ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ

ΠΜΣ: « ΜΕΘΟΔΟΛΟΓΙΑ ΙΑΤΡΙΚΗΣ ΕΡΕΥΝΑΣ, ΒΙΟΣΤΑΤΙΣΤΙΚΗ ΚΑΙ ΚΛΙΝΙΚΗ ΒΙΟΠΛΗΡΟΦΟΡΙΚΗ»

ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ

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Assessment of the reporting quality of Systematic Reviews of Observational Studies in preeclampsia using the MOOSE statement.

Αξιολόγηση της ποιότητας των συστηματικών ανασκοπήσεων των μελετών παρατήρησης για την προεκλαμψία χρησιμοποιώντας τη δήλωση MOOSE.

ΙΩΑΝΝΗΣ ΤΣΑΚΙΡΙΔΗΣ

Assessment of the reporting quality of Systematic Reviews of Observational Studies in preeclampsia using the MOOSE statement.

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INTRODUCTION: The vast majority of epidemiological studies in pregnancy and related complications like preeclampsia are observational. The overview of these studies is expressed by systematic reviews (SRs) of observational studies (OS). The MOOSE (Meta-analysis of Observational Studies in Epidemiology) statement is an evidence-based approach to improve the quality of systematic reviews of OS.
PURPOSE: The aim of this study was to evaluate the reporting quality of published systematic reviews of observational studies concerning preeclampsia in the past 5 years, according to the MOOSE statement.
METHODS: PubMed was searched for SRs of OS involving preeclampsia published from January 2011 through July 2016. The SRs were evaluated for their reporting quality according to the MOOSE statement, a checklist of items that are considered essential for good reporting of SRs of OS. The evaluation was focused on 35 methodological items/sub-items. The effect of MOOSE statement in high- and low-ranked journals, according to their impact factor, has also been evaluated.
RESULTS: The search identified 48 eligible systematic reviews of observational studies in preeclampsia. 16 items/sub-items were reported by more than 90% of studies and 21 items/sub-items were reported by more than 70%. Some essential search strategy aspects of SRs of OS (such as search software used, name and version, including special features used and method of addressing articles published in languages other than English) were under-reported. High and lower ranked journals were different in reporting of five items included in background, methods and results.
CONCLUSIONS: The quality of reporting in SRs of OS focusing on preeclampsia was considered satisfactory, although certain items were under-reported. Further improvement of reporting is necessary in order to enhance the validity of observational research.

KEY WORDS: MOOSE, Systematic Review of Observational studies, Quality, Preeclampsia, Hypertensive disorders, Pregnancy, Methodology.

INTRODUCTION

Principles of evidence-based methods to assess the effectiveness of health care interventions and set policy are cited increasingly (1). A substantial amount of clinical and public health knowledge originates from observational studies (OS) (2) and systematic reviews (SRs) are required of the best available type of study for answering the clinical question posed (3). The term "systematic review" was coined long before evidence-based medicine (4). SRs are ''prepared using a systematic approach to minimizing biases and random errors which is documented in a materials and methods section'' (5) and have become established as a linchpin of evidence-based practice, influencing clinical practice and informing health policy. It is, therefore, important that SRs adhere to rigorous methodology and are clear and unbiased. While interventional SRs are prominent in the assessment of the comparative effectiveness of healthcare procedures, other reviews including epidemiologic reviews, reviews of diagnostic tests, qualitative reviews and individual patient meta-analysis are commonplace and increasingly influential (6). There is, therefore, a similar onus on clear and accurate reporting of these types of SR.

Generally systematic reviews and meta-analyses are performed for randomized trials (7-10). Randomized-controlled trials are considered to provide the strongest evidence regarding an intervention (11, 12), however in many situations randomized controlled designs are not feasible, and only data from OS are available (13). As a result, systematic reviews also may be performed for observational studies (14-18).

