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Prevalence of Diabetes among Patients with Chronic Kidney Disease in Hail Region

Saleh Muflih Alghaythi, Meshari Sultan Turki Alsudayri, Fouad Taiwilaa Alshammari, Ali Ghannam Alrashidi, Abdulaziz Muflih Alghaithi, Meshal Fazaa Alrashidi, Abdulhafiz Ibrahim Bashir
College of Medicine, University of Hail, Kingdom of Saudi Arabia

ABSTRACT

Background: Diabetes is associated with increasing prevalence of chronic kidney disease (CKD) and progression of the disease. Therefore, objective of this study was to estimate the prevalence of diabetes among patients with CKD in Hail, Kingdom of Saudi Arabia (KSA).

Methodology: This is a cross-sectional study carried in the nephrology outpatient's clinic in King Khalid Hospital. A total of 200 patients known to have CKD were included in the study**.**

Results: The study included 200 patients, of whom 98 (49%) were females and 102 (51%) were males, the mean age of the population study is 55.6 years. The females were significantly lower age than the males. The overall prevalence of diabetes in patients with CKD was 69% among them 73.9% with retinopathy. Diabetes and female gender are associated with more advanced stage of CKD. The mean average of eGFR was significantly lower in patients with diabetes and it inversely correlates with HbA1c. The mean time of onset of CKD in diabetic patients after the diagnosis of diabetes is 11.7 ± 0.67 years, females are significantly lower than males in the meantime of onset of CKD after the diagnosis of diabetes. Association of diabetes and hypertension in patients with CKD 87.7% were hypertensive among them 72.6% were diabetics.

Conclusion: The role of diabetes as a risk factor for CKD and ESRD is higher than it has been estimated in previous studies in other regions in Saudi Arabia. Females are at higher risk of CKD and eventually ESRD than males.

Keywords: CKD, Risk factors, Hail, Saudi Arabia, GFR , ESRD,

INTRODUCTION

Chronic Kidney Disease (CKD), defined as kidney damage that lead to progressive deterioration of renal function as measured by Glomerular filtration rate (GFR), and it is a worldwide public health problem [1, 2]. CKD is diagnosed when GFR becomes less than 60 ml/min per 1.73 m2 and/or kidney damage for three or more months, kidney damage is most commonly defined by presence of microalbuminuria [3].

CKD is classified into five stages (stages 1–5) according to estimated GFR and urinary protein excretion. End-stage renal disease (ESRD) which corresponds to an eGFR of <15 mL/min/1.73m [4]. Prevalence of CKD is 8-16% worldwide [5] while prevalence of CKD in Saudi population is around 5.7% [6] and the prevalence of CKD in Hail region is (9.4%) [7].

Diabetes is a major health problem and it is estimated to be the 7th leading cause of death in 2030 [8]. The prevalence of diabetes is high among Saudi population and is estimated to be 34.1% in males and 27.6% in females [9]. Saudi Arabia is ranked among the top 10 countries in the world for the prevalence of diabetes [10].

Diabetes is the most common cause of CKD and ESRD in most parts of the world, 33% of the cases with CKD [11, 12]. therefore, increase of diabetic patients will lead to increase of CKD, 20 to 30% of diabetic patients have diabetic nephropathy , clinical nephropathy occurs about 10-20 years after onset of diabetes , ESRD Almost 20-30 years after onset of diabetes, Both types of diabetes can lead to chronic kidney disease and eventually ESRD , and type 1 diabetic patients after onset of clinical nephropathy is approximately 75 % are likely to reach ESRD while type 2 diabetic patients are approximately 20% likely to reach ESRD [13]. A greater incidence of end stage CKD has been reported in Males [14], while Female gender has been associated with a slower progression of CKD and better kidney conservation and patient health outcomes [15].

Diabetic nephropathy is significantly associated with diabetic Retinopathy and the greater severity of Retinopathy is associated with lower estimated glomerular filtration rate (eGFR) [16, 17]. Therefore, objective of this study was to estimate the prevalence of diabetic nephropathy among patients with CKD in Hail, Kingdom of Saudi Arabia (KSA).

SUBJECTS AND METHODS

This is a cross-sectional study carried in the nephrology outpatients clinic in King Khalid Hospital- Hail City which is located in the northwestern of Saudi Arabia and has a population of around 412,758 inhabitants. **The study was**

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done after approval of ethical board of University of Hail.

Data was collected from September to December 2015.A total of 200 patients of both genders, aged between 18 and 60 years, and known to have CKD were included in the study. Data and medical details of each subject were collected using a data collection tool from an interview with the patient and from his medical records. All patients gave their informative consent for the participation in the study. The body mass index (BMI) was calculated using weight (kg)/height (m^2).

