PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Association between kimchi consumption and obesity by BMI and abdominal obesity in Korean adults: a cross-sectional analysis of the Health Examinees study
AUTHORS	Jung, Hyein; Yun, Ye-Rang; Hong, Sung Wook; Shin, Sangah

VERSION 1 – REVIEW

REVIEWER	Son, Hong-Seok Korea University
REVIEW RETURNED	26-Jul-2023

GENERAL COMMENTS	This study investigated the association between kimchi consumption and obesity in Korean through a cross-sectional analysis of the Health Examinees study. This study is considered to be a meaningful epidemiological study in that it evaluated the independent relationship between kimchi consumption and obesity by adjusting several confounding factors with a large number of participants. I think this is a good manuscript that could be published on BMJ Open with some modifications. Major comments 1. In this study, inn men, total kimchi consumption of 1–3 servings/day was related to a lower prevalence of obese compared with total kimchi consumption of <1 serving/day. However, total kimchi consumption of >5 servings/day increased the prevalence of obese to 1.014. In addition, the higher the consumption of kimchi in women, the higher the prevalence of obese. A discussion of these results should be added to the manuscript. 2. Several studies related to this study are not included in the references. A thorough review of studies on kimchi consumption should be conducted. See the kimchi studies below. Song, E., Ang, L., Lee, H.W. et al. Effects of kimchi on human health: a scoping review of randomized controlled trials. J. Ethn. Food 10, 7 (2023) Kim MS, Yang HJ, Kim SH, Lee HW, Lee MS. Effects of Kimchi on human health: A protocol of systematic review of controlled clinical trials. Medicine (Baltimore). 2018; 97(13) Tan, Li-Juan & Yun, Yerang & Hong, Sung & Shin, Sangah. (2023). Effect of kimchi intake on body weight of general community dwellers: a prospective cohort study. Food & function. 3. It is difficult to find the key contents described in the manuscript from Tables because too detailed information is presented in Tables. It is necessary to modify Tables 1–4 so that only the key contents

	are included. 4. Line 278-307: Discussion on previous studies on the efficacy of kimchi should be reduced to a minimum, and intensive discussion on the contents of the results of this study (see major comment No. 1) is needed. Minor comments Line 86: BMI → body mass index Line 87: FFQ → food frequency questionnaire Line 163: by a The Korean Food → by The Korean Food Line 242: 1–3 servings/day → 1–2 servings/day Line 243: OR: 875 → OR: 0.875 Line 246: OR: 904 → OR: 0.904

REVIEWER	Pereyra-González, Isabel Universidad Catolica del Maule
REVIEW RETURNED	03-Oct-2023

GENERAL COMMENTS	• This article presents new information on the association between kimchi consumption and obesity. Overall the paper is clearly written. The strength of the paper is the massive dataset they have used to estimate the independent relationship between kimchi consumption and obesity

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Prof. Hong-Seok Son, Korea University
Comments to the Author:
This study investigated the association between kimchi consumption and obesity in Korean through a cross-sectional analysis of the Health Examinees study. This study is considered to be a meaningful epidemiological study in that it evaluated the independent relationship between kimchi consumption and obesity by adjusting several confounding factors with a large number of participants. I think this is a good manuscript that could be published on BMJ Open with some modifications.

➔ **RESPONSE:** We appreciate the opportunity to revise our manuscript. We have carefully considered your suggestions and revised the manuscript based on your comments and recommendations. The revised portions of the text are in red font in the manuscript.

Major comments
1. In this study, inn men, total kimchi consumption of 1–3 servings/day was related to a lower prevalence of obese compared with total kimchi consumption of <1 serving/day. However, total kimchi consumption of >5 servings/day increased the prevalence of obese to 1.014. In addition, the higher the consumption of kimchi in women, the higher the prevalence of obese. A discussion of these results should be added to the manuscript.

➔ **RESPONSE:**Thank you so much for your opinion.We agree with your comment, and you have raised an important point.We have, accordingly, added the result in the discussion section to emphasize this point.

[pages 12-13, lines274-284]
In our results, a non-linear J-shaped curve was observed for kimchi consumption and obesity. Although not statistically significant, increased kimchi intake over 5 servings/day was associated with a high prevalence of obesity. This might be due to high total energy, carbohydrate, fat might lead to kimchi consumption. In this study, increased total kimchi

consumption was associated with higher intake of total energy, carbohydrates, protein, fat, sodium, and cooked rice. Also, in women, the higher kimchi consumption group showed inactive. An imbalanced energy balance associated with matched energy intake and expenditure could increase the prevalence of obesity [46]. Rice and kimchi pattern are common dietary patterns in Korean adults, and in a previous study, the white rice and kimchi pattern was positively associated with obesity [47]. Previous results can support the reason for the J-shaped results in our study, but further research is needed.

2. Several studies related to this study are not included in the references. A thorough review of studies on kimchi consumption should be conducted. See the kimchi studies below.

Song, E., Ang, L., Lee, H.W. et al. Effects of kimchi on human health: a scoping review of randomized controlled trials. J. Ethn. Food 10, 7 (2023)
Kim MS, Yang HJ, Kim SH, Lee HW, Lee MS. Effects of Kimchi on human health: A protocol of systematic review of controlled clinical trials. Medicine (Baltimore). 2018; 97(13)
Tan, Li-Juan & Yun, Yerang& Hong, Sung & Shin, Sangah. (2023). Effect of kimchi intake on body weight of general community dwellers: a prospective cohort study. Food & function.

➔ **RESPONSE:**Thank you for your recommendation. We reviewed the articles you mentioned and added to the discussion section.

