamed, Al-Shaebi, & Osman, 2005), these factors may play a role in the increased prevalence of ESKD in the Western region of Saudi Arabia (Jalalah, 2009). Moreover, Mohamed et al. (2005) found that 7% of people receiving dialysis therapy in Madinh

Al-Munorah (in the Western region of Saudi Arabia) had hereditary diseases that have caused ESKD, but this study may not accurately reflect the actual causes of ESKD as data was obtained from family history without concurrent evidence of laboratory investigations. Another factor that may contribute to the increased prevalence of CKD in the Western region is the mixing of pilgrims who come from different countries and cultures which has altered the traditional diet and lifestyle of people living in this region. The Western region now reports an increasing occurrence of obesity and diabetes, both of which are significant risk factors for the development of CKD (Belqacem, 2007; Karkar, 2011; Shaheen & Al-Khader, 2005).

Comparatively, the trend in incidence and prevalence of ESKD in Saudi Arabia is lower than that of most industrial countries, but is still progressively increasing. Within the last few years, the incidence rates of new people with ESKD have stabilised in a number of countries. For instance in the UK (UK Renal Registry, 2010), USA (Eggers, 2011), Australia and New Zealand (AIHW, Australia and New Zealand Dialysis and Transplant Registry [ANZDTA], 2011) there has been a steady rate in ESKD incidence in recent years. Thus, early detection and management of CKD may illustrate the reason for the stability of incidence rates of ESKD in these countries. In Saudi Arabia, in almost 70% of patients who are diagnosed with ESRD, there has not been any previous monitoring of their kidney function (Mohamed, Sirwal, Vakil, & Ashfaquddin, 2004).

Nurses should be aware of the risk factors for CKD and be able to detect the people in high risk groups so that early management that aims to delay the progression of CKD can be commenced. Thus, nurses can play a major role in early detection and delay disease progression.

Risk Factors for Chronic Kidney Disease

Risk factors for CKD are classified into three categories (see Table 2) (AIHW, 2009; Mohamed, et al., 2005). Like other countries, Saudi Arabia shares these risk factors but there are also some elements unique to Saudi Arabian environment and context that need to be explored.

Risk Factors for CKD in Saudi People

Diabetes. Diabetes mellitus (DM) is the leading cause of CKD, particularly type two DM (Anothaisintawee, Rattanasiri, Ingsathit, Attia, & Thakkinstian, 2009; Karkar, 2011; Nugent, et al., 2011). Type two DM causes damage to the glomerulus by affecting the microscopic blood vessels in the glomeruli (Kidney Health Australia, 2012). DM has become a major cause of CKD in Saudi Arabia. In the 1990s, the incidence of DM in Saudi Arabia as the primary cause of ESKD ranged from 12% to 26% (Al-Homrany & Abolfotoh, 1999; Al Wakeel et al., 2002; Jondeby et al., 2001; Mitwalli et al., 1997), but recent figures now indicate that DM is responsible for more than 37% of all cases of ESKD (Al-Sayyari & Shaheen, 2011; Mohamed, et al., 2004; SCOT, 2010; Shaheen & Basri, 2002). This increase in new ESKD cases is due to the increased prevalence of DM in Saudi Arabia. Recent dramatic changes in lifestyles and social patterns in Saudi Arabia have contributed to the increasing prevalence of DM and obesity; for example, changed eating behaviours towards a Western diet (high in fat and sugar, and the consumption of sugar-laden soft drinks); reduced activity levels; embracing Western work practices; reduction in the number of practicing Bedouins; development of a youth culture (e.g. smoking habit) and changes in modern labour-saving technology and transport systems (Al-Nozha et al., 2007; World Health Organization [WHO], 2006).

Recently, Saudi Arabia has been ranked sixth across the Middle East and North Africa for the highest diabetes prevalence, where the regional prevalence is approximately 19.6 % and projected to rise to 22.3% by 2030 (Whiting, Guariguata, Weil, & Shaw, 2011). These alarming rates in DM prevalence may be strongly associated with the increased number of people with ESKD in Middle Eastern and North African countries. Although DM has become a common health issue globally, the greatest impact of diabetes occurs in low and middle-income countries, because there are limited health prevention activities, early recognition and treatment, and resources to deal with associated complications such as the micro and macroscopic sequelae of DM (Assady, et al., 2011).

