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Impact of cancer types on COVID-19 infection and mortality risk: a protocol for systematic review and meta-analysis

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ABSTRACT

Introduction The COVID-19 pandemic has created a huge social and economic burden, and the lifestyles of individuals have significantly changed. In addition, the diagnosis, treatment and management of patients with cancer were greatly affected. Studies have shown that patients with cancer are at a higher risk of COVID-19 infection-related complications, which require aggressive preventive measures. Different types of cancer may have different risks of COVID-19 infection and death, and different preventive care measures are needed for different types of patients with cancer. Here, we designed a protocol for systematic review and meta-analysis to explore the impact of cancer types on COVID-19 infection and mortality risk.

Methods and analysis A systematic search plan will be performed to filter the eligible studies in the seven databases, namely PubMed, Cochrane search strategy, EMBASE search strategy, SinoMed, China National Knowledge Infrastructure, China Science and Technology Journals Database, and Wanfang database from 2019 to 10 August 2021. Two independent reviewers will choose the eligible studies and extract the data. The risk of bias will be evaluated based on the Newcastle-Ottawa Scale recommended by the Cochrane Collaboration. Finally, a systematic review and meta-analysis will be performed using Review Manager (V.5.3) statistical software.

Ethics and dissemination Formal ethical approval is not required, and the findings will be published in a peer-reviewed journal.

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STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The methodology of this review will comprehensively assess published studies on the risk and mortality of COVID-19 in patients with different cancers.
⇒ A careful search of seven Chinese and English databases will be performed to ensure a comprehensive review. Reviews will follow the guidelines and use proven tools to assess the quality of the included articles to minimise bias.
⇒ Two independent reviewers will screen, extract data and assess their quality.
⇒ Potential study limitations of the study may be the limitation of language. Studies published in languages other than English or those in Chinese may be excluded.

INTRODUCTION

COVID-19, caused by SARS-CoV-2, has spread rapidly globally since it emerged in China in December 2019.[1] As of 1 October 2021, there have been more than 230 million confirmed cases of COVID-19 worldwide and more than 4.7 million deaths, as reported by the WHO.[2] COVID-19 has emerged as one of the most serious public threats globally, creating an increased social and economic burden, as well as a significant impact on diagnostic, treatment and psychological effects on patients with cancer.[3–6] COVID-19 is mild to moderate in most individuals who were healthy before the infection, but in some cases, it can lead to life-threatening illness for some important determinants of disease, such as age and immune deficiency.[7] According to research reports, patients with cancer may be at risk of being more susceptible to COVID-19, more likely to develop severe symptoms and higher mortality than non-cancer individuals.[8–11] Patients with cancer infected with COVID-19 are characterised by the high rates of hospitalisation and severe outcomes.[12] Participants with cancer had a 60% increased risk of testing positive for COVID-19 compared with individuals without cancer, and those who currently received chemotherapy or immunotherapy had a 2.2-fold increased risk of a positive test.[13] The increased risk of patients with cancer undergoing anticancer therapy during the COVID-19 pandemic depends largely on the risk of COVID-19 over the course of the anticancer therapy and the risk of serious complications or death during cancer treatment.[14] Furthermore, patients with cancer need aggressive preventive care and surveillance to detect COVID-19 infection early. Different types of cancers may differ in their COVID-19 infection risk and mortality; therefore, management and care measures for

different types of cancer may also be different during the COVID-19 epidemic. Further studies are needed to identify the COVID-19 infection risk and adverse outcomes based on cancer type.

Some studies have examined the risk of infection and death due to COVID-19 in patients with cancer. To our knowledge, although there is a systematic review of the risk and prognosis of COVID-19 infection in patients with cancer in 2020,[15] there is no relatively new systematic review of the impact of COVID-19 infection risk and mortality in different types of cancer.

METHODS

This systematic review and meta-analysis will be performed in compliance with the MOOSE statement. The protocol follows the guidelines and recommendations of the systematic review and meta-analysis priority report item (Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols 2015 statement).[16]

Patient and public involvement

No patient was involved.

Inclusion/exclusion criteria for study selection

Study designs and characteristics

We will include case–control and cohort studies. These studies should report the impact of cancer on COVID-19, including the types of cancer and the incidence and mortality from COVID-19 infections in patients with cancer. The systematic review will be conducted using the PECO(T) approach (participants, exposure, comparator, outcomes and type of study). PECO(T) provides a framework from which studies are identified and selected for inclusion.

Population: Patients with cancer infected with COVID-19.

Exposure: The exposure factor is infection with COVID-19, primarily diagnosed by RT-PCR using a nasal swab, tracheal aspirate or bronchoalveolar lavage specimens.

