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Frequency AndAssociated Risk Factors Of Renal Cysts In Adults

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Abstract
Background: Cystic lesions of the kidney are relatively frequent and may represent benign cysts, premalignantlesions, or malignant neoplasms. When asingle layer of cuboidal or flattened cells lines a cystic lesion, they are considered simple renal cortical cysts.
Aim Of The Work: Our study aims to determine the frequency and associated risk factors of renal cysts.
Patients&Methods: A cross-sectional study including 242 subjects undergoing abdominal CT, aging more than 18 years, and with no history of medical diseases. All involved patients were subjected to Routine investigations,including Random bloodsugar, postprandial bloodglucose., HbA1c, Complete bloodpicture, Serum creatinine, urea, andcholesterol in addition to Complete Urineanalysis. All participants were subjected to Computed tomography (CT)abdomen.
Results:18.6% of the studied group had Pyuria, 29.5% had Urate crystal, 14% had microscopic hematuria, 1.2% had gross hematuria, and 29.3% had proteinuria. 20.2% (49 cases) had cyst among the studied population. Cyst cases were significantly associated with older age, male sex, smoking, diabetes mellitus, hypertension, and longer duration of treatment of DM and HTN. RBS, 2PP BS, HbA1C, Cholesterol, Cr, and Urea were significantly higher among cases with the cyst. Also, cases with cysts were significantly associated with Pyuria and Proteinuria.
Conclusion: Significant risk factors for the occurrence of renal cysts include older age, male sex, hypertension, diabetes mellitus, smoking, longer DM or HTN TTTduration.
Serum Urea, Creatinine, Cholesterol, urinary Pus, and Proteinuria are also significant factors affecting renalcysts. However, BMI, chronic use of NSAIDs, CBC findings, urate crystals, and hematuria are not statistically significant factors affecting renalcysts.
Keywords:Renal Cysts, Risk factors, Kidney, Cystic lesions.

Introduction

Cystic kidney lesions are quite common and can be benign cysts, premalignant lesions, or malignant neoplasms. Whenever a cystic lesion is lined by a monolayer of cuboidal or flattened cells, they are referred to as simple renal cortical cysts **[1]**.The incidence of renal cysts identified by ultrasonography (US) was predicted to be 5.0–20.8 percent in the overall population, with the majority of studies suggesting a greater frequency with age. Additionally, male gender, high blood pressure, as well as renal impairment have been associated with the formation of simple renal cysts. Additionally, few investigations have been conducted to determine the frequency and features of simple renal cysts in a healthy community **[2]**.
Increased utilization of ultrasonography, as well as computed tomography (CT), has aided in the identification of benign tumors whose origin and clinical relevance remain unknown. Simple renal cysts are examples of these lesions. Although some are associated with well-defined medical disorders, such as polycystic kidney disease, the majority are asymptomatic and appear to have little clinical significance**[3]**.
While there are various ideas about the development of renal cysts, their origin remains unknown **[4]**. Renal cysts are clinically significant due to their high frequency in imaging results. A misdiagnosis of a cancerous renal cystic lesion might have serious consequences for the patient. Thus, understanding the frequency and risk factors for the formation of renal cysts might aid physicians in interpreting imaging results**[6]**.

Patients And Methods:

2.1.1. Research Design and Ethical consideration:

A cross-sectional study including 242 subjects undergoing abdominal CT, aging more than 18 years, and with no history of medical diseases. This study was conducted in the radiology department of Agouza police

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Hospital.Permission was obtained from the Institutional Review Board (IRB) and Ethical Committee of Zagazig University's faculty of medicine before starting the study. In addition, informed consent was received from all patients who participated in the study.

2.1.2. Patients:
The case sample included 242 subjects undergoing abdominal CT in the radiology department of Agouza police Hospital, aging more than 18 years and with no history of medical diseases.

2.1.3. Inclusion Criteria:
All participants had older age than 18years and no history of medicaldiseases.

2.1.4. Exclusion Criteria:
All suggested participants with a younger age than 18 years were suffering from recent infection or inflammation, and also pregnant females have been excluded from our study.

2.2. Methods:

2.2.1. Sample Size:
Using OPEN-EPI, the sample size was estimated to be 242 subjects assuming that the number of patients attending the radiology department per year is 14400. The prevalence of renal cysts is 20% at confidence limitsof 5%.

2.2.2. Operative Design:
All involved participants were subjected to Routine investigations,including Random bloodsugar, postprandial bloodglucose., HbA1c, complete bloodpicture, serum creatinine, urea, andcholesterol in addition to Complete Urineanalysis. All participants were undergoingcomputed tomography (CT)abdomen.

