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Quality Assessment and Knowledge Discovery for Chinese Systematic Review/Meta-analysis of Hypertension Prevention and Control

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Abstract—Systematic Review/Meta-analysis is the essential source of best evidence in medical research and its quality is necessary to assess due to the difference among researchers. The AMSTAR, PRISMA, cited frequency and downloads were used to assess the quality of domestic systematic review/meta-analysis about hypertension prevention and control from three perspectives including methodology, reporting and usage, and then discovered the evidence from the high methodologically quality literature. The current domestic systematic review/meta-analysis research counters different problems in the quality of methodology, reporting and usage, and further improvement of the methodological and standardization of the publication are needed to provide achievements and recommendations with a high evidence level.

Keywords—Hypertension, Systematic Review, Meta-analysis, Quality assessment, Knowledge Discovery

I. INTRODUCTION

As the most common chronic non-communicable diseases, hypertension not only endangers people's health but also the main risk factor for cardiovascular and cerebrovascular diseases. The prevalence rate of hypertension in the Chinese population is high and rising while the rate of recognition, treatment and control are still low [1]. High-quality systematic review/meta-analysis of randomized controlled trials are the sources of the best evidence [2]. Quality assessment of systematic review/meta-analysis is getting more and more attention all over the world, the research field of published quality assessment covered traditional Chinese medicine, anesthesiology, psychology, nursing, surgery, dentistry, etc. [2-7]. Some researchers assessed the quality of methodology and randomized controlled trials of the meta-analysis published in English in the field of hypertension [8-10]. All existing researches focused on methodological or reporting quality of systematic review/meta-analysis while the quality of usage was not mentioned. Moreover, no quality assessment referred to systematic review/meta-analysis on prevention and control of hypertension. Therefore, it is significant to assess the quality of domestic literature of hypertension prevention and control to promote the whole research level and provide a more higher level of evidence.

II. DATA AND METHODS

A. Data Collection and Screening

The systematic review/meta-analysis of hypertension prevention and control were comprehensively retrieved in the CNKI, WANFANG MED ONLINE, VIP and CBM before December 31, 2017. The search subject was (“Systematic Review” OR “meta-analysis”) AND “Hypertension”. Two researchers screened and assessed the literatures separately according to the inclusion/exclusion criteria and assessment scales. The final results were determined after discussion when disagreement divided.

B. Quality Assessment

The AMSTAR (A Measurement Tool to Assess Systematic Reviews) is one of the international common scales to assess the methodology quality of the systematic review/meta-analysis [11]. The scale consists of 11 items, each of them is judged with "Yes", "No", "Can't Answer" and "Not Applicable", respectively scored 1/0/0/0 points, totals 11 points.

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) provides structured guidance for the author to comprehensively and systematically report systematic reviews/meta-analysis [12]. The scale consists of 27 items in 7 aspects, each of them is judged with "sufficient", "partially compliant" and "non-conforming", respectively scored 1/0.5/0 points, totals 27 points.

Both the higher cited frequency and larger downloads of literature were published reflect the influence, practical value and academic level to some extent. The cited frequency of the literature can directly reflect the academic and reference value, meanwhile, the number of downloads directly reflect the communication and attention.

Methodological high-quality literatures were selected after quality assessment, and the research results were extracted from them to summarize and analyze. The high level of evidence and their relevance were finally discovered.

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C. Data Analysis

Excel and SPSS22.0 were used for statistical analysis and calculate the scores of methodological, reporting and usage quality separately. The score was expressed by $\bar{X}\pm SD$. Pearson analysis was used to compute the correlation and $p<0.01$ was considered statistically significant.

III. Results

A. Literature Search and Screening

3,330 articles were identified via database retrieval and 94 articles were finally included. The literature screening process and results are shown in Fig. 1.

