### ARTICLE DETAILS

<table>
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<th>TITLE (PROVISIONAL)</th>
<th>Age and gender differential relationship between employment status and body mass index among middle aged and elderly adults: A cross-sectional study</th>
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<tr>
<td>AUTHORS</td>
<td>Noh, Jin-Won; Kim, Jinseok; Park, Jumin; Oh, In-Hwan; Kwon, Young Dae</td>
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### VERSION 1 - REVIEW

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<th>REVIEWER</th>
<th>Dr Martin Hofmeister</th>
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<td>Consumer Centre of the German Federal State of Bavaria, Germany</td>
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<td>REVIEW RETURNED</td>
<td>02-May-2016</td>
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### GENERAL COMMENTS

Dr. Kwon and colleagues have presented a very interesting cross-sectional study of the influence of age and gender respectively on the association between employment status and body mass index (BMI) in Korea using data from a large, nationally representative sample. Congratulations for the interesting examination. Overall the manuscript is well-written. I think that this paper should be considered for publication with minor revisions to address the points set out below:

**Abstract – the method section needs to be more clearly written.**
Maybe the authors add to abstract the survey short form and year: “KLoSA 2012”.

**Introduction/Methods –** The authors rightly pointed out that physical activity level has an essential influence on the relationship between employment status and body mass index/obesity. This relationship also applies to Korean adults, as recent studies have shown (1, 2). I do not understand why the authors did not include the physical activity in the evaluation (such as smoking status and alcohol drinking status).

In the “KLoSA 2012”, physical activity was queried with the following questions (Health Status of survey KLoSaw4 - https://g2aging.org/?section=module&moduleid=1592&display):

- **C108** - The next few questions are about exercise. Do you work out more than once a week?
- **C109** - What is the main reason that you cannot exercise regularly?
- **C110** - If others, please specify.
- **C111** - How often do you work out per week? (unit: a time/per week) times / per week
- **C112** - How long do you work out per session? (unit: a minutes) [IWER: Calculate one hour as 60 minutes. For example, mark 150 minutes for 2 hours and 30 minutes.] minutes
C113 - How long have you been working out regularly?"

Other recent analysis of the fourth wave of the KLoSA includes the physical activity status in the evaluation (for example 3). The cited study by Kang et al in Korea has also included physical activity in the evaluation (4). Variables: The authors should explain why they do not have analyzed the physical activity level in terms of health-related behaviors.

Statistical methods (page 9, lines 37-54) – The authors should add which various types of statistical regression analysis they used.

Results – In my opinion, the authors should also indicate prevalence of obesity (underweight, normal weight, overweight, obese and severely obese) in this Korean sample.

Discussion – Maybe the authors can add a few new references (for example 1, 2, 5-10). I think in the missing analysis of physical activity should be mentioned in the strengths and limitations section.

Thank you for the opportunity to review this paper. I look forward to reading the published version.

REFERENCES
The manuscript „Age and gender differential relationship between employment status and body mass index among middle aged and elderly adults“ investigates whether the association between employment and BMI is moderated by employment status and sex. Analyses were based on cross-sectional data from 7228 adults aged 45 or older. In general, the study is of public health relevance as the findings may help to define target populations for tailored intervention approaches. However, there are some limitations or areas where more precise details would be helpful.

1) Employment status was treated as a dichotomous variable (employed/ unemployed). It states: „retirement […] can be defined as unemployment among individuals aged 60 and older“ (p. 13). However, it seems to be important to distinguish between people currently unemployed and retired persons. Unemployed and retired people may differ considerably with regards to lifestyle habits and context variables (e.g. social norms).

2) For analysis, some continuous variables were categorized (e.g., age). However, there are many problems caused by categorization, e.g., loss of information and the adequate selection of cut points.

3) Some lifestyle variables have been included, e.g., alcohol and tobacco use. There are important variables that need to be considered, e.g. physical activity and diet.

4) The limitations of BMI should be discussed.

5) It states: “understanding the pattern of weight change in elderly might provide insight in developing appropriately timed and effective strategies to improve health status” (p. 7). Some practical implications should be added to the discussion section.

Minor comments:

6) Some references should be added, e.g., “[…] retirement leads to an overall decrease in physical activity compared to being active in the workforce” (Introduction, p. 5)

7) A consistent terminology would improve readability (e.g., weight change vs. BMI, p. 7). Further, “weight change” implies that longitudinal data were analyzed.

