Meta Analysis

1-Do Meta-Analyses of Total Hip Arthroplasty Produce Reliable Results? A Systematic Review and Meta-Epidemiological Study of Statistical Methods

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Abstract

BackgroundTotal hip arthroplasty (THA) is a highly successful orthopedic procedure, with numerous meta-analyses published to optimize its outcomes. However, the reliability of their results and conclusions depends heavily on the use of appropriate statistical methods. Therefore, the aim was to test the reliability of statistical methods in meta-analyses of THA by examining the degree of heterogeneity, the effect of different between-study variance estimators, and the equality of sample size of pooled primary studies.MethodsThe literature was systematically searched in PubMed from January 1, 2022, to December 31, 2023, for meta-analyses on THA. The quality of the meta-analyses was assessed using the revised Measurement Tool to Assess Systematic Reviews (AMSTAR 2). All meta-analyses were recalculated using eight different heterogeneity estimators. The following indicators were considered: inequality of patient numbers, proportion of random-effects and fixed-effects models, heterogeneity with I2 value, ratio of effect sizes (RES), ratio of confidence interval width (RCIW), and the number of significant results. Mixed linear regression was then used to analyze whether the effect sizes and CIW were significantly different using different heterogeneity estimators. Finally, all examined meta-analyses were recalculated using the eight heterogeneity estimators and the Hartung-Knapp (HK) adjustment.ResultsOf the 24 meta-analyses examined, 15 reported an outcome using a mean difference and 20 reported an outcome using an odds ratio. The quality assessment identified 10 meta-analyses of high quality, 7 of moderate quality, 4 of low quality, and 3 of critically low quality. The significance of the examined meta-analyses varied considerably depending on the heterogeneity estimators used. In particular, the DerSimonian and Laird and Hunter-Schmidt heterogeneity estimators tended to produce false-positive results. The meta-analyses examined generally did not use HK adjustment. This effect is amplified when combined with the weak DerSimonian and Laird heterogeneity estimator, which were used in almost all examined meta-analyses.ConclusionWithout HK adjustment, the results depend strongly on the heterogeneity estimator chosen and there is a risk of false positives, especially for the widely used DerSimonian and Laird heterogeneity estimator. For HK adjustment, the choice of heterogeneity estimator seems to play a less important role. We recommend the use of more reliable heterogeneity estimators as well as the HK adjustment as a measure to improve the statistical methodology of meta-analyses. This study highlights the critical need for improved statistical rigor in meta-analyses of THA, ensuring more reliable evidence for clinical decision-making and guideline development.

Keywords

Meta Analysis

Author Keywords
heterogeneityheterogeneity estimatormeta-analysesstatistics

Keywords Plus
VARIANCE-ESTIMATION

2-Meta-analysis accelerator: a comprehensive tool for statistical data conversion in systematic reviews with meta-analysis

By Abbas, A (Abbas, Abdallah) [1] ; Hefnawy, MT (Hefnawy, Mahmoud Tarek) [2] ; Negida, A (Negida, Ahmed) [2] , [3] (provided by Clarivate) Source BMC MEDICAL RESEARCH METHODOLOGY Volume 24 Issue 1 DOI 10.1186/s12874-024-02356-6 Article Number 243 Published OCT 18 2024 Indexed 2024-10-29 Document Type Article

Abstract

BackgroundSystematic review with meta-analysis integrates findings from multiple studies, offering robust conclusions on treatment effects and guiding evidence-based medicine. However, the process is often hampered by challenges such as inconsistent data reporting, complex calculations, and time constraints. Researchers must convert various statistical measures into a common format, which can be error-prone and labor-intensive without the right tools.ImplementationMeta-Analysis Accelerator was developed to address these challenges. The tool offers 21 different statistical conversions, including median & interquartile range (IQR) to mean & standard deviation (SD), standard error of the mean (SEM) to SD, and confidence interval (CI) to SD for one and two groups, among others. It is designed with an intuitive interface, ensuring that users can navigate the tool easily and perform conversions accurately and efficiently. The website structure includes a home page, conversion page, request a conversion feature, about page, articles page, and privacy policy page. This comprehensive design supports the tool's primary goal of simplifying the meta-analysis process.ResultsSince its initial release in October 2023 as Meta Converter and subsequent renaming to Meta-Analysis Accelerator, the tool has gained widespread use globally. From March 2024 to May 2024, it received 12,236 visits from countries such as Egypt, France, Indonesia, and the USA, indicating its international appeal and utility. Approximately 46% of the visits were direct, reflecting its popularity and trust among users.ConclusionsMeta-Analysis Accelerator significantly enhances the efficiency and accuracy of meta-analysis of systematic reviews by providing a reliable platform for statistical data conversion. Its comprehensive variety of conversions, user-friendly interface, and continuous improvements make it an indispensable resource for researchers. The tool's ability to streamline data transformation ensures that researchers can focus more on data interpretation and less on manual calculations, thus advancing the quality and ease of conducting systematic reviews and meta-analyses.