An OS is defined as an etiologic or effectiveness study using data from existing database, a cross-sectional study, a case series, a case-control design, a design with historical controls, or a cohort design (19). Observational designs might lack the experimental element of a random allocation to an intervention and rely on studies of association between changes or differences in 1 characteristic (e.g., an exposure or intervention) and changes or differences in an outcome of interest. In addition, OS may be more suitable to detect rare or late adverse effects of interventions compared to randomized trials (20). At times, observational data may also be needed to assess the effectiveness of an intervention in a community as opposed to the special setting of a controlled trial (21). Studies of risk factors generally cannot be randomized because they relate to inherent human characteristics or practices, and exposing subjects to harmful risk factors is unethical (22). Given the challenges associated with performing randomized-controlled trials in pregnant populations, because it is unethical to expose the pregnant and the fetus to potential cause of disease, OS of high methodological quality and systematic reviews of them may provide evidence of any associations needed. Moreover, OS are often less expensive, and they can be performed over shorter time-intervals. On the other hand, owing the lack of randomization, observational studies are inherently more prone to potential biases (23, 24). Thus, a clear understanding of the advantages and limitations of statistical syntheses of observational data is needed (25).

The validity and applicability of a systematic review depends on the quality of the primary studies that have been included in the review and on the conduct of the review itself (26). Inadequate reporting of the published systematic reviews of OS restricts the generalizability and the credibility of studies' results. So far, a considerable number of guidelines and practical checklists, often with intriguing acronyms, have been developed to improve the quality of a variety of study designs (27), including the SRs of OS design (28).

In response to the need for improving the reporting of SRs of OS, the Meta-analysis of Observational Studies in Epidemiology (MOOSE) statement was recently proposed (28). The MOOSE checklist, resulting from workgroup deliberations, is organized around recommendations for reporting background, search strategy, methods, results, discussion and conclusions (Table 1). The MOOSE statement, which was first introduced in 1997, includes

35 criteria (items) to which systematic reviews of observational studies should conform in order to make their conclusions easier to assess, interpret and generalize (28, 29). A general checklist is available at http://www.equator-network.org. Although there is a considerable number of studies evaluating the quality of reporting in randomized studies (30) and observational studies (31), there are very few studies that critically evaluate the epidemiological literature according to the MOOSE statement (32, 33). In the field of preeclampsia, no meticulous evaluation of SRs of OS reporting, based on the MOOSE statement, has been conducted so far.

In the present study, we critically appraise the quality of reporting of 48 SRs of OS in preeclampsia (Figure 1) according to the MOOSE statement. Eligible studies were identified after exhaustive search and analyzed. Our analysis was focused on the reporting of all the items recommended by MOOSE (background, search strategy, methods, results, discussion and conclusions). The differences in reporting quality in the SRs of OS and the impact of the journal ranking were also examined.

Selected Abbreviations and Acronyms
SR= systematic review
OS= observational studies
MOOSE= meta-analysis of observational studies in epidemiology
IF= impact factor

Table 1. A Proposed Reporting Checklist for Authors, Editors, and Reviewers of Meta-analyses of Observational Studies

Reporting of background should include
Problem definition
Hypothesis statement
Description of study outcome(s)
Type of exposure or intervention used
Type of study designs used
Study population
Reporting of search strategy should include
Qualifications of searchers (e.g., librarians and investigators)
Search strategy, including time period included in the synthesis and keywords
Effort to include all available studies, including contact with authors
Databases and registries searched
Search software used, name and version, including special features used (e.g., explosion)
Use of hand searching (e.g., reference lists of obtained articles)
List of citations located and those excluded, including justification
Method of addressing articles published in languages other than English
Method of handling abstracts and unpublished studies
Description of any contact with authors
Reporting of methods should include
Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested
Rationale for the selection and coding of data (e.g., sound clinical principles or convenience)
Documentation of how data were classified and coded (e.g., multiple raters, blinding, and interrater reliability)
Assessment of confounding (e.g., comparability of cases and controls in studies where

appropriate)
Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results
Assessment of heterogeneity
Description of statistical methods (e.g., complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated
Provision of appropriate tables and graphics
Reporting of results should include
Graphic summarizing individual study estimates and overall estimate
Table giving descriptive information for each study included
Results of sensitivity testing (e.g., subgroup analysis)
Indication of statistical uncertainty of findings
Reporting of discussion should include
Quantitative assessment of bias (e.g., publication bias)
Justification for exclusion (e.g., exclusion of non–English-language citations)
Assessment of quality of included studies
Reporting of conclusions should include
Consideration of alternative explanations for observed results
Generalization of the conclusions (i.e., appropriate for the data presented and within the domain of the literature review)
Guidelines for future research
Disclosure of funding source

Figure. 1. Classification, prevalence, and diagnostic criteria of hypertension in pregnancy. ACOG, American College of Obstetricians and Gynecologists; ISSHP, International Society for the Study of Hypertension in Pregnancy.