8) More details on KLoSA would be helpful (e.g., aim, why wave 4). (Methods, p. 7)

9) Ns should be provided for sample description. (Results, p. 10)

VERSION 1 – AUTHOR RESPONSE

Reviewer 1: Dr Martin Hofmeister

Dr. Kwon and colleagues have presented a very interesting cross-sectional study of the influence of age and gender respectively on the association between employment status and body mass index (BMI) in Korea using data from a large, nationally representative sample. Congratulations for the interesting examination. Overall the manuscript is well-written.

Abstract – the method section needs to be more clearly written. Maybe the authors add to abstract the survey short form and year: “KLoSA 2012”.

We added in data source in the Abstract.
Introduction/Methods – The authors rightly pointed out that physical activity level has an essential influence on the relationship between employment status and body mass index/obesity. This relationship also applies to Korean adults, as recent studies have shown (1, 2). I do not understand why the authors did not include the physical activity in the evaluation (such as smoking status and alcohol drinking status).

Other recent analysis of the fourth wave of the KLoSA includes the physical activity status in the evaluation (for example 3). The cited study by Kang et al in Korea has also included physical activity in the evaluation (4). Variables: The authors should explain why they do not have analyzed the physical activity level in terms of health-related behaviors.

Following the reviewer’s suggestion, a physical activity related variable (whether respondents exercised regularly or not) was added in the analysis. We updated Methods, Tables and Results correspondingly. We cited the study by Kang et al. in Korea as well.

Statistical methods (page 9, lines 37-54) – The authors should add which various types of statistical regression analysis they used.

We added a more detailed description of the two multiple regression analysis models used in this study.

Results – In my opinion, the authors should also indicate prevalence of obesity (underweight, normal weight, overweight, obese and severely obese) in this Korean sample.

We reported the weight status among the sample in the Results section.

Discussion – Maybe the authors can add a few new references (for example 1, 2, 5-10). I think in the missing analysis of physical activity should be mentioned in the strengths and limitations section.

We added more references which the reviewer recommended and revised Discussion section accordingly to the references.

Reviewer 2: Sophie Baumann

The manuscript, "Age and gender differential relationship between employment status and body mass index among middle aged and elderly adults" investigates whether the association between employment and BMI is moderated by employment status and sex. Analyses were based on cross-sectional data from 7228 adults aged 45 or older. In general, the study is of public health relevance as the findings may help to define target populations for tailored intervention approaches.

1) Employment status was treated as a dichotomous variable (employed/unemployed). It states: „retirement […] can be defined as unemployment among individuals aged 60 and older“ (p. 13). However, it seems to be important to distinguish between people currently unemployed and retired persons. Unemployed and retired people may differ considerably with regards to lifestyle habits and context variables (e.g. social norms).

We revised Introduction and Discussion section clearly in terms of our study aim (employed/unemployed).

2) For analysis, some continuous variables were categorized (e.g., age). However, there are many problems caused by categorization, e.g., loss of information and the adequate selection of cut points.
Age variable was categorized as we wanted to compare the relationship between employment status and BMI of different age groups. 60 was selected as it was considered as retirement age and 75 was selected as the second cutoff age as it was considered “very old” in Korea.

3) Some lifestyle variables have been included, e.g., alcohol and tobacco use. There are important variables that need to be considered, e.g. physical activity and diet.

Following the reviewer's suggestion, a physical activity related variable (whether respondents exercised regularly or not) was added in the analysis. We updated the Methods, Tables and Results correspondingly.

4) The limitations of BMI should be discussed.

We added the limitations of BMI in the Discussion section like bellows; “Also because BMI does not differentiate fat and muscle, high BMI does not always mean obesity.”

5) It states: “understanding the pattern of weight change in elderly might provide insight in developing appropriately timed and effective strategies to improve health status” (p. 7). Some practical implications should be added to the discussion section.

We added practical implications in the Discussion.

Minor comments:
6) Some references should be added, e.g., “[...] retirement leads to an overall decrease in physical activity compared to being active in the workforce” (Introduction, p. 5)

We did reanalysis including physical activity variable and added more references and interpretation according to the result.

7) A consistent terminology would improve readability (e.g., weight change vs. BMI, p. 7). Further, “weight change” implies that longitudinal data were analyzed.

We changed terminology to BMI.

8) More details on KLoSA would be helpful (e.g., aim, why wave 4). (Methods, p. 7)

We mentioned that the wave 4 data was used in this study because it was the latest data available at the time of this analysis. And we added the purpose of KLoSA like bellows; “The purpose of KLoSA is to create the basic data needed to devise and implement effective social and economic policies to address the trends that emerge in the process of population ageing.”