2.2.3. Statistical Analysis:
Data collected throughout history, basic clinical examination, laboratory investigations, and outcome measures coded, entered,and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) software for analysis. According to the type of data, qualitative represented as number and percentage, and quantitatively represented by mean ± SD, the following tests were used to test differences for significance, difference, and association of qualitative variable by Chi-square test (X^2), differences between quantitative independent multiple by ANOVA and correlation by Pearson's correlation. P-value was set at <0.05 for significant results &<0.001 for high significant result. Data were collected and submitted to statistical analysis. The following statistical tests and parameters were used.

1- Mean

$$\bar{x} = \sum x / n$$

$\sum x$ is the sum of the values. n is the number of subjects.

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2.The chi square (x^2) test:

This test was used to compare two groups regarding the distribution of different variables.

$$x^2 = \sum \frac{(O-E)^2}{E}$$

Where:
O: The observed value.
E: The expected value.

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3- The *t* statistic to test whether the means are different can be calculated as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{s_{X_1X_2} \cdot \sqrt{\frac{2}{n}}}$$

4.The standard deviation (SD) as a measure of the dispersion of the results around the mean:

$$SD = \sqrt{\frac{\sum (X - \bar{X})^2}{n}}$$

1- Sensitivity specificity predictive value: Table(1)

2-

		Condition (as determined by "Gold standard")		
		Positive	**Negative**	
Test outcome	**Positive**	**True Positive**	**FalsePositive (Type Ierror)**	→ **Positive predictive value** $= \frac{\Sigma \text{ True Positive}}{\Sigma \text{ Test outcome Positive}}$
	Negative	**False Negative (Type IIerror)**	**True Negative**	→ **Negative predictive value** $= \frac{\Sigma \text{ True Negative}}{\Sigma \text{ Test outcome Negative}}$
		↓ **Sensitivity** $= \frac{\Sigma \text{ True Positive}}{\Sigma \text{ Condition Positive}}$	↓ **Specificity** $= \frac{\Sigma \text{ True Negative}}{\Sigma \text{ Condition Negative}}$	

ROC curve

A receiver operating characteristic (ROC) is a graphical representation of a binary classifier system's performance while the discriminating threshold is adjusted. It is calculated by comparing the percentage of true positives among positives (TPR = true positive rate) against the proportion of false positives among negatives (FPR = false positive rate) at different thresholds. TPR is sometimes referred to as sensitivity, while FPR is defined as one minus the specificity or true negative rate. ROC analysis enables the identification of potentially optimum models and the elimination of inferior ones irrespective of (and prior to specifying) the cost context or class distribution. ROC analysis is inextricably linked to cost-benefit analysis in diagnostic decision-making.

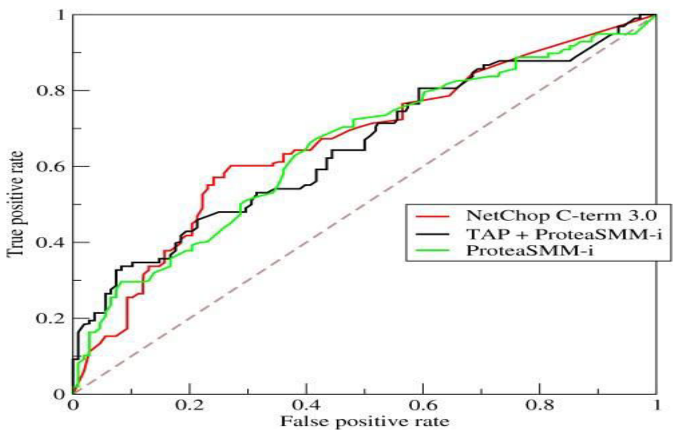

Figure 1: Roc curve.

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Results

The mean age of the studied group was 49.48±12.7 with a median of 50.5 ranging from 24 to 71, and the mean BMI was 25.85±1.62, with a median of 25.6 ranging from 23 to 29.5. As regarding sex, male and female, they were distributed nearly equal (**Table 2**).34.7% of study populations were smokers, 42.6% were diabetics, 27.7% were hypertensives, and 35.1% were chronically using NSAIDs (**Table 3**).

The mean DM treatment duration of the studied group was 16.28±5.55 years, with a median of 15 ranging from 5 to 34. The mean HTN treatment duration was 11.1±3.8 years, with a median of 10 ranging from 4 to 25 for 103 diabetic patients and 67 hypertensive patients (**Table 4**).

The mean SBP of the studied group was 130.61±16.1 mmHg, with a median of 125 mmHg ranging from 100 to 170 mmHg, and the mean DBP was 84.66±9.4 mmHg, with a median 85 mmHg ranging from 70 to 110 mmHg. Among the studied group, the mean RBS was 154.21±51.2 mg/dL with a median 132 mg/dL ranging from 99 to 320 mg/dL, and the mean 2PP BS was 197.66±65.8 mg/dL with a median 154 mg/dL ranging from 124 to 410 mg/dL while the mean HbA1C was 6.64±1.48% with a median 6% ranging from 5 to 11.5%. About CBC findings, the mean HB was 12.51±1.05 gm/dL with a median of 12.4 gm/dL ranging from 10.2 to 15.5 gm/dL, the mean WBCs was (7.22±2.12 ×103/mm^3) cells with a median 7 gm/dL (**Table 5**).

