



## Prevalence of asymptomatic simple renal cysts using ultrasonography in Iranian patients: A systematic review and meta-analysis

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### Abstract

**Introduction:** Cystic disease cover a heterogeneous range of inherited, non-inherited and acquired disorders. Kidney cysts is a relatively prevalent cystic disease. Simple kidney cysts are the most common benign kidney mass in adults and are usually diagnosed accidentally. Regarding the fact that the prevalence of simple kidney cysts in different geographical regions of the world has been reported differently, therefore, the present systematic and meta-analysis study was conducted to determine the prevalence of this disease in Iran.

**Methods:** The methods used in this systematic review were developed in accordance with the PRISMA checklist instructions . Cross-sectional, case control, and cohort studies were included in this research, and the case series, letter to editors, case reports, clinical trials, study protocols, systematic reviews, and narrative reviews were excluded.

**Results:** According to the results from the random effects model, the total Prevalence of asymptomatic simple renal cysts using ultrasonography among the 2517 Iranian patients was 8.9% (95% confidence interval [CI]: 7.9, 10 , I<sup>2</sup>=98.5).

**Discussion:** Ultrasound detects a simple cyst with 95% accuracy; cases of inaccurate detection occur due to localized hydronephrosis hematoma, the internal walls of the cysts, vascular malformations and arterial aneurysm; calcification might be observed in less than 1% of subjects with cysts.

**Keywords:** renal, cysts, ultrasonography, asymptomatic, simple renal cysts

### Introduction

Cystic disease cover a heterogeneous range of inherited, non-inherited and acquired disorders. Kidney cysts is a relatively prevalent cystic disease (1). Simple kidney cysts are the most common benign kidney mass in adults and are usually diagnosed accidentally; the prevalence of such cysts increases with age (2). The size of simple kidney cyst varies, ranging from 1 to 5 centimeters (3). Simple cysts are covered with a smooth membrane and contain a clear liquid (4). The location of these cysts is usually in the

kidney cortex (5). Simple cysts do not have much clinical significance, but known complications include infection, bleeding, hypertension, compressive effects on the pelvicalyceal system, and the formation of hydronephrosis and even cases of malignancy(6). The primary importance of a simple cyst is differentiating it from kidney tumors(7). Parenchymal simple cysts is the most common single-focal mass in the kidney, which is found in approximately 50% of the population over 50 years of age; the pathogenesis of

such cysts is not completely clear, but the way they are developed and acquired has come into bright light for scientists (8). Most cysts grow slowly over the years (9). Cysts are less common in early puberty and are rare during childhood (10). There is no particular relationship with the sex of the subject, but some studies have reported the incidence of such cysts to be twice as many as women (11). Different radiological methods have been used to diagnose simple kidney cysts, among which ultrasound is one of the best and most reliable ones (12). Doppler ultrasound is a non-invasive, side effect-free, inexpensive diagnostic method, the results of which are prepared quite fast (13). Different studies have shown different prevalence rates for simple cysts, ranging from 2.5% to 24%, which is much lower than the prevalence of reference books (14). Regarding the fact that the prevalence of simple kidney cysts in different geographical regions of the world has been reported differently, therefore, the present systematic and meta-analysis study was conducted to determine the prevalence of this disease in Iran.

## Methods

### Inclusion Criteria (Eligibility Criteria)

The methods used in this systematic review were developed in accordance with the PRISMA checklist instructions. Cross-sectional, case control, and cohort studies were included in this research, and the case series, letter to editors, case reports, clinical trials, study protocols, systematic reviews, and narrative reviews were excluded. Output: The main goal was to find the prevalence, and the output was collected as it was reported. Sampling techniques and sample size: all observational studies were excluded in the systematic review regardless of their design. The minimum sample size was greater than or equal to 25 (patients).