Estimated GFR was calculated using the Modification of Diet in Renal Disease (MDRD). CKD stages were categorized according to the following:

Stage I: Kidney with normal GFR (90 ml/min/1.73m2or above).

Stage II: Kidney with mild decrease in GFR (60 to 89 ml/min/1.73m2).

Stage III: Kidney with moderate decrease in GFR (30 to 59 ml/min/1.73m2).

Stage IV: Kidney with severe reduction in GFR (15 to 29 ml/min/1.73m2).

Stage V: ESRD (GFR less than 15 ml/min/1.73m2).

Statistical Analysis

The data obtained were entered into spreadsheet and analyzed using SPSS versions 20 (IBM corporation NY, USA). Data were presented as frequencies and means ± standard error. The difference between mean values of more than two investigated groups was determined using ANOVA method, while the difference between mean values of variables of two groups was tested by t-test. Association was tested using chi square test. The correlation coefficient was determined by Spearman's method. P values less than 0.05 were considered as significant.

RESULTS

The study included 200 patients, of whom 98 (49%) were females and 102 (51%) were males as indicated in (Figure. 1). The mean age is 55.6 years, and the females were significantly lower than the males (52.1 ± 1.59 vs 59.4 ± 1.63) years (Figure. 2).

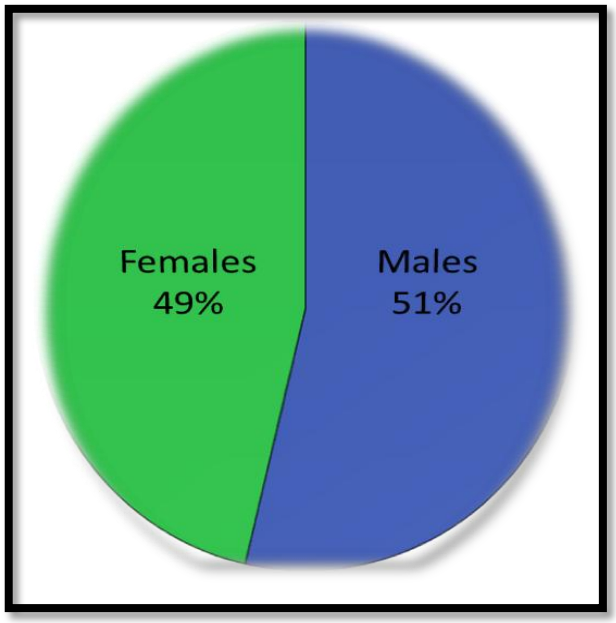


Figure 1 : Description of the study population by gender

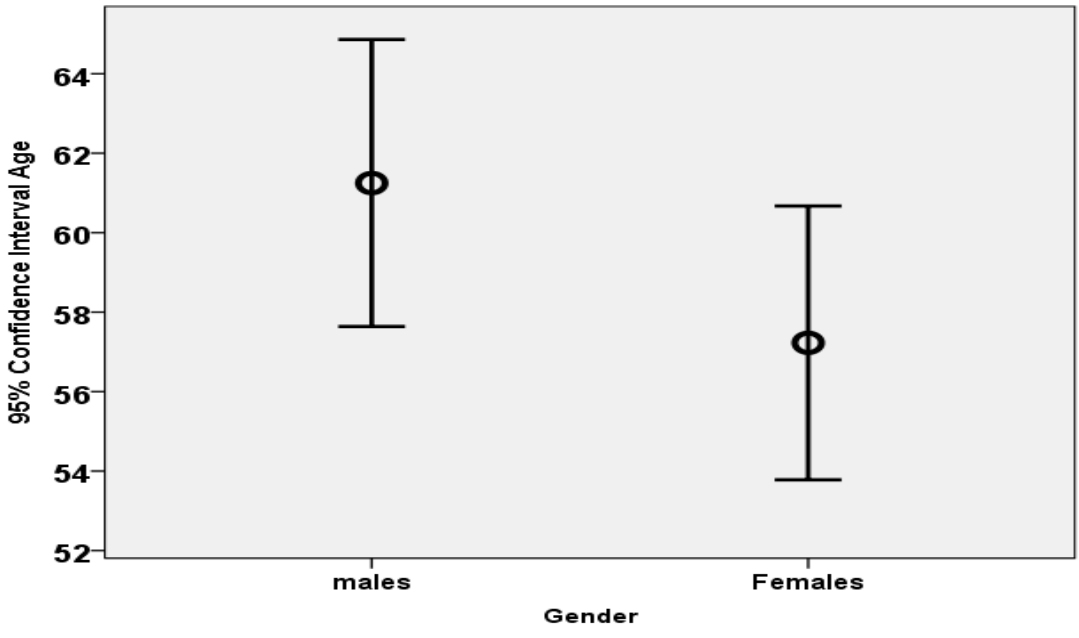
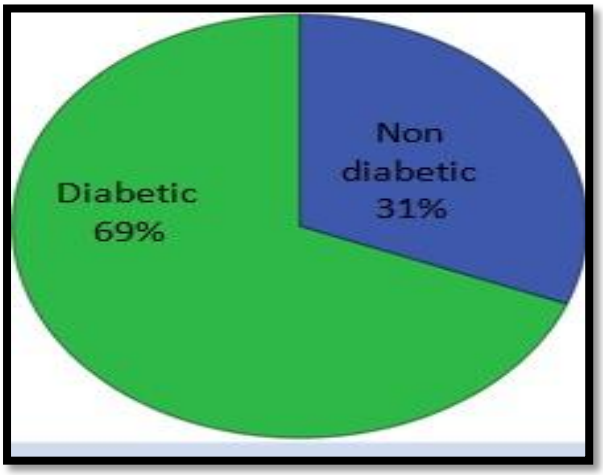


