Pre-existing allergic diseases as risk factors for long-term Long-COVID symptoms: a systematic review of prospective cohort studies

Doreen Wolff[1], Karl Philipp Drewitz[1], Angela Ulrich[1], Doreen Siegels[2], Stefanie Deckert[2], Antonia Anabella Sprenger[1], Paula Ricarda Kuper[1], Jochen Schmitt[2], Daniel Munblit[3], and Christian Apfelbacher[1]

[1]Otto von Guericke Universitat Magdeburg Institut fur Sozialmedizin und Gesundheitsokonomie
[2]Universitatsklinikum Carl Gustav Carus Zentrum fur Evidenzbasierte Gesundheitsversorgung
[3]King's College London - Waterloo Campus

June 14, 2023

Abstract

Background: The role of allergy as risk factor for Long-COVID (LC) is unclear. We aimed to systematically review and appraise the epidemiological evidence on allergic diseases as risk factors for LC (PROSPERO: CRD42023391245). Methods: We examined literature for prospective cohort studies with a follow-up duration of 12 months for LC symptoms, published within the timeframe from January 2020 and January 2023 that recruited individuals with confirmed SARS-CoV-2 infection and information on pre-existing allergic diseases. Risk of bias and certainty of evidence were assessed (GRADE). Random effects meta-analyses were used to pool unadjusted ORs within homogeneous data subsets. Results: We identified 13 studies (participants range = 39 - 1,950), all of which were associated with high risk of bias. Four of these studies did not provide data to calculate ORs. Significant associations were observed between increased LC incidences and pre-existing asthma measured in hospital-based populations ($n = 6$) and pre-existing rhinitis ($n = 3$) ($OR = 1.94$; 95% CI [1.08, 3.50]; $OR = 1.96$; 95% CI [1.61, 2.39]), respectively. However, the level of certainty regarding these exposure outcome associations was very low. Conclusion: Findings show that allergies may increase the risk of LC, although the reliability of this evidence is tenuous.

Hosted file

`SR_allergy_LC_20230613.docx` available at https://authorea.com/users/628611/articles/649164-pre-existing-allergic-diseases-as-risk-factors-for-long-term-long-covid-symptoms-a-systematic-review-of-prospective-cohort-studies

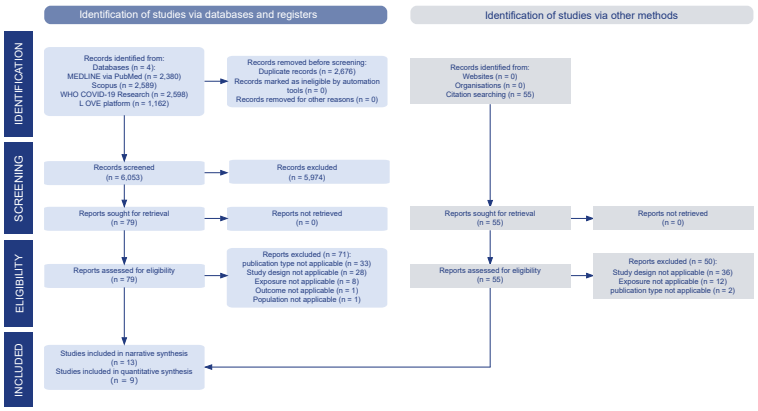

Figure 1: Overall PRISMA flow diagram. Study flow chart illustrating the selection of evidence.

Figure 1_Wolff et al.

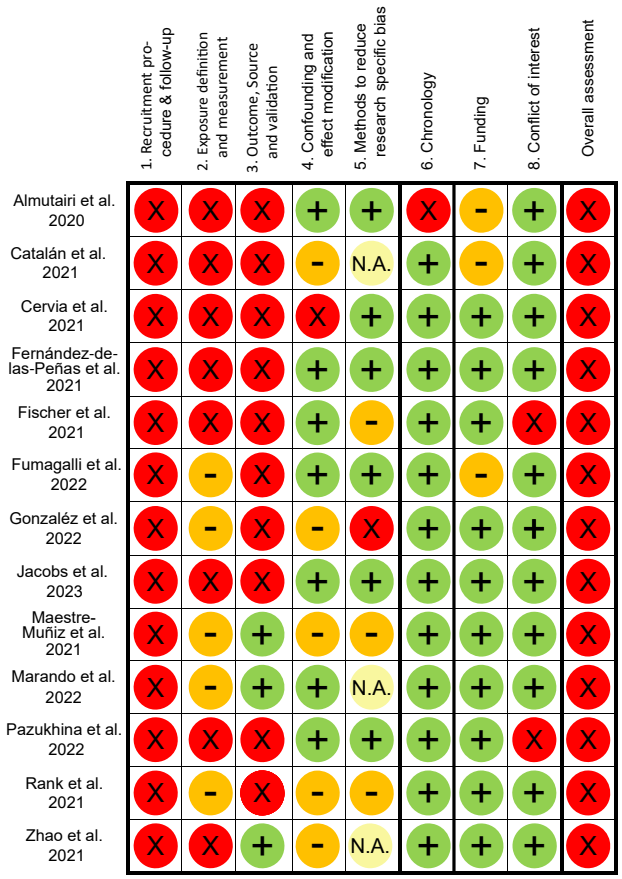

Figure 2: Risk of bias assessment.
Green/+: low risk of bias; orange/-: unclear risk of bias; red/x: high risk of bias; bright yellow/N.A.: item not applicable. In order for a study to have an overall low risk of bias, every major domain for risk of bias would have to be rated as low risk. If one of the major domains for risk of bias was rated as either high risk or unclear risk, the study was considered to have a high overall risk of bias.

