

SIMPLE RENAL CYSTS AND ITS ASSOCIATION WITH HYPERTENSION IN PATIENTS ATTENDING AT PHCC CLINICS IN QATAR BETWEEN 2019-2020

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Abstract

Objective/Aim: Determine the prevalence of simple renal cysts (SRCs) and their sex difference and the relationship between simple renal cysts diagnosed by abdominal ultrasonography and hypertension.

Material and Methods: The medical records of the patients were retrospectively analyzed for 11716 individuals who underwent ultrasonography of the kidneys and abdomen of patients attending at PHCC centers in the state of Qatar in the period between 2019 to 2020.

Results: A total of 11716 subjects were included (6710 female, 5006 male), Mean age 43.3 years (18-108 years), 319 subject's simple renal cysts. The prevalence SRCs was 2.72%, and it increased with age from 0.5% at the age of 18-19 years to 10.2% at the age of ≥ 70 years, and it was more common in males (2.9%) than in females (2.6%). The mean age and prevalence of hypertension in the group with SRCs (52.96 years, 41.7%) was greater than in the group without SRCs (43.06 years, 26.3%). The presence of SRCs increased the prevalence of arterial hypertension in females (odds ratio 2.05; 95% CI: 1.51-2.79), as well as in males (odds ratio 1.92; 95% CI: 1.38-2.69), and in all research sample (odds ratio 2; 95% CI: 1.59-2.51), the difference was statistically significant.

Conclusion: The prevalence of SRCs was 2.72%, which constituted a risk factor for arterial hypertension. Patients with SRCs must be monitored closely for blood pressure in routine clinical practice. Also, patients with arterial hypertension should investigate the presence of renal cysts.

Keywords: simple renal cysts, hypertension, risk factors.

Introduction

A simple kidney cyst is a pocket of fluid that forms on the surface of the kidney and is surrounded by a thin wall. Within the kidneys, one or more simple cysts may occur [1-3].

Simple renal cysts are common in healthy kidneys. They are the most prevalent kind of renal mass, accounting for 65 to 70% of all cases. Cysts can be single, numerous, or bilateral [4-7].

The incidence of simple renal cysts varies depending on the population investigated and the imaging technique used. According to postmortem inspection, renal ultrasonography, and/or abdominal computed tomography (CT) scanning, these cysts arise most frequently in people over the age of 50 and are more common in males than women [6], [8-12].

Simple kidney cysts affect roughly 25% of adults aged 40 and older, and nearly 50% of those aged 50 and older [13].

Bosniak established and refined a categorization of renal cysts based on their appearance on computed tomography in 1986 [14].

Simple renal cysts (type I in Bosniak classification) are normally asymptomatic, do not affect the kidney, and do not require treatment once discovered. An growing cyst, on the other hand, produces gradual blockage of caliceal and pelvic outflow. There may be a link between renal cysts and arterial hypertension. Renal cysts can cause segmental renal ischemia, which stimulates the renin-angiotensin system. Blood pressure may drop as a result of percutaneous cyst aspiration or surgical cyst excision [15].

The prevalence of hypertension varies by WHO region and nation income level. The WHO African Region has the greatest prevalence of hypertension (27%), while the WHO Americas Region has the lowest incidence of hypertension (5%). (18 percent). According to current trends, the number of individuals with hypertension grew from 594 million in 1975 to 1.13 billion in 2015, with the majority of the rise occurring in low- and middle-income nations. This surge is mostly attributable to an increase in hypertension risk factors in those groups. Hypertension is a dangerous medical condition that raises the chance of developing heart, brain, kidney, and other problems [16].

According to the statistics, the leading cause of death in QATAR in 2017 was "circulatory system disorders" such as high blood pressure, diabetes, and cholesterol, which killed 32% of the population [17].

Since the first report in 1942 of a renal cyst producing renal compression in a hypertensive teenager [18], various studies have shown that renal cysts may cause hypertension, which frequently resolves following cyst ectomy [19] or aspiration [20]. The mechanism of cyst-associated hypertension has been postulated to be renin-related, with epithelial cells lining the cyst generating renin [21].

The prevalence of hypertension normally rises with age, with gender differences observed. [22] The relationship between SRC and hypertension should be thoroughly investigated, with confounding variables such

as age, gender, BMI, estimated glomerular filtration rate (eGFR), uric acid, metabolic syndrome parameters, and hypertension itself considered, as all of these may influence the prevalence of renal cyst as well as hypertension. [23] Simple renal cysts and hypertension are rather frequent in the population, particularly among the elderly. Some studies have found a link between simple renal cysts and hypertension [24-26], but not in a large research of over 1000 patients, which found no increase in the incidence of hypertension, flank discomfort, hematuria, or proteinuria when compared to matched controls without cysts [8]. Individuals suffering with SRC and hypertension. Surgical excision of the cyst or suction decompression of the cyst, on the other hand, has shown enhanced renin release from the afflicted kidney and stabilization of blood pressure (BP) [15], [27-28]. As a result, additional research into the link between simple renal cysts and hypertension is required.

