Evaluation of the reporting quality of observational studies in Master of Public Health’s dissertations in China: a systematic review

ShuangYang Dai
The medical college of Qingdao university

Xiaobin Zhou (xiaobin_zhou@126.com)
Qingdao University

Hong Xu
The affiliated hospital of Qingdao university

Beibei Li
The medical college of Qingdao university

JinGao Zhang
The medical college of Qingdao university

Research article

Keywords: Dissertation, Evaluating, Master of Public Health, Observational studies, Reporting quality

Posted Date: October 2nd, 2019

DOI: https://doi.org/10.21203/rs.2.15451/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Version of Record: A version of this preprint was published on September 11th, 2020. See the published version at https://doi.org/10.1186/s12874-020-01116-6.
Abstract

Backgrounds Master of public health (MPH) plays an important role in Chinese medical education, and the dissertations is an important part of MPH education. In MPH dissertations, most are observational studies. Compared with randomized controlled trial (RCT), observational studies are more prone to information bias. So, the reporting of the observational studies should be transparent and standard. But, no research on evaluating the reporting quality of the MPH dissertation has been found.

Methods A systematic literature search was performed in the Wanfang database from January 1, 2014 to May 31, 2019. The Strengthening the Reporting of Observation Studies in Epidemiology (STROBE) statement was adopted to evaluate the reporting quality of the selected studies.

Results The median of compliance with STROBE statement of 165 articles was 67.82%. The mean (standard deviation) of STROBE score was 14.3 (1.91). Five items/sub-items were 100% reported: background, objectives, study design, report numbers of individuals at each stage, and key result. Fifteen items/sub-items were reported by 75% or more. Reporting of methods and results was often omitted: missing data (12.73%), sensitivity analyses (3.03%), flow diagram (15.15%), and absolute risk (0%). Logistic regression analysis indicated that funding support (OR=13.98, 95% CI=4.37-44.70) and more published papers during postgraduate period (OR=2.77, 95% CI=1.02-7.54) were related to high reporting quality.

Conclusion In short, the reporting quality of observational studies in MPH's dissertations in China is suboptimal. However, it's necessary to improve the reporting of method and results sections. We recommend that authors should be stricter to adhere STROBE statement when conducting observational studies.

Background

Public health in the 21st century faces problems that are very different from those in previous centuries [1]. With the development of economic in China, more and more public health problems are appearing, which poses a serious challenge to public health practitioners [2, 3]. As of 2014, the total number of professional staff in China's public health institutions was only 87.5 million, which was well below the target of reaching 95 million in 2015. In addition, only 4.2% of public health professionals had a postgraduate degree [4]. The shortage of health professionals and highly educated health personnel has hindered the development of public health services in China. Therefore, it is urgent to optimize the training program and train more highly educated, application-oriented public health personnel. In order to fulfill this requirement, the Ministry of Education of China launched the full-time Master of Public Health (MPH) postgraduate program in 2009 [5]. Although the dissertation is an important part of MPH education, the studies on the quality of their dissertation are still limited [6].

Randomized controlled trial (RCT) has been advocated as the gold standard for evaluating treatment modalities. However, many studies are difficult to be verified by trials due to various ethical problems and...
side effects of intervention in practice [7–9]. Well-produced observational studies can not only provide abundant clue for investigating the causal relationship between exposure and diseases, but also be more suitable for investigating long-term and rare side effects of treatment modalities. What's more, one study showed that about 90% of the papers published in medical journals are observational studies [10].

Compared with RCT, the researchers of observational studies cannot randomly assign the study factors to the participants. They can only rely on comprehensive, objective descriptions or well-designed programs to analyze, compare and summarize the population phenomena, and further explore the causal relationships between disease and exposure factors. Hence, the reporting of observational studies should be transparent, clear and complete. The standardized reporting of observational studies not only can help the editors and reviewers of medical journals to better understand the research design, but also provide important information for readers in related fields, so that they can clearly understand the content and results of the research and improve their professional skills. Several incipient studies on reporting quality had recognized deficiencies in the medical education articles, but all of these were limited by incomplete reporting quality evaluation standards [11–14].