Among the studied group, the mean RBS was 154.21±51.2 mg/dL with a median 132 mg/dL ranging from 99 to 320 mg/dL, and the mean 2PP BS was 197.66±65.8 mg/dL with a median 154 mg/dL ranging from 124 to 410 mg/dL while the mean HbA1C was 6.64±1.48% with a median 6% ranging from 5 to 11.5%. About CBC findings, the mean HB was 12.51±1.05 gm/dL with a median of 12.4 gm/dL ranging from 10.2 to 15.5 gm/dL,themeanWBCswas7.22±2.12×10^3mm^3cellswithamedian7×10^3mm^3 cells ranging from 4 to 11.2 ×10^3mm^3 cells and the mean PLT was 250.2±45.29 ×10^3mm^3cells with a median 247 ×10^3mm^3cells ranging from 169 to 335×10^3mm^3 cells. Also the mean Cholesterol was 190.97±23.1 mg/dL with a median 198 mg/dL ranging from 136 to 225 mg/dL, the mean Cr was 1.05±0.17 mg/dL with a median 1 mg/dL ranging from 0.8 to 1.5 mg/dL and the mean Urea was 31.05±8.8 mg/dL with a median 28 mg/dL ranging from 17 to 50mg/Dl (**Table 6**).

18.6% of the studied group had Pyuria, 29.5% had Urate crystal, 14% had microscopic hematuria, 1.2% had gross hematuria, and 29.3% had proteinuria (**Table 7**). 20.2% (49 cases) had cyst among the studied population (**Table 8**).

The mean of longest cyst diameter found among the studied group was 19.64±4.5 mm, with a median of 19 mm ranging from 13 to 28 mm. Also, 22.4% of cysts were previously detected, 34.7% were left, and 30.6% were right, and 34.7% were bilateral, 67.3% were single, and 32.7% were multiple, and the majority were grade I in bosniak classification (71.4%) while 18.% were II, 6.1% IIF, and 4.1% were III (**Table 9**).

Cyst cases were significantly associated with older age, male sex, smoking, diabetes mellitus, hypertension, and longer DM and HTN TTT duration (**Table 10**).RBS, 2PP BS, HbA1C, Cholesterol, Cr, and Urea were significantly higher among cases with a cyst. Also, cases with cysts were associated considerably with Pyuria and Proteinuria (**Table 11**).

Table 2: Age, BMI, and sex distribution among the studied group (N=242)

		Age (years)	**BMI (kg/m^2)**
Mean± SD		**49.48±12.7**	**25.85±1.62**
Median (Range)		**50.5 (24-71)**	**25.6 (23-29.5)**
		N (number)	**% (percentage)**
Sex	**Male**	**122**	**50.4**
	Female	**120**	**49.6**
	Total	**242**	**100.0**

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Table 3 : Medical history and risk factors distribution among the studiedgroup

		N (number)	% (percentage)
Smoking	**No**	**158**	**65.3**
	Smoker	**84**	**34.7**
DM	**No**	**139**	**57.4**
	Yes	**103**	**42.6**
HTN	**No**	**175**	**72.3**
	Yes	**67**	**27.7**
NSAID chronic use	**No**	**157**	**64.9**
	Yes	**85**	**35.1**
	Total	**242**	**100.0**

Table 4: Duration of TTT of DM and HTN among the studied group

	DM TTT duration (years)	HTN TTT duration (years)
Mean± SD	**16.28±5.55**	**11.1±3.8**
Median (Range)	**15.0 (5-34)**	**10.0 (4-25)**

Table 5: SBP and DBP distribution among the studied group

	SBP(mmHg)	DBP(mmHg)
Mean± SD	**130.61±16.1**	**84.66±9.4**
Median (Range)	**125.0 (100-170)**	**85.0 (70-110)**

Table 6: RBS, 2PP, HbA1C, CBC findings, Cholesterol, Creatinine, and urea distribution among the studied group

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	Mean±SD	Median (Range)
RBS (mg/dL)	154.21±51.2	132.0 (99-320)
2PP BS (mg/dL)	197.66±65.8	154.0 (124-410)
HbA1C (%)	6.64±1.48	6.0 (5-11.5)
HB (gm/dL)	12.51±1.05	12.4 (10.2-15.5)
(WBCs $\times 10^3$/mm^3) cells	7.22±2.12	7.0 (4-11.2)
(PLT)$\times 10^3$/mm^3) cells	250.2±45.29	247.0 (169-335)
Cholesterol (mg/dL)	190.97±23.1	198.0 (136-225)
Cr (mg/dL)	1.05±0.17	1.0 (0.8-1.5)
Urea (mg/dL)	31.05±8.8	28.0 (17-50)