Obesity

The changes in lifestyle among Saudis as a result of urbanisation and globalisation have resulted in more obesity and lack of exercise (Shaheen & Al-Khader, 2005; Shaheen & Souqiyyeh, 2010; Whiting, et al., 2011). The obesity prevalence has been reported to be as high as 14.2 % and 23.6% in males and females respectively in Saudi Arabia (Al-Othaimeen, Al-Nozha, & Osman, 2007). Although the direct link between obesity and CKD is not clear, it is well known that obesity contributes to a growing number of associated factors of CKD, such as diabetes and hypertension (Al-Nozha, et al., 2007; Saeed et al., 2011).

Smoking

Smoking habits have increased in Saudi Arabia including different kinds of tobacco, such as cigarettes and jirak (Bassiony, 2009). The prevalence rates of smoking among adult Saudis ranges between 11.6%-52% (Bassiony, 2009). Smoking consumption is also reported as higher among older people as it reaches to 25% (Almas, al-Shammari, & al-Dukhyeel, 2003). In a systematic review Bassiony (2009) found that smoking was more prevalent in males than females, however, most of the studies included in the review only included males which could suggest an

under-reporting of smoking in Saudi women. Smoking Shisha (water pipe) using a jirak is a common practice among Saudi women, particularly in the Jeddah area as women consider it to be more stylish than cigarette smoking (Merdad, Al-Zahrani, & Farsi, 2007).

These practices increase each individual's risk of developing CKD, especially when smoking is combined with other risk factors for CKD. Smoking reduces blood flow to the kidneys resulting in nephrosclerosis (Orth & Hallan, 2008). Smoking can also be an independent risk factor for the development of nephropathy and the progression of ESKD in people with DM and hypertension as smoking increases the excretion of protein and albumin in the urine (Ejerblad et al., 2004).

Hypertension

The prevalence of hypertension is high in Saudi Arabia. It affects more than 25% of the adult population (Al-Nozha, et al., 2007; Saeed, et al., 2011). Hypertension has been reported more in urban communities than in rural areas in Saudi Arabia (Al-Nozha, et al., 2007; Saeed, et al., 2011). This indicates the influence of changing lifestyles. The relationship between hypertension and CKD is well known as high blood pressure leads to damaged glomeruli by affecting the arteries and blood vessels which reduce the blood flow to the kidneys (Bidani & Griffin, 2004); a condition called hypertensive nephropathy; a condition which is responsible for approximately 36% of all ESKD in Saudi Arabia (SCOT, 2011).

Family history and genetic disorders

The prevalence of certain inherited diseases that are responsible for developing CKD is often due to consanguinity. Consanguineous mar-riages are a common practice in Middle Eastern countries, especially in Saudi Arabia (Al-Eisa, Samhan, & Naseef, 2004; Barbari et al., 2003; Shaheen & Al-Khader, 2005). This contributes to an increased incidence and prevalence of genetic disorders, such as polycystic kidney disease (Al-Eisa, et al., 2004; Barbari, et al., 2003; Shaheen & Al-Khader, 2005) and sickle cell nephropathy (Shaheen & Al-Khader, 2005).

Gender

There is inconsistency in reporting gender as a risk factor for CKD worldwide. Several reports indicate that CKD affects more males than females (ANZDTA, 2011; AIHW, 2009; McClellan, 2005; UK Renal Registry, 2010). In contrast, a systematic review found that female gender was identified as a risk factor for CKD in many European, USA and Asian countries (Zhang & Rothenbacher, 2008). Thus, differences in a gender prevalence of CKD are demonstrated in most reports. CKD affects both genders in Saudi Arabia with similar frequency, although rates are slightly higher in males (Al-Homrany & Abolfotoh, 1999; SCOT, 2010; Shaheen & Basri, 2002). In the 1980s, the male and female prevalence ratio was 2:1 for ESKD in Saudi Arabia (Khader, Saltissi & Abomelha, 1984 as cited in Jondeby et al., 2001). As males normally have more muscle mass than females, which is a main determinant for concentration of creatinine in the serum, it is not surprising that male gender could be a risk factor for CKD development (Zhang & Rothenbacher, 2008). However, by the end of 1990s, the gender ratio had changed, with no significant differences between males and females (1:1.2) (Jondeby, et al., 2001). The changes in the gender ratio of ESKD patients in Saudi Arabia could also be due to the changes of attitude of Saudi women to attend and accept medical care compared to the last two decades (Jondeby, et al., 2001). Another explanation for increased rates of CKD among Saudi woman could be associated with the increased prevalence of obesity and smoking in women. The impact of more Saudi women with CKD could have implications for the health workforce as more female nurses, doctors and allied health professionals will be needed to provide care for women (Jondeby, et al., 2001).