Hypertension in pregnancy

ACOG (34) & ISSHP (35): systolic blood pressure ≥140 mmHg or a diastolic blood pressure ≥90 mmHg

Preeclampsia : 3-6% of pregnancies (36-42)

ACOG: hypertension that occurs after 20 weeks of gestation in a woman with previously normal blood pressure and proteinuria

- *Proteinuria:* urinary excretion of ≥ 0.3g protein in a 24-hour specimen, which correlates with ≥1+ but should be confirmed with a random urine dipstick evaluation and a 24-hour (i.e. “timed”) collection
- *Severe preeclampsia:* blood pressure ≥160/110 mmHg on two occasions at least 6 hours apart while on bed rest and/or proteinuria of ≥5.0 g in a 24-hour urine specimen or ≥3+ on two random urine samples at least 4 hours apart

ISSHP: de novo hypertension after 20 weeks’ gestation and properly documented proteinuria with normalization of blood pressure within 3 months

- *Proteinuria:* ≥300 mg/day of urinary protein, which correlates with ≥30 mg/dL in a spot urine

METHODS

Data Sources, Search Strategies and Studies Selection

PubMed was searched for SRs of OS involving preeclampsia from January 2011 to July 2016. The search strategy included “preeclampsia” and “hypertensive disorders pregnancy” as title tag terms (i.e., to appear in the title). The search was limited to the following criteria: SR as the article type, inclusion of studies on human subjects and English language. An SR was considered eligible if it was published in a peer-reviewed journal and provided the complete list of references of all articles included in the SR.

Then, one reviewer (I.T.) screened all titles and abstracts of records retrieved from database searches. The reference lists of relevant retrieved articles were also hand-searched. Records considered potentially relevant by the reviewer (I.T.), were retrieved in full text and proceeded to evaluation. These articles were eligible if they were SRs of OS (i.e., cohort, case-control, and cross-sectional), investigated preeclampsia, and had been published as full papers or short reports in a regular issue or supplement of peer-reviewed journals indexed in PubMed. Articles published as editorials, letters, conferences or meeting abstracts were excluded.

Data Extraction and Reporting Assessment Tool

As assessment tool for quality of reporting, we used the MOOSE checklist, which includes a 35-item questionnaire (28). As MOOSE was developed in 1997 and all the included studies were published since 2011, we found no substantial benefit in dividing the studies into subcategories according to publication date (pre-MOOSE/post MOOSE period). Hence, based on MOOSE reporting items, we developed a 35-item data extraction sheet (Table 2). No pilot training of the data extraction was performed.

All items were investigated in terms of whether they were reported, not whether they were actually carried out during the study. Articles were scored as “yes” if they were reported in enough detail to allow the reader to judge that the definition had been met. Articles were coded as “no” when the checklist item was not reported.

Methodological Evaluation

The evaluation of articles included all the items of the MOOSE statement: the reporting of background, search strategy, methods, results, discussion and conclusions. Methodological items refer to the reporting of the problem definition, hypothesis statement, description of study outcome(s), type of exposure or intervention used, type of study designs used, study population, qualifications of searchers (e.g., librarians and investigators), search strategy, including time period included in the synthesis and keywords, effort to include all available studies, including contact with authors, databases and registries searched, search software used, name and version, including special features used (e.g., explosion), use of hand searching (e.g., reference lists of obtained articles), list of citations located and those excluded, including justification, method of addressing articles published in languages other than English, method of handling abstracts and unpublished studies, description of any contact with authors, description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested, rationale for the selection and coding of data (e.g., sound clinical principles or convenience), documentation of how data were classified and coded (e.g., multiple raters, blinding, and interrater reliability), assessment of confounding (e.g., comparability of cases and controls in studies where appropriate), assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results, assessment

of heterogeneity, description of statistical methods (e.g., complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated, provision of appropriate tables and graphics. Furthermore, the items in the results section of the MOOSE statement refer to graphic summarizing individual study estimates and overall estimate, table giving descriptive information for each study included, results of sensitivity testing (e.g., subgroup analysis) and indication of statistical uncertainty of findings. The items in the discussion and conclusions section of the MOOSE statement refer to the quantitative assessment of bias (e.g., publication bias), justification for exclusion (e.g., exclusion of non–English-language citations), assessment of quality of included studies, consideration of alternative explanations for observed results, generalization of the conclusions (i.e., appropriate for the data presented and within the domain of the literature review), guidelines for future research and disclosure of funding source.