[page 11, lines 247-249]

In a cohort study of 20,066 obese participants aged 40–69 years old, the average intake of kimchi 2–3 servings per day was associated with changing to a normal weight group[34].

[page 11, lines 250-252]
In the results of the scoping review including 2 RCT studies, intake of fresh kimchi (before fermented) showed a decrease in waist circumferences and body fat percentage [35].

3. It is difficult to find the key contents described in the manuscript from Tables because too detailed information is presented in Tables. It is necessary to modify Tables 1–4 so that only the key contents are included.

➔ **RESPONSE:** Thank you for your comments.Thank you for your comments. We modified Tables 1–4 to show clear resultsas succinct as possible.The revised table is shown in the manuscript's Table 1–4.

4. Line 278-307: Discussion on previous studies on the efficacy of kimchi should be reduced to a minimum, and intensive discussion on the contents of the results of this study (see major comment No. 1) is needed.

➔ **RESPONSE:** Thank you for your comments.We reduced the part about kimchi efficacy in the discussion section and added a discussion related to comment No.1.

Minor comments
Line 86: BMI → body mass index
Line 87: FFQ → food frequency questionnaire
Line 163: by a The Korean Food → by The Korean Food
Line 242: 1–3 servings/day → 1–2 servings/day
Line 243: OR: 875 → OR: 0.875
Line 246: OR: 904 → OR: 0.904

➔ **RESPONSE:** Thank you for your commentson minor revisions. We revised the manuscript as follows:

[page3, lines58]

Body mass index might have limitations as an obesity measure.

[page3, lines 59]

A food frequency questionnaire may make it difficult to quantify the portion size of kimchi consumption.

[page7, lines 139-140]
by The Korean Food Composition Table
[page 10, lines 216-217]
total kimchi consumption of 1–2 servings/day and 1–3 servings/day was related to a lower prevalence of obese
[page 10, lines 217]
OR: 0.875
[page 10, lines 221]
OR: 0.904

We want to thank the referee sincerely for their valuable time. Please do reach out if there are any questions or comments.

Manuscript ID: bmjopen-2023-076650

Reviewer: 2
Dr. Isabel Pereyra-González, Universidad Catolica del Maule
Comments to the Author:
• This article presents new information on the association between kimchi consumption and obesity. Overall the paper is clearly written. The strength of the paper is the massive dataset they have used to estimate the independent relationship between kimchi consumption and obesity

We would like to thank the referee sincerely for their valuable time. Please do reach out if there are any questions or comments.

VERSION 2 – REVIEW

REVIEWER	Son, Hong-Seok Korea University
REVIEW RETURNED	31-Oct-2023

GENERAL COMMENTS	The manuscript has been well improved, and I think most of my comments have been addressed. I have no further comments.

REVIEWER	Pereyra-González, Isabel Universidad Catolica del Maule
REVIEW RETURNED	21-Nov-2023

GENERAL COMMENTS	Authors should check keywords if they are all MeSh terms. For example, kimchi consumption isn't a MeSh term Detailed information on food and nutrient intake according to kimchi consumption is included. However, it isn't a study objective and this information should deleted from this paper. Table 2 is not related to the objective. It is necessary to put it a supplementary table. Authors should clarify the participation of the funding institution in the research because it could be a conflict of interest situation.

VERSION 2 – AUTHOR RESPONSE

Reviewer: 1

Prof. Hong-Seok Son, Korea University

Comments to the Author:

The manuscript has been well improved, and I think most of my comments have been addressed. I have no further comments.

We would like to thank the referee sincerely for their valuable time. Please do reach out if there are any questions or comments.

Reviewer: 2
Dr. Isabel Pereyra-González, Universidad Catolica del Maule
Comments to the Author:

➔ We appreciate the opportunity to revise our manuscript. We have carefully considered your suggestions and revised the manuscript based on your comments and recommendations. The revised portions of the text are in red font in the manuscript.

Authors should check keywords if they are all MeSh terms. For example, kimchi consumption isn't a MeSh term

➔ **RESPONSE:** Thank you so much for your comment. We revised the keywords according to MeSh terms as follows:

[Page 3]

Keywords: Fermented foods, Obesity, Abdominal obesity, Cross-Sectional Study, Republic of Korea

Detailed information on food and nutrient intake according to kimchi consumption is included. However, it isn't a study objective and this information should deleted from this paper.

Table 2 is not related to the objective. It is necessary to put it a supplementary table.

➔ **RESPONSE:** Thank you for your opinion. Table 2 moved into Supplementary Table 1, and the "Daily Food and Nutrient Intake According to Kimchi Consumption" section of the result has been deleted. The contents are placed after the participants' Characteristics part.

[Page 10]

The food and nutrient intakes of the study participants according to kimchi consumption are provided in Table S1 in supplementary file. The higher consumption of kimchi was associated with higher consumption of Jang-ajji, pickled radish, and cooked rice in both men and women (all p <0.0001). The average nutrient intake in each group of kimchi consumption showed that total energy intake, carbohydrate, protein, fat, sodium, potassium, and fiber were significantly higher in the highest kimchi intake than in the lowest kimchi intake.

Authors should clarify the participation of the funding institution in the research because it could be a conflict of interest situation.

➔ **RESPONSE:** Thank you so much for your careful comment. We have written the participation of the staff of the funding institution as follows:

[Page 15]

Competing of interest
Authors Hyein Jung and Sangah Shin have no conflicts of interest to declare for this study.
Authors Ye-Rang Yun and Sung Wook Hong are members of the staff at the World Institute of Kimchi.

We want to thank the referee sincerely for their valuable time. Please do reach out if there are any questions or comments.