BMJ Open Work-related psychosocial factors and onset of metabolic syndrome among workers: a systematic review and meta-analysis protocol

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ABSTRACT

Introduction Metabolic syndrome is an important public health target because of its high prevalence worldwide. Work-related psychosocial factors have been identified as determinants of metabolic syndrome components. However, there have been no systematic reviews or meta-analyses conducted to evaluate the relationship between work-related psychosocial factors and metabolic syndrome as an aggregated cluster. The aim of this study is to examine this association from published prospective studies.

Methods and analysis The systematic review and meta-analysis will be conducted using published studies that will be identified from electronic databases (ie, PubMed, EMBASE, PsycINFO, PsycARTICLES and Japan Medical Abstracts Society). Studies that (1) examined the association between work-related psychosocial factors and the onset of metabolic syndrome, (2) had a longitudinal or prospective cohort design, (3) were conducted among workers, (4) provided sufficient data for calculating ORs or relative risk with a 95% CI, (5) were published as original articles written in English or Japanese, and (6) having been published until the end of 2016 will be included. Study selection, data collection, quality assessment and statistical syntheses will be conducted based on discussions among investigators.

Ethics and dissemination Ethics approval was not required for this study because it was based on published studies. The results and findings of this study will be submitted and published in a scientific peer-reviewed journal. The findings from this study could be useful for assessing metabolic syndrome risk factors in the workplace, and determining approaches for prevention of metabolic syndrome in the future.

Trial registration number PROSPERO CRD42016039096 (http://www.crd.york.ac.uk/PROSPERO_REBRANDING/display_record.asp?ID=CRD42016039096)

INTRODUCTION

Metabolic syndrome is a cluster of medical conditions that has multiple risk factors for cardiovascular disease and type 2 diabetes, characterised by comorbidity of abdominal obesity, high blood glucose or insulin

Strengths and limitations of this study

- This systematic review and meta-analysis will offer comprehensive understanding regarding the association between work-related psychosocial factors and metabolic syndrome.
- This study included a wide range of work-related psychosocial factors, and focused on metabolic syndrome as an aggregated cluster.
- This study included only prospective studies for stronger evidence.
- The findings from the study will be useful for assessing metabolic syndrome risk factors in the workplace, and determining approaches for prevention of metabolic syndrome in the future.
- Depending on the results, confounding factors that were not adjusted for in the selected studies, and low generalisability can be limitations.

resistance, hypertension, dyslipidaemia (high triglyceride and low high-density lipoprotein cholesterol) and microalbuminuria.^{1–5} Although there are variations by demographic variables (eg, sex and age) and ethnicity, the prevalence of metabolic syndrome remains high worldwide.^{6–10} In addition to elevating the risks for the incidence of cardiovascular disease and diabetes, metabolic syndrome has influence on cancer risks,¹¹ a low health-related quality of life¹² and all-cause mortality.^{13 14} Therefore, metabolic syndrome is an important public health target.

Work-related psychosocial factors among workers have been identified as a determinant of health.^{15–18} For example, long working hours have been well known to be correlated with workers' health.^{19–23} Relationships between other factors and health status have also been discussed, such as shift work,^{24 25} job demands and controls,²⁶ effort-reward imbalance,²⁷ organisational justice,²⁸ and social

support from supervisors and colleagues.²⁹ Although the biological mechanisms by which these work-related psychosocial factors influence the health of workers are not currently clear, they could be partially explained by a poor metabolism.¹⁶ In many systematic reviews and meta-analyses, it has been suggested that these work-related psychosocial factors are significant risk factors for metabolic syndrome components, including blood pressure and hypertension,^{30 31} weight gain and obesity,^{32 33} and blood glucose and impaired glucose tolerance,³⁴ but insignificant for blood lipids and dyslipidaemia.^{34 35}

However, there have been few systematic reviews and/or meta-analyses conducted regarding the relationship between work-related psychosocial factors and metabolic syndrome as an aggregated cluster, defined by the international clinical criteria.^{1–5} In a previous systematic review conducted by Bergmann *et al*,³⁶ a positive relationship between chronic psychosocial stress and the incident of metabolic syndrome was suggested based on 39 prospective studies. However, they did not statistically synthesise the relationship. In addition, they included studies that targeted both the working and non-working populations, and adopted general stressors as exposures and each metabolic syndrome component as an outcome. Another systematic review and meta-analysis³⁷ only focused on a positive association between night shift work and metabolic syndrome and included both prospective, retrospective and cross-sectional studies in the review. Additional systematic reviews and meta-analyses are necessary to obtain a more comprehensive understanding and stronger evidence regarding the association between work-related psychosocial factors and the onset of metabolic syndrome among workers.

