Health Tech Asmnt Act. 2019 April; 3(1).e5852 doi: 10.18502/htaa.v3i1.5852.

Published online 2019 April 12. **Research Article**

Evaluating the Quality of the Iranian Systematic Reviews, Meta-Analyses, and Economic Evaluations in Healthcare from 2005 to 2015

Morteza Arab-Zozani[1], Zahra Heidarifard[2,*], Efat Jabarpour[3]

[1]Social Determinants of Health Research Center (SDHRC), Birjand University of Medical Sciences, Birjand, Iran
[2]Tehran University of Medical Sciences, Tehran, Iran
[3]Department of Industrial Engineering, School of Engineering, Tehran Shomal Branch, Payam-e-Noor University, Tehran, Iran

*Corresponding authors: M.Sc. student in Health Technology Assessment, Tehran University of Medical Sciences, Tehran, Iran. Tel: +98-9301935805, Email: z.heydari53@yahoo.com

Received 2019 February 01; **Accepted** 2019 April 05.

Abstract

Context: The number of studies on health is increasing rapidly worldwide and in Iran. Systematic review studies, meta-analyses, and economic evaluation are of great importance in evidence-based decision making because of their standing in the evidence-based pyramid. The purpose of this study was to evaluate the reporting and methodological quality of Iranian systematic reviews, meta-analysis studies and economic evaluations on healthcare.

Evidence Acquisition: PubMed and Scopus databases were searched to find considered studies, including systematic reviews, meta-analyses and economic evaluations published from 2005 to 2015. Because of the high volume of review studies, 10% of all systematic reviews and meta-analyses were selected as a random sample. Also, all economic evaluations were included. Articles were evaluated using checklists, including PRISMA, AMSTAR and QHES with a maximum score of 27, 11 and 100, respectively. The quality score for each criterion as well as the epidemiological and descriptive characteristics of all articles was determined. Data were analyzed using SPSS V. 16 software.

Results: After searching the databases, 1084 systematic reviews and meta-analyses were obtained, 10% of which were included in the study. A total of 41 economic evaluations were also included. The mean scores of systematic reviews and meta-analyses based on PRISMA and AMSTAR checklists were 17.04 (5.35) and 5.42 (1.97), respectively, and 68.21 (12.44) for economic evaluations based on QHES. Only three systematic reviews and meta-analysis articles had recorded protocols and 85% of the studies included the terms "systematic review" and "meta-analysis" in their titles. Only one study had been updated. In addition, 81% of the systematic reviews and meta-analyses were published in specialized journals and 47% in Iranian journals. Financial resources and conflict of interests had been mentioned in 33% and 66% of the studies, respectively. Of the selected studies, 60% had evaluated the quality of the articles and 35% of the studies had assessed publication bias. In economic evaluations, 56% had used CEA analysis, 22% CUA analysis, 12% CBA analysis, and one study had used CMA analysis. Of these studies, 54% were model-based health economic studies and 12% were trial-based. The economic perspective was the health care system in most studies. Forty-four percent of the studies had a short time horizon of one year or less, whereas 33% had a lifetime horizon. Moreover, 68% of the studies showed sensitivity analysis and only 5 included the magnitude and direction of the bias.

Conclusions: Overall, the reporting and methodological quality of the selected studies were estimated at a moderate level. Based on these results, it is recommended to adopt strategies to reduce preventable errors in studies. Having a primary plan and protocol and registering it as a systematic review can be an important factor in improving the quality of studies. Economic evaluations should also focus on issues, such as economic perspective, time horizon, available bias, and sensitivity analysis.

Keywords: Quality Assessment; Systematic Review; Meta-Analysis; Economic Evaluation; Health System; Iran

1. Context

Research and education have been an important factor in scientific advancement throughout history. As research has progressed, the number of researches in various fields, especially health, has increased (1). Given the large number of research methods and the need to obtain valid results, using appropriate tools to critique research results as scientific papers are of great importance (2).

The number of systematic reviews, meta-analysis and economic evaluations (CEA, CBA, CUA, and CMA) has increased dramatically in recent years and, especially in the health system (3). Systematic reviews are an effective tool for summarizing the evidence available for a given question and have specific stages. A meta-analysis uses statistical approaches in a systematic review that combines the results of the included studies quantitatively (4). Also, economic evaluations are a comparative analysis of different methods to conduct an intervention in terms of costs and consequences aimed at identifying the best evidence-based intervention or activity (5). Due to their status in the evidence-based pyramid (systematic reviews provide the highest level of evidence) and playing an important and determinant role in policy and management decisions, their evaluation is of particular importance. Given the high number of studies in each field, it is necessary to use a scale to rank the articles in terms of quality, and also to use as high-quality studies as possible for decision making (6).

