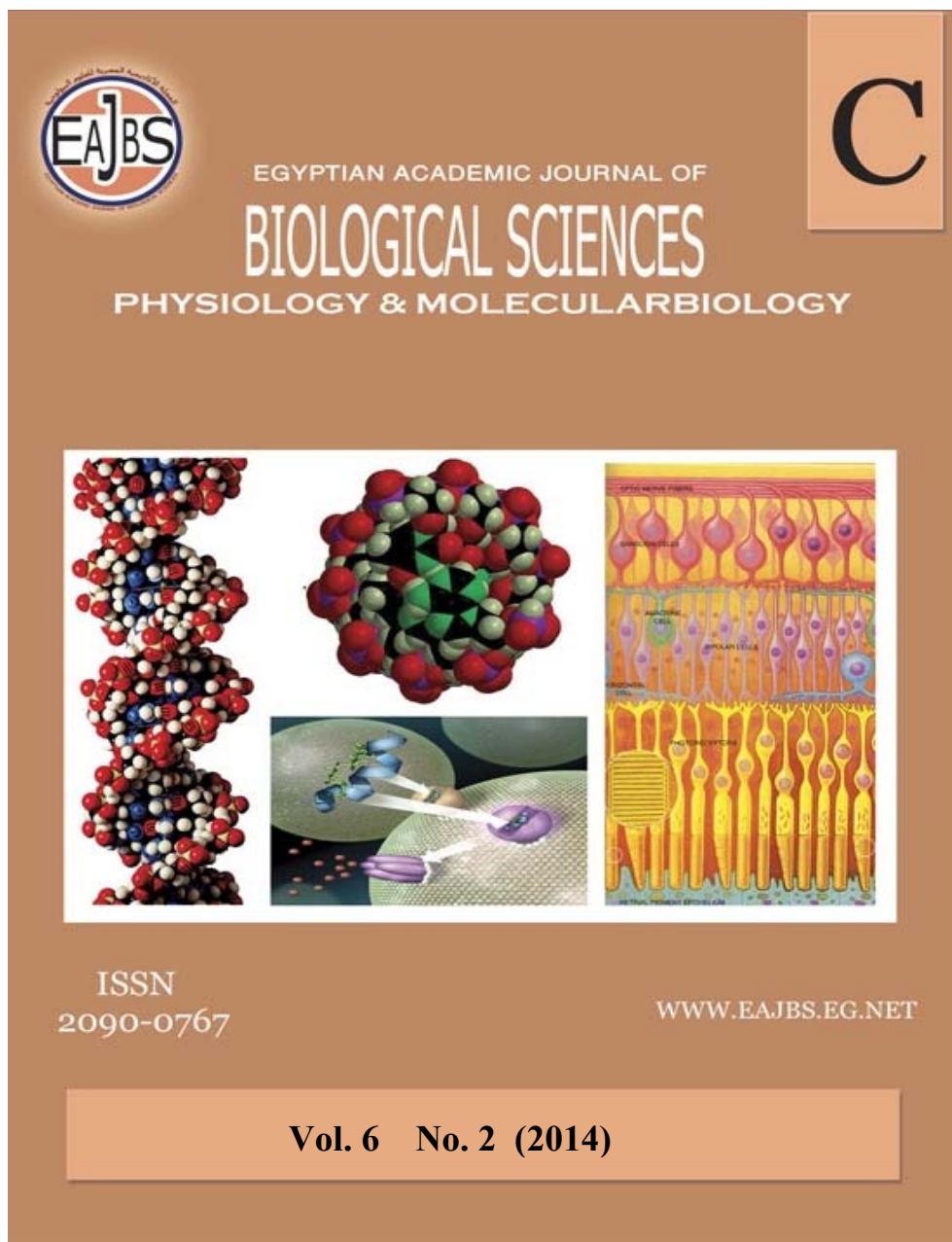


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Distribution of CKD and Hypertension in 13 Towns in Hail Region, KSA

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ABSTRACT

Background: Identification of individuals with early chronic kidney disease (CKD) and impaired blood pressure at community base provides opportunities for successful interventions that decrease burden renal failure and hypertension. Therefore, the aim of present study was to screen for CKD and hypertension in 13 towns around Hail city.

Methodology: Screening for CKD is performed involving 2800 Saudi volunteers with age ranges from 14 to 100 years. Participants fulfilled a questionnaire, underwent blood pressure measurement and were then sent for laboratory investigations for CKD.