The objective of this study is to evaluate published prospective studies in order to investigate this association. To the best of our knowledge, this will be the first systematic review and meta-analysis conducted specifically to analyse this association among the working population. We hypothesised that adverse work-related psychosocial factors would elevated the onset probability of metabolic syndrome among workers.

METHODS AND ANALYSIS

Study design

This is a systematic review and meta-analysis protocol of prospective cohort studies, following the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-Analysis protocols) guideline.³⁸ The systematic review and meta-analysis will be reported according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline.³⁹ The study protocol was registered at PROSPERO (CRD42016039096).

Eligibility criteria

The participants, exposures, comparisons and outcomes (PECO) of the studies in this systematic review and meta-analysis were defined as follows: (P) inclusion

of all workers, (E) presence of adverse work-related psychosocial factors, (C) absence of adverse work-related psychosocial factors, and (O) the onset of metabolic syndrome. We targeted all employed workers as participants. There will be no exclusion criteria for workers according to employment status, job type and shift type. The adverse work-related psychosocial factors (ie, study exposures) included a wide range of task and organisational characteristics, work conditions, and workplace interaction,⁴⁰ such as job strain, effort-reward imbalance, working hours, shift work, low social support and other organisational-level factors. The comparisons will be defined as preferable conditions for these psychosocial factors. The diagnostic standards for metabolic syndrome (ie, study outcome) that were used in this study were defined by several international institutions, such as the WHO,^{1 2} the National Cholesterol Education Program,³ the American Heart Association/National Heart, Lung, and Blood Institute,⁴ and the International Diabetes Foundation.⁵

Studies that (1) were conducted to evaluate the association between work-related psychosocial factors and the onset of metabolic syndrome, (2) used a longitudinal or prospective cohort design, (3) were conducted among workers, (4) provided sufficient data for calculating the ORs or relative risks (RRs) with 95% CIs, (5) were published as original articles written in English or Japanese, and (6) have been published until the end of 2016 will be included in this systematic review and meta-analysis.

Information source, search strategy and data management

Published studies will be searched using the following electronic databases: PubMed, EMBASE, PsycINFO, PsycARTICLES and Japan Medical Abstracts Society. The search terms will include words related to the PECO of the studies. The search strategy that will be conducted is shown in online supplementary appendix 1. All identified studies will be managed within a Microsoft Excel (Washington, USA) file. Prior to screening the studies, deduplication within this Excel file will be conducted by KI. Decisions on all studies will be recorded.

Study selection process

Nine investigators (ASakuraya, KW, KI, EA, YA, HE, YK, NN and HA) will independently conduct the screening of studies according to the eligibility criteria. Duplicated citations will be excluded. The titles and abstracts will be screened according to the eligibility criteria created earlier in the sifting phase, and the full texts of all eligible studies will be obtained. In the full text review phase, the full texts will be reviewed using a standardised form for assessing eligibility for this study. When resolution cannot be accomplished, the disagreements will be settled by consensus with discussion among all authors. Corresponding authors will be contacted directly if (1) the publication is unclear and may be related to multiple interpretations, or (2) the collected data from the

publication did not show data relevant to our study analysis. The reasons for excluding studies will be recorded. A flow chart will be provided to show the entire review process.

Data collection

Data will be extracted independently from the included studies by nine investigators (ASakuraya, KW, KI, EA, YA, HE, YK, NN and HA) using a standardised data extraction form. Any disagreement or inconsistencies will be solved by consultation and consensus among all authors.