In 2008, the Strengthening the Reporting of Observation Studies in Epidemiology (STROBE) statement was published to “improve transparency in reporting of observational studies” [15–18]. A total of 22 items in the STROBE statement include evaluations of such as research design, data collection, analytical techniques, and potential deviations. Since STROBE statement published, several studies have evaluated the reporting quality of clinical medicine articles and found that the reporting of observational studies need to be improvement [19–23].

At present, no research on evaluating the reporting quality of the dissertation of Chinese master in medical has been found. Therefore, we used the STROBE statement to evaluate the reporting quality of the observational studies in MPH's dissertation in China, identify factors associated with high-quality reporting, and provide direction for writing of MPH dissertation.

**Method**

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was observed throughout the design, performance, analysis, and reporting of this systematic review (supplement 1).

**Search Strategy**

We searched the relevant studies in the Wanfang database. The language was limited to Chinese, and the search strategy was (theme:("cohort studies" OR "cohort analyses" OR "case-control studies" OR "case-control analyses" OR "cross-sectional studies" OR "prevalence studies" OR "current situation studies") *profession:( Master of Public Health) * degree:( master)) * Date:2014–2019.
Study selection

Articles that met the following criteria were selected: (1) observational studies, including cross-sectional studies, case-control studies, and cohort studies; (2) original articles; (3) studies on humans, including both adults and children. The exclusion criteria were as follows: (1) review articles; (2) case reports; (3) quasi-randomized trial, randomized controlled trials and other interventional studies; (4) unpublished data and published abstracts only.

The articles retrieved were preliminarily reviewed according to titles and abstracts by two investigators independently. Any disagreement was resolved by consulting with a senior author. After the initial screening, the full text of relevant research was searched, and two investigators determined the final literature based on inclusion and exclusion criteria.

Data extraction

The extraction of data was performed independently from included articles by two investigators. The general information extracted included publication time, type of study, number of papers published during master studies, funding support, and number of statistical methods used.

Quality assessment

According to the detailed per-item descriptions of the STROBE statement, appraisal of reporting was performed by two investigators. The STROBE statement contains 22 items: title and abstract (item 1), introduction (item 2~3), method (item 4~12), result (item 13~17), discussion (item 18~21), other information (item 22). A score of 1 was assigned to the items that all the information detailed was reported, a score of 0.5 was assigned to the item that the information detailed was partly reported, and a score of 0 was assigned to the item that the information was not at all reported. For items with subparts, the fractional points were scored depending on the number of sub-items met. Sub-item 6b was only applicable to match studies, 14c only applicable to cohort studies, and the sub-item were removed from the denominator if they were not applicable[24]. Therefore, every study had an overall STROBE score rated out of a maximum score of 22. The consistency between two investigators was evaluated with kappa, when $\kappa \geq 0.8$, the average score of the two investigators was calculated as the final STROBE Score, and when $\kappa < 0.8$, the differences will be resolved by discussion with the senior author until all differences were resolved.

Data analysis

The continuous data subjected to normal distribution was presented as mean and standard deviation (SD). Categorical variables were expressed as numbers and percentages. Comparisons of STROBE score
between dichotomous groups were conducted using the independent Student’s t-test. Comparisons of study quality between multigroups were conducted using the one-way analysis of variance (ANOVA), with the LSD-t test. The included articles were further divided into high and low reporting quality groups according to the cut-off value (the 75 percentile of the STROBE Score). Univariate logistic regression models were used to analyze the associations between high reporting quality and study type, publication time, papers published during master studies, funding support, and types of statistical methods used. Candidate variables with a \( P \leq 0.05 \) on univariate logistic were included in multivariable logistic regression model. The odds ratios (OR) and 95% confidence intervals (CI) were calculated from logistic regression analyses. Statistical analyses were performed using SPSS version 18.0. All reported probabilities (\( P \) values) were two-sided, and \( P \leq 0.05 \) was considered significant.

Results

Search Results

After the search of database, we confirmed 425 articles without duplication. After the screening of titles and abstracts, 201 articles were excluded. A total of 224 full articles were further reviewed, with 59 articles excluded, because 32 articles were review studies, and 27 were intervention studies. Finally, 165 relevant articles meeting the inclusion criteria were included. Of the 165 articles, 61 articles were cross-sectional studies, 66 articles were case-control studies, and 38 articles were cohort studies (Figure.1).