Figure 2 : Description of the mean age of CKD patients between males and females

In regard to the relation between diabetes and CKD, the overall prevalence of diabetes in patients with chronic kidney disease is 69% as indicated in (Figure 3,a) , among them 73% with retinopathy as indicated in (Figure. 3,b) .



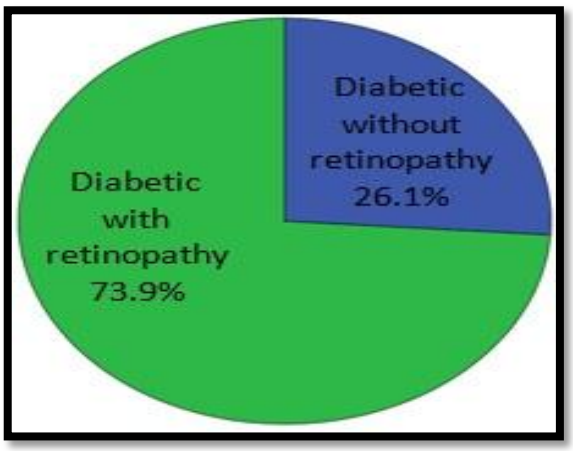


Figure. 3: (a): prevalence of diabetes in patients with chronic kidney disease, (b): Description of diabetic patients by retinopathy.

Prevalence of diabetes

Prevalence of diabetes in males and females patients with CKD as indicated in (Table 1, Figure 4)

Table 1 : Description of the prevalence of diabetes by gender

			Diabetes		Total
			0	1	
Gender	males	Count	28	74	102
		%	27.5%	72.5%	100.0%
	Females	Count	34	64	98
		%	34.7%	65.3%	100.0%
Total		Count	62	138	200
		%	31.0%	69.0%	100.0%

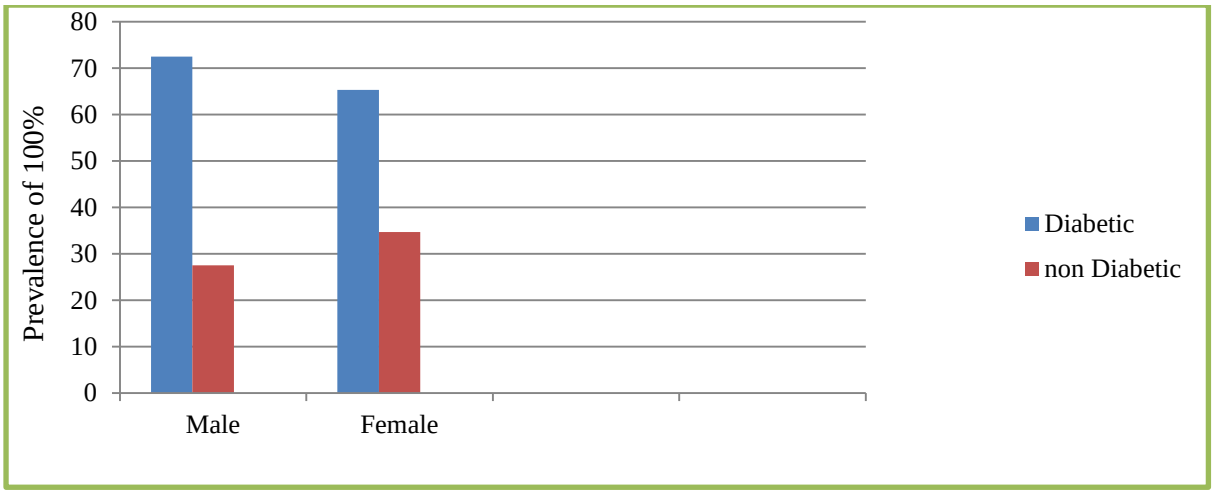


Figure 4 : Description of the prevalence of diabetes by gender

In relation between retinopathy and CKD in diabetic patients (Table 2).