Results: Of the 2800 individuals, CKD was Identified in 217/2800 (7.8%), of whom 95/217 (43.8%) were males and 122/217 (56.2%) were females. Hypertension was identified in 939/2800 (33.4%), of whom 477/939 (50.9%) were males and 462/939 (49.1%) were females.

Conclusion: The prevalence of CKD and hypertension are high in Hail Region and differ from town to another. An intervention at the community base is high required to identify individuals at risk for follow up and early treatment.

INTRODUCTION

Chronic kidney disease (CKD) is a condition characterized by a gradual loss of kidney function over time (K/DOQI, 2004). Screening for early identification of individuals with CKD is an important issue that provides substantial opportunities for effective and useful interventions that reduce the risk of renal failure, or complications of renal dysfunction (Richard, *et al.* 2008; Jaar. *et al.* 2008). An intervention based on early detection of CKD, usually improve the long-term outcome of the disease.

Though it is true, that the progression of CKD in the presence of definite disease, particularly in the presence of proteinuria, can be modified by interventions, such as the use of inhibitors of angiotensin II, the evidence that such approaches can alter the progression of stage III CKD in the absence of other definitive features of kidney damage has not yet been proven (Richard, *et al.* 2008).

CKD is defined by the National Kidney Foundation (K/DOQI, 2002). As, either a decline in glomerular filtration rate (GFR) to $<60 \text{ mL/min/1.73m}^2$ or the presence of kidney damage for at least 3 months. Signs of kidney damage characteristically include proteinuria but other markers of damage, such as persistent glomerulonephritis or structural damage from polycystic kidney disease; can also be present (Murphree and Thelen, 2010).

Regardless of the underlying etiology of the CKD, the community based screening can build a significant impact in slowing the progression of CKD, throughout firm blood pressure control, fixed glycemic control, reduction in the degree of proteinuria, and smoking cessation. All CKD patients are at significantly increased risk of cardiovascular events; therefore, additional cardiovascular risk factors such as hyperlipidemia should be managed insistently (Murphree and Thelen, 2010).

Hypertension is a chronic medical condition in which the blood pressure in the arteries is elevated (Chobania and Oparil, 2003). Normal blood pressure at rest is within the range of 100-140mmHg systolic (top reading) and 60-90mmHg diastolic (bottom reading). High blood pressure is said to be present if it is persistently at or above

140/90 mmHg (Carretero, *et al.* 2000). Hypertension is an enormously familiar finding in the community and a risk factor for many conditions including cardiovascular diseases, particularly myocardial infarction, stroke, congestive heart failure, renal disease, and peripheral vascular disease (Whelton, 1994).

The association between hypertension and CKD is well established in the literature. Sodium retention and activation of the renin-angiotensin system is the key for the mechanisms involved in the rising of blood pressure in patients with CKD (Guyton, *et al.* 1999). Therefore, the aim of this study was to estimate the prevalence of CKD and hypertension at community base and to assess the variation in different towns around Hail city, as well as, to determine the association between CKD and hypertension 13 towns in Hail Region, Kingdom of Saudi Arabia (KSA).

MATERIALS AND METHODS

This study a cross sectional survey was performed during the period from March 2012 to October 2013 covering 13 towns around Hail city (Fig.1), from which 2800 Saudi civilian have participated in the survey.

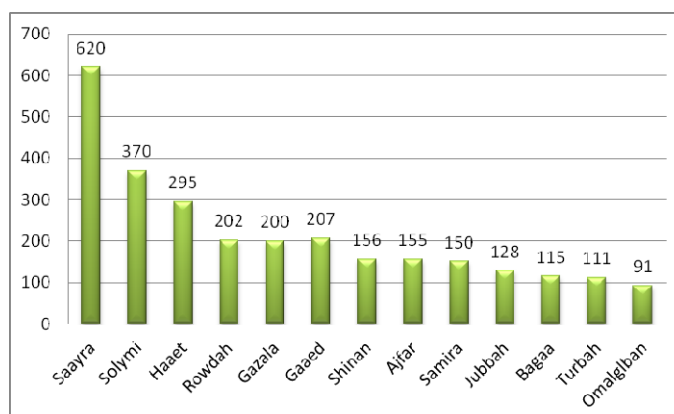


Fig. 1: Proportions of participants in different towns around Hail city in Hail Region After completion of the questionnaire for collection of demographic data, blood pressure was measured and urine and venous blood samples were obtained. The results of diagnostic tests performed at that time (urine dipstick), as well as blood pressure levels were also registered in this form.