The compliance of included studies with STROBE statement

Adherence with 22 items of the included studies was shown in Table 1 (Table 1). The median of compliance with STROBE statement was 67.82% (95% CI: 30.61%–95.37%; range: 0–100%). The overall reporting quality was relatively good. Five items/sub-items (14.29%) were 100% reported: background/rationale, objectives, study design, report numbers of individuals at each stage of study, and key result; 15 items/sub-items (42.86%) were reported by 75% or more of the studies. Specifically, reporting on title and abstract section and introduction section was satisfactory: reporting rates for all four items exceeded 95%. Reporting on methods and results were often omitted: variables\((n = 67, 40.61%)\), examine subgroups and interactions \((n = 21, 12.73%)\), missing data \((n = 21, 12.73%)\), sensitivity analyses \((n = 5, 3.03%)\), reasons for non-participation \((n = 14, 8.48%)\), flow diagram \((n = 25, 15.15%)\), and absolute risk \((n = 0, 0%)\). The reporting rates of each item were similar in the three study types, but the reporting of cohort studies were slightly better (Figure.).

STROBE Score
A consistent analysis of the STROBE scores from the two investigators showed good consistency ($\kappa = 0.861, P<0.001$). Hence, the mean of score of two valulators was used as the final STROBE score in this study. The mean of STROBE score was 14.3 (range: 10.0–18.9) with a standard deviation of 1.91. We found that the STROBE score of the cohort studies was statistically significant higher than the other two studies. Dissertations with funding support were more likely to get high STROBE score. STROBE score of the dissertations with more published papers during postgraduate period and more statistical methods was higher than the others. The mean of STROBE score of the dissertations published in 2018 was higher than those published in other years. The characteristics of 165 included articles were shown in Table.2 (Table.2).

### Univariate and Multivariate Logistic Regression Analyses

According to the cut-off value of the STROBE Score (15.70), the included articles were divided into low ($n = 122$) and high reporting quality groups ($n = 43$). Univariate logistic regression analyses showed that the following factors were related to the superior reporting quality: cohort studies (OR = 2.99, 95% CI = 1.23–7.25), funding support (OR = 10.74, 95% CI = 3.81–30.24), more published papers during postgraduate period (OR = 2.75, 95% CI = 1.21–6.24), and the number of statistical methods (OR = 1.69, 95% CI = 1.12–3.48).

Multivariate logistic regression analysis has demonstrated that funding support (OR = 13.98, 95% CI = 4.37–44.70), and more published papers during postgraduate period (OR = 2.77, 95% CI = 1.02–7.54) were related to the superior reporting quality (Table.3).

### Discussion

#### Summary of Findings

Our study evaluated 165 MPH professional dissertations. Although the overall reporting quality was relatively good, some essential aspects of methods and results were seldom reported, which made difficult for readers to assess the validity and reliability of the observational studies [16]. What’s more, dissertations of superior reporting quality usually contain the following predictive factors: funding support and more published papers during postgraduate period.

Reporting on title and abstract section and introduction section was satisfactory. That may be because each master needs to go through the strictly opening and middle screening stages in the early stage of the dissertation writing. The deficiency of the reporting of MPH dissertations was mainly focused on methods and results. In particular, there was a need for dissertations to improve their reporting of variables definition, statistical methods, and flow diagram.

In actual studies, the outcome, exposure, predictors, potential confounders, and effect modifiers of the study should be clearly defined, but less than half of dissertations fully reported these content. The
inadequate reporting of statistical method may not make full use of research results, resulting in a waste of valuable information and varying degrees of bias. However, only a few articles described any methods used to examine subgroups and interactions, explained how missing data were addressed, and described any sensitivity analysis. Only 25 dissertations (15.15%) used the flow diagram, while others did not take advantage of the simple and direct features of flow diagram. In addition, all articles summarised key results with reference to study objectives, but only about a quarter of the articles discussed the generalisability of the study results.

