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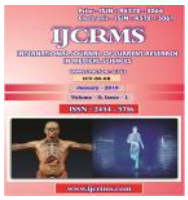

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Prevalence of Renal artery stenosis in Iranian patients with coronary artery disease: A systematic review and meta-analysis

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Abstract

Introduction: The relationship between Coronary Artery Disease (CAD) and the prevalence of Renal Artery Stenosis (RAS) has been demonstrated. Despite high incidence of heart diseases and high frequency of CAD risk factors among Iranian population, this relation has not been clearly determined. This study estimated the Prevalence of Renal artery stenosis in Iranian patients with coronary artery disease.

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 Renal artery stenosis among the 1299 Iranian patients with coronary artery disease cases was 20.4% (95% confidence interval [CI]: 18.2, 22.6, I^2=69.5).

Discussion : The accidental diagnosis of renal artery stenosis in patients with marked peripheral artery disease is an independent predictor of cardiovascular complications, renal damages, and mortality. Thus, patients suffering from renal and peripheral artery stenosis have the highest risk of cardiovascular disease and should be under intensive care.

Keywords: Coronary artery disease, renal artery stenosis, angiography

Introduction

Atherosclerosis is a progressive pathogenic process that affects some vascular beds including renal arteries; atherosclerosis is the main cause of 75-84% of renal artery stenosis(1). Atherosclerosis of renal arteries is widely associated with the atherosclerosis of other vascular beds including the coronary bed.(2)

The atherosclerotic stenosis of renal arteriesat their branching point from aorta accounts for 2-7% of hypertension among the middle-aged and elderly populations (3). Renal ischemia arising from renal artery stenosis accounts for 17-21% of end stage renal disease cases in 71-year-old uremic patients (4). The atherosclerotic stenosis of renal arteries is a progressive disease that is commonly associated with resistant hypertension, unstable ischemic syndromes, renal dysfunction,

kidney failure, and pulmonary edema(5). Over the past few decades, given the increasing prevalence of coronary artery atherosclerosisin different countries including Iran, coronary arteries angiography as well as percutaneous coronary interventions have been widely applied as the standard method of investigating the coronary anatomy and the treatment of atherosclerotic lesion(6). Nowadays, the researchers admit that renal artery stenosis (RAS) is one of the main causes of renovascular hypertension and ischemic nephropathy(7). The prevalence of RAS is 1-10% in the world's hypertension population (8). Given the increased prevalence of old patients as well as the increased prevalence of RAS and ischemic nephropathy, clinical specialists stress the non-invasive diagnosis of this lesion and its therapeutic evaluations with the purpose of achieving a successful treatment of this lesion(9). Over the recent years, numerous studies have been conducted on the relationship between atherosclerosis risk factors and coronary and renal artery stenosis as well as the simultaneous prevalence of these two vascular beds(10).

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 "Coronary artery disease, renal artery stenosis, angiography ", 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 STATA14 statistical software.

Results

Study Selection

A total of 285 articles were extracted through our preliminary searches in different databases. Of the 194 non-redundant studies identified by analyzing the titles and abstracts, 157 studies were ruled out due to irrelevant titles. Of the existing 37 studies, 5 studies met the inclusion criteria, and of the 32 excluded studies, 8 were review articles, 8 were letters to editor, and 16 did not meet the minimum inclusion criteria (Fig. 1).