Age

In Saudi Arabia, CKD is more prevalent in the highly productive age-group. The highest number of people receiving dialysis treatment is found in the age-group of 26 to 45 years (SCOT, 2011). However, the prevalence and incidence of the earlier stages of CKD is shifting to the older age groups (Jondeby, et al., 2001; Muneer, et al., 2004; Shaheen & Basri, 2002). This concurs with global reports where the changes in age demographics to older age groups are associated with increased incidence and prevalence trends of CKD (Zhang & Rothenbacher, 2008). For instance, in Saudi Arabia during the early 1980's the mean age of people with ESKD was 37.9 years, then in the 1990s it was 51.3 years (Jondeby, et al., 2001).

The number of people with CKD in the older age group (65 and older) has been increasing dramatically in the last three decades. Although the older age-group constitutes only 3.2% of the adult populations in Saudi Arabia, 21% of the cases of ESKD were reported in this group (Al-Sayyari & Shaheen, 2011). The number of the older age-group is expected to increase to 13% of the adult population in Saudi Arabia over the next two decades (Al-Sayyari & Shaheen, 2011). Thus, significant increases in the prevalence of CKD in older people in the future can be predicted. This trend in prevalence of CKD among people over 65 is associated with more co-morbid diseases (e.g. cardiovascular disease, diabetes, hypertension, etc) which increases the pressure on health care services, impacts on the quality of life of patients and their families and reduces life expectancies (Muneer, et al., 2004; Shaheen & Basri, 2002). Thus as people age, screening for risk factors of CKD becomes a priority for all healthcare professionals; screening will achieve earlier detection, greater

opportunity to control predisposing risk factors (e.g. glycaemic and hypertension control) and the delay of further deterioration in kidney function (Fassett et al., 2011).

Preventing and Slowing Progression of CKD

Early detection of CKD is essential to monitor and delay disease progression (Codreanu, Perico, Sharma, Schieppati, & Remuzzi, 2006; Schieppati & Remuzzi, 2005). The most efficient method to detect CKD in its early stages is applying a routine screening program that should target people at increased risk (Alsuwaida et al., 2010; Karkar, 2011; Vassalotti, Li, Chen, & Collins, 2009). Alsuwaida et al., (2010) conducted a study in Saudi Arabia and found that only 7.1% of people with CKD were actually aware that they had CKD, and a further 32.1% believed that only protein or blood had appeared in their urine. This may indicate that a large number of people have obtained misleading or have misunderstood results about their health status. The lack of early detection of CKD is also a concern in most Western countries as well (Vassalotti, et al., 2009; Walser, 2010). Thus, more attention should be placed on prevention of CKD by focusing on the methods that assist in early detection. This is because of the silent progression of CKD.

Even in the case of early detection of CKD, late referral to nephrology services is still problematic in many health care sectors. Globally, it is estimated that approximately 25% to 50% of people who have initiated any form of KRT had delayed referral to nephrology services (i.e. less than three months before initiating treatment) (Vassalotti, et al., 2009; Wavamunno & Harris, 2005). A similar percentage of late referrals to nephrologists (27%) has also been found in Saudi Arabia (Shaheen & Basri, 2002). Many studies have revealed the impact of late detection and referral of people with CKD on morbidity and mortality rates (Cass, Cunningham, Snelling, & Ayanian, 2003; Wavamunno & Harris, 2005). Late presentation of people with ESKD to nephrology services is likely to affect many aspects of their quality of life and reduce their prognosis (Cass, et al., 2003; Karkar, 2011; Wavamunno & Harris, 2005). Late referral has been associated with more hospitalisation and increased need for urgent dialysis therapy which is associated with greater complications related to using temporary vascular access (Cass, et al., 2003; Karkar, 2011; Wavamunno & Harris, 2005). It also reduces individuals' chances to select the appropriate dialysis modalities and to have successful kidney transplantation (Wavamunno & Harris, 2005).