Table 2: relation between retinopathy and CKD

		A*	B**	Total
Retinopathy	0	5	31	36
		13.9%	86.1%	100.0%
	1	5	97	102
		4.9%	95.1%	100.0%
Total		10	128	138
		7.2%	92.8%	100.0%

(A*) Diagnosed with diabetes after had been diagnosed with CKD. (B*) Diagnosed with diabetes before had been diagnosed with CKD)

Family history has a significant role in mean age of CKD onset as indicated in (Table 3, Figure 5). P <0.05

Table 3: Description of diabetes according to family history

	positive family history	negative family history
No. of patients	67	133
Mean Age of CKD Onset	44 years	61 years

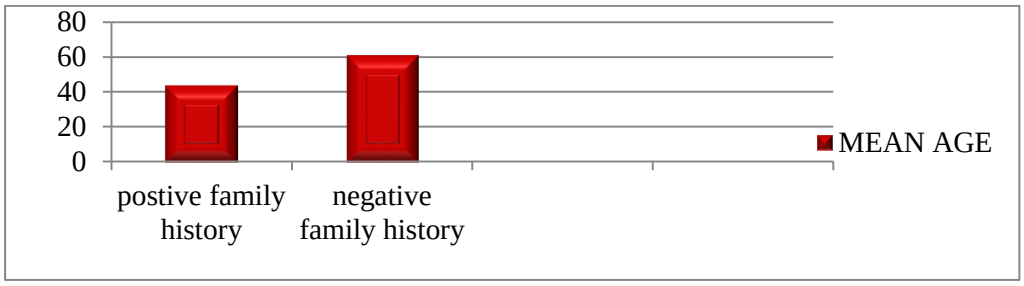


Figure 5: Description mean age of patients with CKD according to family history.

The mean age of patients with non diabetes was significantly lower than the age of diabetics (Figure. 6).

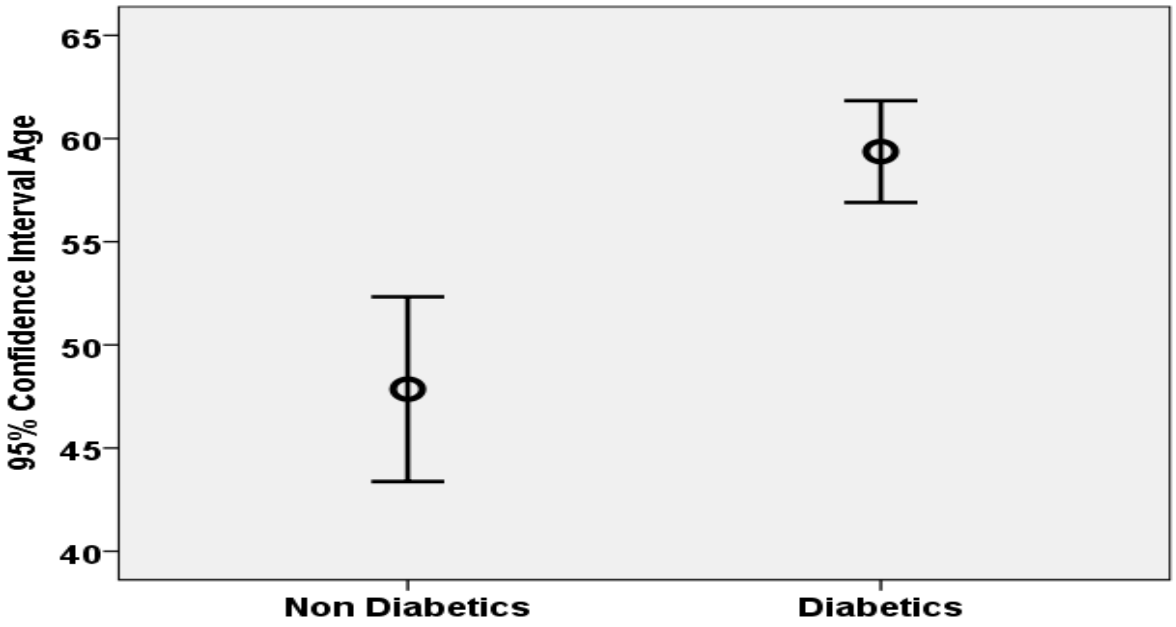


Figure 6: Description of the mean age between diabetics and nondiabetics.
The mean age of onset of CKD in nondiabetic patients is significantly lower than in diabetics (P value < 0.05) (Figure. 7).