Table 7: Urine analysis distribution among the studied group

		N (numbers)	% (percentage)
Pyuria	-VE	197	81.4
	+VE	45	18.6
Urate crystals	-VE	170	70.2
	+VE	72	29.8
Hematuria	-VE	205	84.7
	Microscopic hematuria	34	14.0
	Gross hematuria	3	1.2
Proteinuria	-VE	171	70.7
	+VE	71	29.3
	Total	242	100.0

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Table 8: Cyst prevalence among the studied group

		N (numbers)	% (percentage)
Cyst	**Negative**	**193**	**79.8**
	Positive	**49**	**20.2**
	Total	**242**	**100.0**

Table 9: Table Cyst characters distribution among the studied group

		Largest cyst diameter (mm)	
Mean± SD		**19.64±4.5**	
Median (Range)		**19.0 (13-28)**	
		N (numbers)	**% (percentage)**
Previous detection	**No**	**38**	**77.6**
	Yes	**11**	**22.4**
Side	**Bil.**	**17**	**34.7**
	Lt.	**17**	**34.7**
	Rt.	**15**	**30.6**
Number	**Single**	**33**	**67.3**
	Multiple	**16**	**32.7**
Bosniak	**I**	**35**	**71.4**
	II	**9**	**18.4**
	IIF	**3**	**6.1**
	III	**2**	**4.1**
	Total	**49**	**100.0**

Table 10: Association of basic demographic and clinical data with the presence of renal cyst among the studied group

			Absence of renal cyst	Presence of renal Cyst	t/X^2	P
Age (years)			**46.59±12.2**	**60.85±7.6**	**-7.783**	**0.00****
BMI (kg/m^2)			**25.87±1.67**	**25.75±1.4**	**0.468**	**0.640**
DM TTT duration (years)			**15.04±4.9**	**18.48±6.02**	**-3.145**	**0.002***
HTN TTT duration (years)			**8.78±2.71**	**13.97±5.3**	**-5.052**	**0.00****
SBP (mmHg)			**128.18±14.48**	**140.16±18.5**	**-4.870**	**0.00****
DBP (mmHg)			**83.66±8.89**	**88.57±10.7**	**-3.297**	**0.001****
Sex	**Male**	**N**	**80**	**42**		**0.00****
		%	**41.5%**	**85.7%**		
	Female	**N**	**113**	**7**	**30.62**	
		%	**58.5%**	**14.3%**		
Smoking	**No**	**N**	**153**	**5**		**0.00****
		%	**79.3%**	**10.2%**		
	Yes	**N**	**40**	**44**	**82.26**	
		%	**20.7%**	**89.8%**		
DM	**No**	**N**	**127**	**12**		**0.00****
		%	**65.8%**	**24.5%**		
	Yes	**N**	**66**	**37**	**27.28**	
		%	**34.2%**	**75.5%**		
HTN	**No**	**N**	**156**	**19**		**0.00****
		%	**80.8%**	**38.8%**		
	Yes	**N**	**37**	**30**	**34.51**	
		%	**19.2%**	**61.2%**		
NSAID CHRONIC use	**No**	**N**	**124**	**33**		**0.68**
		%	**64.2%**	**67.3%**		
	Yes	**N**	**69**	**16**	**0.16**	
		%	**35.8%**	**32.7%**		
Total		**N**	**193**	**49**		

Table 11: Association of blood test results with the presence of renal cyst among the studied group

			Absence of renal Cyst	Prescence of renal cyst	t/X^2	P
RBS (mg/dL)			**146.53±45.8**	**184.44±61.6**	**-4.587**	**0.00****
2PP BS (mg/dL)			**185.22±61.7**	**246.67±81.1**	**-5.322**	**0.00****
HA1C (%)			**6.42±1.36**	**7.49±1.65**	**-4.675**	**0.00****
HB (gm/dL)			**12.57±1.05**	**12.34±1.01**	**1.914**	**0.055**
WBCs)×10^3/mm^3(cells			**7.11±2.08**	**7.68±2.21**	**-1.685**	**0.093**
PLT)×10^3/mm^3(cells			**251.33±44.5**	**246.08±48.4**	**0.725**	**0.469**
Cholesterol (mg/dL)			**189.5±22.8**	**196.75±23.1**	**-1.981**	**0.049***
Cr (mg/dL)			**0.99±0.1**	**1.29±0.17**	**-15.112**	**0.00****
Urea (mg/dL)			**29.59±8.19**	**36.83±9.2**	**-5.387**	**0.00****
Pyuria	**-VE**	N	**170**	**27**	**28.08**	**0.00****
		%	**88.1%**	**55.1%**		
	+VE	N	**23**	**22**		
		%	**11.9%**	**44.9%**		
URATE	**-VE**	N	**133**	**37**	**0.81**	**0.36**
		%	**68.9%**	**75.5%**		
	+VE	N	**60**	**12**		
		%	**31.1%**	**24.5%**		
Haematuria	**-VE**	N	**163**	**42**	**0.77**	**0.68**
		%	**84.5%**	**85.7%**		
	Microscopic hematuria	N	**27**	**7**		
		%	**14.0%**	**14.3%**		
	Gross hematuria	N	**3**	**0**		
		%	**1.5%**	**0.0%**		
Proteinuria	**-VE**	N	**155**	**16**	**42.87**	**0.00****
		%	**80.3%**	**32.7%**		
	+VE	N	**38**	**33**		
		%	**19.7%**	**67.3%**		
Total		N	**193**	**49**		
		%	**100.0%**	**100.0%**		