Treatment Modalities for ESKD in Saudi Arabia

The aim of using KRT is to compensate for lost kidney functions and to relieve the symptom burden associated with ESKD. The treatment alternatives for ESKD in Saudi Arabia include: kidney transplantation and dialysis therapies (SCOT, 2011). The first haemodialysis program in Saudi Arabia commenced in 1971, followed by the inception of the first kidney transplant in 1979 (SCOT, 2011). Peritoneal dialysis commenced in 1980 (Najafi, 2009). Since then, there has been a constant expansion of centres providing KRT in Saudi Arabia. Currently, there are 182 dialysis centres with the majority of centres (119) managed and funded by the Ministry of Health (SCOT, 2011). There are two alternative forms of dialysis therapy: haemodialysis and peritoneal dialysis. Haemodialysis is the most common treatment option used among ESKD patients in Saudi Arabia; 58% compared with only 6% for peritoneal dialysis (SCOT, 2011).

Kidney transplantation is the best treatment modality for ESKD, because it improves people's quality of life to nearly normal and is cost effective (Ghadiani, Peyrovi, Mousavinasab, & Jalalzadeh, 2012). In Saudi Arabia, the number of patients who already have a kidney transplant is 36% of all ESKD patients (SCOT, 2011). Kidney survival rates are better when the organs are taken from live rather than deceased donors (Ghadiani, et al., 2012; Howard, Cornell, & Cochran, 2012). Although, Islam encourages the practice of organ donation, evidence indicates that Saudi people are reluctant to donate due to religious concerns (Alam, 2007; Oliver, Woywodt, Ahmed, & Saif, 2011). However, raising awareness in the Saudi community about the religious acceptance of living or deceased organ donation is required (Alam, 2007).

Nurses Role in CKD and ESKD Healthcare

Prevention of chronic conditions has become a main priority for many healthcare systems globally (Sargent, Forrest, & Parker, 2012). Controlling modifiable risk factors and early detection are the key aspects in the prevention and management for these chronic conditions. Nurses, particularly in primary healthcare, have a leading role in disease prevention by early detection, monitoring people at high risk, and controlling the modifiable risk factors (Sargent, et al., 2012). During assessment, the number of risk factors should be taken into account to detect people in the high risk group. People in the general community who do not have any known risk factors for CKD are classified as at "low risk" of developing CKD. When people have one or more of the risk factors for CKD, they are at "high risk" of developing CKD (SCOT, 2007). People who are already in the early stages of CKD are classified as having a "very high risk" of developing ESKD (Codreanu, et al., 2006; SCOT, 2007).

In a systematic review, Sargent et al. (2012) found considerable evidence of the major role nurses have in primary healthcare settings to deliver health promotion activities to prevent chronic disease. Due to the increasing prevalence of CKD and the similarity of its risk factors (as described earlier) to other chronic diseases, warrants nurses working in primary healthcare and community settings to screen people at high

Parameter	Target	Treatment and effects on systolic BP
Lifestyle Factors		
Smoking	Cease smoking	Lifestyle modification
Nutrition	Dietary salt intake ≤100 mmol/ day (or 6 g salt per day)	Lifestyle modification ~ SBP reduction = 2-8 mmHg
Alcohol	Moderate alcohol consumption only (≤2 standard drinks on any day)	Lifestyle modification ~ SBP reduction = 2-4 mmHg
Physical activity	>30 mins physical activity/day ~ SBP reduction = 4-9 mmHg	Lifestyle modification
Weight	BMI 18.5 – 24.9 kg/m^2 WC males ≤94 cm (≤90 cm in Asian populations) WC females ≤80 cm	Lifestyle modification ~ SBP reduction = 5-20 mmHg/10 kg loss
Clinical Factors		
Blood pressure	≤ 140/90 mmHg, or ≤ 130/80 mmHg if albuminuria present (urine ACR >3.5 mg/mmol in females and >2.5 mg/mmol in males)	Lifestyle modification ACE inhibitor or ARB
Albuminuria	>50% reduction of baseline value	ACE inhibitor or ARB
Cholesterol	Total <4.0 mmol/L LDL <2.5 mmol/L	Dietary advice Statins
Blood glucose (for people with diabetes)	HbA1c <7.0%	Lifestyle modification Oral hypoglycaemics Insulin