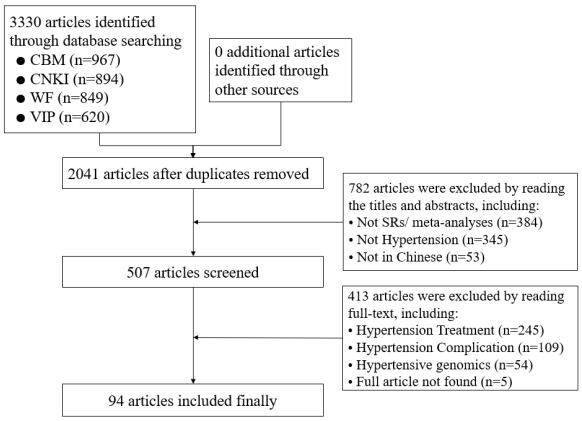

Fig. 1. The literature screening process

B. Quality Assessment

The highest methodological quality score of 94 included literatures was 10 while the lowest was 3, and the average score was 7.68±1.446. Literatures were classified as 35 high quality (9-11), 58 medium quality (5-8) and 1 low (0-4) quality. None of the 94 literatures met the specification requirements of 11 items and provided the list of literatures included and excluded. The high-quality literatures were fully accorded with 7 items (1, 2, 3, 6, 7, 8, 9) and the conformity of 2 items (10, 11) was over 90%; The medium-quality literature confirm items 1, 8, and 9 totally and the conformity of items 3 and 6 were more than 80%; the low-quality literature only fully confirmed to 2 items (8, 9) while other items 2, 4, 5, 7, 10 and 11 did not meet. The average score of each item was shown in Fig. 2.

The highest reporting quality score of 94 included literatures was 22.5 while the lowest was 12, and the average was 17.87±3.08. None of 94 literatures met the specification requirements of all 27 items. The conformity of 7 items (1,6,7,8,14,21,24) was over 90% while that of item 11 and 19 was less than 10%. None of the literatures fully met the requirements of a structured abstract. All literatures didn't report the research approach and registration information in the method section, and then the complete information of research data was reported rarely. 54 literatures (58%) detailed discussed the research and publication bias. 29 literatures (31%) reported the fund while only 1 reported the benefit conflict and author contribution statement. The average score of each item was shown in Fig. 3.

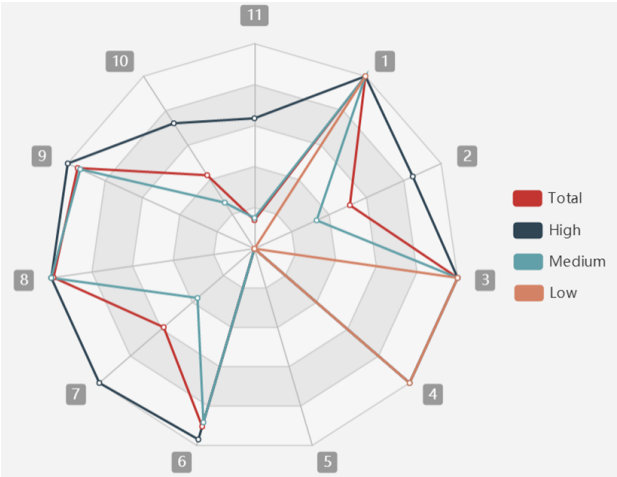

Fig. 2. Radar chat of AMSTAR average score of the included literatures Items: 1.Preliminary Design; 2.Duplicate Study Selection and Data Extraction; 3.A Comprehensive Literature Search; 4.Status of Publication; 5.A List of Literature Included and Excluded; 6.Characteristics of the Included Literatures; 7.Scientific Quality of the Included literature; 8.Conclusion Formulation; 9. The Methods used to Combine the Findings of Studies; 10. Publication Bias Assessment; 11.Conflict of Interest.