Discussion

Renal cysts are clinically significant due to their high frequency in imaging results. A misdiagnosis of a malignant cystic renal lesion might have grave consequences for the patient. Understanding the frequency and risk factors for developing renal cysts aids physicians in interpreting imaging results **[6]**. The majority of simple renal cysts are asymptomatic and hence seldom require treatment unless they become symptomatic or complex **[7]**. Whereas the majority of studies reported a greater frequency of renal cysts in elderly people and males, correlations between renal cysts and other variables such as blood pressure, renal function, smoking, blood sugar, and BMI are less consistent**[2]**.

Our study aimed to evaluate the frequency and associated risk factors of renal Cysts. We investigated the prevalence of renal cysts (on CT) and their association with risk factors in a cross-sectional study on patients referred to the radiology department for abdominal CT.The prevalence of renal cysts reported in the literature varies between 4 and 41% and is clearly age-dependent**[2]**. The overall prevalence of renal cysts in our study was 20.2% (49 cases, including 42 males and seven females) among the studied population (242 cases).

This is consistent with data reported by **Mensel et al. (2018) [5]**, who found that the incidence of renal cysts using MRI was 27% (34% for men, 21% for women) and **Suher et al. (2006) [8]** who evaluated patients who undergone abdominal ultrasonography for various reasons and found their prevalence 13.7%.
Some studies detected a relatively lower prevalence of renal cysts in healthy individuals using ultrasonography as **Terada et al. (2002)[9]** who found 11.9% had at least 1 renal cyst, **Chang et al. (2007) [10]** who found the overall prevalence of simple renal cysts was 10.7%, **Ozveren et al. (2016) [11]** who analyzed the prevalence of simple renal cysts which was found 7.7%, **Choi.(2016) [2]** detected a 5.6% prevalence of simple renal cysts in a healthy Korean population.
Carrim and Murchison, (2003) [3] carried out a study with a higher incidence of 41.0 percent, analyzing 617 individuals with an indication for abdominal CT. This higher incidence was attributed to the fact that the patients included in the research were elderly (median age: 62.8 years for women and 65.5 years for men) than our study participants (median age: 50.5 years).
About cyst distribution characters among our studied group, 34.7% were on the left kidney, and 30.6% were on the right kidney, and 34.7% were bilateral; this is somewhat consistent with **Mensel et al. (2018) [5],** who found that among participantswith at least one renal cyst, only the right kidney was affected in 29%, the leftkidney in 44%, and both kidneys in 27%.
As regards demographic data of our subjects, including age and sex, the major findings were that older age and male sex had been found to significantly associate with the prevalence of renalcysts.This is compatible with the conclusions of **Terada et al. (2002) [9]**, who discovered a 2:1 ratio of men to women with cysts and a more than sevenfolds increases in the incidence of renal cysts with age, from 5.1 percent in the fourth decade to 36.1 percent in the eighth decade of life.
Choi, (2016) [2] found age to be a risk factor for the presence of simple renal cysts but no association with male sex for the Korean population, unlike almost all other studies.The underlying mechanisms of renal cyst association with age and sex are still unclear. **Ozveren et al. (2016)[11]**.
Darmady et al. (1973) [12] and **Baert and Steg. (1977) [13]** proposed that simple renal cysts originated from distal convoluted or collecting tubule diverticula. These diverticula increased considerably in elderly kidneys, most likely due to tubular basement membrane thinning. This might account for the association between senility and cysts.
And in terms of sex, the following theoretical reasons are possible: To begin, it is believed that simple renal cysts evolved from tubular diverticula, which are more prevalent in patients with urinary obstruction, such as males with prostatism **[13]**. Second, cigarette smoking may contribute to the formation of renal cysts by inducing renovascular disorders or by having a direct harmful impact, and males smoke more than women **[3]**. As regards anthropometric measures including BMI, the mean BMI in our study was 25.85±1.62, and we found that it was not a statistically significant factor affecting renal cysts occurrence, unlike other studies **Choi, (2016) [2]**who found that obesity was associated with the occurrence of renal cysts so that they considered BMI a risk factors for the presence of renal cysts while **Mensel et al. (2018) [5]**found that BMI was turned to be an additional correlate of only renal cyst size (largerdiameter).
As regards the clinical state of our study population, 27.7% of them were hypertensives, and we found a significantly higher prevalence of hypertension in those having renal cysts (61.2%) (p=0.00). This is consistent with the findings of **Mensel et al. (2018) [5]**,**Choi, (2016) [2]**withhypertensionprevalence22%and43%,respectively, **Mosharafa, (2008) [14]**, **Suher et al. (2006) [8]**who found hypertension to be an important factor affecting the prevalence of renalcysts.
Caglioti et al. (1993) [15] observed that the prevalence of hypertension is not enhanced in individuals with simple renal cysts, contrary to the findings of the previous study. **Cuxart et al. (1993) [16],** on the other hand, hypothesized that arterial hypertension associated with simple renal cysts was simply due to aging.
Farrell and Young were the first to notice and report on the existence of a link between kidney cysts and high blood pressure. In 1942 **[17]**, another report of a similar case was confirmed by others; testing of renin in a unilateral renal vein revealed a significant increase in renin secretion from the diseased kidney. The surgical excision of the cyst or the decompression of the cyst by percutaneous aspiration have both been associated with a reduction in blood pressure. This reinforced the hypothesis that small renal cysts might induce hypertension instead of hypertension leading to the renal cyst in **Lüscher et al. (1986)[18].**
According to **Chapman et al. (1990), [19]** high blood pressure arises in 50–75 percent of individuals with autosomal dominant polycystic kidney disease prior to the actual development of severe renal impairment. Hypertensive individuals with polycystic kidney disease had considerably higher levels of activity in the renin-angiotensin system than similar hypertensive patients with essential hypertension. The enhanced renin release as a consequence of renal ischemia induced by cyst growth, it appears, may contribute to the development of hypertension in this condition at an earlier stage than in other cases.
Pedersen et al. (1993) [20] investigated the relationship between a simple renal cyst and high blood pressure, finding that the mean arterial blood pressure elevated with age and was substantially higher in individuals who had cysts in their kidneys. Patients having at least one cyst measuring less than 20 mm were shown to be more likely to have this condition. Smaller cysts, they hypothesized, were more likely to form completely intra-