Materials and Methods:

Study design population:

The medical records of 11716 patients who underwent ultrasonography of the kidneys and abdomen of patients visiting PHCC facilities in the state of Qatar from 2019 to 2020 were reviewed retrospectively. For patients aged 18 and up, data on age, gender, hypertension, and renal ultrasound results were gathered. Patients with infectious renal cysts, polycystic kidney disease, renal cystic or solid tumor, solitary renal owing to previous surgery or congenital renal agenesis were excluded.

The research has been approved by Department of Clinical Research, The Primary Health Care Corporation (PHCC), Qatar.

Outcome Measurements

Simple renal cyst: On ultrasonography, there are three primary criteria for a single simple renal cyst that, if present, allows the cyst to be distinguished from a malignancy or abscess: (1) The mass is spherical and well-defined, with smooth walls; (2) there are no echoes (anechoic) within the mass; (3) there is a strong posterior wall echo, suggesting excellent transmission through the cyst and improved transmission beyond the cyst [4,29]. Hypertension is defined as a mean blood pressure of 130/80 mmHg or the use of antihypertensive medication. [30]

Statistical analysis

The IBM SPSS Statistics (Edition 23 of 2015) tool was used to examine the data. The clinical parameters of participants with and without renal cysts were compared using chi-squared (for categorical variables) and t-test (for continuous variables). On the basis of logistic regression models, these effects were assessed using odds ratios (OR) and their 95 percent confidence intervals (CI). All statistical tests were two-tailed, and P-values less than 0.05 were deemed significant.

RESULTS

A total of 11716 subjects were included (6710 female, 5006 male), Mean age 43.3 years (18-108 years) and divided into two groups: without simple renal cysts (11397) and with simple renal cysts (319).

	-SRC group (11397)	group (319)	Value	Prevalence SRC
(mean±s.d.)	46±13.01	46±14.05	0.01	
18-19 year	1(1.8%)	3(3%)	0.01	0.5%
20-29 year	7(10.9%)	14(4.4%)		0.5%
30-39 year	15(32.2%)	13(3.5%)		0.5%
40-49 year	14(26.3%)	15(5.1%)		0.5%
50-59 year	11(16.8%)	15(5.7%)		0.5%
60-69 year	10(8.9%)	15(8.5%)		0.5%
≥70 year	3(3.3%)	3(3.5%)		10.2%
Female	55(57.3%)	15(54.9%)		0.07
Male	22(42.7%)	15(45.1%)		0.5%
HTN	15(73.7%)	15(58.3%)	0.01	0.5%
N	22(26.3%)	15(41.7%)		

N: hypertension; s.d.: standard deviation; SRC: simple renal cysts

Table 1 shows the comparisons of clinical parameters among subjects with and without simple renal cysts.

The group with simple renal cysts had a higher mean age and prevalence of hypertension (52.96 years, 41.7 percent) than the group without simple renal cysts (43.06 years, 26.3 percent).

The proportion of patients aged 50 years or older is higher in the group with simple renal cysts, whereas the proportion of patients aged 50 years or older is higher in the group without simple renal cysts. There were significant differences in age, age groups, and hypertension prevalence. The prevalence of simple renal cysts rose with age, from 0.5 percent in patients aged 18-19 years to 10.2 percent in individuals aged 70 years. Simple renal

cysts are more common in men (2.9 percent) than in women (2.6 percent), and they are more common in patients with arterial hypertension (4.2 percent) than in patients without hypertension.

Table 2: Effect of simple renal cysts on the prevalence of arterial hypertension					
		total no.	cases of HTN no. (%)	(95% CI)	
19 year	SRC		49%)	(reference)	3
	without SRC		6%)	(0.95-0.99)	
			48%)		
29 year	SRC	7	7.72%)	(reference)	5
	without SRC		6%)	(0.95-0.97)	
		8	6.69%)		
39 year	SRC	5	9.14%)	(reference)	9
	without SRC		65%)	(0.12-2.01)	
		9	9.08%)		
49 year	SRC	4	24.62%)	(reference)	8
	without SRC		6.25%)	(0.66-1.81)	
		4	24.66%)		
59 year	SRC	1	46.78%)	(reference)	9
	without SRC		3.9%)	(0.57-1.39)	
		3	46.66%)		
69 year	SRC	0	67.03%)	(reference)	1
	without SRC		1.02%)	(0.45-1.32)	
		9	66.7%)		
79 year	SRC		81.48%)	(reference)	3
	without SRC		8.37%)	(0.66-4.55)	
			82.19%)		
male	SRC	5	3(24.07%)	(reference)	10
	without SRC		9.43%)	(1.51-2.79)	
		0	2(24.47%)		
female	SRC	2	9(29.39%)	(reference)	10
	without SRC		4.44%)	(1.38-2.69)	
		5	3(29.83%)		
total	SRC	97	2(26.34%)	(reference)	101
	without SRC		41.69%)	(1.59-2.51)	
		16	5(26.76%)		

CI: 95% Confidence Interval; HTN: hypertension; OR: Odds Ratio; SRC: simple renal cysts;

Table 2 shows the effect of simple renal cysts on the prevalence of hypertension.

