**Supplementary material**

**Table S1.** The search strategy of dietary calcium intake and MS in PubMed

**Table S2.** Detailed list of the number of excluded full-text reviewed articles

**Table S3.** Quality assessment of included cross-sectional studies

**Table S4.** Characteristics of studies and participants included in the dose-response analysis of the association between calcium intake and risk of MS

**Fig S1.** The pooled effects between dietary calcium intake and risk of MS in influence analysis

**Fig S2.** The visual inspection of the funnel plot

**Table S1** The search strategy of dietary calcium intake and MS in PubMed

Step Search term (the number of articles)

#1 calcium AND metabolic syndrome（2115）

#2 calcium AND syndrome X（1052）

#3 calcium AND insulin resistant syndrome（435）

#4 #1 OR #2 OR #3(3067)

 MS，metabolic syndrome

**Table S2** Detailed list of the number of excluded full-text reviewed articles

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Step | The number of articles before exclusion | Excluding reasons | The number of articles after exclusion | References number of excluded articles  |
| 1 | 53  | No assessment of the relationship between dietary calcium intake and metabolic syndrome. (n=32) | 21 | ([1-32](file:///C%3A%5CUsers%5CASUS%5CDesktop%5C11.9%5C%E5%AD%A6%E7%94%9F%E6%94%B9%20Table%20S1%20Detailed%20list%20of%20the%20number%20of%20excluded%20full.docx#_ENREF_1)) |
| 2 | 21 | The outcome of interest was not metabolic syndrome. (n=3) | 18 | ([33-35](file:///C%3A%5CUsers%5CASUS%5CDesktop%5C11.9%5C%E5%AD%A6%E7%94%9F%E6%94%B9%20Table%20S1%20Detailed%20list%20of%20the%20number%20of%20excluded%20full.docx#_ENREF_33)) |
| 3 | 18 | Multilevel linear models or multivariable regression models were used in data analysis, and the results could not be converted into ORs with 95%CIs. (n=5) | 13 | ([36-40](file:///C%3A%5CUsers%5CASUS%5CDesktop%5C11.9%5C%E5%AD%A6%E7%94%9F%E6%94%B9%20Table%20S1%20Detailed%20list%20of%20the%20number%20of%20excluded%20full.docx#_ENREF_36)) |
| 4 | 13 | Duplicate data from same population (n=3) | 10 | ([41-43](file:///C%3A%5CUsers%5CASUS%5CDesktop%5C11.9%5C%E5%AD%A6%E7%94%9F%E6%94%B9%20Table%20S1%20Detailed%20list%20of%20the%20number%20of%20excluded%20full.docx#_ENREF_41)) |
| 5 | 10 | The calculation of OR is not the highest versus the lowest dietary intake of calcium (n=1) | 9 | ([44](file:///C%3A%5CUsers%5CASUS%5CDesktop%5C11.9%5C%E5%AD%A6%E7%94%9F%E6%94%B9%20Table%20S1%20Detailed%20list%20of%20the%20number%20of%20excluded%20full.docx#_ENREF_44)) |

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3. van Meijl LE, Vrolix R, Mensink RP. Dairy product consumption and the metabolic syndrome. Nutrition research reviews. 2008;21(2):148-57.

4. Unal G, Akalin AS, Akbulut N. Importance of dairy products - in metabolic syndrome-cardiovascular disease, insulin resistance and diabetes, and hypertension (Part 2). Agro Food Industry Hi-Tech. 2008;19(1):32-4.

5. Troy LM, Jacques PF, Vasan RS, et al. Dairy intake not associated with metabolic syndrome but milk and yogurt intake is inversely associated with prevalence of hypertension in middle-aged adults. Faseb Journal. 2010;24.

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**Table S3** Quality assessment of included cross-sectional studies

|  |  |  |
| --- | --- | --- |
|  | First author year[ref.] |  |
|  | Al-Daghri NM 2013[11] | Kim K 2012[12] | Liu S 2005[13] | Shin SK 2015[14] | Cho GJ 2009[15] | Pannu PK 2017[16] | Motamed S 2013[17] | Bruscato NM2010 [18] | Kim MK2017[29] |
| 1. Define the source of information (survey, record review);
 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1. List inclusion and exclusion criteria for exposed and unexposed subjects (cases and controls) or refer to previous publications;
 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1. Indicate time period used for identifying patients;
 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1. Indicate whether or not subjects were consecutive if not population-based;
 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5. Evaluators of subjective components of study were not masked to other aspects of the status of the participants;  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1. Describe any assessments undertaken for quality assurance purposes (e.g., test/retest of primary outcome measurements);
 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1. Explain any patient exclusions from analysis;
 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1. Describe how confounding was assessed and/or controlled;
 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1. Explain how missing data were handled in the analysis;
 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1. Summarize patient response rates and completeness of data collection;
 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1. Clarify what follow-up, if any, was expected and the percentage of patients for which incomplete data or follow-up was obtained;
 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Overall quality score | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

The quality of studies was assessed by the Agency for Healthcare Research and Quality (ARHQ) methodology checklist.