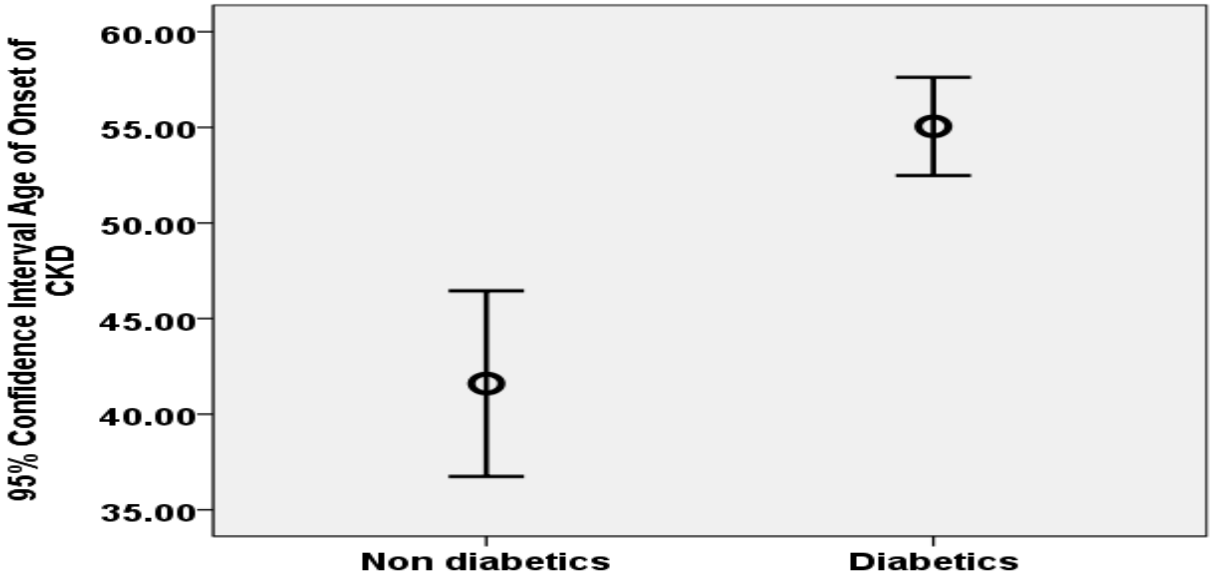


Figure 7: Description of the mean age of onset between diabetics and non diabetics

Association of diabetes and hypertension in patients with CKD 87.7% were hypertensive among them 72.6% were diabetic as indicated in (Table 4) (P value < 0.05).

Table 4: Association of diabetes and hypertension in patients with CKD

	Non hypertensives	**Hypertensives**
Non diabetics	19 52.8%	43 12.3%
Diabetics	17 47.2%	121 87.7%

The duration of CKD in patients with diabetes was significantly lower than in non-diabetic (4.3 ± 0.42 vs 6.3 ± 0.92. p value < 0.05) (Figure. 8).

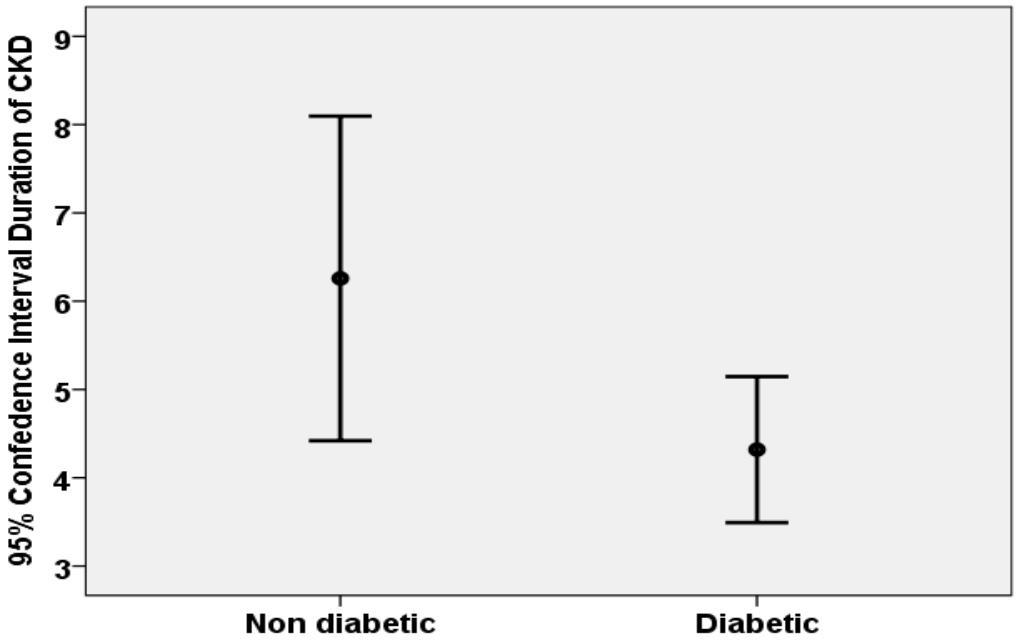


Figure 8: Description of the duration of CKD between diabetics and non diabetics

Diabetic patients were associated with more advanced stage of CKD (p value < 0.05) (Table. 5).

