



Prevalence of Malignancy and Chronic Obstructive Pulmonary Disease among Patients with COVID-19: A Systematic Review and Meta-analysis

Somaye Jamali^{a,*}, Cicilia Marcella^b, Pallavi Prakash^c, Azadeh Moradkhani^d, Ehsan Kasraei^e

^a Department of Internal Medicine, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran

^b Medical Center of Digestive Disease, The Second Affiliated Hospital of Nanjing Medical University, Nanjing, China

^c School of Medicine, Capital Medical University, Beijing, China

^d Department of Internal Medicine, School of Medicine, Bandarabbas University of Medical Sciences, Hormozgan, Iran

^e Department of Cardiology, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran

ARTICLE INFO

Article history:

Received 11 April 2020

Received in revised form 30 May 2020

Accepted 09 June 2020

Available online 17 June 2020

Keywords:

Chronic Obstructive
COVID-19 vaccine
Meta-analysis
SARS-CoV

ABSTRACT

Background and aim: Prevalence malignancy and COPD in the patients infected by COVID-19 has been considered to be of high importance for the health-care laborers. Therefore, the present systematic review and meta-analysis aimed to determine the malignancy prevalence and the chronic obstructive pulmonary disease amongst COVID-19 patients.

Materials and methods: Some electronic databases, PubMed, Cochrane Library, Embase, and ISI have been used to perform systematic literature in May 2020. Then, a software program (Endnote X8) has been utilized for managing the electronic titles. Two reviewers blind and independently extracted data from abstracts and full-text studies. Moreover, the prevalence of malignancies and COPD with 95% CI has been estimated via the inverse variance method and fix effect model of meta-analysis. Also, heterogeneity has been assessed with I² and Chi-square. Consequently, forest plots and Funnel plot have been evaluated with the use of a software program (i.e., Comprehensive Meta-Analysis Stata V16).

Results: A total of 167 potentially relevant titles and abstracts have been found during the electronic and manual search. Finally, ten studies have been included. Prevalence of Malignancy equalled 1.56%, effect size has been (ES 2.04 95% CI -61.03, 65.11. P= 0.95) among the six studies and the total number of patients has been 1595 (915 men, 680 female) with the age range of 20-68 years. No statistically significant difference has been found between studies (p=1.00).

Conclusion: It has been found that malignancy and chronic obstructive pulmonary disease are the most pervasive underlying diseases in patients with COVID-19.

1. Introduction

Rapid expansion and spread of 2019 novel coronavirus (2019-nCoV) infection throughout China, as well as several other nations^[1, 2] have been observed in Wuhan, China, in December 2019. Moreover, the World Health Organization (WHO) reported a modern title for the epidemic disease due to 2019-nCoV called Corona Virus Disease (COVID19) in 11 February 2020. Early studies reported transmission from animals to humans, but studies have illustrated transmission from human to human via the covid-19 through direct contact or droplets.^[3, 4] Like naming for the virus, International Committee on the Taxonomy of Infections has re-named the already temporarily called 2019-nCoV as the severe acute respiratory syndrome (SARS) corona-virus-2, SARS-CoV-2.^[5] So far, 2019-nCoV has affected more than 5,931,963

reported cases according to a new report in the WHO situation report (May 30, 2020).^[6] Therefore, increased risk of morbidity and mortality in pneumonia can be directly related to the Chronic Obstructive Pulmonary Disease (COPD).^[7] Another study demonstrated that immune system disorders, microbial imbalances, changes in local inflammation, persistent mucus production, and the use of inhaled corticosteroids could all contribute to pneumonia.^[8] Studies showed that in patients with COPD, elevated levels of angiotensin-converting enzyme 2 (ACE2) are responsible for the host receptor for COVID-19.^[9] Hence, malignancy weakens the immune system^[10] and increases the risk of developing COVID-19.^[11, 12] Also, knowing the prevalence of malignancy and COPD in the patients infected by COVID-19 is of high importance for the health care laborers. Consequently, this

* Corresponding author. Somaye Jamali

E-mail address: somaye_jamali@yahoo.com

Department of Internal Medicine, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran

<http://doi.org/10.30485/IJSDMS.2020.233746.1062>



systematic review and meta-analysis aimed to determine the chronic obstructive pulmonary disease and malignancy prevalence amongst COVID-19 patients.