Abbreviations: BP: blood pressure; SBP: systolic blood pressure; BMI: body mass index; WC: waist circumference; ACR: albumin: creatinine ratio; ARB: angiotensin II receptor blocker; ACE: angiotensin-converting enzyme; LDL: low-density lipoprotein; HbA1c: glycated haemoglobin.
Printed with permission from Kidney Health Australia (2012)

Table 3: Treatment Targets for People with CKD

risk for CKD, promote awareness about CKD risk factors, and to more effectively monitor and control these risk factors. Promoting lifestyle changes through health education is necessary to prevent high risk patients from developing CKD. Other important strategies include referring patients to dieticians for weight loss and glycaemic control or to smoking cessation clinics. Nurses can also identify people with CKD early and collaborate with medical staff in primary healthcare to ensure there is appropriate and timely referral to speciality renal services.

Nursing risk factor assessment and early intervention for CKD is warranted in all primary care services. For example, in Australia, the primary care facilities use a "Well Person's Health Check" (Jackson, Mayne, & Burke, 2001). This screening assists in obtaining a clear picture about a person's health status, such as current medical problems, family history, the mental and physical wellbeing, lifestyle and risk behaviours (i.e., diet, smoking, activity, stress). Thus nurses can promote health by identifying people at high risk, undertake health education and provide early referral and management.

For people at high risk of developing CKD, the nursing role aims to control the modifiable factors and monitor kidney functions. Annual screening of people at risk for CKD is essential and the Kidney Health Check

provides a guide for early detection of CKD (Kidney Health Australia, 2012). Checking blood pressure, monitoring the blood test (eGFR), dipstick testing for urinary protein levels, and albumin to creatinine ratio (ACR) are recommended yearly (Kidney Health Australia, 2012).

When people are at a very high risk to develop ESKD, management will vary according to the stage of CKD. Table three summarises the key treatment targets for people with CKD. Early and effective pre-dialysis management can reduce the risk for urgent dialysis and also lead to improve clinical outcomes (Curtis et al., 2005). Table four provides some useful resources for nurses about CKD management.

Conclusion

The number of people with CKD is rapidly increasing in Saudi Arabia. This poses challenges for health professionals and increases the burden on the health care system. Given the mostly asymptomatic nature of CKD, prevention by early detection and controlling modifiable risk factors are essential to delay disease progression and to improve patient outcomes. In response to increasing numbers of people at risk for or with CKD, there is a need for Saudi nurse education to increase the number of nurses with postgraduate education in: 1) chronic disease prevention and management to respond to the growing prevalence of CKD stages 1-3 in the community; and 2) renal trained specialist nurses are needed for CKD stages 4 and 5.

References

Al-Eisa, A. A., Samhan, M., & Naseef, M. (2004). End-stage renal disease in Kuwaiti children: an 8-year experience. Transplantation Proceedings, 36(6), 1788-1791.

Al-Homrany, M., & Abolfotoh, M. (1999). Incidence of treated end-stage renal disease in Asir Region, Southern Saudi Arabia. Saudi Journal of Kidney Diseases and Transplantation, 9(4), 425-430.

Al-Nozha, M., Abdullah, M., Arafah, R., Khalil, Z., Khan, B., Al-Mazrou, Y., et al. (2007). Hypertension in Saudi Arabia. Saudi Medical Journal, 28(1), 77-84.

Al-Othaimeen, A., Al-Nozha, M., & Osman, A. (2007). Obesity: an emerging problem in Saudi Arabia. Analysis of data from the National Nutrition Survey. Eastern Mediterranean Health Journal, 13(2), 441-448.

Al-Sayyari, A. A., & Shaheen, F. A. (2011). End stage chronic kidney disease in Saudi Arabia. A rapidly changing scene. Saudi Medical Journal, 32(4), 339-346.