Comparators: Non-cancer patients infected with COVID-19; patients with cancer with matched type but without COVID-19 infection.

Outcomes: Prevalence of COVID-19 in patients with cancer and mortality from COVID-19 infection in patients with cancer.

Type of study: Case–control and cohort studies

Exclusion criteria

We will also exclude the following: (1) studies which results could not be pooled through calculation; (2) case reports, case series, duplicate reports, and in vitro and animal studies; (3) studies which full text was not available and (4) studies not relevant to the subject.

Search strategy and study selection

Two independent reviewers will search PubMed, Cochrane, EMBASE, SinoMed, China National Knowledge Infrastructure, China Science and Technology Journals Database and Wanfang Database. We will use the MeSH/Emtree terms combining free-text words, such as cancer, novel coronavirus-infected pneumonia, COVID-19 and SARS-CoV-2, which will be properly adjusted for the different databases. The search terms in the Chinese databases will be translations of the above words. We will limit the search language to English and Chinese, with no restrictions on the country or publication status. To ensure a comprehensive search, the latest research references will be manually screened to identify eligible studies.

There are slightly different search strategies for the aforementioned databases. We will use the specific search strategy in PubMed as a typical example, and the specific retrieval steps are shown in box 1.

Box 1 Search strategy in PubMed database

Search items

1. Neoplasms. MeSh.
2. Cancer* .ti.ab.
3. Tumor* .ti.ab.
4. Carcinoma*. ti.ab.
5. Neoplas*. ti.ab.
6. Oncolog* .ti.ab.
7. Metastas*. ti.ab.
8. Malign*. ti.ab.
9. 1 or 2–8
10. COVID-19. MeSh.
11. 19 novel coronavirus disease.ti.ab.
12. 19-nCoV.ti.ab.
13. SARS-CoV-2.ti.ab.
14. 10 or 11–13
15. 9 and 14

Data collection and management

We will use Endnote (V.X9) to manage the retrieved results and perform screening. After removing duplicates, the selected studies will be independently reviewed by two researchers based on the inclusion and exclusion criteria. Preliminary screening is performed based on the title and abstract, and the remaining studies are screened based on their full text for final eligibility. If there is disagreement regarding the selection, we can reach a consensus through discussion or consultation with a third reviewer.

Data extraction

Two researchers will independently extract data using a standardised Excel spreadsheet. A standardised data form will be used to extract the following information: author name, year of publication, country, study design and population, sample size, cancer types, number and incidence of COVID-19 patients with cancer, number of deaths and mortality from COVID-19 infection in patients with cancer, and statistical adjustment of confounding factors.

Quality and bias assessment

The Newcastle-Ottawa Scale (NOS) recommended by the Cochrane Collaboration will be used to evaluate the methodological quality for assessing the quality of case–control and cohort studies.[17] The evaluation content includes three parts: selection, comparability and exposure/outcome. There are eight items in this scale, with a total score of 9. NOS scores greater than 6 are of relatively high quality, 5–6 for medium quality and less than 5 for low quality. Quality assessments will be performed by two researchers and any discrepancies will be resolved by discussion or consensus.

Strategy for data synthesis

RevMan (V.5.3) will be used to calculate the ORs and 95% CIs of dichotomous variables. Standardised mean differences or weighted mean differences with 95% CIs will be used for continuous variables. Forest plots will be generated to shown summarised results. Heterogeneity between the included studies will be assessed by the I^2 index. A rough guide to its interpretation is as follows: 0%–40%, mild heterogeneity; 30%–60%, moderate heterogeneity; 50%–90%, substantial heterogeneity and 75%–100%, considerable heterogeneity. When heterogeneity cannot be readily explained, one analytical approach is to incorporate it into a random effects model, such as a fixed-effect model. A sensitivity analysis will be performed to identify the sources of heterogeneity.

Publication bias

Begg's rank correlation test or Egger's linear regression test will be performed to quantitatively determine the publication bias.

Analysis of subgroups or subsets

Predefined subgroups will be analysed based on outcomes, such as study region, study type, sample size and adjustment for confounders.

ETHICS AND DISSEMINATION

This is a protocol for a systematic review and meta-analysis; therefore, ethical approval is not required. The results will be disseminated through the publication of the manuscript in a peer-reviewed journal and national and international presentations.

Contributors All the authors contributed to the preparation of this manuscript. YW and JZ conceived of and designed the study. JZ and ZX contributed equally to protocol drafting and writing. JZ, ZX, JY, TH, NC, JW and LL designed the search and analysis plans.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

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