Quality is not a specific and simple concept; therefore, its simple interpretation can lead to errors. There have been various approaches to assess the quality of studies, and various researchers have tried to use the best evidence for their decisions (7). Accordingly, different organizations have prepared checklists to evaluate the quality of the reports or articles extracted from investigations. The checklists, such as preferred reporting items for systematic reviews and meta-analyses (PRISMA), assessment of multiple systematic reviews (AMSTAR), and QUOROM are the most important tools for evaluating the quality of systematic reviews and meta-analysis. PRISMA has been developed to evaluate the quality of reporting of systematic reviews and meta-analyses, including 27 questions. AMSTAR has been developed to evaluate the methodological quality of systematic reviews and includes 11 questions. There are also several checklists for evaluating the quality of economic evaluations, such as CHEC, BMJ list, and quality of health economic studies (QHES), among which the QHES is the most important tool with a specific scoring system (8-10).

Due to the establishment of a health technology assessment system in Iran and its association with studies, such as systematic reviews, meta-analyses, and economic evaluations, the number of such studies has increased in recent years in the Iranian health system (11, 12). Therefore, this study aimed at evaluating the quality of the Iranian systematic reviews, meta-analyses and economic evaluations in healthcare published between 2005 and 2015 to provide appropriate feedback on the quality of these studies for decision-makers in the Iranian health system.

2. Evidence Acquisition

Adhering to PRISMA guidelines, we performed the present systematic review of 10 years from 2005 to 2015. The most important international databases, including Scopus and PubMed and also SID, an Iranian database, were searched for systematic reviews, meta-analyses and economic evaluations. The used keywords included systematic review, meta-analysis, economic evaluation, cost-effectiveness analysis, cost-benefit analysis, cost-utility analysis and cost-minimization analysis. The articles were entered into the EndNote V. 6 software after searching. The duplicates were then removed and the remaining items were screened independently by two researchers by title, abstract, and full text, considering the inclusion and exclusion criteria.

2.1. Inclusion and Exclusion Criteria:

Systematic reviews, meta-analyses, or economic evaluations on healthcare either in English or in Persian published between 2005 and 2015 and written by Iranian authors were selected. Other types of studies and those with no access to their full texts were excluded. Due to a large number of systematic reviews and meta-analyses published in the considered period, 10% of the studies were randomly selected for quality assessment. According to the prepared checklist, researchers extracted the information, such as study design, number of searched databases, type of economic evaluation, type of economic perspective, time horizon, sensitivity analysis, discounting, and number of authors. PRISMA and AMSTAR checklists were used to evaluate the quality of systematic reviews and meta-analysis and the QHES checklist was employed for economic evaluation studies (8-10). AMSTAR is an 11-item assessment tool, each of which is scored from zero to one. Based on AMSTAR, studies are classified as high (scoring 8 - 11), medium (4 - 7), or low quality (0 - 3). PRISMA is a 27-item checklist, which is scored from zero (lack of PRISMA criterion) to one (presence of PRISMA criterion). Scores of less than 9 are considered as poor quality, between 9 and 18 as moderate, and more than 18 as high quality. Finally, a QHES checklist is an assessment tool that is scored from zero to 100, in which a score of 0 to 25 is set as poor quality, 25 - 50 as moderate quality, 50 - 74 as fair quality, and 75 - 100 as high quality. Data extraction and quality assessment were also performed by two independent researchers (8-10). Statistical analysis was performed using SPSS software version 16 and descriptive statistics.

3. Results

A total of 2,390 systematic reviews and meta-analysis, and 1,794 economic evaluations were found. After reviewing and screening the articles, finally, 110 systematic reviews and meta-analysis and also 41 economic evaluations were included. Figure 1 shows the steps involved in selecting articles.