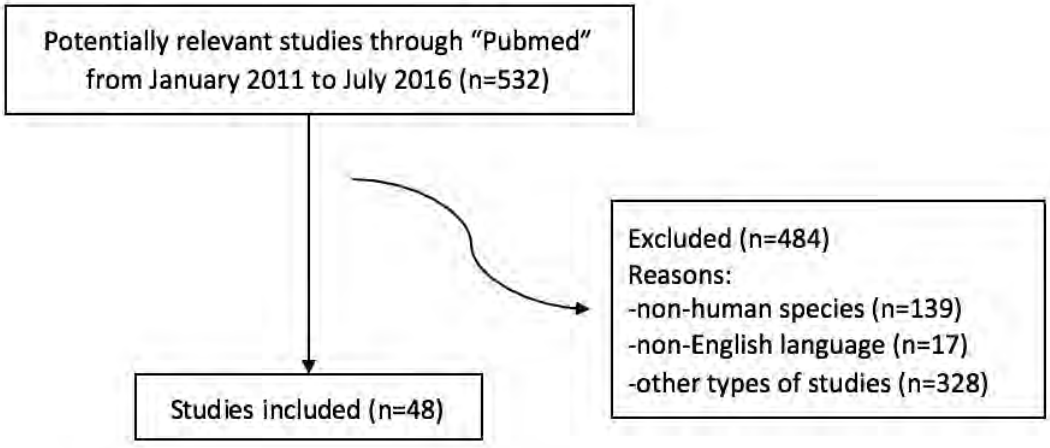
We also ranked the included articles according to the ISI (Institute for Scientific Information) impact factor (IF) list and we compared the quality of reporting in high-ranked journals (IF$\geq$ 5) versus journals with lower rank (IF<5). The choice of IF=5 represented the upper (75%) quartile of all the impact factors of the included journals.

RESULTS

Eligible studies

A total of 532 potentially eligible references where identified (Figure 2), which were screened by the reviewer (I.T.). After eligibility screening, 139 citations that were not in human species and 17 that were not in English were excluded. After abstract screening 328 studies were also excluded because they didn't fulfill the inclusion criteria (i.e., systematic reviews of randomized controlled trials, meta-analyses). Consequently, a total of 48 reports remained for analysis, requiring complete full-text evaluation. A full list of the 48 reports that were retrieved as full-text and included in final analysis is available upon request from the authors.

Figure 2. Flow diagram of article retrieval



Main results

The 48 eligible articles were published during the period 2011-2016. All the articles were published after the introduction of the MOOSE statement. Articles were published in high-ranked journals (IF≥5) and in lower ranked journals (IF<5). Table 2 shows the overall frequency of reporting of the 35 items of the MOOSE statement.

Compliance with the MOOSE checklist items ranged from 0% to 100%. Overall, 16 items/sub-items (5 in the background, 4 in the search strategy, 3 in the methods, 1 in the results and 3 in the conclusions sections) were reported by 90% or more of the studies (Table 2). In background, the items include 1) the problem definition, 2) hypothesis statement, 3) description of study outcome(s), 4) type of exposure or intervention used, 5) study population. In the search strategy, the items include 1) search strategy, including time period included in the synthesis and keywords, 2) effort to include all available studies, including contact with authors, 3) databases and registries searched, 4) use of hand searching (e.g. reference lists of obtained articles). In the methods, the items include 1) description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested, 2) rationale for the selection and coding of data (e.g., sound clinical principles or convenience), 3) documentation of how data were classified and coded (e.g., multiple raters, blinding, and interrater reliability). In the results, the items include 1) table giving descriptive information for each study included. In the conclusions, the items include 1) consideration of alternative explanations for observed results, 2) generalization of the conclusions (i.e., appropriate for the data presented and within the domain of the literature review), 3) guidelines for future research. Thirteen of these sub-items were reported by all (100%) the studies.