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parenchymal and, as a result, more prone to generate a high hydrostatic pressure that compresses the neighboring renal tissue **[21]**.

Risk factors that were associated with higher renal cyst prevalence and detected in our study for the first time include also DM treatment duration and HTN treatment duration which distributed as 16.28±5.55 and 11.1±3.8 respectively for 103 diabetic patients and 67 hypertensivepatients.

Many further studies also reported a relationship between genes of the renin-angiotensin system and patients with hypertension and renal cysts. Genetic polymorphism could explain different findings regarding risk factors for renal cysts in the different populations**[22]**.We found 42.6% of our study population were diabetics (103 patients), and 75.5% of those having renal cysts were diabetics, so we considered DM a significant risk factor for renal cysts that were consistent with **Ozveren et al. (2016)[11]Carrim and Murchison, (2003) [3]**. This could be attributed to that DM might cause renal dysfunction, which leads to the development of renalcysts.As regards smoking, **Mensel et al. (2018) [5]**and **Chang et al. (2007) [10]**identified it as an additional risk factor for renal cysts, and so did we. Our data showed that 34.7% of the study population were smokers with a significantly higher prevalence of renal cysts (89.8% of those having cysts weresmokers).As regards laboratory findings, in our study, there was a relative increase of cholesterol, urea, and creatinine in cases of renal cysts with means 190.97±23.1, 31.05±8.8, and 1.05±0.17 mg/dL, respectively.

We found that abnormal kidney function tests, including serum urea and creatinine, were significantly associated with the presence of renal cysts. This was consistent with the findings of **Terada et al. (2002) [9],**who studied the risk factors for renal cysts in >17000 participants in a health-screening program, and reported a significantly higher average serum creatinine level for those with renal cysts than those without (0.83 vs.0.76 mg/dL), **Choi, (2016) [2]**who found renal dysfunction to be a risk factor for the presence of renal cysts, **Mosharafa, (2008) [14]**who found that Simple renal cysts were associated with increased levels of serumcreatinine.