### Search Strategy

The searches were conducted by two independent researchers in the international (PubMed, Web of Science, Scopus, and Google Scholar) and national databases (Magiran and SID) to find the relevant studies published in English and Persian languages since the creation of the databases until September 2017 (without time limitations). To ensure the literature saturation, the list of the included research references or the relevant reviews found by searching was studied. The special search strategies were created using the Health Sciences Librarian website with specialization in systematic review searches using

the MESH phrases and open phrases in accordance with the PRESS standards. After finalizing the MEDLINE strategy, the results were compared to search the other databases. Similarly, PROSPERO was searched to find the recent or ongoing systematic reviews. The keywords used in the search strategy were “renal, cysts, ultrasonography, asymptomatic, simple renal cysts”, and “Iran”, which were combined using the AND, OR, and NOT operators.

### Study Selection and Data Extraction

Two researchers independently analyzed the titles and abstracts of the articles with regard to the research eligibility criteria. After omitting the redundant studies, the full texts of the studies were assessed against the eligibility criteria and the information on the authors was collected when required. General information (the corresponding author, province, and year of publication), the study information (the sampling technique, questionnaire design, information collection method, research conditions, sample size, and risk of bias), and the output scales (Prevalence) were collected.

### Quality Assessment

The scale developed by Hoy et al. was used to assess the quality of the methodology and the risk of bias for each observational study. This 10-item scale is used to assess the quality of the studies with respect to their external validity (items 1 to 4 assess the target population, sampling framework, and minimum participation bias) and internal validity (items 5 to 9 assess the data collection method, problem statement, research scale, and data collection instruments while item 10 assesses the bias of data analysis). The risk of bias was measured independently by two researchers, and the differences were solved by reaching a consensus.

### Data Aggregation

All of the eligible studies were included in the data aggregation following a systematic review and the data was integrated using a forest plot. The random effects model was assessed based on the overall Prevalence of the participants. The heterogeneity of the preliminary studies was tested using the  $I^2$  test. Besides, the subgroups were analyzed to determine the heterogeneity based on the gender and age of the respondents. Finally, a meta-analysis was conducted in STATA 14 statistical software.

## Results

### Study Selection

A total of 263 articles were extracted through our preliminary searches in different databases. Of the 184 non-redundant studies identified by analyzing the titles

and abstracts, 160 studies were ruled out due to irrelevant titles. Of the existing 24 studies, 3 studies met the inclusion criteria, and of the 21 excluded studies, 5 were review articles, 6 were letters to editor, and 10 did not meet the minimum inclusion criteria (Fig. 1).