Furthermore, 21 items/sub-items (including the seventeen items already mentioned above) were reported by 70% or more of the studies. The five additional items were 1) assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results, 2) indication of statistical uncertainty of findings, 3) quantitative assessment of bias (e.g., publication bias), 4) assessment of quality of included studies, 5) disclosure of funding source.

In contrast, some items were reported only by a small fraction of articles. Ten MOOSE checklist sub-items (1. type of study designs used, 2. qualifications of searchers, 3. search software used, name and version, including special features used, 4. list of citations located and those excluded, including justification, 5. method of addressing articles published in languages other than English, 6. method of handling abstracts and unpublished studies, 7. description of any contact with authors, 8. assessment of confounding, 9. provision of appropriate tables and graphics, 10. justification for exclusion) were mentioned in less than 50% of the total reports, and two of these sub-items were included in less than 10% of the reports (1. search software used, name and version, including special features used, 2. method of addressing articles published in languages other than English). Especially, no study provided the name and version of the search software employed (search software used, name and version, including special features used) and there was no mention of the special features used. Also, only one study reported the method of addressing articles published in languages other than English (Table 2).

Table 2. MOOSE assessment of reporting characteristics (n=48)

Category	Yes (%)	No (%)
Reporting of background should include		
Problem definition	48 (100)	0 (0)
Hypothesis statement	48 (100)	0 (0)
Description of study outcome(s)	48 (100)	0 (0)

Type of exposure or intervention used	48 (100)	0 (0)
Type of study designs used	13 (27.1)	35 (72.9)
Study population	48 (100)	0 (0)
Reporting of search strategy should include		
Qualifications of searchers (e.g., librarians and investigators)	6 (12.5)	42 (87.5)
Search strategy, including time period included in the synthesis and keywords	48 (100)	0 (0)
Effort to include all available studies, including contact with authors	48 (100)	0 (0)
Databases and registries searched	48 (100)	0 (0)
Search software used, name and version, including special features used (e.g., explosion)	0 (0)	48 (100)
Use of hand searching (e.g., reference lists of obtained articles)	47 (98)	1 (2)
List of citations located and those excluded, including justification	12 (25)	36 (75)
Method of addressing articles published in languages other than English	1 (2)	47 (98)
Method of handling abstracts and unpublished studies	6 (12.5)	42 (87.5)
Description of any contact with authors	11 (22.9)	37 (77.1)
Reporting of methods should include		
Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	48 (100)	0 (0)
Rationale for the selection and coding of data (e.g., sound clinical principles or convenience)	48 (100)	0 (0)
Documentation of how data were classified and coded (e.g., multiple raters, blinding, and interrater reliability)	48 (100)	0 (0)
Assessment of confounding (e.g., comparability of cases and controls in studies where appropriate)	13 (27.1)	35 (72.9)
Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results	34 (70.8)	14 (29.2)
Assessment of heterogeneity	24 (50)	24 (50)
Description of statistical methods (e.g., complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated	30 (62.5)	18 (37.5)
Provision of appropriate tables and graphics	8 (16.6)	40 (83.4)
Reporting of results should include		
Graphic summarizing individual study estimates and overall estimate	29 (60.4)	19 (39.6)
Table giving descriptive information for each study included	46 (95.8)	2 (4.2)
Results of sensitivity testing (e.g., subgroup analysis)	24 (50)	24 (50)
Indication of statistical uncertainty of findings	36 (75)	12 (25)

Reporting of discussion should include		
Quantitative assessment of bias (e.g., publication bias)	37 (77.1)	11 (22.9)
Justification for exclusion (e.g., exclusion of non–English-language citations)	21 (43.8)	27 (56.2)
Assessment of quality of included studies	36 (75)	12 (25)
Reporting of conclusions should include		
Consideration of alternative explanations for observed results	48 (100)	0 (0)
Generalization of the conclusions (i.e., appropriate for the data presented and within the domain of the literature review)	48 (100)	0 (0)
Guidelines for future research	44 (91.7)	4 (8.3)
Disclosure of funding source	37 (77.1)	11 (22.9)

Impact of High-Ranked Journals

In total, all the studies were published in 46 different journals. Only nine journals (18.8%) had an impact factor ≥5 and are considered as high ranked. Table 3 shows the proportion of reporting items/sub-items in high-ranked and lower ranked journals. Significant difference between the two IF groups was seen in the reporting of type of study designs used (p=0.033), assessment of heterogeneity (p=0.001), description of statistical methods in sufficient detail to be replicated (p=0.01), graphic summarizing individual study estimates and overall estimate (p=0.007) and results of sensitivity testing (p=0.001), with the higher ranked journals appearing to have a better reporting on these items. None of other items resulted in statistical differences between the two IF groups.

