Author’s response to reviews

Title: Risk for cervical herniated intervertebral disc in dentists: a nationwide population-based study

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Author’s response to reviews:

Editor Comments

1. As this is a secondary data analysis article, please state in the Methods and Declarations (“Ethics approval and consent to participate”) please include the statement that all necessary permissions were obtained to access and use the data and who gave this permission.

Response: In response to the Reviewer’s comment, we added “This is a secondary data analysis article from the NHIRD and all necessary permissions were obtained to access and use the data.” to the Methods and Declarations of the revised manuscript.

2. Please move the Declarations section to after the Abbreviations.

Response: We have moved the Declarations section to after the Abbreviations in the revised manuscript according to the Editor’s suggestion.
3. Please include the email addresses of all authors on the title page.

Response: We have included the email addresses of all authors on the title page in the revised manuscript according to the Editor’s suggestion.

4. Please describe the role of the funding body in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript should be declared.

Response: We have added “The funding agency was not involved in any aspects of the study design, including data collection, interpretation of data or manuscript preparation.” to the Funding of the revised manuscript.

5. Please remove the figure title embedded within the figure and re-upload the corrected version.
Please upload the Figure as a separate file.

Response: We have removed the figure title and uploaded the revised Figure as a separate file.

6. In accordance with BioMed Central editorial policies (http://www.biomedcentral.com/submissions/editorial-policies#standards+of+reporting), could you please ensure your manuscript reporting adheres to STROBE guidelines (https://www.strobe-statement.org). This is so your methodology can be fully evaluated and utilized.

Response: We ensure that the revised manuscript adheres to STROBE guidelines.

7. Can you please include a completed STROBE checklist as an additional file when submitting your revised manuscript.

Response: We have included a completed STROBE checklist as an additional file in the revision.

Reviewer 1

1. This study is an interesting analysis of the risk of cervical herniated intervertebral disc in dentists using a national insurance database in Taiwan. While the study addresses a topic that is not well researched and brings up an important occupational concern for health care professionals, the rationale to support the current study is not articulated well in the introduction.
Also, the methods section has several areas that need clarification or re-organization. I would recommend that the authors use the STROBE statement (www.strobe-statement.org) while revising the manuscript. Using the STROBE as a guide will help ensure that vital information necessary in the reporting of observational study designs is communicated to the readers.

Response: We thank the Reviewer’s comment and revised the methods section by using the STROBE statement in the revised manuscript. We also uploaded a STROBE statement in the revision.

2. Introduction. Rationale to conduct the study is not compelling: The authors are requested to provide some more background related to their concern of a greater risk of C-HIVD in the dentist population. For example, what are the typical working hours and typical procedures that require prolonged forward head posture? How much time is spent during these procedures in forward head during a procedure that would increase their risk to C-HIVD more than other health care providers. Providing this information would potentially support the argument for conducting this analysis. Also, in general what is the average prevalence of neck disorders in dentists and is it higher than the general population or other health care providers? While there are references (#4, 6, 7, 8) from studies that have investigated neck disorders in the dentists, there is no discussion about what those studies found and how those results support the current analysis. Authors are requested to provide additional information to support their study rationale.

Response: We thank the Reviewer’s comment and revised the sentences as “There were many studies reported that neck pain were very common and troublesome for their careers in the dentists [6-8]. Rahmani et al. reported that point, last month, last year and lifetime prevalence of neck pain were 19.3%, 27.3%, 29.9% and 34.7%, respectively [6]. Shaik et al. reported that 70% of dental surgeons experienced neck pain [7]. Dentists are at the higher end of health care professionals in terms of musculoskeletal injury [9]. However, the typical working hours and typical procedures that require prolonged forward-head postures in the dentists and comparison for neck pain between dentists and general population are still unclear.” in the Background and “Second, occupational exposures including postures during work, working hours, time spent in forward-head postures, personal life styles (e.g., exercise and habit), and tobacco use were not available in the NHIRD, and these factors may affect the causal relationship between exposure and disease.” in the limitations of the revised manuscript.