Data will include the number of participants included in the analysis, country where the study was conducted, length of follow-up, year of publication, number of participants who were excluded or lost to follow-up, demographic characteristics of participants (ie, mean age, sex proportions and employment status), sample size, exposure variables (ie, adverse psychosocial factors at work), diagnostic criteria for metabolic syndrome, number and proportion with metabolic syndrome, and sufficient data for calculating ORs or RRs with 95% CIs for the association between adverse work-related psychosocial factors and the onset of metabolic syndrome. This extraction form will be piloted and modified as required. When multiple ORs or RRs were reported in the included studies, we preferentially selected ORs or RRs adjusted by demographic variables (eg, age, sex, educational status and marital status) and lifestyle variables (eg, smoking, physical activity and sleep). ORs or RRs adjusted by other adverse work-related psychosocial factors and/or metabolic syndrome components will not be adopted in the systematic review and meta-analysis because of overadjustment. Sex-stratified ORs or RRs were selected for our study if those were the only reported measures of association. Relevant research teams will be contacted about the possibility of obtaining any missing data from the studies.

Assessment of study quality

Nine investigators (ASakuraya, KW, KI, EA, YA, HE, YK, NN and HA) will independently assess each selected study for study quality using the Newcastle-Ottawa Quality Assessment Scale (NOS).⁴¹ The NOS evaluates cohort studies based on eight items categorised into the following three groups: (1) selection of the study cases, (2) comparability of the population, and (3) ascertainment of whether the exposure or outcome includes any risk of bias (ie, selection bias or bias from lost to follow-up). The NOS is scored ranging from 0 to 9, and studies with scores ≥ 7 are considered as high quality.⁴² Discrepancy of quality assessment among the investigators will be solved by discussion and consensus among all authors.

Data synthesis and statistical methods

The included studies will be statistically synthesised by a meta-analysis to estimate the pooled risk of work-related psychosocial factors related to metabolic syndrome. We will calculate ORs or RRs transformed to a natural logarithm and estimate its SEs based on the 95% CIs for the

association measures. These parameters will be used for the meta-analysis and required for examining publication bias using a funnel plot and the Egger's test.²³ We will use a random effect model to sum the results of the studies⁴³ using Stata V.12 (LightStone, Tokyo, Japan). The results will be summed in a narrative format if conducting a meta-analysis is not appropriate or possible. Heterogeneity will be assessed by the χ^2 test on Cochrane's Q statistic, which is calculated into I^2 values⁴⁴ assuming that I^2 values of 25%, 50% and 75% indicate low, medium and high heterogeneity, respectively.

Subgroup and sensitivity analyses will also be conducted to compare the results across subgroups or under specific conditions when sufficient heterogeneity is detected. Major grouping characteristics will include sex, age, employment status, occupational groups and work-related physical activity,^{45 46} and study quality. Any subgroup differences will be reported, and our findings will be explained by considering these differences. A possible sensitivity analysis will be conducted for included studies that only scored as high quality according to the NOS (≥ 7).

All the collected data and analysed results will be deposited by the corresponding author and available upon requests by external reviewers and readers.

ETHICS AND DISSEMINATION

This systematic review and meta-analysis is based on previously published studies and therefore, the study does not require ethical approval. Results and Findings will be submitted and published in a scientific peer-reviewed journal.

STRENGTHS AND LIMITATIONS

To the best of our knowledge, this systematic review and meta-analysis will be the first study to offer the strongest evidence regarding the association between work-related psychosocial factors and metabolic syndrome because we targeted only prospective studies. Considering the high incidence of metabolic syndrome among the working population, the findings from the study will be useful for public and occupational health, particularly for assessing metabolic syndrome risk factors in the workplace, and determining approaches for prevention of metabolic syndrome in the future. However, a limitation of this study will be confounding factors that were not adjusted for in the selected studies. In addition, our study findings will not be generalisable to other countries or populations.

Correction notice This paper has been amended since it was published Online First. Owing to a scripting error, some of the publisher names in the references were replaced with 'BMJ Publishing Group'. This only affected the full text version, not the PDF. We have since corrected these errors and the correct publishers have been inserted into the references.

Contributors ASakuraya, KW, NK, KI, EA, YA, HE, YK, NN, HA, AShimazu and AT have made substantial contributions to the conception and design, writing of the protocol and revising it critically for important intellectual content, and approving the final

version to be published. All authors will be involved in the entire study process (ie, data collection, assessment and synthesis).

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