Table 5: Staging CKD according to diabetics and non diabetics patients

	CKD stages					Total
	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	
Non Diabetic	13	10	25	8	6	62
	59.1%	37.0%	28.4%	21.1%	24.0%	31.0%
Diabetic	9	17	63	30	19	138
	40.9%	63.0%	71.6%	78.9%	76.0%	69.0%
Total	22	27	88	38	25	200
	100%	100%	100%	100%	100%	100%

Also Female gender is associated with more advanced stage of CKD (p value < 0.05) (Table. 6).

Table 6: Staging CKD according to gender

	CKD stages					Total
	1	2	3	4	5	
Males	5	11	41	13	4	74
	55.6%	64.7%	65.1%	43.3%	21.1%	53.6%
Females	4	6	22	17	15	64
	44.4%	35.3%	34.9%	56.7%	78.9%	46.4%
Total	9	17	63	30	19	138
	100%	100%	100%	100%	100%	100%

The mean time of onset of CKD in diabetic patients after the diagnosis of diabetes is 11.7 ± 0.67.
In diabetic females the mean time of onset of CKD after the diagnosis of diabetes is significantly lower than in males indicated in (Figure. 8) (p value < 0.05).

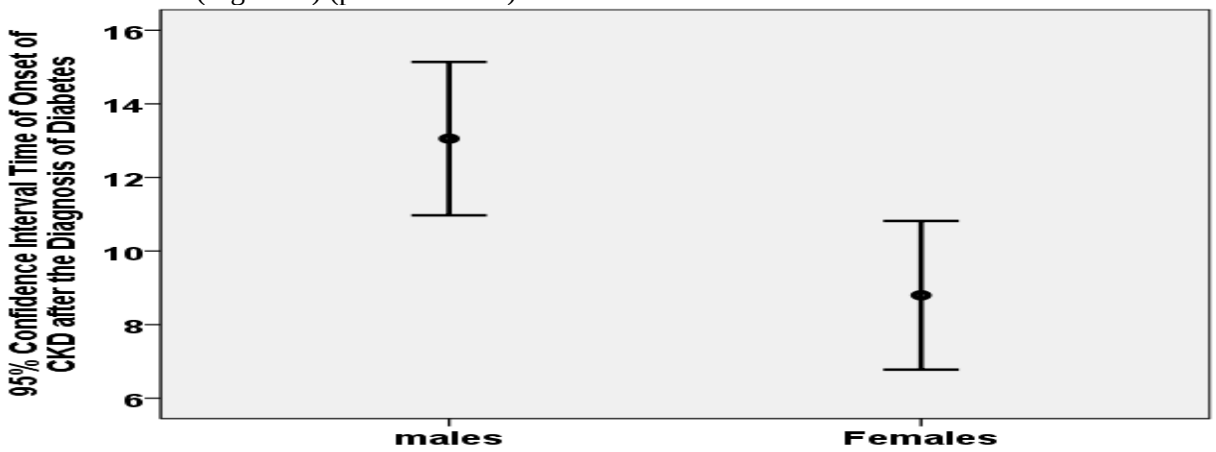


Figure 8: Description of mean age of CKD onset after diagnosis of diabetes by gender.

The mean average of eGFR was significantly lower in patients with diabetes (44.4 ± 2.35 vs 58.4 ± 5.16 mL/min/1.73m^2)(p value < 0.05).shown in (Figure 9)