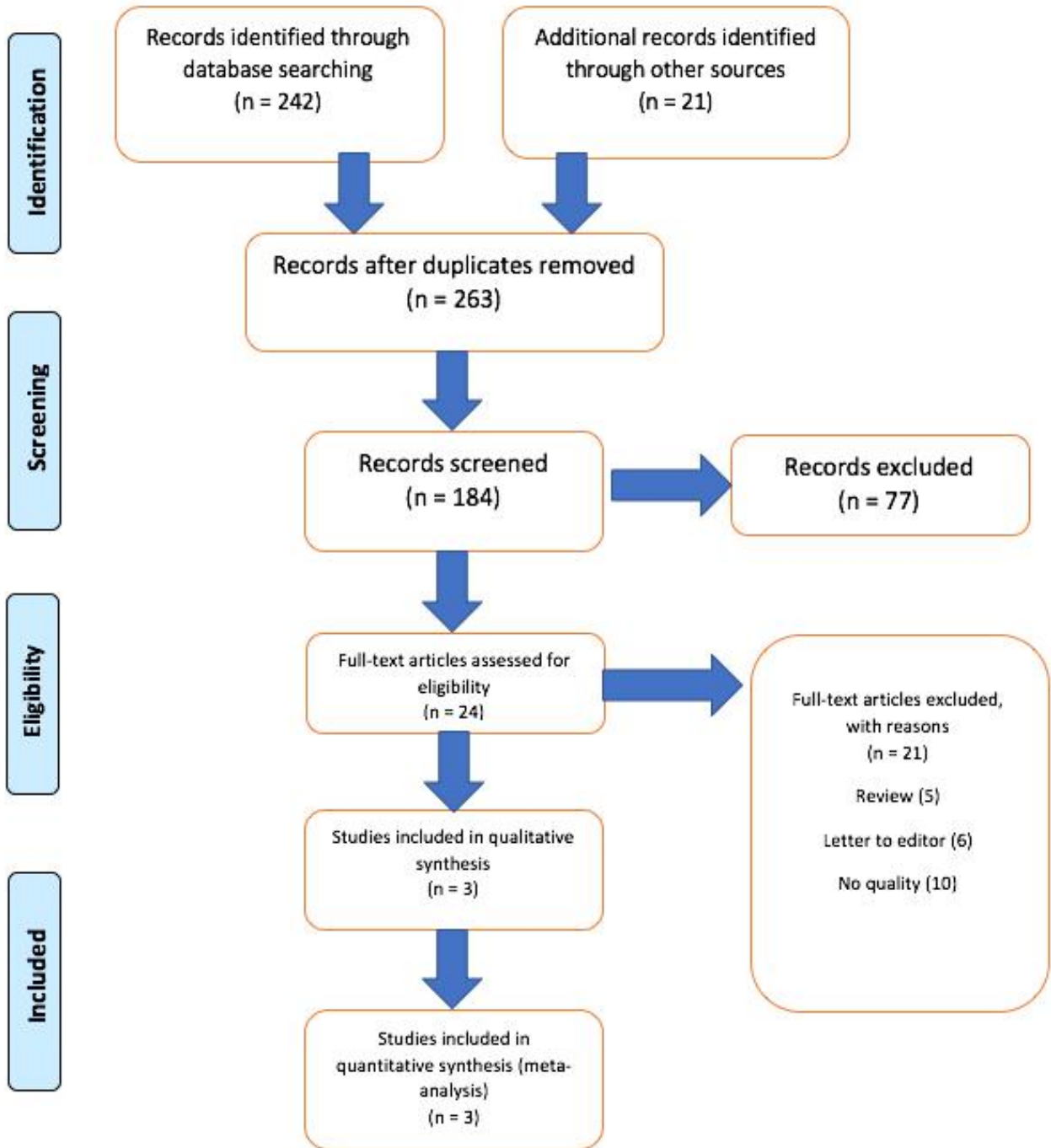


Fig 1.

**Research Specifications**

A total of 1299 patients suffering from coronary artery disease were studied. The age of the participants varied between 30 and 80 years. Of the 3 studies, 3 presented cross-sectional data . A total of 3 studies from 3 provinces meeting the inclusion criteria were reviewed. Of these 3 studies, one study was

fromkermanshah , and two studies were from Yazd and Tabriz. The most common sampling techniques were also simple sampling (n=2).More than 50% of the studies had low risk of bias. The most prevalent data collection methods were the interview and self-report methods used in 2 studies. The most common study locations were also hospitals (Table 1).

**Table 1. Studies included in the systematic review**

Author	Year	Sample size	Province	Prevalence	Risk of bias
Niyafar	1995	900	Kermanshah	0.21/7	low
Mansouriyan	2000	514	Yazd	0.03/5	Moderate
Naami	2003	1103	Tabriz	010/2	Low

**Meta-Analysis of Prevalence of asymptomatic simple renal cysts using ultrasonography in Iranian patients**

According to the results from the random effects model, the total Prevalence of asymptomatic simple

renal cysts using ultrasonography among the 2517Iranian patients was 8.9% (95% confidence interval [CI]: 7.9, 10, I<sup>2</sup>=98.5).