9) Ns should be provided for sample description. (Results, p. 10)

We reported N (=7,228) in the sample description section as suggested by the reviewer.

| REVIEWER | Dr Martin Hofmeister  
Consumer Centre of the German Federal State of Bavaria, Germany |
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<td>REVIEW RETURNED</td>
<td>13-Jul-2016</td>
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GENERAL COMMENTS

I thank Dr. Kwon and colleagues for their efforts and additional work in addressing all reviewers’ comments on the first submission. All necessary changes were done. I am satisfied with the revised manuscript as it stands and I recommend accepting it for publication.

REVIEWER
Sophie Baumann
University Medicine Greifswald, Institute of Social Medicine and Prevention, Germany

REVIEW RETURNED
26-Jul-2016

GENERAL COMMENTS

I appreciate the revision made by the authors. Most of my concerns have been addressed adequately, except of two important issues:

1) In response to the comment that it is important to distinguish between people currently unemployed and retired persons, retirement/retired has simply been replaced by unemployment/unemployed – even if the text references refer to retirement (e.g., 5, 6, 8, 10, 14-17). However, this has rather intensified the problem and should be reversed. Instead, the independent variable should be changed (i.e., employed vs. unemployed/job-seeking vs. retired) or the limitation that unemployment status included both unemployed and retired people should be added to the discussion section.

2) I am still not able to make some sense of the rationale behind the categorization of age. First, the three age groups seem arbitrary (e.g., “75 […] was considered ‘very old’ in Korea”) and reasoning is contradictory (“60 […] was considered as retirement age” vs. “the actual retirement age is closer to 70 years”). Second, information is tossing away. This is unfortunate, especially when considering that age is of central interest in this study. Further, some minor corrections and clarifications would be helpful:

3) Some sentences of the manuscript read strangely, e.g., “smokers are less likely to have obesity” (p. 10) or “the unemployed were associated with higher BMI” (p. 14).

4) Please clarify weight status categories (p. 12).

VERSION 2 – AUTHOR RESPONSE

Reviewer 2: Sophie Baumann

I appreciate the revision made by the authors. Most of my concerns have been addressed adequately, except of two important issues:

1. In response to the comment that it is important to distinguish between people currently unemployed and retired persons, retirement/retired has simply been replaced by unemployment/unemployed – even if the text references refer to retirement (e.g., 5, 6, 8, 10, 14-17). However, this has rather intensified the problem and should be reversed. Instead, the independent variable should be changed (i.e., employed vs. unemployed/job-seeking vs. retired) or the limitation that unemployment status included both unemployed and retired people should be added to the discussion section.

   -> We revised all the references and rewrote Introduction according to new references to make it clearer and added the limitation in the Discussion section too.

2. I am still not able to make some sense of the rationale behind the categorization of age. First, the three age groups seem arbitrary (e.g., “75 […] was considered ‘very old’ in Korea”) and reasoning is contradictory (“60 […] was considered as retirement age” vs. “the actual retirement age is closer to 70 years”). Second, information is tossing away. This is unfortunate, especially when considering that
age is of central interest in this study.

We first chose ‘60’ as the first cutoff because ‘60’ is considered rather a ‘formal’ retirement age in Korea as defined by a Korean law (ACT ON PROHIBITION OF AGE DISCRIMINATION IN EMPLOYMENT AND ELDERLY EMPLOYMENT PROMOTION). While many people may retire before or later that age for various reasons, ‘60’ is still considered as a common retirement age especially for wage-earners. We understand that the second cutoff age of ‘75’ seem to be arbitrary. However, Korea is well-known for its rather high proportion of people who are self-employed or working for micro family businesses to which the upper-mentioned law is not applied so that they continue to work until well above the ‘formal’ retirement age of ‘60’. The seemingly contradictory notion of “practical retirement age close to 70 (or older)” should be viewed in this context. However, ‘75’ is considered as old enough age, so that people practically quit their work (due to various issues, mostly health-related issues) and are excluded from economically active population.

Further, some minor corrections and clarifications would be helpful:

3. Some sentences of the manuscript read strangely, e.g., “smokers are less likely to have obesity” (p. 10) or “the unemployed were associated with higher BMI” (p. 14).

4. Please clarify weight status categories (p. 12).

We used weight score of BMI as continuous variable not using weight status categories.
Age and gender differential relationship between employment status and body mass index among middle-aged and elderly adults: a cross-sectional study

Jin-Won Noh, Jinseok Kim, Jumin Park, In-Hwan Oh and Young Dae Kwon

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