The result of multivariate logistic regression analysis indicated that the funding support was associated with high reporting quality. Funding projects require rigorous research designs, and need to be screened and approved. Therefore, masters are strictly required and trained to learn more knowledge, so that their thesis quality will be higher. Moreover, the positive association between more published papers during postgraduate period and high reporting quality were observed. The masters published more papers during postgraduate period have stronger academic ability, are ore familiar with the writing of the articles, and know what should be reported in detail. In addition, the results of univariate logistic regression analyses showed that the number of statistical methods was associated with high reporting quality. Masters who use more statistical methods have a deeper understanding of methodology, are more proficient in using statistical methods, and are more complete in methods reporting in dissertations.

**Compared with other studies**

A few articles had evaluated the reporting quality of observational studies in other medical disciplines. Several studies have found that the reporting quality of the articles that used STROBE statement to standardize was better than the others [19, 20, 25, 26]. Jacqueline Ramke et al. has used the STROBE statement to evaluated the reporting in the blindness prevalence surveys, and they found that the mean of STROBE score of studies published in the journal requiring STROBE statement was higher than the score for the others [19]. Swords C's study indicated that STROBE statement had increased the reporting quality of observational Otology and Audiology studies [20]. Hence, we strongly recommend that masters should be familiar with STROBE statement.

On the other hand, many studies have found that reporting of observational studies have defects in methods and results [27–29]. Adams AD et al. discovered that poor reporting was seen in obstetrics observational studies for study size, missing data, and absolutely studies [27]. Karaçam Z have evaluated the reporting quality of observational studies in Turkish nursing journals, and found that the methods sections of the reports were mostly omitted [29]. Our research had yielded similar results.

**Education implication**

Our study has highlighted the important deficiencies in the reporting of observational studies in MPH’s dissertations. Based on these findings, we believe that if universities adopt the STROBE criteria to guide
MPH, it will help improve the reporting quality of MPH's dissertations. In the course of master's training, it is necessary to strengthen the understanding and flexible application of the statistical methods, and the graduate tutors should pay more attention to the masters who published less papers during postgraduate period.

Strengths and limitations of this study

As a systematic review of MPH's dissertations, our study has some advantages. First, this study is a comprehensive assessment and used logistic regression analyses to identify factors associated with high-quality reporting. For evaluation of dissertations, we included not only adherence with items but also STROBE score. Second, some of the evaluation items are not applicable to all articles, such as 6b, 14c, and some items are not adequately reported. To minimize biases against systematic review, we identified items as: full reporting, partly reporting, no reporting, not applicable, and assign different scores. Thus, different articles have a more consistent score criterion. Third, since the STROBE statement was published in 2007, no studies has used this guidelines to evaluate the reporting quality of master dissertation. Therefore, our work is innovative and will provide a reference for subsequent similar research. Fourth, the study include the independent assessment of all articles by two authors. All details of our search were transparent and clear, and our search can therefore easily be reproduced.

There are also some limitations in this study. First, scoring of items remains a subjective task, with differences between investigators. Several items were prone to discussion between the investigators. However, the analysis showed that we reached good interobserver agreement (κ = 0.861). Second, given that our research was restricted to MPH dissertations published by Chinese master in the past five years, the results can only reflect the integrity and standardization of the reporting of Chinese MPH's master dissertation to a certain extent. Finally, since there is no literature to be found on the reporting quality of the medical master dissertation with STROBE statement, it is impossible to compare the reporting quality of the dissertation with other profession.

Conclusion

In short, the reporting quality of observational studies in MPH dissertation is suboptimal. However, there is still a need to improve the reporting of method and results sections, especially statistical methods’ reporting. The STROBE statement was intended to help researchers to improve transparency in reporting of observational studies. Therefore, we think it is highly plausible that using the STROBE Statement will improve the quality of reporting. We recommend masters of observational studies to use the STROBE Statement and recommend research supervisor to use this Statement to guide MPH masters.

Abbreviations

MPH: Master of public health; RCT: Randomized controlled trial; STROBE: Strengthening the Reporting of Observation Studies in Epidemiology statement; OR: odds ratios; CI: confidence intervals; PRISMA:
Declarations

Acknowledgements

None

Funding

The study was supported by the Natural Science Foundation of National Medical Professional Degree Graduate Education Steering Committee (B2-YX20180203–01) and Shandong Provincial Postgraduate Education Quality Improvement Plan for 2018 (SDYAL18047).