Table 3. Proportion of reporting of the items in the MOOSE statement in a total of 48 SRs of OS involving preeclampsia by impact factor

Category	% Reporting item	
	Lower IF papers (IF<5) (n=39)	Higher IF papers (IF≥5) (n=9)
Reporting of background should include		
Problem definition	100	100
Hypothesis statement	100	100
Description of study outcome(s)	100	100
Type of exposure or intervention used	100	100
Type of study designs used	21 *	56 *
Study population	100	100
Reporting of search strategy should include		
Qualifications of searchers (e.g., librarians and investigators)	10	22
Search strategy, including time period included in the synthesis and keywords	100	100
Effort to include all available studies, including contact with authors	100	100

Databases and registries searched	100	100
Search software used, name and version, including special features used (e.g., explosion)	0	0
Use of hand searching (e.g., reference lists of obtained articles)	97	100
List of citations located and those excluded, including justification	23	33
Method of addressing articles published in languages other than English	3	0
Method of handling abstracts and unpublished studies	10	22
Description of any contact with authors	18	44
Reporting of methods should include		
Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	100	100
Rationale for the selection and coding of data (e.g., sound clinical principles or convenience)	100	100
Documentation of how data were classified and coded (e.g., multiple raters, blinding, and interrater reliability)	100	100
Assessment of confounding (e.g., comparability of cases and controls in studies where appropriate)	26	33
Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results	74	44
Assessment of heterogeneity	38 *	100 *
Description of statistical methods (e.g., complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated	54 *	100 *
Provision of appropriate tables and graphics	18	1
Reporting of results should include		
Graphic summarizing individual study estimates and overall estimate	51 *	100 *
Table giving descriptive information for each study included	95	100
Results of sensitivity testing (e.g., subgroup analysis)	38 *	100 *
Indication of statistical uncertainty of findings	69	100
Reporting of discussion should include		
Quantitative assessment of bias (e.g., publication bias)	77	78
Justification for exclusion (e.g., exclusion of non–English-language citations)	41	56
Assessment of quality of included studies	74	78
Reporting of conclusions should include		

Consideration of alternative explanations for observed results	100	100
Generalization of the conclusions (i.e., appropriate for the data presented and within the domain of the literature review)	100	100
Guidelines for future research	92	89
Disclosure of funding source	72	100

IF= impact factor
* Parameters indicate statistical significance ($p<0.05$). Values for p were obtained from chi-square test in order to express the association between proportions for reporting an item across the two groups of papers.

DISCUSSION

The present study investigated the quality of reporting of SRs of OS in preeclampsia according to the MOOSE statement. To the best of our knowledge, this is the first study ever conducted in order to assess the reporting quality of SRs of OS in preeclampsia according to the MOOSE statement. Our analysis focused on the overall reporting of the items reported in each SR of OS (background, search strategy, methods, results, discussion, conclusions). In total, 48 articles published from January 2011 until July of 2016 were evaluated, covering a publication period of 5 years. All the articles used in our analysis published after publication of the MOOSE statement (1997). The reporting quality of each SR and also the effect of journal's ranking were examined.

Although the overall reporting quality was relatively good (21 items/sub-items were reported by 70% or more of the studies), there are some essential aspects of SRs of OS (especially in the search strategy and methods) that are seldom reported, making it difficult for the reader to assess explicitly the validity of a SR of OS. In addition, this study demonstrated that ten of the reporting sub-items were reported in less than 50% of the studies. Moreover, the lack of search software used, including special features used and the method of addressing articles published in languages other than English should also be noted. In checking the potential impact of journals ranking in reporting quality, the reporting of five items (type of study designs used, assessment of heterogeneity, description of statistical methods in sufficient detail to be replicated, graphic summarizing individual study estimates and overall estimate, results of sensitivity testing) was significantly different between the two IF groups. Groenwold et al. (43) reported that the quality of reporting on confounding in observational studies was rather poor, even in high-impact general medical journals. Our studies showed that less than 50% of the included studies assessed confounding.