Compared with patients without simple renal cysts, the presence of simple renal cysts in patients aged 40-49 years and aged ≥ 70 years increased the prevalence of arterial hypertension, while in other age groups it decreased the prevalence rate, but the difference was small and not statistically significant.

The presence of simple renal cysts increased the prevalence of arterial hypertension in females (odds ratio 2.05; 95% CI: 1.51-2.79), as well as in males (odds ratio 1.92; 95% CI: 1.38-2.69), and in all research sample (odds ratio 2; 95%CI: 1.59-2.51), the difference was statistically significant.

DISCUSSION

In this study, the prevalence of simple renal cysts (SRCs) was 2.72%, and it increased with age from 0.5% at the age of 18-19 years to 10.2% at the age of ≥ 70 years, and it was more common in males (2.9%) than in females (2.6%).

In Chin et al [24] study, the prevalence of SRCs was 7.8%, and they were more common in males (9.9%) than in females (5.2%), and found that their prevalence increased with age from 2.02% at age <40 years to 25.6% in age ≥70 years.

In Hong et al. [23] study the prevalence of SRCs was 19.2%, and it was more common in males (23.8%) than in females (12.2%), and its prevalence increased with age from 12.1% at the age of 40-49 years to 38.1% at the age of ≥70 years.

In Kim et al. [31] study the prevalence of renal cysts was 15.5%, and they were more common in males (16.2%) than in females (6.9%).

The prevalence of arterial hypertension was 26.76%, and it was greater in males than females, and increased with age.

We found that the presence of SRCs increased the prevalence of arterial hypertension from 26.34% to 41.69%.

Chin et al [24] also found that the presence of renal cysts was associated with a high prevalence of arterial hypertension from 36% to 43.6%.

In Hong et al. study [23] the presence of renal cysts increased the prevalence of arterial hypertension from 31.34% to 42.14%, also in Kim et al. study [31] (from 14.54% to 20.59%).

The relationship of arterial hypertension with SRCs in the age subgroups was not statistically significant, while we found that the presence of renal cysts increased the prevalence of arterial hypertension in males as well as in females with a statistically significant difference, as the presence of renal cysts increased the likelihood of arterial hypertension in females (OR: 2.05; 95% CI: 1.51-2.79) as well as in males (OR: 1.92; 95% CI: 1.38-2.69).

We found that SRCs are a risk factor for arterial hypertension (OR: 2; 95%CI: 1.59-2.51), and this is consistent with the results of several previous studies. Hong et al. [23] found that renal cysts increased the risk of arterial hypertension (OR: 1.6; 95% CI: 1.15-1.70) as well as of Kim et al. study [31] (OR: 1.53; 95% CI: 1.20-1.94), and in Gupta et al. [32] study found that SRCs is a risk factor of Prehypertension (OR: 1.14; 95% CI: 1.26-1.73) and Hypertension (OR: 1.86; 95% CI: 1.68-2.15) especially when there is more than one SRC or cysts larger than 2 cm.

Similarly, Lee et al. [33] was found that the presence of SRCs increased systolic and diastolic blood pressure by 2.38 and 1.61mmHg, respectively, and the presence of SRCs was found to be a risk factor of Prehypertension (OR: 1.12; 95%CI: 0.97-1.28) and Hypertension (OR: 1.25) ; 95%CI: 1.04-1.49, especially when ≤ 2 cysts are present, increases the risk of Prehypertension (OR: 1.56; 95%CI: 1.21-2.00) and Hypertension (OR: 2.69; 95%CI: 2.05-3.54).

Some studies have suggested that perihilar cysts cause increased renin release [25,34], whereas cyst expansion may cause renal ischemia leading to increased renin release [25, 34-36], and even small intraparenchymal cysts can create high internal hydrostatic pressure causing renal ischemia by compressing surrounding renal tissue [34]. Furthermore, several investigations have indicated that SRCs can induce hypertension by decreasing plasma rennin activity and normalizing blood pressure following surgical removal or decompression of cysts, lending credence to the notion that SRCs can cause hypertension[20], [37].

Another hypothesis for the relationship between renal cysts and hypertension is that aging-related nephron loss contributes to both hypertension development and the production of peripheral renal cysts. The loss of a nephron raises the work load on tubules and may result in tubular cell hypertrophy and hyperplasia to the point where cyst development develops [36], [38-40].

Finally, because our study was not longitudinal, we were unable to determine if there was a causal relationship between hypertension development and SRC. A longitudinal study will be required in the near future to discover the specific relationship between SRC and the incidence of hypertension.

Conclusion:

We found in this study that the prevalence of simple renal cysts was 2.72 percent, which represented a risk factor for arterial hypertension, and that their existence should not be neglected. In standard clinical practice, patients with SRCs must have their blood pressure constantly monitored. Patients with arterial hypertension should also be checked for the occurrence of renal cysts.

Conflicts of Interest

The other authors declare they have no conflict of interest.

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