A medical team from College of Medicine and College of applied Medical Sciences, University of Hail, in collection of data and subsequent laboratory investigations.

Whether urinary abnormalities were detected or risk factors for CKD were identified, people with such conditions were referred to local health centres, usually previously identified and informed about the planned screening.

A dipstick test (Choice Line 10; Roche Diagnostics Ltd, UK) was performed to check the presence of albumin and erythrocytes/haemoglobin in the urine samples. This procedure was performed immediately after the urine sample was brought by each participant. Dipstick was read manually by a group of professionals trained for this purpose, and final result of each reagent strip was confirmed by two of them, as they worked in pairs. They followed a standardized procedure, according to the instructions provided by the manufacturer, including the use of a stopwatch with countdown timer. In addition, traces of proteinuria were not considered as an abnormal result for this study purpose, and a supervisor was available whenever there was any doubt. In fact, proteinuria and haematuria were defined by a reading of 1+ or more of protein or blood on dipstick.

Diagnosis of hypertension was based on observation of blood pressure levels >140/90 mmHg or based on the information provided by the participant of being under treatment for hypertension due to a previous well-established diagnosis. Creatinine, urea, and uric acid were subsequently measured.

All individuals with a glomerular filtration rate (GFR) <60 mL/min/1.73 m², were regarded as having CKD [10] and further classified in to the following stages:
Stage III: Mild reduction in GFR (59–30 mL/min/1.73 m²)

Stage II: Moderate reduction in GFR (29–16 mL/min/1.73 m²)

Stage I: Severe reduction in GFR (15 ≤ mL/min/1.73 m²)

Statistical analysis:

Data management was done using Statistical Package for Social Sciences (SPSS version 16). SPSS was used for analysis and to perform Pearson Chi-square test for statistical significant (P value P<0.5). The 95% confidence level and confidence intervals were used.

Ethical consent:

The study was approved by College of Medicine, University of Hail and Health affairs in Hail Region, KSA. All study subjects consented for participation by completing the self-administered questionnaire.

RESULTS

In this study 2800 participants from 13 towns were investigated for the presence of CKD and hypertension. The age of the participants ranged from 14 to 100 years with a mean age of 45 years. The male female ratio was 1.00: 1.03. Of the 2800 full respondents, 217/2800 (7.8%) were found with different stages of CKD. Of the 217 patients with CKD, 196/217 (90.3%), 11/217 (5%) and 10/217(4.7%) were identified with Stage III (GFR=59–30 mL/min/1.73 m²), Stage II (GFR=29-16 mL/min/1.73 m²) and Stage I (GFR=15 ≤ mL/min/1.73 m²), respectively (Table 1). The description of study population in different towns by CKD was shown in Fig.2. The highest percentage of patients with CKD were found in Jubba and Haaet representing 10.2% for each followed by Turbah and Gaaed constituting 10% and 9.2% in this order. The lowest percentages were identified in Samira, Ajfar and Solymi, constituting 3.3%, 5.3% and 6.3% respectively.

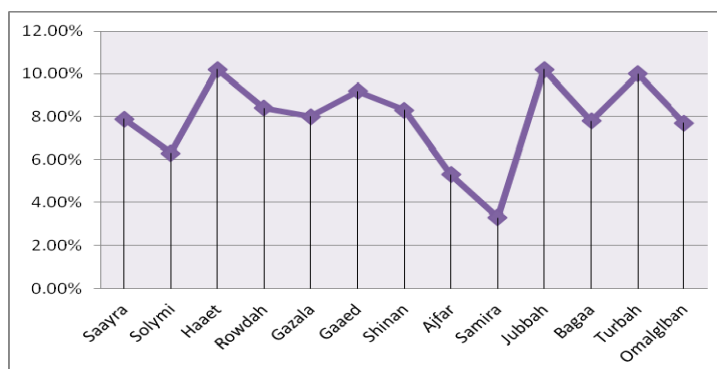


Fig. 2: Percentages of CKD in different Towns.