Al Wakeel, J., Mitwalli, A. H., Al Mohaya, S., Abu-Aisha, H., Tarif, N., Malik, G. H., et al. (2002). Morbidity and mortality in ESRD patients on dialysis. Saudi Journal of Kidney Diseases and Transplantation, 13(4), 473-477.

Alam, A. A. (2007). Public opinion on organ donation in Saudi Arabia. Saudi Journal of Kidney Diseases and Transplantation, 18(1), 54-59.

Alghythan, K. A., & Alsaeed, H. A. (2012). Hematological changes before and after hemodialysis. Scientific Research and Essays, 7(4), 490-497.

Almas, K., al-Shammari, B., & al-Dukhyeel, S. (2003). Education level, oral hygiene and smoking habits of an elderly Saudi population in Riyadh. Odonto-Stomatologie Tropicale = Tropical Dental Journal, 26(101), 4-6.

Alsuwaida, A. O., Farag, Y. M. K., Al Sayyari, A. A., Mousa, D., Alhejaili, F., Al-Harbi, A., et al. (2010). Epidemiology of chronic kidney disease in the Kingdom of Saudi Arabia (SEEK-Saudi investigators) - a pilot study. Saudi Journal of Kidney Diseases and Transplantation, 21(6), 1066-1072.

Anothaisintawee, T., Rattanasiri, S., Ingsathit, A., Attia, J., & Thakkinstian, A. (2009). Prevalence of chronic kidney disease: a systematic review and meta-analysis. Clinical Nephrology, 71(3), 244-254.

Assady, S., Ramadan, R., & Rubinger, D. (2011). Near and Middle East. In M. W. Taal, B. M. Brenner & F. C. Rector (Eds.), Brenner and Rector's the kidney, 9th ed.: Elsevier/ Saunders.

Australia and New Zealand Dialysis and Transplant Registry [ANZDTA]. (2011). The 34th annual ANZDATA report 2011 - data to 2010. from http://www.anzdata.org.au/v1/report_2011.html

Australian Institute of Health and Welfare [AIHW]. (2009). An overview of chronic kidney disease in Australia. from http://www.aihw.gov.au/publication-detail/?id=6442468245

Barbari, A., Stephan, A., Masri, M., Karam, A., Aoun, S., El Nahas, J., et al. (2003). Consanguinity-associated kidney diseases in Lebanon: an epidemiological study. Molecular Immunology, 39(17-18), 1109-1114.

Bassiony, M. M. (2009). Smoking in Saudi Arabia. Saudi Medical Journal, 30(7), 876-881.

Belqacem, S. (2007). Health issues in the Arab American community. Commentary: the growing risk factors for noncommunicable diseases in the Arab world. Ethnicity & Disease, 17(2 Suppl 3), S3-51-S53-52.

Bidani, A. K., & Griffin, K. A. (2004). Pathophysiology of hypertensive renal damage: implications for therapy. Hypertension, 44(5), 595-601.

Cass, A., Cunningham, J., Snelling, P., & Ayanian, J. Z. (2003). Late referral to a nephrologist reduces access to renal transplantation. American Journal of Kidney Diseases: the Official Journal of the National Kidney Foundation, 42(5), 1043-1049.

Codreanu, I., Perico, N., Sharma, S. K., Schieppati, A., & Remuzzi, G. (2006). Prevention programmes of progressive renal disease in developing nations. Nephrology (Carlton, Vic.), 11(4), 321-328.

Curtis, B. M., Ravani, P., Malberti, F., Kennett, F., Taylor, P. A., Djurdjev, O., et al. (2005). The short and long term impact of multi-disciplinary clinics in addition to standard nephrology care on patient outcomes. 20(1), 147-154.

Eggers, P., W. (2011). Has the incidence of end-stage renal

disease in the USA and other countries stabilized? Current Opinion in Nephrology & Hypertension, 20(3), 241-245.

Ejerblad, E., Fored, C. M., Lindblad, P., Fryzek, J., Dickman, P. W., Elinder, C.-G., et al. (2004). Association between smoking and chronic renal failure in a nationwide population-based case-control study. Journal of the American Society of Nephrology: JASN, 15(8), 2178-2185.

Fassett, R. G., Robertson, I. K., Mace, R., Youl, L., Challenor, S., & Bull, R. (2011). Palliative care in end-stage kidney disease. Nephrology (Carlton, Vic.), 16(1), 4-12.