**Table 2: Prevalence of asymptomatic simple renal cysts using ultrasonography in Iranian patients**

ID	First Author	Year	Province	ES	95% CI for ES		% weight
					Low	Up	
1	Niyafar <sup>(20)</sup>	1995	Kermanshah	0.217	0.190	0.244	16.32
2	Mansouriyan <sup>(21)</sup>	2000	Yazd	0.035	0.019	0.051	46.69
3	Naami <sup>(22)</sup>	2003	Tabriz	0.102	0.084	0.120	36.99
Sub-total Random pooled ES	-----	-----	-----	0.089	0.079	0.100	100

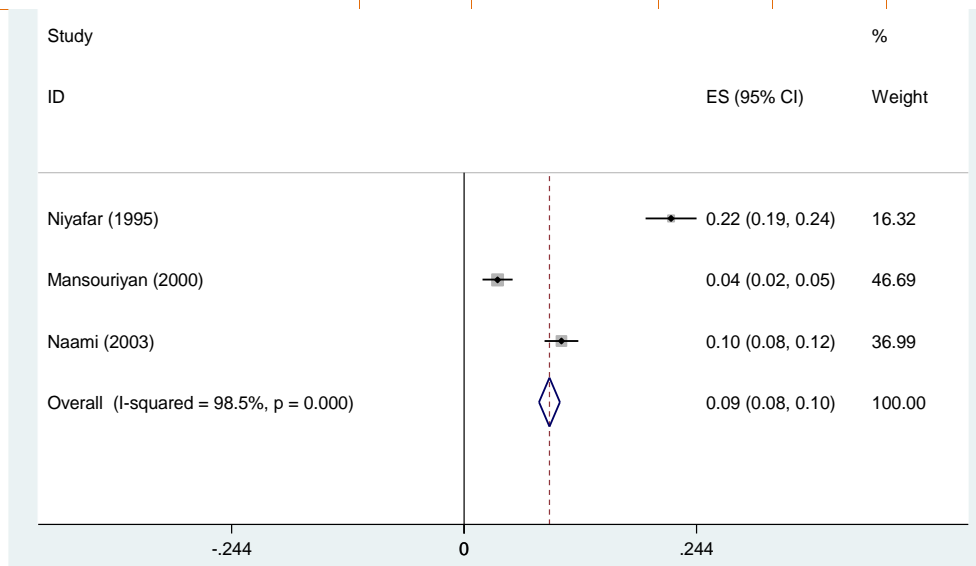


Fig. 2 :Prevalence of asymptomatic simple renal cysts using ultrasonography in Iranian patientsand its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the% value and the length of the lines showing the 95% confidence interval in each study. The oval sign shows Prevalence of asymptomatic simple renal cysts using ultrasonography in Iranian patients.

## Discussion

According to the results from the random effects model, the total Prevalence of asymptomatic simple renal cysts using ultrasonography among the 2517 Iranian patients was 8.9% (95% confidence interval [CI]: 7.9, 10,  $I^2=98.5$ ). The diagnostic criteria for simple kidney cysts in ultrasound is as follows: 1. Lack of internal echoes 2. Thin and distinct walls with clear and smooth edges 3. Good conduction of sound waves from the inside of the cyst with posterior resonance 4. Spherical or elliptical shape in case of the presence of a thick septum, irregular edges, calcification and internal echoes (15). Further examination with CT or needle aspiration is recommended by ultrasound or CT control (16). The accuracy of cysts diagnosed with ultrasound is 95-98%; cases of inaccurate diagnosis occur due to the presence of localized hydronephrosis hematoma or septum in the cysts (17-18). Simple kidney cysts are usually single-celled, have a mucosal covering and can be seen in any part of the kidney. Ultrasound detects a simple cyst with 95% accuracy; cases of inaccurate detection occur due to localized hydronephrosis hematoma, the internal walls of the cysts, vascular malformations and arterial aneurysm; calcification might be observed in less than 1% of subjects with cysts (19).

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