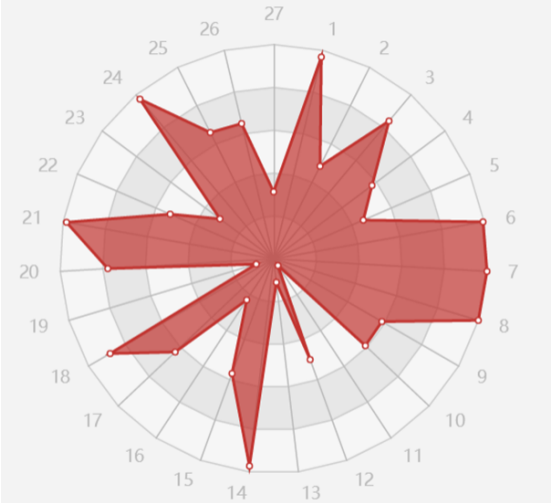

Fig. 3. Radar chat of PRISMA average score of the included literatures Items: 1.Title; 2.A Structured Abstract; 3.Theoretical Basis; 4.Research Purpose; 5.Scheme and Registration; 6.Inclusive Criteria; 7.Information Sources; 8.Literature Retrieval; 9.Selection of Study; 10.Data Extraction; 11. Data Items; 12.Single Research Bias; 13.Summaries of Effective Index; 14.Results; 15.Bias; 16.Other Analysis; 17.Research Selection; 18.Research Characteristics; 19.Internal Bias of Research; 20.Single Results; 21.Results; 22.Bias; 23.Other Analysis; 24.Summaries of Evidence; 25.Limitations; 26.Conclusion; 27.Fund.

The total cited frequency of 94 literatures were 1179, the maximum was 276 and the average cited frequency was 12.54±31.723. The total number of downloads were 30617, the maximum was 3002 and the average was 364.49±479.388. The result indicated there was a large difference in the number of cited frequency and downloads among literatures.

C. Correlation Analysis

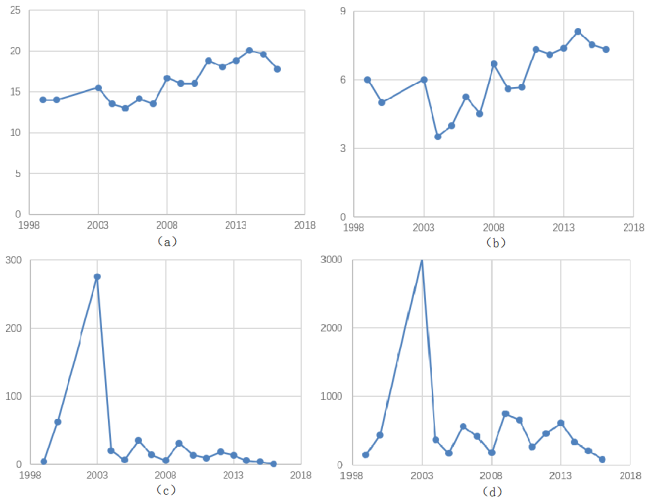

Fig. 4. Timing change diagram

The results of Pearson correlation showed that the scores of methodological quality and reporting quality were significantly related (P<0.01) as well as the number of downloads and cited frequency. There was no significant correlation between other indexes.

The annual average values of four assessment indexes were calculated according to the publication time, and Fig. 4 showed that each value changed over the time. Fig. 4 (a) and (b) represented the annual average scores of reporting quality and methodological quality and the overall changes were both fluctuating and rising. The trends of the two figures were similar over the publication time, which further explained the interaction between methodological quality and reporting quality. Fig. 4 (c) and (d) stood for the annual average number of cited frequency and downloads. The overall trends were both fluctuating and declining, and then the peak appeared in 2003. The similar changes over time were further showed the interaction between cited frequency and downloads.

D. Knowledge Discovery of High Methodological Quality Literature

Management and intervention of hypertension, risk factors and population research were researched in 35 high methodological quality literatures. At present, China had carried out multiple disease management and intervention, which played a positive role in the control of blood pressure, therapeutic effect and incident of complication. Understanding and verifying the risk factors of hypertension could help medical staff and patients to prevent and control the hypertension. The research of patients with hypertension focused on the risk factors and protective factors of elderly, rural patients, children and adolescents. See Fig. 5 for details.