3. Introduction. Please state the study aims (and/or hypothesis) at the end of the introduction. This sentence is missing from the introduction.

Response: In response to the Reviewer’s comment, we revised the sentences as ‘In addition, we did not find studies specific for C-HIVD, even after searching with keywords such as “cervical”,
“herniated intervertebral disc”, “radiculopathy”, and “dentist” in PubMed and Google Scholar. Therefore, we conducted this study intending to clarify whether the risk for C-HIVD is higher in the dentists comparing to the general population and other health care providers (HCPs).’ in the Background of the revised manuscript.

4. Methods. Please state the study design: this seems to be a retrospective cohort study using a national database, but it is not mentioned in the methods section.

Response: In response to the Reviewer’s comment, we revised the sentences as “This is a retrospective cohort study using a national database, the Taiwan National Health Insurance Research Database (NHIRD).” in the Methods of the revised manuscript.

5. Methods. The information about the database is slightly confusing. The authors mentioned they used a 2009 registry. Was the data in this registry only cross-sectional or did it include data on dentists prior to 2007 and five years after 2011? Also were ICD9 codes identified from the same insurance database?

Response: In response to the Reviewer’s comment, we revised the sentences as “We identified all the dentists from the 2009 registry for medical personnel in the NHIRD (Figure 1) [11-13]. The 2009 registry for medical personnel we used included all the HCPs registered in 2009 and their medical histories between 1996 and 2012…” The ICD-9 codes were also identified from the same insurance database (i.e., the NHIRD). We also revised the sentences as “The NHIRD contains registration files and original claims data including International Statistical Classification of Diseases (ICD) codes for reimbursement for approximately the entire population of Taiwan [10].” in the Methods of the revised manuscript.

6. Methods. Could the authors clarify the data collection and follow-up period? In the methods you mention that you identified dentists between 2007 and 2011, but later in results you mentioned that you calculated the 5-year cumulative incidence. Did you follow your study sample for 5 years post 2007-2011? Was follow up period from 2012-2016? Please clarify in the text.

Response: In response to the Reviewer’s comment, we revised the sentences as “…The 2009 registry for medical personnel we used included all the HCPs registered in 2009 and their medical histories between 1996 and 2012…The participants who had been diagnosed with C-HIVD (ICD-9-CM codes: 722.0, 722.4, 722.71, or 722.91) before 2007 were excluded…We followed up the development of C-HIVD in the participants between 2007 and 2011 to compare the cumulative incidence of C-HIVD between dentists and general population, and between
dentists and other HCPs. To assess whether age and sex were effect modifiers, stratified analyses for age and sex subgroups were also performed.” in the Methods and “Follow-up the development of C-HIVD between 2007 and 2011” in the Figure 1 of the revised manuscript.

7. Methods. The eligibility criteria is confusing to follow. The authors note that dentists with a C-HIVD prior to 2007 were excluded but there is no explanation following this exclusion criteria. Several paragraphs later the authors mention they intend to calculate incidence rate which explains why prior C-HIVD was excluded. However, this explanation should immediately follow the exclusion criteria of prior C-HIVD. Please re-organize and include this sentence within the paragraph for study inclusion/exclusion.

Response: We agree with the Reviewer’s suggestion and revised the sentences as “The participants who had been diagnosed with C-HIVD (ICD-9-CM codes: 722.0, 722.4, 722.71, or 722.91) before 2007 were excluded. C-HIVD was defined as the participants who received the diagnosis during at least one hospitalization or ambulatory care. We excluded the participants with C-HIVD before 2007 because we wanted to calculate the cumulative incidence of C-HIVD by following up between 2007 and 2011…We followed up the development of C-HIVD in the participants between 2007 and 2011 to compare the cumulative incidence of C-HIVD between dentists and general population, and between dentists and other HCPs.” in the Methods of the revised manuscript.