Availability of data and materials

None

Authors’ contributions

Study concepts: D. S.Y, Z. X.B; Study design: D. S.Y, Z. X.B; Manuscript writing D. S.Y, Z. X.B; Manuscript editing: S.X, Z. X.B, X.H, L. B.B, Z. J.G; Data extraction: S.X, L. B.B; Data elaboration and interpretation: D. S.Y, X.H, L. B.B, Z. J.G; Statistical analysis:D. S.Y, Z. X.B; Manuscript revision and approval of submission in its present form: D. S.Y, X.H, L. B.B, Z. J. G.

Ethics approval and consent to participate

Not applicable. This study does not involve human participants, human data or human tissue.

Consent for publication

Not applicable. This study does not involve individual data.

Competing interests

The authors declare that they have no competing interests.

Reference
1. Begg, M. D., et al., *MPH education for the 21st century: design of Columbia University’s new public health curriculum.* Am J Public Health, 2014. 104(1): p. 30–6.

2. Blair, S. N., *Physical inactivity: the biggest public health problem of the 21st century.* Br J Sports Med, 2009. 43(1): p. 1–2.

3. Li, W., B. Chen, and X. Ding, *Environment and reproductive health in China: challenges and opportunities.* Environ Health Perspect, 2012. 120(5): p. A184–5.

4. NHaFPCotPsRo, C., *Beijing: Peking Union Medical College Press.* 2015 china health statistics yearbook, 2015.

5. Wang N WY, J. J., et al, *The investigation on the current status of cultivation of full-time MPH students in China.* Chin J Med Educ Res. 2015;3:228–31.

6. Katikireddi, S. V. and J. Reilly, *Characteristics of good supervision: a multi-perspective qualitative exploration of the Masters in Public Health dissertation.* J Public Health (Oxf), 2017. 39(3): p. 625–632.

7. Chen, Y., et al., *Assessment of the quality of reporting in abstracts of randomized controlled trials published in five leading Chinese medical journals.* PLoS One, 2010. 5(8): p. e11926.

8. Cho, H. J., et al., *Assessments of the quality of randomized controlled trials published in International Journal of Urology from 1994 to 2011.* Int J Urol, 2013. 20(12): p. 1212–9.

9. McIntyre, A., et al., *The evolution of stroke rehabilitation randomized controlled trials.* Int J Stroke, 2014. 9(6): p. 789–92.

10. Stang, A. and E. Kantelhardt, *Too many statistical errors for meaningful interpretation.* Breast Cancer Res Treat, 2013. 138(2): p. 643–4.

11. Wolf, F. M., *Methodological quality, evidence, and Research in Medical Education (RIME).* Acad Med, 2004. 79(10 Suppl): p. S68–9.

12. Price, E. G., et al., *A systematic review of the methodological rigor of studies evaluating cultural competence training of health professionals.* Acad Med, 2005. 80(6): p. 578–86.

13. Cook, D. A., T. J. Beckman, and G. Bordage, *Quality of reporting of experimental studies in medical education: a systematic review.* Med Educ, 2007. 41(8): p. 737–45.

14. Howley, L., et al., *Quality of standardised patient research reports in the medical education literature: review and recommendations.* Med Educ, 2008. 42(4): p. 350–8.

15. Vandenbroucke, J. P., *The making of STROBE.* Epidemiology, 2007. 18(6): p. 797–9.
16. von Elm, E., et al., *The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies*. Int J Surg, 2014. 12(12): p. 1495–9.

17. von Elm, E., et al., *The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies*. Lancet, 2007. 370(9596): p. 1453–7.

18. Cuschieri, S., *The STROBE guidelines*. Saudi J Anaesth, 2019. 13(Suppl 1): p. S31-s34.

19. Ramke, J., et al., *Using the STROBE statement to assess reporting in blindness prevalence surveys in low and middle income countries*. PLoS One, 2017. 12(5): p. e0176178.

20. Swords, C., et al., *An Assessment of the Change in Compliance of Observational Otology and Audiology Studies With the STROBE Statement Guidelines: A Systematic Review*. Otol Neurotol, 2019. 40(3): p. 284–291.

21. Sorensen, A. A., et al., *Using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement to assess reporting of observational trials in hand surgery*. J Hand Surg Am, 2013. 38(8): p. 1584–9 e2.