2. Materials and methods

Search strategy

From the electronic databases, Embase, ISI, PubMed as well as Cochrane Library have been used to perform systematic literature to May 2020. Therefore, a software program (Endnote X8) has been utilized for managing electronic titles. Searches has been performed with the mesh terms: ("COVID-19 vaccine" [Supplementary Concept]) OR "spike protein, SARS-CoV-2" [Supplementary Concept]) AND "Neoplasms"[Mesh]) AND "Lung Diseases, Obstructive"[Mesh]) AND "Pneumonia"[Mesh]. This systematic review has been conducted based on the key consideration of the Preferred Reporting Items for the Systematic Review and Meta-analysis (PRISMA Statement),^[13] and PICO or PECO strategy (Table1).

Selection criteria

Inclusion criteria

1. Any studies that have reported epidemiological information of COVID-19
2. Any design related to case reports and reviews
3. Full-text
4. Prevalence of malignancies
5. Prevalence of COPD
6. In English

Studies with incomplete reports have been excluded.

Table1. PICO OR PECO strategy

PICO OR PECO strategy	Description
P	Patient: patients with COVID-19
E	Exposure/ Intervention: COVID-19
C	Comparison: different continental
O	Outcome: prevalence of malignancies and COPD

Data Extraction and method of analysis

The data have been extracted from the research included about the study, years, several patients, mean/range of age, the prevalence of malignancies, and COPD. The qualities of the publications have been evaluated with the Newcastle-Ottawa Scale (NOS).^[14] The scale scores ranged from 0 (lowest grade) to 6 (highest grade). For data extraction, two reviewers blind and independently extracted data from the included abstracts and full-text studies. Moreover, the prevalence of malignancies and COPD with 95% CI has been estimated via the inverse variance method and fix effect model of meta-analysis. Furthermore, heterogeneity has been assessed with I^2 and chi-square. Then, forest plots and Funnel plot have been evaluated with the use of a software program (i.e., Comprehensive Meta-Analysis Stata V16).

3. Results

According to the research design, 167 potentially relevant research abstracts and titles have been discovered in our electronic searches. At the first phase of the study selection, 89 research has been found about the topics

and abstracts. Therefore, we thoroughly assessed the complete full-text papers of the rest 65 studies in the second stage and thus 55 publications had been excluded due to the lack of the defined inclusion criteria. Then, ten papers remained in agreement with our inclusion criteria (Figure 1). Table 2 reports the individual studies in this meta-analysis.

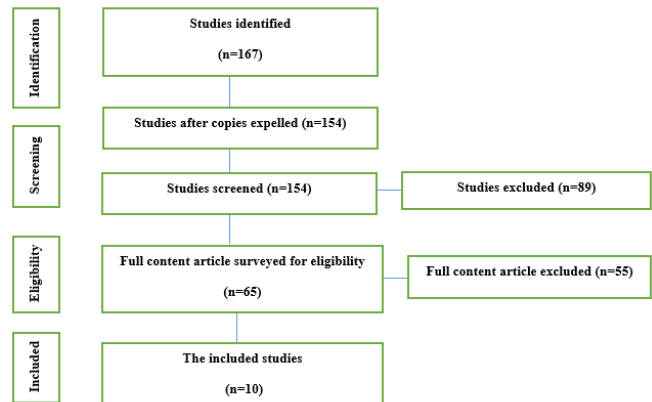


Figure 1. Study Attrition.

Sample size

Therefore, ten studies have been included. The total number of patients has been 2000 (1148 men, 852 female) with the age range of 10-87 years.

Bias assessment

According to the Newcastle-Ottawa Scale, all studies had a moderate risk of bias.

Overall prevalence

Prevalence of malignancy amongst the COVID-19 patients

Malignancy prevalence equalled 1.56% with an effect size of (ES 2.04 95% CI -61.03, 65.11. $P=0.95$) among the six studies and the total number of patients has been 1595 (915 men, 680 female) with the age range of 20-68 years. Heterogeneity has been found to be ($I^2 = 0\%$; $P=1.00$) (Figure2). Moreover, no statistically significant difference has been found for the prevalence of malignancy among patients with COVID-19. Also, there has been no statistically significant difference between the studies ($p=1.00$). Figure 3 displays the Funnel plot of prevalence of malignancy among patients with COVID-19.