Keywords

Author Keywords

Meta-analysisStatistical conversionData transformationResearch toolSystematic reviewData analysisMedical statisticsMeta converterMeta-analysis accelerator

Meta Analysis

3-Global prevalence and contributing factors of nurse burnout: an umbrella review of systematic review and meta-analysis

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Abstract

IntroductionNurse burnout negatively impacts patient care quality, safety, and outcomes, while harming nurses' mental health, job satisfaction, and retention. It also imposes financial burdens on healthcare organizations through absenteeism, reduced productivity, and higher turnover costs, highlighting the need for research to address these challenges. The umbrella review methodology was selected to integrate evidence from multiple systematic reviews and meta-analyses, offering a broad and in-depth summary of existing research to guide practice and policy. This approach equips stakeholders with a holistic understanding of the multifaceted impacts of nurse burnout, facilitating the design of effective interventions that support nurses, enhance healthcare delivery, and optimize patient outcomes. Consequently, this umbrella review aims to evaluate the global prevalence and contributing factors of nurse burnout.MethodsThis umbrella review included 14 systematic reviews and meta-analyses identified from various databases. The quality of each study was assessed using the Assessment of Multiple Systematic Reviews (AMSTAR II). Data were extracted using Microsoft Excel and analyzed with STATA 17.0. Heterogeneity was measured using Higgin's I2 Statistics, and summary prevalence estimates were calculated with the Der Simonian-Laird random-effects model. Meta-regression and subgroup analyses were conducted to identify the source of high heterogeneity. Publication bias was assessed using funnel plots and Egger's regression test, with the former providing a visual assessment of bias and the latter offering a statistical method to detect asymmetry.ResultsThe global prevalence of nurse burnout was evaluated in three areas: emotional exhaustion (33.45%, 95% CI 27.31-39.59), depersonalization (25.0%, 95% CI 17.17-33.00), and low personal accomplishment (33.49%, 95% CI 28.43-38.55). Emotional exhaustion was most common among nurses working during the COVID-19 pandemic (39.23%, 95% CI 16.22-94.68). Oncology nurses experienced the highest rate of depersonalization (42%, 95% CI 16.71-77.30), while nurses in intensive care units reported the highest rate of low personal accomplishment (46.02%, 95% CI 43.83-48.28).ConclusionsNurse burnout is prevalent worldwide, often marked by a sense of low personal accomplishment. Several factors contribute to this issue, including role conflict, negative emotions, family problems, moral distress, stress, commuting distance, predictability of work tasks, and workplace advancement.

Keywords
Author Keywords
NurseBurnoutDeterminant factorsAnd umbrella review
Keywords Plus IMPACT

4-Long-Term Exposure to Particulate Matter and Mortality: An Update of the WHO Global Air Quality Guidelines Systematic Review and Meta-Analysis

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By Orellano, P (Orellano, Pablo) [1] ; Kasdagli, MI (Kasdagli, Maria-Iosifina) [2] ; Velasco, RP (Perez Velasco, Roman) [3] ; Samoli, E (Samoli, Evangelia) [2] (provided by Clarivate) Source INTERNATIONAL JOURNAL OF PUBLIC HEALTH Volume 69 DOI 10.3389/ijph.2024.1607683 Article Number 1607683 Published SEP 27 2024 Indexed 2024-10-17 Document Type Review

Abstract

Objectives For the development of the 2021 global air quality guidelines, the World Health Organization (WHO) commissioned a series of systematic reviews and meta-analyses to assess the association between exposure to air pollution and all-cause and cause-specific mortality. One of these reviews, which we aim to update, focused on the effects of long-term exposure to PM2.5 and PM10 on all-cause and cause-specific mortality.Methods The protocol for this study was registered in PROSPERO (CRD42023425327). We searched the PubMed and Embase databases for studies published between September 2018 and May 2023. Study-specific effects were pooled using random-effects models.Results We included 106 studies in the meta-analysis, 46 studies from the previous review and 60 from this update. All exposure-outcome pairs analysed showed positive and significant associations, except for PM10 and cerebrovascular mortality. The certainty of the evidence was rated as high for the majority of exposure-outcome pairs.Conclusion We included a large number of new cohorts, and provided new concentration-response functions that will inform WHO advice on the use of this information for air pollution health risk assessments.