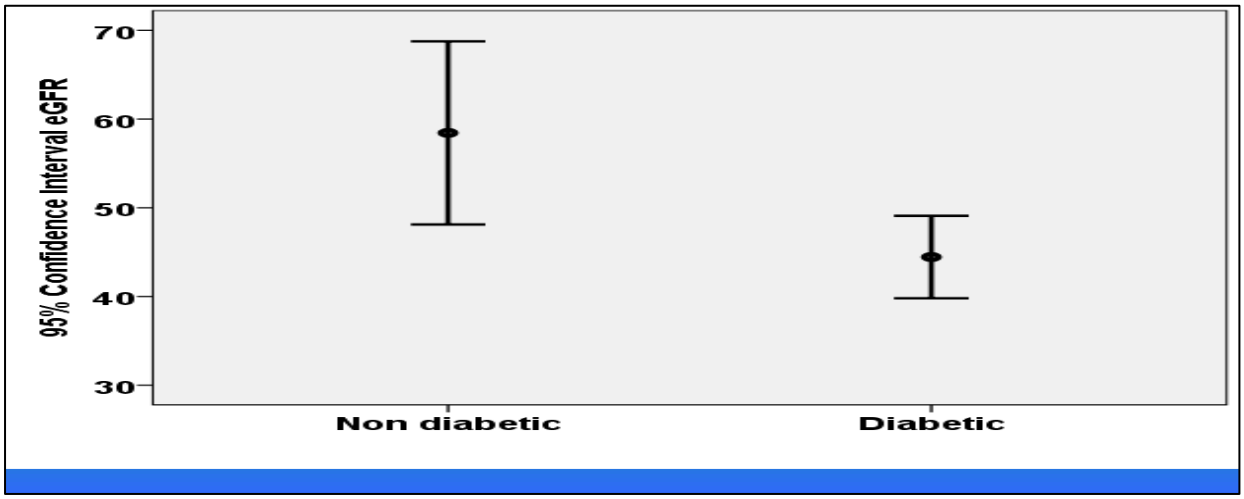


Figure 9: Descreption of eGFR between diabetics and non diabetics

In Diabetics with CKD, eGFR correlates inversely with HbA1c (p value < 0.05) as indicated in Figure 10.

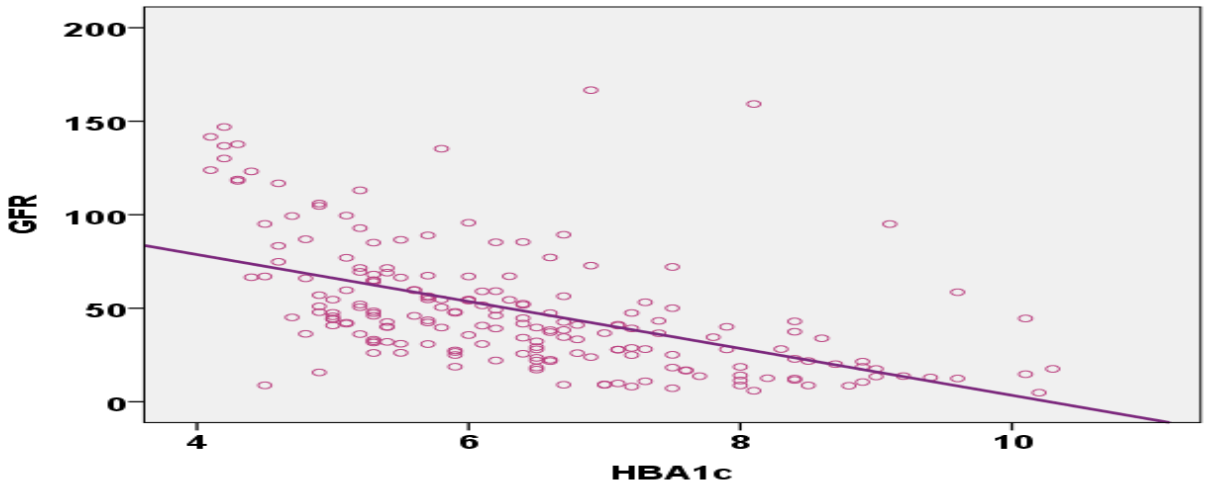


Figure 10: relation between HBA1C and GFR

The mean average of eGFR was significantly lower in diabetic females with CKD (38.2 ± 3.48vs 49.8 ± 3.07 mL/min/1.73m^2. p value < 0.05) as indicated in (Figure. 11)