Federal Research Division. (2003). A country study: Saudi Arabia. from http://lcweb2.loc.gov/frd/cs/satoc.html

Ghadiani, M. H., Peyrovi, S., Mousavinasab, S. N., & Jalalzadeh, M. (2012). Delayed graft function, allograft and patient srvival in kidney transplantation. Arab Journal of Nephrology and Transplantation, 5(1), 19-24.

Howard, R., Cornell, D. L., & Cochran, L. (2012). History of deceased organ donation, transplantation, and organ procurement organizations. Progress in Transplantation, 22(1), 6-17.

Hsu, C.-y. (2011). Epidemiology of kideny disease. In M. W. Taal, B. M. Brenner & F. C. Rector (Eds.), Brenner and Rector's the kidney, 9th ed: Elsevier/Saunders.

Jackson, L., Mayne, D., & Burke, H. (2001). The experience of the Well Person's Health Check in the Far West Area Health Service. New South Wales Public Health Bulletin, 12(6), 152-155.

Jalalah, S. (2009). Patterns of primary glomerular diseases among adults in the Western Region of Saudi Arabia. Saudi Journal of Kidney Diseases and Transplantation, 20(2), 295-299.

James, M. T., Hemmelgarn, B. R., & Tonelli, M. (2010). Early recognition and prevention of chronic kidney disease. Lancet, 375(9722), 1296-1309.

Jondeby, M. S., De-Los Santos, G. G., Al-Ghamdi, A. M., Al-Hawas, F. A., Mousa, D. H., Al-Sulaiman, M. H., et al. (2001). Caring for hemodialysis patients in Saudi Arabia. Past, present and future. Saudi Medical Journal, 22(3), 199-204.

Karkar, A. (2011). The value of pre-dialysis care. Saudi Journal of Kidney Diseases and Transplantation, 22(3), 419-427.

Kidney Disease: Improving Global Outcomes [KDIGO] CKD Work Group. (2013). KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney inter., Suppl., 3(1), 1-150.

Kidney Health Australia. (2012). Chronic Kidney Disease (CKD) Management in General Practice (2 ed.). Melbourne.

McClellan, W. M. (2005). Epidemiology and risk factors for chronic kidney disease. The Medical Clinics of North America, 89(3), 419-445.

Merdad, L. A., Al-Zahrani, M. S., & Farsi, J. M. (2007). Smoking habits among Saudi female university students: prevalence, influencing factors and risk awareness. Annals of Saudi Medicine, 27(5), 366-369.

Mitwalli, A. H., Al-Swailem, A. R., Aziz, K., Paul, T. T., Aswad, S., Shaheen, F. A., et al. (1997). Etiology of end-stage renal disease in two regions of Saudi Arabia. Saudi Journal of Kidney Diseases and Transplantation, 8(1), 16-20.

Mohamed, A. O., Al-Shaebi, F. M., & Osman, S. (2005). Families with chronic renal diseases: one center experience. Saudi Journal of Kidney Diseases and Transplantation, 16(1), 81-83.

Mohamed, A. O., Sirwal, I. A., Vakil, J. A. M., & Ashfaquddin, M. (2004). Incidence and etiology of end-stage renal disease in Madinah Munawarah area: any changing trends? Saudi Journal of Kidney Diseases and Transplantation, 15(4), 497-502.

Muneer, A., Al Nusairat, I., & Kabir, M. Z. (2004). Clinical profiles of chronic renal failure patients at referral to nephrologist. Saudi Journal of Kidney Diseases and Transplantation, 15(4), 468-472.

Najafi, I. (2009). Peritoneal dialysis in Iran and the Middle East. Peritoneal Dialysis International: Journal of The International Society for Peritoneal Dialysis, 29 Suppl 2, S217-S221.

National Institute for Health & Clinical Excellence (NICE). (2008). Chronic kidney disease: early identification and management of chronic kidney disease in adults in primary and secondary care. from http://www.nice.org.uk/guidance/qualitystandards/chronickidneydisease/ckdqualitystandard.jsp

National Institute of Diabetes and Digestive and Kidney Disease. (2011). Kidney and Urologic Diseases Statistics for the United States. from www.kidney.niddk.nih.gov

Nugent, R. A., Fathima, S. F., Feigl, A. B., & Chyung, D. (2011). The burden of chronic kidney disease on developing nations: a 21st century challenge in global health. Nephron. Clinical Practice, 118(3), c269-c277.