8. Methods. For the two matched groups: Were both the general population and health care provider groups matched with the dentists on age and sex? Please clarify in text.

Response: We thank the Reviewer’s suggestion and revised the sentences as “The other HCPs included all the physicians, pharmacists, medical technicians, audiologists, consultant experts, clinical experts, dietitians, social workers, and language experts identified in the database we used, which were not matched with the dentists or general population.” in the Methods and described that the matching was only performed in the dentists and general population in the Figure 1 of the revised manuscript.

9. Methods. Statistical analysis: The authors need to include how cumulative incidence over 5 years was calculated from the variables in the dataset. You mention that you traced medical histories of dentists between 2007 and 2011, which is only two years. This point will be clarified if you provide the period of follow-up.

Response: In response to the Reviewer’s comment, we added “The 5-year (i.e., follow-up period between 2007 and 2011) cumulative incidences of C-HIVD in the dentists, general population,
and other HCPs were also calculated.” to Statistical analysis of the Methods in the revised manuscript.

10. Methods. Please provide some supporting statement for selecting the underlying comorbidities and controlling for them in the analysis. Why was BMI or obesity not included?

Response: In response to the Reviewer’s comment, we added “We included and adjusted for these underlying comorbidities in the logistic regression to control confounding effects [17].” to the Methods and Ref. 17 to the References of the revised manuscript. BMI or obesity is a risk factor for lumbar HIVD (please see the following reference (Weiler et al. 2011). However, BMI or obesity is not thought to be a risk factor and possible confounding factor for C-HIVD (please see our Ref. 1-4). We also described “Risk factors of C-HIVD are age, race, lack of regular exercise, tobacco use, and poor posture caused by engaging in activities such as holding prolonged static postures, lifting heavy objects, frequent platform diving, operating vibrating equipment, playing golf, and experiencing other types of physiological trauma [1-4].” in the Background of the manuscript. Therefore, we did not included BMI or obesity into this study.


11. Methods. The number of dentists, general population, and health providers in the sample is right now in the middle of the methods section (page 9, line numbers 8-13). I would suggest move this to the beginning of the results section since this is an observational study design. Alternatively, this sentence can be moved closer to the beginning of the paragraph under "Identification of dentists, general population and health care providers"

Response: We agree with the Reviewer’s suggestion and moved the sentences “Initially, we identified 11275 dentists and 76123 other HCPs from the NHIRD (Figure 1). After excluding participants with C-HIVD before 2007 and missing data, 10930 dentists, 10930 participants from the general population, and 73718 other HCPs were recruited for this study (Table 1). The rate of missing data in the dentists and other HCPs were 0.053% (6/11275) and 0.046% (35/76123), respectively.” to the beginning of the Results of the revised manuscript.
12. Methods. What was the rate of missing data in this study? How big is the registry and how many dentists had missing information on diagnosis or comorbidities etc, and had to be excluded from the analysis?

Response: In response to the Reviewer’s comment, we revised the Figure 1 and revised the sentences as “Initially, we identified 11275 dentists and 76123 other HCPs from the NHIRD (Figure 1). After excluding participants with C-HIVD before 2007 and missing data, 10930 dentists, 10930 participants from the general population, and 73718 other HCPs were recruited for this study (Table 1). The rate of missing data in the dentists and other HCPs were 0.053% (6/11275) and 0.046% (35/76123), respectively.” in the Results of the revised manuscript.

13. Results. 5-year cumulative incidence is mentioned for the first time in the results section. Please indicate in the methods how this was calculated.

Response: In response to the Reviewer’s comment, we added “The 5-year (i.e., follow-up period between 2007 and 2011) cumulative incidences of C-HIVD in the dentists, general population, and other HCPs were also calculated.” to the Methods of the revised manuscript.