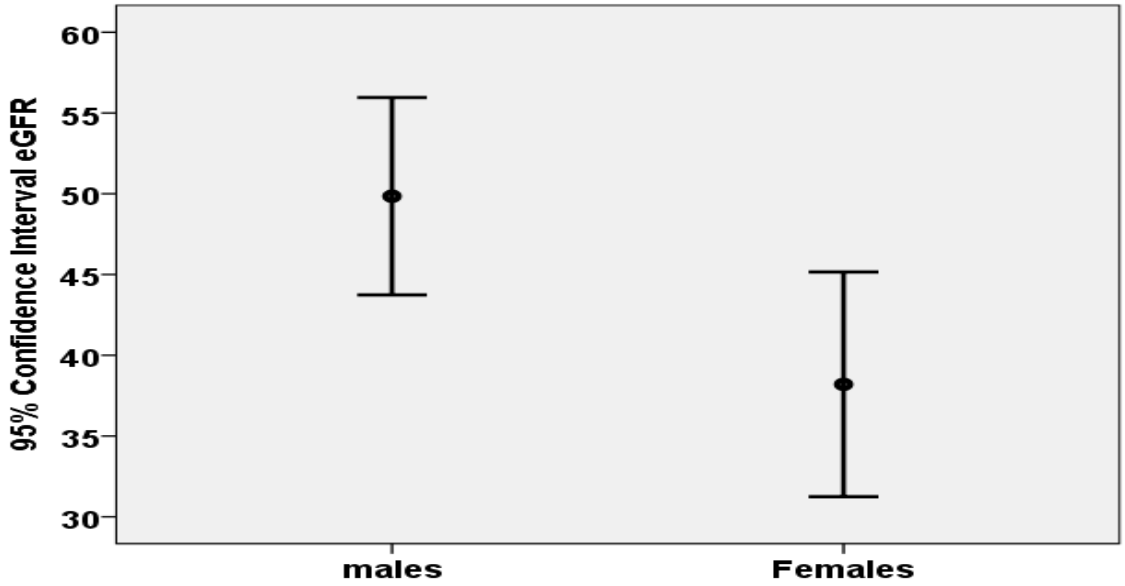


Figure 5: Descreption of eGFR between males and females

DISCUSSION

The results of our study showed that the overall prevalence of diabetes among patients with CKD attending the nephrology clinic in Hail, Kingdom of Saudi Arabiais69%, which support that diabetes is the most common cause of CKD [(11)]. Aprevious community based study carried in 2012 in Hail region has estimated a lower prevalence at around 33% [(7)].The difference in the prevalence estimated from this hospital based study and the previous community based study might be attributed to underdiagnoses of CKD in non-diabetic patients as compared with diabetics. The difference could also, at least in part, due to an increase in the prevalence of diabetes and CKD as a complication of diabetes. A similar increase in the prevalence of diabetic kidney disease has been reported in a study carried in Tabuk, KSA in the period 2009 to 2012 [(18)].

Among diabetic patients with CKD 92.7% were diagnosed with diabetes before they had been diagnosed with CKD. In these patients, though no definite diagnosis of diabetic kidney disease was found in their records, diabetes is likely to have a role in the initiation and progression of CKD in these patients. The mean time between the diagnosis of diabetes and the diagnosis of CKD was 11 years, which confirms the results pointed out by previous studies that indicate the onset of CKD is likely to occur within 10 to 20 years after the diagnosis of diabetes [(10)].

In this study we found that 76.0% of patients with ESRD are diabetic. This finding contrast previous studies carried in Saudi Arabia and other countries. Theprevalence of diabetic kidney disease among ESRD patientswas 18% in Tabuk KSA in 2012 [(18)], 16% in Egypt in 2008 [(19)], 48% in Qatarin 2009 [(20)] and 38% in the USin 2012 [(21)]. Our findings denote the predominant role of diabetes as a risk factor for ESRD. This might be in part due to the high prevalence of diabetes and in part due to an interaction between diabetes and other yet undetermined other risk factors in Hail region.

The lower eGFR in diabetic patients compared with non-diabetic and the lack of its correlation with the duration of CKD, the inverse correlation of HbA1c with eGFR, and the association of diabetes with more advanced stages of CKD support the predominance of diabetes as a poor prognostic factor in patients with CKD.

Around 73.9% of diabetic patients with CKD have retinopathy and that correlates with results from previous studies concluded that diabetic nephropathy is found to be significantly associated with diabetic retinopathy [(14, 15)].

We found that diabetic females in comparison with diabetic males are diagnosed with CKD at an earlier age, and they are at higher risk of developing end stage renal disease ESRD. These findings doesn't agree with previous studiesthat reported a greater incidence of ESRD in men while female gender has been associated with a lower incidence and a slower progression of CKD and better kidney conservation and patient health outcomes [(12, 13)]. Our finding may indicate the presence of yet undetermined risk factor for the females that is responsible for higher prevalence and earlier age of onset of CKD.

CONCLUSION

The role of diabetes as a risk factor for CKD and ESRD is higher than it has been estimated in previous studies in other regions in Saudi Arabia,

There is a strong association between progression of CKD and the glycemic control in diabetic patients. Diabetic females are at higher risk of developing CKD and eventually ESRD.

RECOMMENDATIONS

More studies are needed to investigate the role of diabetes and its interaction with other risk factors for CKD and ESRD in Saudi Arabia. More attention must be directed to the diagnosis and follow up of patients with diabetes in Hail region especially females.

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