 1= “Yes”, 0=“No” or “Unclear”. The full score for the scale is 11 points.

**Table S4** Characteristics of studies and participants included in the dose-response analysis of the association between calcium intake and risk of MS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Author (Year) | Study design | Gender | Dose(mg/day) | *OR*(95%*CI*) | Cases | Controls | Adjustment for covariant |
| Pannu PK（2017） | C-S-S | both | 5798581233 | 10.92(0.63-1.33)0.83(0.56-1.21) | 245187163 | 847908924 | Age, gender, country of birth, income, education, smoking, season, energy intake, physical activity level, body weight, alcohol, dietary fiber, Mg and 25-hydroxyvitamin D concentration. |
| Shin SK (2015) | C-S-S | men | 190.8278.7370.8530.8 | 10.98(0.75-1.27)0.86(0.65-1.14)0.82(0.6-1.14) | 180190184194 | 442433439429 | Age, education, glycemic load and daily intake of fat, fiber, and sodium  |
| Shin SK (2015) | C-S-S | women | 166.2252.6353.6516.7 | 10.96 (0.78-1.18)0.85 (0.67-1.06)0.71(0.54-0.94) | 337340323301 | 634631648670 | Age, education, farmer, marital status, exercise habits, glycemic load, daily intake of fat, fiber, sodium and energy |
| Kim K (2012) | C-S-S | men | 282.9404567.2 |  1 0.92 (0.76-1.13) 0.77(0.61-0.98）  | 344358332 | 938924950 | Age, educational level, smoking status, exercise, glycemic load, and intakes of energy, protein, fat, cholesterol, and fiber |
| Kim K (2012) | C-S-S | women | 287.6431.4628.7 | 10.81(0.67-0.98)0.65(0.52-0.81) | 506460416 | 889935979 | Age, educational level, exercise, glycemic load, and intakes of energy, protein, fat, cholesterol, and fiber |
|  Liu S（2005） | C-S-S | women | 4867401168 | 10.87(0.73-1.04)0.74(0.6-0.92) | 409346288 | 160416671725 | Age, smoking, exercise, total calories, alcohol use, multivitamin use, parental history of myocardial infarction before age 60 years, dietary intakes of total fat, cholesterol, protein, glycemic load, and total vitamin D |
| Motamed S (2013) | C-S-S | both | 430.5603.3736.8887.91130.1 | 11.04(0.8-1.2)1.08(0.8-1.2)1.12(0.9-1.4)1.17(0.9-1.4) | 339339339339339 | 387387387387387 | Sex, age, physical activity level, smoking, past medical history, energy intake, and BMI |
| Cho GJ (2009)Cho GJ (2009)Cho GJ (2009) | C-S-SC-S-SC-S-S | menPremenopausal womanpostmenopausal women | 265429623848229371537725181325503715 | 10.96(0.76-1.22)0.92(0.72-1.18)0.79(0.60-1.03)11.11(0.78-1.57)1.06(0.74-1.53)0.97(0.65-1.45)10.93(0.69-1.26)0.91(0.66-1.26)0.63(0.45-0.89) | 275275275275106106106106237237237237 | 753753753753733733733733229229229229 | Age, body mass index, marital status, education level, alcohol intake, smoking history, exercise, and energy intakeAge, body mass index, marital status, education level, alcohol intake, smoking history, exercise, and energy intakeAge, body mass index, marital status, education level, alcohol intake, smoking history, exercise, hormone therapy use, and energy intake |
| Bruscato NM （2010） | C-S-S | women | 669756789748 | 12.43(1.12-5.27)1.59(0.73-3.47)1.5(0.68-3.31) | 22222222 | 48484848 | Age, smoking, years of education, physical activity and dietary fiber |
| Kim MK（2017） | C-S-S | men | 20060010001400 | 11.012(0.81-1.25)0.908(0.65-1.26)1.942(1.23-3.05) | 291291291291 | 905905905905 | Total calorie intake, calcium supplement intake, age, living area, education level, income, occupation, marital status, alcohol consumption, smoking, exercise level, stature, BMD, fatness, and BMI |
| Kim MK（2017） | C-S-S | Premenopausal woman | 20060010001400 | 10.791(0.55-1.12)1.172(0.64-2.13)0.722(0.23-2.24) | 63636363 | 937937937937 | Total calorie intake, calcium supplement intake, age, living area, education level, income, occupation, marital status, alcohol consumption, smoking, exercise level, stature, BMD, fatness, and BMI |
| Kim MK（2017） | C-S-S | postmenopausal women  | 20060010001400 | 10.788(0.64-0.96)0.921(0.63-1.33)0.801(0.41-1.55) | 334334334334 | 789789789789 | Total calorie intake, calcium supplement intake, age, living area, education level, income, occupation, marital status, alcohol consumption, smoking, exercise level, stature, BMD, fatness, and BMI |

MS, metabolic syndrome; *OR*, Odds Ratio; C-S-S, cross-sectional study.