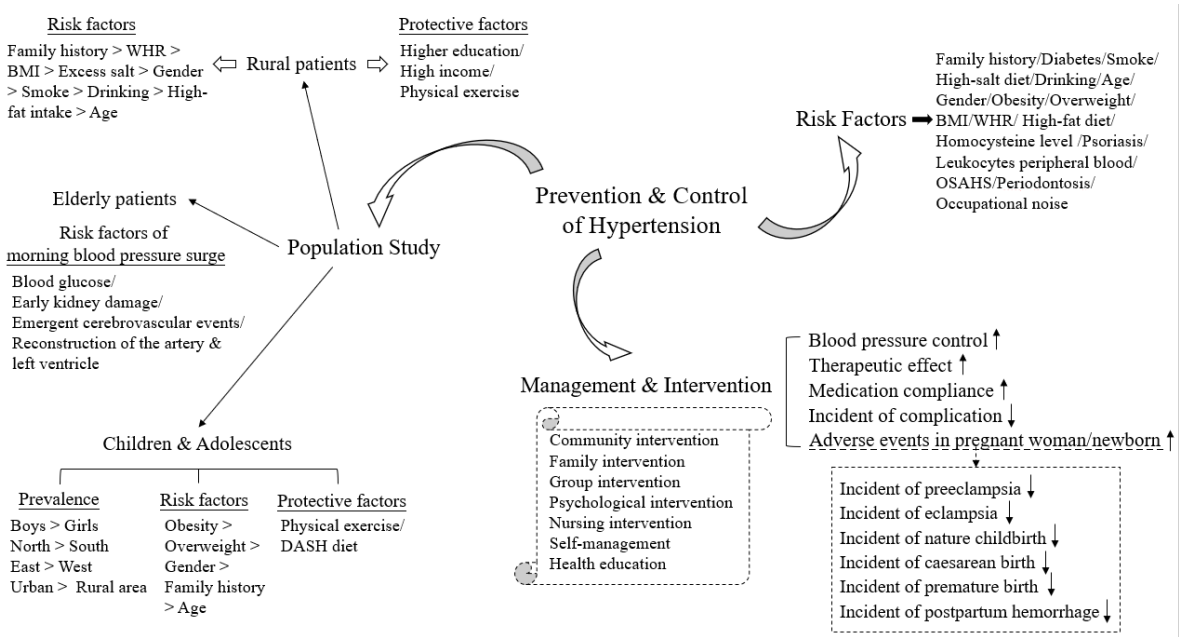

Fig. 5. Knowledge discovery of high methodological quality literature

IV. Conclusions

At present, there are many problems in methodology quality, reporting quality and usage quality of the domestic systematic review/meta-analysis about hypertension prevention and control. The methodological and reporting quality of most systematic review/meta-analysis about hypertension prevention and control were in the middle. The main problems were lack of explanations of the original research and effective measures to control bias. All literatures lacked effective control over the course of study and publication bias and detailed information on original research, which may influenced the accuracy and reproducibility. Meanwhile, the non-standard paper writing was still a serious problem. All literatures lacked detailed report on structured abstract and research protocols. Most

literatures were short of visual illustration of figures and tables to explain the results of data screening and analysis. The usage quality of included literatures was generally low. The citation of 24 literatures was 0 while 20 were downloaded less than 100. That reasons were related to the publication date as well as the influence of the journal which the literature was published.

For the problems mentioned above, it was recommended that researchers of systematic review/meta-analysis should make themselves master of research methods and writing standard, and then strictly ensure the accuracy and repeatability of data analysis, controlling the bias of research process as much as possible to ensure results reliably and improve the value of literature. Literature with higher methodological quality had more standardized writing, the strict and clear writing of research methods can present results with the higher level of evidence. The high-level evidence is beneficial to the theoretical and practical research, and also provides an accurate and reliable reference for the development of biomedical domain. The low reporting quality literature may have a higher methodological quality, however, non-standard paper writing may affect the readability and accuracy of the results.

This research only assessed the quality of systematic review/meta-analysis about hypertension prevention and control. There may be a few omissions in the process of literature retrieve and data analysis. The post-study can focus on systematic review/meta-analysis of prevention and control of other disease, in order to summarize the current research status comprehensively and assess the quality of the current prevention and control of domestic disease. The more high quality of systematic review/meta-analysis, the more higher level of evidences were provided.

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