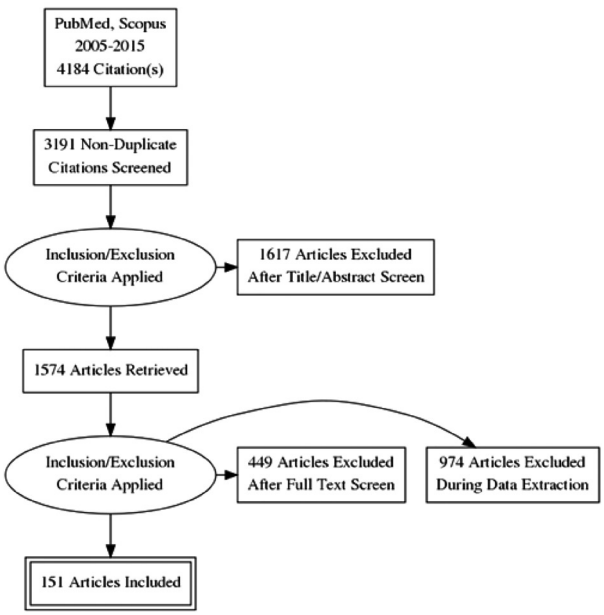

Figure 1. PRISMA flow chart diagram

3.1. Results of Systematic Reviews and Meta-Analyses

The selected articles had an average of 4 authors. In addition, 89 articles were published in specialized journals (81%), whereas 52 articles were published in Iranian journals (51%). Only one study was an updated form of previous studies. Moreover, 24 studies (22%) included gray literature. Screening titles/abstracts, data extraction, and assessing the quality of the studies were evaluated by two researchers for 55, 52, and 39 studies. Almost half of the systematic reviews included a meta-analysis (51%). Of the meta-analyses, 5 studies (9%) were found with the fixed-effects model, 40 (71%) studies with the random-effects models, and the rest (20%) did not mention the used model. In 49 studies (88%) the heterogeneity across studies was investigated and in 20 studies (36%) the reasons for heterogeneity were mentioned. To assess the publication bias, 32, 29, and 4 articles had used Funnel plot, Begg-Egger, and Fill & trim methods, respectively.

The mean quality score of the articles was 17.4 ± 5.35 based on the PRISMA. The lowest and highest level of compliance with the PRISMA reporting guidelines were 2.7% and 100%, respectively. The terms "systematic review" and "meta-analysis" had been mentioned in 85% of the articles. In 93.6% of the studies, the importance of research and in 43%, the research objectives had been mentioned in the introduction. Only 2.7% (3 cases) of the studies were found with a recorded protocol. Inclusion and exclusion criteria had been mentioned in 95% of the studies. Table 1 presents a summary of research assessments, including title, abstract, introduction, methods, results, discussion, and funding.

Table 1. The Number of Studies Conducted in Accordance with the PRISMA Guidelines

Sections		Description	No. (%)
Results			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	103 (93.6)
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	108 (98)
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	71 (65)
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	89 (81)
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	58 (53)
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	39 (35)
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	31 (28)
Discussion			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	99 (90)
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	52 (47)
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	85 (77)
Funding			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	37 (33)

The mean quality score of the articles based on the AMSTAR checklist was 5.42 ± 1.97. The lowest and highest level of compliance with the AMSTAR guidelines was 2.7% and 97%, respectively. According to AMSTAR, 40% of the articles were selected and extracted by two individuals. In addition, 88% of the studies were found with a comprehensive search strategy and in 22% of the cases, the status of publication was considered as an inclusion criterion. In addition, 61% of the studies showed quality assessment and 44% of them included conflict of interests. Table 2 presents the summary of research assessments using the AMSTAR checklist.

Table 2. The Number of Studies Conducted in Accordance with the AMSTAR Guidelines

Row	Item	No. (%)
1	Was an "a priori" design provided?	3 (2.7)
2	Was there duplicate study selection and data extraction?	44 (40)
3	Was a comprehensive literature search performed?	97 (88)
4	Was the status of publication (i.e. gray literature) used as an inclusion criterion?	24 (22)
5	Was a list of studies (included and excluded) provided?	66 (60)
6	Were the characteristics of the included studies provided?	107 (97)
7	Was the scientific quality of the included studies assessed and documented?	67 (61)
8	Was the scientific quality of the included studies used appropriately in formulating conclusions?	44 (40)
9	Were the methods used to combine the findings of studies appropriate?	58 (54)
10	Was the likelihood of publication bias assessed?	39 (35)
11	Was the conflict of interest included?	48 (44)

