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The incidence of presperved ratio impaired spirometry in adults: a meta-analysis

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ADMINISTRATIVE INFORMATION

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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 28 February 2024 and was last updated on 28 February 2024.

INTRODUCTION

Review question / Objective The present study aimed to investigate the incidence of preserved ratio impaired spirometry (PRISm) in adults.

Condition being studied Preserved Ratio Impaired Spirometry (PRISm) is a condition characterized by a preserved ratio of forced expiratory volume in one second (FEV1) to forced vital capacity (FVC), but a reduced FEV1, i.e., FEV1/FVC ≥ 0.7, FEV1%pre<0.8 [1-2]. It is often associated with early stages of chronic obstructive pulmonary disease (COPD) or restrictive lung diseases. PRISm is common in clinical practice but is often overlooked. While PRISm does not meet the diagnostic criteria for COPD, individuals with PRISm have a significantly increased risk of developing COPD, as well as elevated risks of cardiovascular-related mortality and all-cause mortality compared to individuals with normal lung function. Therefore, early detection and intervention for PRISm are of paramount importance.

Although there have been numerous studies reporting the incidence of PRISm [3-5], variations in study design and inconsistent inclusion and exclusion criteria have led to significant differences in reported incidence rates. Currently, there is no published evidence-based studies on the incidence of PRISm. To comprehensively understand the incidence of PRISm in adults, this study conducted a systematic review of clinical studies on the occurrence of PRISm by searching relevant literature. The aim is to provide evidence-based support for clinical prevention and control.

METHODS

Search strategy We searched the China National Knowledge Infrastructure (CNKI), VIP Information, Wanfang Medical Database, PubMed, Embase and Web of Science to collect clinical studies reporting

the incidence of PRISm. The search period ranged from database inception to October 1, 2023. A combination of online database searches and manual searches were conducted, and relevant references from included studies were also supplemented.
If there were two or more studies described the same population, only the study with the largest sample size was chosen. The search term was "preserved ratio impaired spirometry."

Participant or population The study population is the general population, excluding studies that investigate specific diseases such as COPD and myocardial infarction that may affect lung function outcomes.

Intervention This is an observational study without intervention.

Comparator This is an observational study without comparator.

Study designs to be included observational studies including cross-sectional studies, case-control studies and cohort studies published in Chinese and English.

Eligibility criteria Studies were included in the meta-analysis if they had observational studies including cross-sectional studies, case-control studies and cohort studies published in Chinese and English; if the study population is the general population, excluding studies that investigate specific diseases such as COPD and myocardial infarction that may affect lung function outcomes; if the observed outcome is the occurrence of PRISm. Exclusion criteria: (1) Duplicate publications of the same clinical study; (2) Literature that does not have relevant outcome measures for this study; (3) Literature that cannot be accessed in full or has incomplete data, making it impossible to extract the necessary data for the observed outcome or contact the original authors for data.

Information sources We searched the China National Knowledge Infrastructure (CNKI), VIP Information, Wanfang Medical Database, PubMed, Embase and Web of Science to collect clinical studies reporting the incidence of PRISm. The search period ranged from database inception to October 1, 2023. A combination of online database searches and manual searches were conducted, and relevant references from included studies were also supplemented.
If there were two or more studies described the same population, only the study with the largest sample size was chosen. The search term was "preserved ratio impaired spirometry."

Main outcome(s) The occurrence of PRISm.

Quality assessment / Risk of bias analysis The quality of included studies was independently evaluated by the two reviewers. Cross-sectional studies were evaluated based on the scale developed by the Agency for Healthcare Research and Quality (AHRQ) of the United States . The AHRQ criteria consist of 11 items, with a total score of 11 points. Studies scoring 0-3 points are considered low-quality, 4-7 points are considered moderate-quality, and 8-11 points are considered high-quality. Cohort studies and case-control studies were assessed for quality using the Newcastle-Ottawa Scale (NOS) , with a maximum score of 9. Studies with scores of ≥6 were considered high-quality. Any disagreement was resolved by another reviewer.

Strategy of data synthesis All statistical analyses were performed using STATA 16 (StataCorp, Texas, USA). Original incidence rates r were transformed by the double arcsine method to ensure a normal distribution, and the resulting transformed rate tr was used in single-arm meta-analysis. The heterogeneity between studies was analyzed using a chi-squared test ($p < 0.10$) and quantified using the I2 statistic. When no statistical heterogeneity was observed, a fixed-effects model was utilized. Otherwise, a random-effects model is used for meta-analysis or descriptive analysis is performed. Subgroup analysis and meta-regression analysis are used to explore the sources of heterogeneity, and sensitivity analysis is conducted to examine the impact of individual studies on the overall incidence rate. Pooled incidence rates R were back-calculated from transformed rates tr using the $R = [\sin (tr / 2)]2$. A two-tailed $p < 0.05$ was considered statistically significant. Publication bias was evaluated using a funnel plot along with Egger's regression test.

Subgroup analysis Potential sources of clinical heterogeneity were identified using subgroup.

Sensitivity analysis Sensitivity analysis was conducted to examine the impact of individual studies on the overall effect size.

Language restriction Chinese and English.

Country(ies) involved China.

Keywords Preserved ratio impired spirometry; Incidence; Meta-analysis.

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