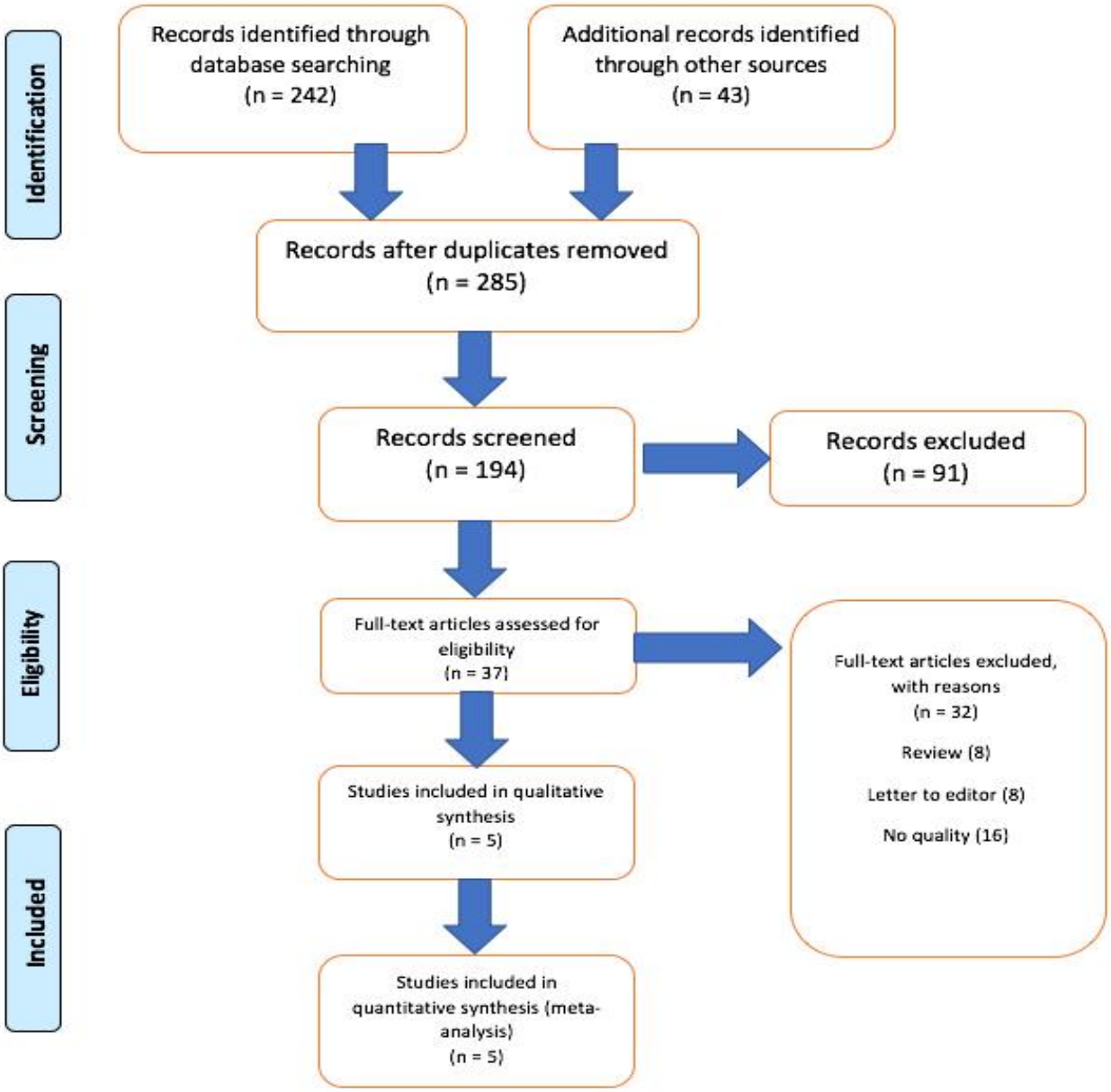

Fig 1.

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 5 studies, 3 presented cross-sectional data .A total of 5 studies from 4 provinces meeting the inclusion criteria were reviewed. Of these 5studies, three studies were from Isfahan ,Tehran,Ahvaz and two studies were from Mashad. The most common sampling techniques were also simple sampling (n=3).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 4 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
Shamirani	2000	300	Isfahan	0.16/6	Moderate
Edalatifard	2010	146	Tehran	0.25/3	Low
Abdollahimoghaddam	2012	204	Mashhad	0.28/9	Low
Abdollahimoghaddam	2013	375	Mashhad	0.20/5	Low
Payami	2015	274	Ahvaz	0.18/2	Low

Meta-Analysis of Prevalence of Renal artery stenosis in Iranian patients with coronary artery disease

According to the results from the random effects model, the total Prevalence of Renal artery stenosis among the 1299 Iranian patients with coronary artery disease cases was 20.4% (95% confidence interval [CI]: 18.2, 22.6, I^2=69.5).