Oliver, M., Woywodt, A., Ahmed, A., & Saif, I. (2011). Organ donation, transplantation and religion. Nephrology Dialysis Transplantation, 26(2), 437-444.

Orth, S. R., & Hallan, S. I. (2008). Smoking: a risk factor for progression of chronic kidney disease and for cardiovascular morbidity and mortality in renal patients--absence of evidence or evidence of absence? Clinical Journal of the American Society of Nephrology: CJASN, 3(1), 226-236.

Saeed, A. A., Al-Hamdan, N. A., Bahnassy, A. A., Abdalla, A. M., Abbas, M. A. F., & Abuzaid, L. Z. (2011). Prevalence, awareness, treatment, and control of hypertension among Saudi adult population: a national survey. International Journal of Hypertension, 2011, 174135-174135.

Sargent, G. M., Forrest, L. E., & Parker, R. M. (2012). Nurse delivered lifestyle interventions in primary health care to treat chronic disease risk factors associated with obesity: a systematic review. Obesity Reviews, 13(12), 1148-1171.

Saudi Center for Organ Transplantation (SCOT). (2007). Guidelines for evaluation and conservative management of chronic kidney disease patients in Saudi Arabia. from http://www.scot.org.sa/en/

Saudi Center for Organ Transplantation (SCOT). (2008). Annual report 2008. from http://www.scot.org.sa/en/

Saudi Center for Organ Transplantation (SCOT). (2010). Annual report 2010. from http://www.scot.org.sa/en/

Saudi Center for Organ Transplantation (SCOT). (2011). Annual report 2011. from from http://www.scot.org.sa/en/

Schieppati, A., & Remuzzi, G. (2005). Chronic renal diseases as a public health problem: epidemiology, social, and economic implications. Kidney International. Supplement(98), S7-S10.

Shaheen, F., & Al-Khader, A. (2005). Epidemiology and causes of end stage renal disease (ESRD). Saudi Journal of Kidney Diseases and Transplantation, 16(3), 277-281.

Shaheen, F., & Basri, N. A. (2002). Pre-end stage chronic renal failure: the Jeddah Kidney Center experience. Saudi Journal of Kidney Diseases and Transplantation, 13(3), 371-375.

Shaheen, F., & Souqiyyeh, M. Z. (2010). Kidney health in the Middle East. Clinical Nephrology, 74(1), S85-S88.

Souqiyyeh, M. Z., Al-Attar, M. B., Zakaria, H., & Shaheen, F. A. (2001). Dialysis centers in the kingdom of saudi arabia. Saudi Journal Of Kidney Diseases And Transplantation: An Official Publication Of The Saudi Center For Organ Transplantation, Saudi Arabia, 12(3), 293-304.

UK Renal Registry. (2010). The thirteenth annual report. from http://www.renalreg.com/Reports/2010.html

Vassalotti, J. A., Li, S., Chen, S.-C., & Collins, A. J. (2009). Screening populations at increased risk of CKD: the Kidney Early Evaluation Program (KEEP) and the public health problem. American Journal of Kidney Diseases, 53(3 Suppl 3), S107-S114.

Walser, M. T., Betsy. (2010). Coping with kidney disease: a 12-step treatment program to help you avoid dialysis: Hoboken : John Wiley & Sons, Inc.

Wavamunno, M. D., & Harris, D. C. H. (2005). The need for early nephrology referral. Kidney International. Supplement(94), S128-S132.

Whiting, D., Guariguata, L., Weil, C., & Shaw, J. (2011). IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Research & Clinical Practice, 94(3), 311-321.

World Health Organization [WHO]. (2006). Country Cooperation Strategy for WHO and Saudi Arabia. from http://www.who.int/countryfocus/cooperation_strategy/ccs_sau_en.pdf

Zhang, Q.-L., & Rothenbacher, D. (2008). Prevalence of chronic kidney disease in population-based studies: systematic review. BMC Public Health, 8, 117-129.