Keywords
Author Keywords
air pollutionparticulate mattermortalitysystematic reviewmeta-analysis

Keywords Plus
ALL-CAUSE MORTALITYCARDIOVASCULAR-DISEASEPOLLUTIONCOHORTPM2.5RISK

Meta Analysis

5-Ultra-processed food exposure and adverse health outcomes: umbrella review of epidemiological meta-analyses

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Abstract

OBJECTIVE To evaluate the existing meta-analytic evidence of associations between exposure to ultra-processed foods, as defined by the Nova food classification system, and adverse health outcomes. DESIGN Systematic umbrella review of existing meta-analyses. DATA SOURCES MEDLINE, PsycINFO, Embase, and the Cochrane Database of Systematic Reviews, as well as manual searches of reference lists from 2009 to June 2023. ELIGIBILITY CRITERIA FOR SELECTING STUDIES Systematic reviews and meta-analyses of cohort, case -control, and/or cross sectional study designs. To evaluate the credibility of evidence, pre-specified evidence classification criteria were applied, graded as convincing ("class I"), highly suggestive ("class II"), suggestive ("class III"), weak ("class IV"), or no evidence ("class V"). The quality of evidence was assessed using the GRADE (Grading of Recommendations, Assessment, Development, and Evaluations) framework, categorised as "high," "moderate," "low," or "very low" quality. RESULTS The search identified 45 unique pooled analyses, including 13 dose -response associations and 32 nondose -response associations (n=9 888 373). Overall, direct associations were found between exposure to ultra-processed foods and 32 (71%) health parameters spanning mortality, cancer, and mental, respiratory, cardiovascular, gastrointestinal, and metabolic health outcomes. Based on the pre-specified evidence classification criteria, convincing evidence (class I) supported direct associations between greater ultraprocessed food exposure and higher risks of incident cardiovascular disease related mortality (risk ratio 1.50, 95% confidence interval 1.37 to 1.63; GRADE=very low) and type 2 diabetes (dose -response risk ratio 1.12, 1.11 to 1.13; moderate), as well as higher risks of prevalent anxiety outcomes (odds ratio 1.48, 1.37 to 1.59; low) and combined common mental disorder outcomes (odds ratio 1.53, 1.43 to 1.63; low). Highly suggestive (class II) evidence indicated that greater exposure to ultra-processed foods was directly associated with higher risks of incident all cause mortality (risk ratio 1.21, 1.15 to 1.27; low), heart disease related mortality (hazard ratio 1.66, 1.51 to 1.84; low), type 2 diabetes (odds ratio 1.40, 1.23 to 1.59; very low), and depressive outcomes (hazard ratio 1.22, 1.16 to 1.28; low), together with higher risks of prevalent adverse sleep related outcomes (odds ratio 1.41, 1.24 to 1.61; low), wheezing (risk ratio 1.40, 1.27 to 1.55; low), and obesity (odds ratio 1.55, 1.36 to 1.77; low). Of the remaining 34 pooled analyses, 21 were graded as suggestive or weak strength (class III -IV) and 13 were graded as no evidence (class V). Overall, using the GRADE framework, 22 pooled analyses were rated as low quality, with 19 rated as very low quality and four rated as moderate quality. CONCLUSIONS Greater exposure to ultra-processed food was associated with a higher risk of adverse health outcomes, especially cardiometabolic, common mental

disorder, and mortality outcomes. These findings provide a rationale to develop and evaluate the effectiveness of using population based and public health measures to target and reduce dietary exposure to ultra-processed foods for improved human health. They also inform and provide support for urgent mechanistic research.

Keywords

Keywords Plus

OBSERVATIONAL RESEARCHNUTRITIONOBESITYBIASINDIVIDUALSCONSUMPTIONPRODUCTSGUIDANCECANCERSAMPLE