3.2. Results of the Economic Evaluations

The mean quality score of the articles based on the QHES checklist was 12.44 ± 68.21. The lowest and highest scores were 39.5 and 90, respectively, and four studies had a quality score of lower than 50. Of the 41 reviewed studies, about 54% of them were model-based health economic studies and 12 were trial-based. In addition, 23 articles were found with cost-effectiveness method, nine articles with cost-utility, five articles with cost-benefit, and one article had used least cost path analysis methods. The healthcare system and government perspective was the most used economic perspective in the studies (12 articles (29%), followed by the community (24%), patient (9.7%), healthcare provider (9.7%), the third-party payer (7.3%) and others (19.5%). Considering the time horizon, studies were divided into three categories: one year and less (44%), lifetime, (31.7%) and others (24.3%). Moreover, the discounting rate and sensitivity analysis had been used in 17 (41.4%) and 28 (68%) articles. The used interventions were medication or vaccine (17 cases), screening methods (10 cases) and others (14 cases).

4. Discussion

The present research was the first study to investigate the quality of Iranian systematic reviews, meta-analyses, and economic evaluations. We used international approved checklists, such as PRISMA, AMSTAR, and QHES to validate the results. In our study, the mean quality score of the systematic reviews and meta-analysis reviewed by PRISMA and AMSTAR checklists were 17.4 and 5.42, respectively, indicating their moderate quality. Similar studies have been conducted worldwide, which can be compared with the results of this study. For example, Liu et al. conducted a similar study and examined the quality of systematic reviews and meta-analysis using PRISMA and AMSTAR checklists. According to their results, the quality of studies reviewed by PRISMA and AMSTAR checklists was 19.9 and 5.4, respectively. Their results were consistent with our findings indicating the articles' quality at a moderate level (13).

Other studies, such as those conducted by Moher et al. and Zhang et al. also examined other items, such as the number of authors, the number of searched databases, the number of included studies, meta-analyses, the type of quality assessment, the heterogeneity across studies, etc. (14, 15). In contrast, Al Faleh and Al-Omran used other checklists, such as QUOROM and OQAQ to evaluate reporting and methodology, respectively. Consistent with our study, they selected a sample of the studies to assess their quality due to a large number of studies (16).

Based on our obtained results, the mean quality score of economic evaluations was 68.21, indicating their good quality. Yong and Shafie also used the QHES checklist to assess the quality of economic evaluations on asthma and reported a score of 73.7 (close to our findings), which indicated the good quality of included studies (17). Mishra and Nair also studied economic evaluations in India using the QHES checklist; however, they included only model-based health economic studies (18). Another similar study was carried out by Schwappach and Boluarte in Germany (19). In contrast to our study, they did not use a specific checklist and considered only some criteria, such as the economic perspective of the studies, study design, type of study, etc. However, we used a valid checklist in addition to these factors.

This study also had some limitations. The used tools in this study mainly find deficiencies in reporting, therefore, the numbers expressed do not necessarily indicate a defect in these studies and the case possibly may have been considered by the author without reporting so that the authors are unable to investigate these cases. Another limitation was the lack of access to the full text of some articles.

4.1. Conclusions

Overall, the reporting and methodological quality of systematic reviews and meta-analyses were at a moderate level and the quality of economic evaluations was at a good level. It seems that adopting some strategies, such

as developing primary protocols for conducting studies, registering protocols in related databases and publishing protocols can improve the quality of studies. On the other hand, conducting these studies by at least two people and reviewing disagreements by a third party or by consensus is another effective method to reduce potential errors in conducting studies and reporting.