Table 1: Summarizes the distribution of stages of CKD by different towns

Town	Stage III (GFR=59-30 mL/min/1.73 m ²)	Stage II (GFR=29-16)	Stage I (GFR= \leq 15)	Total
Saayra	46	2	1	49
Solyimi	19	0	0	19
Haaet	30	0	0	30
Rowdah	16	0	1	17
Gazalah	13	1	2	16
Gaaed	16	3	0	19
Shinan	11	1	1	13
Ajfar	8	1	0	9
Samira	5	0	0	5
Jubbah	11	0	2	13
Bagga	7	0	2	9
Turbah	9	2	0	11
Omalgban	5	1	1	7
Total	196	11	10	217

Of the 2800 study subjects hypertension was identified in 939/2800 (33.4%), of whom 477/939 (50.9%) were males and 462/939 (49.1%) were females. In regard to the proportions of hypertension in different towns, the highest percentage of

hypertension was found in Saayra constituting 30% of individuals participating from Saayra, followed by Shinan, Gaaed and Omalgban, representing 26%, 25% and 23%, respectively, as indicated in Fig3.

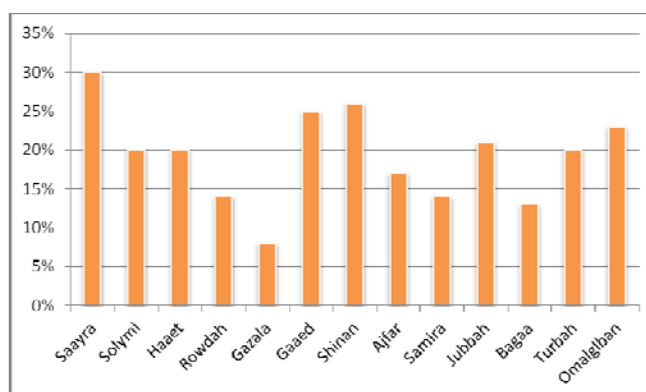


Fig. 3: Percentages of Hypertension in different Towns

Nevertheless, of the 217 patients with CKD, 121/2017 (55.8%) were patients with hypertension, consequently the risk associated hypertension as a risk factor for the development of CKD was found to be statistically significant (P value < 0.0001).

DISCUSSION

Hail Region is a region of Saudi Arabia, located in the north of the country. It has an area of 103,887 km² and a population of 527,033 (2004) census). Its capital is Ha'il. It is subdivided into four governorates: (with population, Baqa 38,778; Al-Ghazalah 94,670; Ha'il 356,876; As-hinan 36,709) (Al Kahtani, *et al.* 2013).

Community-based studies can make important contributions toward understanding how local environments impact the health status of a population. Therefore, the present study screened a large population at community base involving 13 towns around Hail city to make available absent data about CKD and hypertension. On the other hand, the intervention based on early detection can improve the long-term outcome of CKD.

Since there is strong relationship between CKD and hypertension we evaluated the burden of both conditions. Both CKD and hypertension are common public health anxiety related to substantial morbidity rates. Screening for disease in apparently healthy individuals in the prospect that early identification can guide to more successful intervention strategies is a very sensible goal (Jaar, *et al.* 2008)

However, the prevalence of CKD (7.8%) in the present studied population is relatively varying compared to studies from other countries. The prevalence of an estimated GFR < 60 mL/min per 1.73 m² was 7% in a study from Taiwan (Hsu, *et al.* 2006). In another study, the overall prevalence of CKD in Norway was 10.2%, which is comparable to that reported in the United States (Hsu, *et al.* 2006).

Studies from Kingdom of Saudi Arabia and other Gulf countries, more frequently dealt with end stage renal disease (ESRD).

The epidemiology of ESRD in the countries of the Gulf Cooperation Council (GCC) (which consist of Saudi Arabia, the United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman) was described in a review included 44 studies. The review showed that the incidence of ESRD has increased while the prevalence and mortality rates of ESRD in the GCC have not been reported adequately (Hallan, *et al.* 2006).

However, there are modifiable and non-modifiable factors that contribute to decline of GFR in patients with CKD. Modification of diet following CKD at all stages can decline GFR with average of 4ml/min annually regardless of the baseline GFR (Hunsicker, *et al.* 1997). These factors have been shown to be significant regardless of the underlying etiology of the chronic kidney disease. In common, the non-modifiable risk factors are linked to a fast decline in kidney disease which includes increased age, African-American race, and male sex. The modifiable risk factors are the focal point of treatment to stop the progress of disease, which includes elevated proteinuria, serum hypoalbuminemia, hypertension, poor glycemic control, and smoking (K/DOQI, 2002).