Figure 2_Wolff et al.

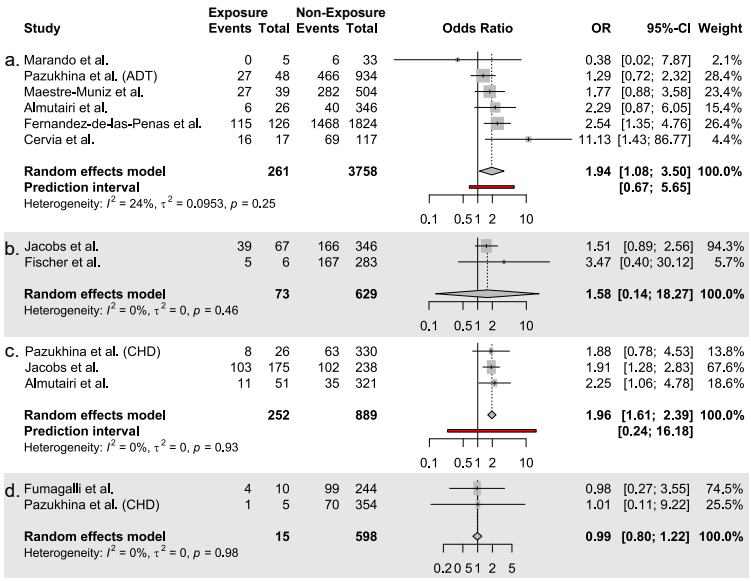

Figure 3: Forest plots resulting from random-effects meta-analyses. Odds ratios > 1 indicate that Long-COVID is more likely to occur in participants in the exposure group, i.e. participants with pre-existing allergic conditions, than in the non-exposure group. Panel a: Association be-tween pre-existing asthma measured in a hospital-based population and incidences of Long-COVID. Panel b: Association between pre-existing asthma measured in the general population and incidences of Long-COVID. Panel c: Association between pre-existing rhinitis and inci-dences of Long-COVID. Panel d: Association between pre-existing allergies and incidences of Long-COVID. ADT = adults. CHD = children. CI = confidence interval. OR = odds ratio.

Figure 3_Wolff et al.

MOOSE (Meta-analyses Of Observational Studies in Epidemiology) Checklist

A reporting checklist for Authors, Editors, and Reviewers of Meta-analyses of Observational Studies. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Reporting Criteria	Reported (Yes/No)	Reported on Page No.
Reporting of Background		
Problem definition	Yes	p.4-5
Hypothesis statement	Yes	p.5
Description of Study Outcome(s)	Yes	p.6
Type of exposure or intervention used	Yes	p.6
Type of study design used	Yes	p.6
Study population	Yes	p.6
Reporting of Search Strategy		
Qualifications of searchers (eg, librarians and investigators)	Yes	p.5
Search strategy, including time period included in the synthesis and keywords	Yes	p.5, S1-S4
Effort to include all available studies, including contact with authors	Yes	p.5
Databases and registries searched	Yes	p.5
Search software used, name and version, including special features used (eg, explosion)	Yes	p.5
Use of hand searching (eg, reference lists of obtained articles)	Yes	p.5
List of citations located and those excluded, including justification	Yes	S5,S6
Method for addressing articles published in languages other than English	Yes	p.6
Method of handling abstracts and unpublished studies	Yes	S1,S2
Description of any contact with authors	Yes	p.6
Reporting of Methods		
Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	Yes	p.6
Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	Yes	p.6
Documentation of how data were classified and coded (eg, multiple raters, blinding, and interrater reliability)	Yes	p.6-7
Assessment of confounding (eg, comparability of cases and controls in studies where appropriate	Yes	p.7

Reporting Criteria	Reported (Yes/No)	Reported on Page No.
Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results	Yes	p.7
Assessment of heterogeneity	Yes	p.8
Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated	Yes	p.7-8
Provision of appropriate tables and graphics	Yes	Table 1-3, Fig 1
Reporting of Results		
Table giving descriptive information for each study included	Yes	Table 1
Results of sensitivity testing (eg, subgroup analysis)	Yes	S1
Indication of statistical uncertainty of findings	Yes	Fig 3
Reporting of Discussion		
Quantitative assessment of bias (eg, publication bias)	No	not applicable
Justification for exclusion (eg, exclusion of non–English-language citations)	Yes	S5
Assessment of quality of included studies	Yes	p.11
Reporting of Conclusions		
Consideration of alternative explanations for observed results	Yes	p.14-15
Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature review)	Yes	p.16
Guidelines for future research	Yes	p.15-16
Disclosure of funding source	Yes	p. 2

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.