References

1. Dellsen F. Scientific progress: Knowledge versus understanding. *Stud Hist Philos Sci*. 2016;**56**:72-83. doi:10.1016/j.shpsa.2016.01.003. [PubMed:27083086].
2. Campbell SM, Braspenning J, Hutchinson A, Marshall M. Research methods used in developing and applying quality indicators in primary care. *Qual Saf Health Care*. 2002;**11**(4):358-64. doi:10.1136/qhc.11.4.358. [PubMed:12468698]. [1758017:1758017].
3. Bornmann L, Mutz R. Growth rates of modern science: A bibliometric analysis based on the number of publications and cited references. *J Assoc Inform Sci Tech*. 2015;**66**(11):2215-22. doi:10.1002/asi.23329.
4. Malboosbaf R, Azizi F. What is systematic review and how we should write it? *Res Med*. 2010;**34**(3):203-7.
5. Rabarison KM, Bish CL, Massoudi MS, Giles WH. Economic evaluation enhances public health decision making. *Front Public Health*. 2015;**3**:164. doi:10.3389/fpubh.2015.00164. [PubMed:26157792]. [4478374:4478374].
6. Pussegoda K, Turner L, Garritty C, Mayhew A, Skidmore B, Stevens A, et al. Identifying approaches for assessing methodological and reporting quality of systematic reviews: A descriptive study. *Syst Rev*. 2017;**6**(1):117. doi:10.1186/s13643-017-0507-6. [PubMed:28629396]. [5477124:5477124].
7. Katrak P, Bialocerkowski AE, Massy-Westropp N, Kumar S, Grimmer KA. A systematic review of the content of critical appraisal tools. *BMC Med Res Methodol*. 2004;**4**:22. doi:10.1186/1471-2288-4-22. [PubMed:15369598]. [521688:521688].
8. Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Ann Intern Med*. 2009;**151**(4):264-9, W64. doi:10.7326/0003-4819-151-4-200908180-00135. [PubMed:19622511].
9. Ofman JJ, Sullivan SD, Neumann PJ, Chiou CF, Henning JM, Wade SW, et al. Examining the value and quality of health economic analyses: Implications of utilizing the QHES. *J Manag Care Pharm*. 2003;**9**(1):53-61. doi:10.18553/jmcp.2003.9.1.53. [PubMed:14613362].
10. Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: A measurement tool to assess the methodological quality of systematic reviews. *BMC Med Res Methodol*. 2007;**7**:10. doi:10.1186/1471-2288-7-10. [PubMed:17302989]. [1810543:1810543].
11. Arab-Zozani M, Jalilian H, Oskouei MM, Dehghanian M, Aghbalaghi ZA. Implementing health technology assessment in Iran: A stakeholder analysis. 5th International Society for Evidence-Based Healthcare Congress; Kish Island, Iran. 2017.
12. Arab Zozani M, Bagheri Faradonbeh S, Jaafari Pooyan E. The role of health technology assessment in improving healthcare quality. *Payavard Salamat*. 2015;**9**(4):400-14. Persian
13. Liu D, Jin J, Tian J, Yang K. Quality assessment and factor analysis of systematic reviews and meta-analyses of endoscopic ultrasound diagnosis. *PLoS One*. 2015;**10**(4):e0120911. doi:10.1371/journal.pone.0120911. [PubMed:25905713]. [4408104:4408104].
14. Zhang J, Wang J, Han L, Zhang F, Cao J, Ma Y. Epidemiology, quality, and reporting characteristics of systematic reviews and meta-analyses of nursing interventions published in Chinese journals. *Nurs Outlook*. 2015;**63**(4):446-55 e4. doi:10.1016/j.outlook.2014.11.020. [PubMed:26187084].
15. Moher D, Tetzlaff J, Tricco AC, Sampson M, Altman DG. Epidemiology and reporting characteristics of systematic reviews. *PLoS Med*. 2007;**4**(3):e78. doi:10.1371/journal.pmed.0040078. [PubMed:17388659]. [1831728:1831728].
16. Al Faleh K, Al-Omran M. Reporting and methodologic quality of Cochrane Neonatal review group systematic reviews. *BMC Pediatr*. 2009;**9**:38. doi:10.1186/1471-2431-9-38. [PubMed:19534780]. [2709610:2709610].
17. Yong YV, Shafie AA. Economic evaluation of enhanced asthma management: A systematic review. *Pharm Pract (Granada)*. 2014;**12**(4):493. doi:10.4321/s1886-36552014000400008. [PubMed:25580173]. [4282768:4282768].
18. Mishra D, Nair SR. Systematic literature review to evaluate and characterize the health economics and outcomes research studies in India. *Perspect Clin Res*. 2015;**6**(1):20-33. doi:10.4103/2229-3485.148802. [PubMed:25657899]. [4314843:4314843].
19. Schwappach DL, Boluarte TA. HEE-GER: A systematic review of German economic evaluations of health care published 1990-2004. *BMC Health Serv Res*. 2007;**7**:7. doi:10.1186/1472-6963-7-7. [PubMed:17222334]. [1781069:1781069].