In **Mosharafa, (2008) [14]**study, a higher serum creatinine level and increased parenchymal echogenicity were significant independent predictors of renal cysts. In addition, cysts were detected in 14.4% of patients with a serum creatinine level of ≥ 1.5 mg/dL. As regards smoking, **Mensel et al. (2018) [5]**and **Chang et al. (2007) [10]** identifiedit as an additional risk factor for renal cysts, and so did we. Our data showed that 34.7% of the study population were smokers with a significantly higher prevalence of renal cysts (89.8% of those having cysts weresmokers).As regards laboratory findings, in our study, there was a relative increase of cholesterol, urea, and creatinine in cases of renal cysts with means 190.97±23.1, 31.05±8.8, and 1.05±0.17 mg/dL, respectively.

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In Mosharafa, (2008) [14] research study, a greater blood creatinine level and enhanced parenchymal echogenicity were significant predictive factors of renal cysts. A additionally, cysts were found in 14.4 percent of individuals having a blood creatinine level of ≥ 1.5 mg/dL. This data could imply that simple renal cysts can be an early indication of renal disease and that underlying renal disease should indeed be examined in persons (particularly younger people) with renal cysts.

We also found that serum cholesterol was a significant risk factor associated with renal cysts. That was consistent with **Suher et al. (2006) [8]**. This could be attributed to that hyperlipidemia increases the possibility of blood vessel narrowing and hypertension, increasing the risk of renal cysts prevalence.In our study population, we found 29.3% had proteinuria, 18.6% had Pyuria, 29.5% had urate crystals, 14% had microscopic hematuria, and 1.2% had macroscopic hematuria with a significantly higher prevalence of renal cysts in those having proteinuria and Pyuria but no statistically significant association with urate crystals or hematuria.

Regarding proteinuria, our findings were consistent with **Suher et al. (2006) [8]**, who found albuminuria higher in a group with simple renal Cyst while **Caglioti et al. (1993) [15]**did not support these results.As regards hematuria, our findings were consistent with **Caglioti et al. (1993) [15]** but disagreed with **(Choi, 2016)** who found microscopic hematuria to be a risk factor for the presence of simple renal cysts, and **Marumo et al.**

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(2003) [25] who reported the incidence of renal cysts as 32.6% for ages of 60 years or older in patients referred for asymptomatic microscopic hematuria.

And finally, about Pyuria, our results were consistent with the findings of **Wood et al. (2015) [6]**.But not with**Mensel et al. (2018)[5],** who discovered that Pyuria does not correlate with simple renal cysts. In addition to the risk considerations mentioned above, the imaging technique (US, CT, MRI) as well as the study population are additional factors influencing the incidence of renal cysts (patients, participants of a healthy cohort of reproduction, volunteers from the population-based study). It is obvious that standardized CT or MRI tests identify more renal cysts than the USA, that also depend more on observers.**[26]**.

Our study has some limitations. The first is the small study population that gave insufficient data to compare renal cyst sizes in both males and females and in different age groups. In addition, only non-contrast CT images were used for cyst grading according to the Bosniak classification, which may have resulted in under- grading of potentially malignant cysts.

Conclusion:

Prevalence of renal cysts was 20.2% in our cross-sectional study applied on 242 patients referred to Agouza Police Hospital, radiology department for abdominal CT in 6months.

Significant risk factors for renal cysts include older age, male sex, hypertension, diabetes mellitus, smoking, longer DM or HTN TTTduration.Serum Urea, Creatinine, Cholesterol, urinary Pus, and Proteinuria are also significant factors affecting renalcysts. However,BMI, chronic use of NSAIDs, CBC findings, urate crystals, and hematuria are not statistically significant factors affecting renalcysts.

Conflicts of Interest: The authors declare no conflict of interest.

References

Matoso,A.,Chen,Y.B.,Rao,V.,Wang,L.,Cheng,L.,&Epstein,J.I.(2016).Atypical Renal Cysts.The American journal of surgical pathology, 40(2),202-211.

Choi, J. D. (2016). Clinical characteristics and long-term observation of simple renal cysts in a healthy Korean population.International urology and nephrology, 48(3), 319-324.

Carrim, Z. I., & Murchison, J. T. (2003). The prevalence of simple renal and hepatic cysts detected by spiral computed tomography. Clinical radiology, 58(8), 626-629

Bergmann, C., Guay-Woodford, L. M., Harris, P. C., Horie, S., Peters, D. J., & Torres, V. E. (2018).Polycystic kidney disease. Nature Reviews Disease Primers, 4(1),1-24.

Mensel, B., Kühn, J. P., Kracht, F., Völzke, H., Lieb, W., Dabers, T., &Lorbeer,R. (2018). Prevalence of renal cysts and association with risk factors in a general population: an MRI-based study. Abdominal Radiology, 43(11), 3068-3074.

Wood III, C. G., Stromberg III, L. J., Harmath, C. B., Horowitz, J. M., Feng, C., Hammond, N. A., ... &Nikolaidis, P. (2015). CT and MR imaging for evaluation of cystic renal lesions and diseases.Radiographics, 35(1), 125-141.