22. Irani, M., et al., *Weaknesses in the Reporting of Cross-sectional Studies in Accordance with the STROBE Report (The Case of Congenital Anomaly among Infants in Iran): A Review Article*. Iran J Public Health, 2018. 47(12): p. 1796–1804.

23. Serrano, M., et al., *Adherence to reporting guidelines in observational studies concerning exposure to persistent organic pollutants and effects on semen parameters*. Hum Reprod, 2014. 29(6): p. 1122–33.

24. Agha, R. A., et al., *Reporting Quality of Observational Studies in Plastic Surgery Needs Improvement: A Systematic Review*. Ann Plast Surg, 2016. 76(5): p. 585–9.

25. Pouwels, K. B., et al., *Quality of reporting of confounding remained suboptimal after the STROBE guideline*. J Clin Epidemiol, 2016. 69: p. 217–24.

26. Rao, A., et al., *Quality of Reporting and Study Design of CKD Cohort Studies Assessing Mortality in the Elderly Before and After STROBE: A Systematic Review*. PLoS One, 2016. 11(5): p. e0155078.

27. Adams, A.D., et al., *Use of the STROBE Checklist to Evaluate the Reporting Quality of Observational Research in Obstetrics*. Obstet Gynecol, 2018. 132(2): p. 507–512.

28. Wang, Y. T., et al., *Quality analysis of observational studies on pelvic organ prolapse in China*. Zhonghua Fu Chan Ke Za Zhi, 2017. 52(6): p. 379–385.

29. Karacam, Z., E. Sen, and B. Yildirim, *Evaluation of observational research reports published in Turkish nursing journals*. Int Nurs Rev, 2015. 62(3): p. 394–403.
## Tables

### Table 1: Adherence to the STROBE Reporting Criteria
| Item                          | Recommendation                                                                 | Adherence n (%) |
|-------------------------------|-------------------------------------------------------------------------------|-----------------|
| **Title and abstract**        | (a) Indicate the study’s design with a commonly used term in the title or the abstract  
(b) Provide in the abstract an informative and balanced summary of what was done and what was found | 164 (99.39)   |
| **Introduction**              |                                                                                | 163 (98.79)    |
| Background/rationale          | Explain the scientific background and rationale for the investigation being reported | 165 (100)      |
| Objectives                    | State specific objectives, including any prespecified hypotheses                | 165 (100)      |
| **Methods**                  |                                                                                |                |
| Study design                  | Present key elements of study design early in the paper                        | 165 (100)      |
| Setting                       | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 158 (95.76)   |
| Participants                  | (a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up  
Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls  
Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants  
(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed  
Case-control study—For matched studies, give matching criteria and the number of controls per case | 130 (78.79) |
| Variables                     | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 67 (40.61)    |
| Data sources                  | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 143 (86.67)  |
| Bias                          | Describe any efforts to address potential sources of bias                        | 135 (81.82)   |
| Study size                    | Explain how the study size was arrived at                                       | 71 (43.03)     |
| Quantitative variables        | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 54 (32.73)    |
| Statistical methods           | (a) Describe all statistical methods, including those used to control for confounding  
(b) Describe any methods used to examine subgroups and interactions  
(c) Explain how missing data were addressed  
(d) Cohort study—If applicable, explain how loss to follow-up was addressed  
Case-control study—If applicable, explain how matching of cases and controls was addressed  
Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy  
(e) Describe any sensitivity analyses | 153 (92.73)  |
| Results                       | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed  
(b) Give reasons for non-participation at each stage  
(c) Consider use of a flow diagram | 165 (100)  |
| Participants                  | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders  
(b) Indicate number of participants with missing data for each variable of interest | 163 (98.79)    |
(c) Cohort study—Summarise follow-up time (eg, average and total amount) 6 (15.79)

| Outcome data | 15 | Cohort study—Report numbers of outcome events or summary measures over time 163 (98.79) |
|--------------|----|-----------------------------------------------------------------------------------------|
|              | 15 | Case-control study—Report numbers in each exposure category, or summary measures of exposure |
|              |    | Cross-sectional study—Report numbers of outcome events or summary measures               |

Main results 16 (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included 82 (49.70)

(b) Report category boundaries when continuous variables were categorized 26 (15.76)

(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period 0 (0)

Other analyses 17 Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses 19 (11.52)

Discussion

Key results 18 Summarise key results with reference to study objectives 165 (100)

Limitations 19 Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias 103 (62.42)

Interpretation 20 Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence 154 (93.33)

Generalisability 21 Discuss the generalisability (external validity) of the study results 47 (28.48)

Other information

Funding 22 Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based 20 (12.12)

Note: The compliance of 6b refer to the compliance of match studies (n=56). The compliance of 14c refer to the compliance of cohort studies (n=38).