The differences in the reporting of methodology items were common between the individual SRs. It is possible that these differences in reporting are an effect of different years of publication, or represent chance finding. Also, Barnes and Bero (44) have reported that funding sources may influence the outcomes and quality of the research. These important methodology components must be considered in future research.

The reporting of SRs of OS based on the MOOSE statement has been evaluated in various medical fields, especially in meta-analyses. Zhang et al. (45) evaluated the reporting quality of meta-analyses of observational studies published in Chinese journals by applying the MOOSE and AMSTAR (Assessment of Multiple Systematic Reviews). They found questionable reporting quality according to MOOSE statement and they recommend that

Chinese journals should adopt the MOOSE criteria. Accurate reporting is essential to maintain a clear scientific record, which can then be used for the synthesis of existing evidence, clinical decision-making and health policy determination.

Panic et al. (46) reported that the endorsement of PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) resulted in increase of both quality of reporting and methodological quality. PRISMA offers help in writing systematic review articles and reports on meta-analyses (47), but the main focus of this guideline is on systematic reviews and meta-analyses of randomized controlled studies. While there is significant overlap between MOOSE (28) and PRISMA (47), there are items unique to each, with MOOSE (28) guidelines comprised of 35 items. In particular, MOOSE (28) incorporates very detailed instructions in respect of search strategy, including delineation of the qualifications of the searchers, use of hand-searching and approaches to dealing with unpublished and non-English literature, emphasizing the centrality of this aspect of the review to meta-analysis. The importance of the assessment of the potential for bias in primary studies is reinforced in both guidelines. However, greater emphasis is placed on the interpretation of the results of the review, specifically regarding possible alternate explanations for the observed findings in the MOOSE guidelines (28). This distinction reflects the elevated susceptibility of observational research to both bias and confounding, limiting the potential inferences and the degree to which the results of the review can be trusted and used to inform healthcare decisions (48). The finding from a study (32) of 83% of epidemiologic reviews citing PRISMA (47) without referring to MOOSE (28) suggests that these reviews may lack complete reporting of these methodological aspects and failure to explore the reasons for the observed findings in sufficient detail.

A limitation of our study is that the literature search was restricted to PubMed, the most common used medical database, and we did not extend our search to other databases (e.g., EMBASE). Another limitation of our study was that it was designed only to evaluate the reporting quality of SRs of OS overall and not to assess the quality of the individual study design or to assess how study design affects the outcomes. Yet another potential limitation is that we assessed only publications in English, which may contribute to overall bias. However only 3.2% of the retrieved articles were reports in other languages, so the risk of bias is limited. Furthermore, the inclusion of the words “preeclampsia” and “hypertensive disorders pregnancy” as title tag terms in the search strategy might be a restrictive search for appropriate studies. However, the number of the retrieved articles provided an overview of reporting quality in the field of preeclampsia search. Another limitation was that our studies relied on reporting from authors and it is possible that the authors may have omitted important details from their reports or that the peer-review process resulted in the removal of key information from these reviews. Specifically, lack of reporting of a methodology item does not necessarily mean that it was not performed. Taken to an extreme, this means that a biased but well-reported study will receive full credit.

In conclusion, our findings indicate that reports of SRs of OS involving patients with preeclampsia conform satisfactorily to the guidelines of MOOSE. Our attempt to assess the reporting quality of SRs of OS highlights the need for improvement and the knowledge gained from this study should be viewed as an opportunity for improved adherence and increased awareness of the MOOSE statement. Implementation of the CONSORT (Consolidated Standards of Reporting Trials) initiative has already improved the quality of reporting in other fields of medical research (49, 50). The adoption of the MOOSE statement (28) on the reporting of SRs of OS, during a period of rapid transition in the healthcare delivery system and especially during a period of new pharmaceutical and genetic discoveries, has the potential to improve study reporting, facilitate the appraisal and interpretation of SRs of OS reviewers, journal editors and readers and finally support the practice of evidence-based medicine.

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