14. Discussion. It would be beneficial if the authors provided some discussion on the future directions for this research. How do you intend to build on this research if these findings are validated in other studies. If younger dentists have a higher risk of cervical herniation, how would this impact the dental profession? And would there be preventative measures that can be implemented in their work environment?

Response: In response to the Reviewer’s comment, we added “The trend of increased risk for C-HIVD in the younger dentists may impact their jobs. Dentists should receive education about musculoskeletal health, injury prevention, and dental ergonomics as early as possible in the dental school and through their professional life [4]. Most dentists lack the skills and knowledge for practicing in a manner that is ergonomically correct [4]. The insufficiency of training may be due to lack of better teachers and teaching tools [4]. The following approaches could be adopted, including preventive education, proper selection and use of ergonomic equipment, postural and positioning strategies, and frequent breaks with stretching and strengthening techniques before painful episodes occur [4].” to the Discussion of the revised manuscript.
Reviewer 2

1. Methods. Why did you exclude those diagnosed before 2007? Why did you not use a longer follow-up period? You indicate this as a limitation but what was the rationale?

Response: In response to the Reviewer’s comment, we added “We excluded the participants with C-HIVD before 2007 because we wanted to calculate the cumulative incidence of C-HIVD by following up between 2007 and 2011.” and “The 2009 registry for medical personnel we used included all the HCPs registered in 2009 and their medical histories between 1996 and 2012.” to the Methods and revised the sentences as “First, the follow-up period of 5 years may be not enough to reflect the real difference in the comparisons due to the limitation of the data we used. Longer follow-up period may be needed to validate the current finding.” in the limitations of the revised manuscript. The follow-up period was limited to the data we used (1996-2012).

2. Methods. You should explain the inclusion criteria of the study. I am also wondering why you did not look at other musculoskeletal conditions as part of your list of comorbidities such as low back pain. This is surprising as you cite several studies that link PSP to other MSD conditions in the discussion section (line 39-44 on page 9).

Response: In response to the Reviewer’s comment, the inclusion criteria was described as “We identified all the dentists from the 2009 registry for medical personnel in the NHIRD (Figure 1) [11-13]. The 2009 registry for medical personnel we used included all the HCPs registered in 2009 and their medical histories between 1996 and 2012. An identical number of age- and sex-matched participants from the general population was identified for comparison. In order to decrease the number of potential confounders, we also identified a cohort consisting of other HCPs who may share similar working environments and socioeconomic status with the dentists for comparison [14,15]. The other HCPs included all the physicians, pharmacists, medical technicians, audiologists, consultant experts, clinical experts, dietitians, social workers, and language experts identified in the database we used, which were not matched with the dentists or general population.” in the Methods. Low back pain was not included as the comorbidities because it is not a risk factor for C-HIVD (please see the description for risk factors of C-HIVD in the Background). In addition, low back pain is a subjective symptom, not a confirmed diagnosis such as the list of comorbidities in our study. Therefore, we did not include low back pain into the analysis.

3. Discussion. There needs to be a greater demonstration of linking the study findings to the existing literature. The current discussion is thin and needs to be expanded.
Response: In response to the Reviewer’s comment, we added “The trend of increased risk for C-HIVD in the younger dentists may impact their jobs. Dentists should receive education about musculoskeletal health, injury prevention, and dental ergonomics as early as possible in the dental school and through their professional life [4]. Most dentists lack the skills and knowledge for practicing in a manner that is ergonomically correct [4]. The insufficiency of training may be due to lack of better teachers and teaching tools [4]. The following approaches could be adopted, including preventive education, proper selection and use of ergonomic equipment, postural and positioning strategies, and frequent breaks with stretching and strengthening techniques before painful episodes occur [4].” to the Discussion of the revised manuscript.

4. REQUESTED REVISIONS: The methods section needs to be revised to align with the study objectives and the discussion.

Response: We have revised the methods section according to the Reviewers’ suggestions in the revised manuscript.