**Table 2 The main characteristics of included studies**
| Characteristic                        | N (%) | Mean(SD)       | t/F   | P     |
|--------------------------------------|-------|----------------|-------|-------|
| **Type of study**                    |       |                |       |       |
| Cohort studies                       | 38 (23.0) | 15.25±1.78* |       |       |
| Case-control studies                 | 66 (40.0) | 13.97±1.78   | 6.79  | 0.001 |
| Cross-sectional studies              | 61 (37.0) | 14.02±1.95   |       |       |
| **Funding support**                  |       |                |       |       |
| No                                   | 143 (87.27) | 13.96±1.77 | -6.16 | <0.001|
| Yes                                  | 21 (12.73) | 16.43±1.35   |       |       |
| **Number of published papers during postgraduate period** |       |                |       |       |
| <2                                   | 60 (36.36) | 13.77±1.73   | -2.68 | 0.008 |
| ≥2                                   | 105 (63.64) | 14.58±1.95   |       |       |
| **Number of the statistical methods** |       |                |       |       |
| <3                                   | 73 (44.24) | 13.80±1.77   | -2.94 | 0.004 |
| ≥3                                   | 92 (55.76) | 14.66±1.94   |       |       |
| **Year of published**                |       |                |       |       |
| 2014                                 | 33 (20) | 14.41±1.94   |       |       |
| 2015                                 | 48 (29.10) | 13.84±1.89  |       |       |
| 2016                                 | 47 (28.48) | 14.35±1.77   | 2.89  | 0.024 |
| 2017                                 | 31 (18.79) | 14.30±1.90   |       |       |
| 2018                                 | 6 (3.64) | 16.52±1.87*  |       |       |

Note: *P<0.05 compared with other groups

Table 3: Univariate and Multivariate Logistic Regression Analyses of Predictive Factors Associated With Superior Reporting Quality

| Variables                                      | Univariate | Multivariate |
|------------------------------------------------|-------------|--------------|
| **Type**                                       |             |              |
| Cross-sectional studies                        | 1           |              |
| Case-control studies                           | 0.91 (0.38-2.15) | 0.822 | 0.72 (0.27-1.92) | 0.506 |
| Cohort studies                                 | 2.99 (1.23-7.25) | 0.015 | 2.27 (0.81-6.34) | 0.118 |
| **Funding support**                            |             |              |
| No                                             | 1           |              |
| Yes                                            | 10.74 (3.81-30.24) | <0.001 | 13.98 (4.37-44.70) | <0.001 |
| **Number of published papers during postgraduate period** |       |                |       |       |
| <2                                             | 1           |              |
| ≥2                                             | 2.75 (1.21-6.24) | 0.015 | 2.77 (1.02-7.54) | 0.046 |
| **Number of the statistical methods**          |             |              |
| <3                                             | 1           |              |
| ≥3                                             | 1.69 (1.12-3.48) | 0.049 | 1.72 (0.74-3.99) | 0.206 |
| **Year**                                       |             |              |
| 2014                                           |             |              |
| 2015                                           |             |              |
| 2016                                           |             |              |
| 2017                                           |             |              |
| 2018                                           |             |              |

Univariate OR (95% CI) | P     | Adjusted OR (95% CI) | P     |
Figures

Records found through searching Wanfang (n=425)

Records after duplicates removed (n=425)

201 articles excluded on screening of Titles and/or abstracts

224 full-text articles reviewed

Articles excluded because:
- Review articles: 32
- Intervention studies: 27

165 articles included in present

Figure 1
Flow diagram of the literature
Figure 2

The compliance of three study types in each item.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- supplement1.docx