Ou, Y. C., Yang, C. R., Chang, Y. Y., Kuo, J. H., & Wu, H. C. (1997). The clinical experience of gaseous retroperitoneoscopic and gasless retroperitoneoscopy- assisted unroofing of renal cyst. Zhonghuayixuezazhi= Chinese medical journal; Free China ed, 59(4), 232-239.

Suher, M., Koc, E., &Bayrak, G. (2006).Simple renal cyst prevalence in internal medicine department and concomitant diseases.Renal failure, 28(2), 149-152.

Terada, N., Ichioka, K., Matsuta, Y., Okubo, K., Yoshimura, K., & Arai, Y. (2002).The natural history of simple renal cysts.The Journal of urology, 167(1), 21-23.

Chang, C. C., Kuo, J. Y., Chan, W. L., Chen, K. K., & Chang, L. S. (2007).
Prevalence and clinical characteristics of simple renal cyst. Journal of the Chinese Medical Association, 70(11), 486-491.

Ozveren, B., Onganer, E., &Türkeri, L. N. (2016). Simple renal cysts: prevalence, associated risk factors and follow-up in a health screening cohort. Urology journal, 13(1),2569-2575.

Darmady, E. M., Offer, J., & Woodhouse, M. A. (1973).The parameters of the ageing kidney.The Journal of pathology, 109(3),195-207.

Baert, L., & Steg, A. (1977). Is the diverticulum of the distal and collecting tubules a preliminary stage of the simple cyst in the adult?The Journal of urology, 118(5), 707-710.

Mosharafa,A.A.(2008).PrevalenceofrenalcystsinaMiddle‐Easternpopulation:an evaluation of characteristics and risk factors. BJU international, 101(6), 736-738.

Caglioti, A., Esposito, C., Fuiano, G., Buzio, C., Postorino, M., Rampino, T., ...& Dal Canton, A. (1993). Prevalence of symptoms in patients with simple renal cysts. BMJ: British Medical Journal, 306(6875), 430.

Cuxart, P. M., Matas, S. M., Sans, L. R., Garci, C. M., Ferrer, S. J., & Nadal, V. C. (1993). Prevalence of arterial hypertension, proteinuria and hematuria in patients with simple renal cyst.Revistaclinicaespanola, 193(7), 368.

ISSN:0975-3583,0976-2833 VOL12,ISSUE04,2021

Farrell, J. I., & Young, R. H. (1942). Hypertension caused by unilateral renal compression. Journal of the American Medical Association, 118(9), 711-712.

Lüscher, T. F., Wanner, C., Siegenthaler, W., & Vetter, W. (1986). Simple renal cyst and hypertension: cause or coincidence?Clinical nephrology, 26(2),91.

Chapman, A. B., Johnson, A., Gabow, P. A., & Schrier, R. W. (1990).The renin– angiotensin–aldosterone system and autosomal dominant polycystic kidney disease. New England Journal of Medicine, 323(16),1091-1096.

Pedersen, J. F., Emamian, S. A., & Nielsen, M. B. (1993). Simple renal cyst: relations to age and arterial blood pressure. The british journal of radiology, 66(787), 581- 584.

Pedersen, J. F., Emamian, S. A., & Nielsen, M. B. (1997).Significant association between simple renal cysts and arterial blood pressure.British journal ofurology, 79(5),688-688.

Tabei, S. M. B., Nariman, A., Daliri, K., Roozbeh, J., Khezri, A., Goodarzi, H. R., &Entezam, M. (2015). Simple renal cysts and hypertension are associated with angiotensinogen (AGT) gene variant in Shiraz population (Iran). Journal of the Renin-Angiotensin-Aldosterone System, 16(2), 409-414.

Terada, N., Arai, Y., Kinukawa, N., Yoshimura, K., &Terai, A. (2004).Risk factors for renal cysts. BJU international, 93(9),1300-1302

Chijioke, A., Aderibigbe, A., Olarenwaju, T. O., Makusidi, A. M., &Oguntoyinbo,A.E. (2010). Prevalence and pattern of cystic kidney diseases in Ilorin, Nigeria.Saudi Journal of Kidney Diseases and Transplantation, 21(6),1172.

Marumo, K., Horiguchi, Y., Nakagawa, K., Oya, M., Ohigashi, T., Asakura, H., ...&Murai, M. (2003). Incidence and growth pattern of simple cysts of the kidney in patients with asymptomatic microscopic hematuria. International journal of urology, 10(2), 63-67.

Nascimento, A. B., Mitchell, D. G., Zhang, X. M., Kamishima, T., Parker, L., & Holland, G. A. (2001). Rapid MR imaging detection of renal cysts: age-based standards. Radiology, 221(3), 628-632.