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Echocardiographic assessment of mitral valve prolapse prevalence before and after the year 1999: a systematic review

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ADMINISTRATIVE INFORMATION

Support - No funding.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 August 2024 and was last updated on 27 August 2024.

INTRODUCTION

Review question / Objective The main question is the following one: "What is the real prevalence of mitral valve prolapse in the general population?" The present systematic review has been primarily designed to summarize the main findings of the most relevant echocardiographic studies that assessed mitral valve prolapse (MVP) prevalence in various cohorts of individuals, including heterogeneous study populations, from the 1970s to today. Possible explanations for the divergences bewteen the studies conducted before and after the year 1999 (that used less specific older criteria or more specific new echocardiographic criteria for MVP diagnosis, respectively) will be provided as well.

Rationale The echocardiographic studies that evaluated MVP prevalence before the 1999 predominantly analyzed highly selected individuals, hospitalized due to MVP-related complications or "self-referred" because of affected family members and/or history of heart murmur or subtle symptoms. Moreover, they used motion-mode (M-mode) or two-dimensional (2D) echocardiographic criteria that were not specific for MVP diagnosis. According to M-mode criteria, MVP was generally defined as late or holosystolic bowing of mitral valve leaflets at least 2 mm, below the C-D line, whereas on 2D-TTE MVP was diagnosed in case of systolic motion of one or both mitral leaflets above the mitral anular plane at least in the apical four-chamber view. Such criteria did not take into consideration the three-dimensional shape of the mitral valve apparatus. Due to the saddle-like shape of mitral annulus, leaflets can appear to ascend above the mitral annulus in the apical four-chamber view, without real leaflet displacement above the entire mitral valve in three dimensions.
The studies demonstrating the systolic mitral annular nonplanarity gave the input for reconsidering the echocardiographic standards for MVP diagnosis. Based on the new 2D-echocardiographic criteria, since 1999 MVP is diagnosed as the systolic billowing of one or both mitral leaflets >2 mm above the mitral annulus into the left atrium in the parasternal long-axis view.

These new echocardiographic criteria have allowed to minimize false positive diagnoses.

Condition being studied Mitral valve prolapse (MVP) is a common valvular disorder that affects 2-3% of the general population.
It is defined as the systolic displacement of one or both leaflets of at least 2 mm above the annular plane into the left atrium, visualized from the parasternal long-axis view on resting transthoracic echocardiography (TTE).
Even if MVP is generally considered a benign condition, a subset of individuals may be affected by complex ventricular arrhythmias, mitral regurgitation (MR), infective endocarditis, stroke, atrial fibrillation and even sudden cardiac death.

METHODS

Search strategy A comprehensive search of all echocardiographic studies estimating the MVP prevalence in various cohorts of individuals, regardless of the time period, will be carried out by two independent reviewers (A.S. and M.L.) through August 2024, by using Medline and EMBASE databases. The search strategy will include the following terms: “mitral valve prolapse” OR “MVP” AND “prevalence” AND “cardiac function” AND “echocardiography” OR “M-mode echocardiography” OR “two-dimensional (2D) echocardiography” OR “three-dimensional (3D) echocardiography”. Search will be limited to full-text articles published in English.

Participant or population All echocardiographic studies evaluating MVP prevalence in various cohorts of individuals, regardless of the time period, will be included. Conversely, imaging studies conducted on MVP individuals that did not analyze MVP prevalence, non-clinical articles, animal studies, duplicate articles, case reports, conference presentations, reviews, correspondences, editorials, letters without data, and abstracts, will be excluded.

Intervention The present systematic review has been primarily designed to summarize the main findings of the most relevant echocardiographic studies that assessed mitral valve prolapse (MVP) prevalence in various cohorts of individuals, including heterogeneous study populations, from the 1970s to today.
The main outcome is the estimation of the overall pooled MVP prevalence in the general community.
The secondary outcome is the estimation of the pooled MVP prevalence for the studies performed before the year 1999 and for those performed after the year 1999.

Comparator N/A.

Study designs to be included Observational Cohort and Cross-Sectional Studies.

Eligibility criteria All echocardiographic studies evaluating MVP prevalence in various cohorts of individuals, regardless of the time period, were included. Conversely, imaging studies conducted on MVP individuals that did not analyze MVP prevalence, non-clinical articles, animal studies, duplicate articles, case reports, conference presentations, reviews, correspondences, editorials, letters without data, and abstracts, were excluded.

Information sources Medline and EMBASE databases.

Main outcome(s) The main outcome is the estimation of the overall pooled MVP prevalence in the general community.

Additional outcome(s) The secondary outcome is the estimation of the pooled MVP prevalence for the studies performed before the year 1999 and for those performed after the year 1999.

Data management Data will be reported on excel file and then analyzed by using excel.

Quality assessment / Risk of bias analysis Articles included in this systematic review will be assessed for risk of bias (RoB) using the National Institutes of Health (NIH) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. All the studies will be assigned a “yes”, “no”, or “other” to each of the 14 criteria outlined in the appraisal tool. Then, by considering each criterion, the investigators will evaluate the overall quality of the study and assign an overall “good” (met 11–14 criteria), “fair” (met 6–10 criteria), “poor” (met 0–5 criteria) rating to each study. The quality rating will be independently estimated by two authors (A.S. and G.L.N.). Disagreement will be resolved by consensus.

Strategy of data synthesis Two reviewers (A.S. and M.L.) will screen the databases according to the inclusion criteria and perform data extraction independently. Following information concerning MVP individuals: 1) demographics (age and sex); 2) anthropometrics [waist-to-hip ratio (WHR), body mass index (BMI) and eventual chest shape abnormalities, such as straight back syndrome (SBS) and pectus excavatum (PE), or inherited connective tissue disorder, such as Marfan Syndrome (MFS), asssociated with MVP]; 3)

prevalence of the most common cardiovascular risk factors (hypertension, smoking, type 2 diabetes mellitus and dyslipidemia); 4) auscultatory findings (mid-systolic click and/or late systolic murmur) and hemodynamics (heart rate, systolic and diastolic blood pressure); 5) subjective symptoms, such as chest pain, palpitations, dyspnea and/or syncope; 6) electrocardiographic (ECG) findings, particularly ST-T-wave abnormalities in inferior leads, ventricular premature beats (VPBs), atrial premature beats (APBs) and/or atrial fibrillation (AF); 7) left ventricular (LV) internal dimensions, LV systolic and diastolic function, left atrial (LA) size assessed by 2D-TTE; 8) MVP prevalence in each study group; 9) complications associated with MVP, including arrhythmias, MR, IE, HF and sudden cardiac death; 10) concomitant valvulopathies; 11) current medical treatment; 12) follow-up data (if any), will be independently collected by the two reviewers. A third author (G.L.N.) will check the extracted data for accuracy and resolve possible discrepancies between reviewers.

Subgroup analysis The pooled prevalences of MVP for the older echocardiographic studies (performed between 1976 and 1992) and for the more recent ones (conducted between 1999 and 2021) will be estimated.

Sensitivity analysis A sensitivity analysis will be performed by investigating the effect of individual studies on the overall systematic review: the overall MVP prevalence and the MVP prevalence in the two groups of studies (before and after the year 1999) will be re-estimated by omitting each study, sequentially, to determine the robustness of results.

Country(ies) involved Italy.

Keywords mitral valve prolapse; prevalence; general population; M-mode echocardiography; two-dimensional echocardiography; diagnostic criteria.

Contributions of each author

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