Table 2: Prevalence of Renal artery stenosis in Iranian patients with coronary artery disease

ID	First Author	Year	Province	ES	95%CI for ES		%weight
					Low	Up	
1	Shamirani[18]	2000	Isfahan	0.166	0.124	0.208	26.93
2	Edalatifard[19]	2010	Tehran	0.253	0.183	0.323	9.57
3	Abdollahimoghaddam[20]	2012	Mashhad	0.289	0.227	0.351	12.27
4	Abdollahomoghaddam[21]	2013	Mashhad	0.205	0.164	0.246	28.51
5	Payami[22]	2015	Ahvaz	0.182	0.136	0.228	22.72
Sub-total Random pooled ES	----------	--------	----------	0.204	0.182		100

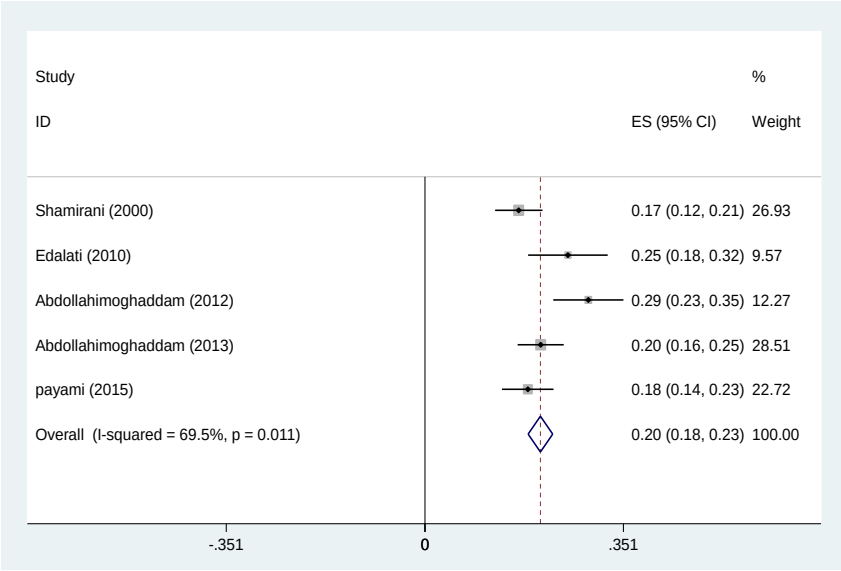

Fig. 2 :Prevalence of Renal artery stenosis in Iranian patients with coronary artery disease and its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the% value and the length of the lines showing the 95% confidence interval in each study. The oval sign shows Prevalence of Renal artery stenosis in Iranian patients with coronary artery disease

Discussion

According to the results from the random effects model, the total Prevalence of Renal artery stenosis among the 1299 Iranian patients with coronary artery disease cases was 20.4% (95% confidence interval [CI]: 18.2, 22.6, I^2=69.5).RAS screening in patients suffering from coronary artery disease have been recently taken into account by specialists (11). This is mainly resulted from the occurrence of renal dysfunction and thus renal failure after the spread of coronary artery disease(12). The prevalence of RAS in heart disease patients is commonly underestimated than the true figure (13).Renal artery stenosis is a prevalent manifestation of atherosclerosis in renal arteries that is closely related to the atherosclerosis of the arteries of other parts of the body (14). It has been indicted that RAS occurs in 60% of peripheral artery disease patients and less than 30% of coronary artery disease patients. The accidental diagnosis of renal artery stenosis in patients with marked peripheral artery disease is an independent predictor of cardiovascular complications, renal damages, and mortality. Thus, patients suffering from renal and peripheral artery stenosis have the highest risk of cardiovascular disease and should be under intensive care(15).

In these patients, conducting renal artery angiography during the coronary angiography is likely to show the cases at risk of RAS with the least cost and risk. It can also save theextra costs of Doppler and MRA and prevent RAS and chronic kidney disease complications. Men and women with a long history of hypertension are regarded as the population at risk. Thus, monitoring the renal function and controlling kidney failure risk factors are of high significance in these patients after the diagnosis of coronary artery disease. Moreover, it is recommended to conduct a long-term follow-up for the investigated patients to evaluatethe incidence and progress of RAS and determine the mortality rate of RAS progress(16).

For conducting the screening process, it is of great significance to recognize the sensitivity and specificity of the method applied as well as the predictive factors. The number of tight coronary arteries is an independent predictive factor for diagnosing renal artery stenosis. Whenever a tight coronary artery increases (with a stenosis of more than 71%) the likelihood of the simultaneous stenosis of renal artery is doubled (17).

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