The prevalence of hypertension was found to be (33.4%) in this study, which was relatively lower than some global reports. Globally, the prevalence of raised blood pressure was around 40%. The highest prevalence rate was in Africa (46%) for both sexes combined. The lowest prevalence of raised blood pressure was in the Americas at 35% for both sexes (WHO, 2013).

In a study from Saudi Arabia defined a patient with hypertension as, having blood pressure $> 140/90$ mm Hg, the highest SBPH prevalence was reported from Makkah (sexes combined) (27.9%), while the lowest was found in Jeddah (14.9%). The highest prevalence of DBPH was reported from Al Taif (36.2%) and the lowest from Makkah and Asir (22% each) (Mansour, *et al.* 1998). However, since, the former study from Saudi was in 1998, our findings are in agreement

with expected increase of hypertension due to growing exposure to different risk factors.

Hypertension is the second commonest cause of CKD which is responsible of 21% of cases of CKD in adults (K/DOQI, 2002). Hypertensive nephrosclerosis is associated with addition signs of hypertensive end-organ damage because of extended duration of inadequately controlled hypertension. In the present study the frequency of patients with hypertension was high approximately 33.4% and the individuals with both hypertension and CKD correspond to 55.8% of the cases with CKD. The summarized estimate of hypertension prevalence among ESRD in GCC study was 77.88% (Amal, *et al.* 2014).

Cardiovascular diseases including stroke, heart attack and CHF were identified in a reasonable number of cases of CKD. In 6 GCC studies, the summarized estimate of cardiovascular disease prevalence is 14.51% (Khan, *et al.* 2002; Al Wakeel, *et al.* 2002; Al-Haddad, *et al.* 2003; Alsuwaida, *et al.* 2007; Gabr, *et al.* 2004)

The strengths of this study firstly, it presents adequate community based information based on epidemiological survey for important outcomes related to CKD and hypertension. This information is important for public health planners and administrators to implement suitable healthcare resources in different towns in Hail region.

Limitations of this study include, the screening for CKD, based on calculation of GFR using creatinine values alone, which was expected to identify a largely older population (mostly female), many of whom will not have any corroborative evidence of “kidney disease.” Thus, it can be assumed that eGFR-based screening will generate a large number of “false positives,” using current criteria. Also selected individuals with CKD should be followed up for at least 3 month, but we didn’t.

CONCLUSION

The Prevalences of both CKD and hypertension are very high in Hail Region. Much needs to be done to establish the role

of these risk factors that have possible contribution to the etiology of CKD and hypertension in Hail region.

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ARABIC SUMMARY

توزيع أمراض الكلى المزمنة وارتفاع ضغط الدم في ١٣ مدينة في منطقة حائل، المملكة العربية السعودية

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المقدمة: الكشف المبكر للأفراد المصابين بأمراض الكلى المزمنة وارتفاع ضغط الدم في المجتمع يوفر فرصا للتدخلات الناجحة التي تقلل عبء الفشل الكلوي وارتفاع ضغط الدم ، لذا، كان الهدف من الدراسة للكشف عن امراض الكلى المزمنة وارتفاع ضغط الدم في ١٣ مدينة بمنطقة حائل.

الطريقة: تم إجراء مسح للكشف عن امراض الكلى المزمنة في ٢٨٠٠ متطوع سعودي في الفئات العمرية ١٤-١٠٠ سنة. تم ملء استبيانات للمشاركين. بعد خضوعوا لقياس ضغط الدم وتم إرسالها للمختبر لإجراء فحوصات أمراض الكلى المزمنة.

النتائج: من ٢٨٠٠ شخص ، تم الكشف عن مرضى الكلى المزمنة في ٢٨٠٠/٢١٧ (٧.٨٪)، منهم ٢١٧/٩٥ (٤٣.٨٪) من الذكور و ٢١٧/١٢٢ (٥٦.٢٪) من الإناث. وقد تم تحديد ارتفاع ضغط الدم في ٢٨٠٠/٩٣٩ (٣٣.٤٪)، منهم ٩٣٩/٤٧٧ (٥٠.٩٪) من الذكور و ٩٣٩/٤٦٢ (٤٩.١٪) من الإناث.

الاستنتاج: إن انتشار أمراض الكلى المزمنة وارتفاع ضغط الدم مرتفعة في منطقة حائل وتختلف من مدينة إلى أخرى. التدخل في قاعدة المجتمع مرتفع يحتاج لتحديد الأفراد المعرضين للخطر للمتابعة والعلاج المبكر.