Prevalence of the chronic obstructive pulmonary disease amongst the COVID-19 patients

According to the analyses, the prevalence of the chronic obstructive pulmonary disease has been 2.26% with an effect size of (ES 10.50 95% CI -11.28, 32.29. $P=0.95$) among the eight studies and a total number of patients equalled 1764 (1020 men, 744 female) with the age range of 10-87 years. Heterogeneity has been found ($I^2 = 0\%$; $P=1.00$) (Figure 4). There has been no statistically significant difference for the prevalence of the chronic obstructive pulmonary disease amongst the COVID-19 patients. Moreover, there has been no statistically significant difference between studies ($p=1.00$). Figure 5 depicts the Funnel plot of the prevalence of the chronic obstructive pulmonary disease amongst COVID-19 patients.

Table 1. Studies included systematic review and meta-analysis.

Study. Years	Sample size		Range and the mean of age	Malignancy	Chronic obstructive pulmonary disease	Bias assessment
	Male	Female				
Huang et al. 2020 ^[11]	30	11	Range: 41-58	1	1	3/6
Guan et al. 2020 ^[15]	640	459	Range: 35-58	10	12	4/6
Zhang et al. 2020 ^[16]	71	69	Range: 25-87	NA	2	3/6
Chen et al. 2020 ^[17]	67	32	Mean: 55.5 ±13.1	1	NA	3/6
Liu et al. 2020 ^[18]	61	76	Range: 20-83	2	NA	3/6
Wang et al. 2020 ^[19]	78	63	Range: 42-68	10	4	4/6
Xu et al. 2020 ^[20]	35	27	Range: 32-52	NA	1	3/6
Zhou et al. 2020 ^[21]	119	72	46.0–67.0	NA	6	3/6
Wei et al. 2020 ^[22]	39	39	33-57	4	2	3/6
Liu et al. 2020 ^[23]	8	4	10-72	NA	12	3/6

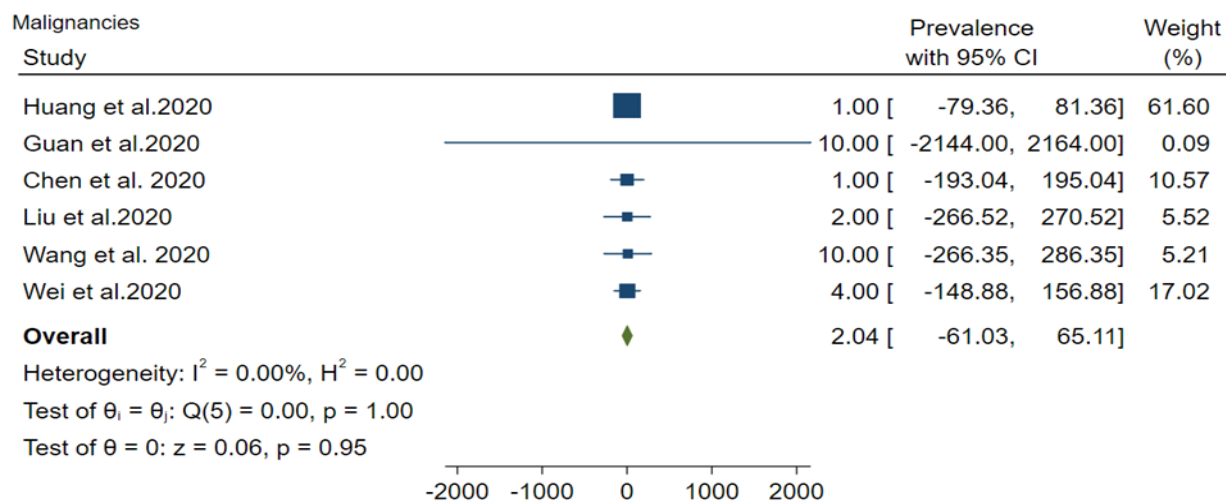


Figure 2. Forest plots showed the malignancy prevalence amongst COVID-19 patients.

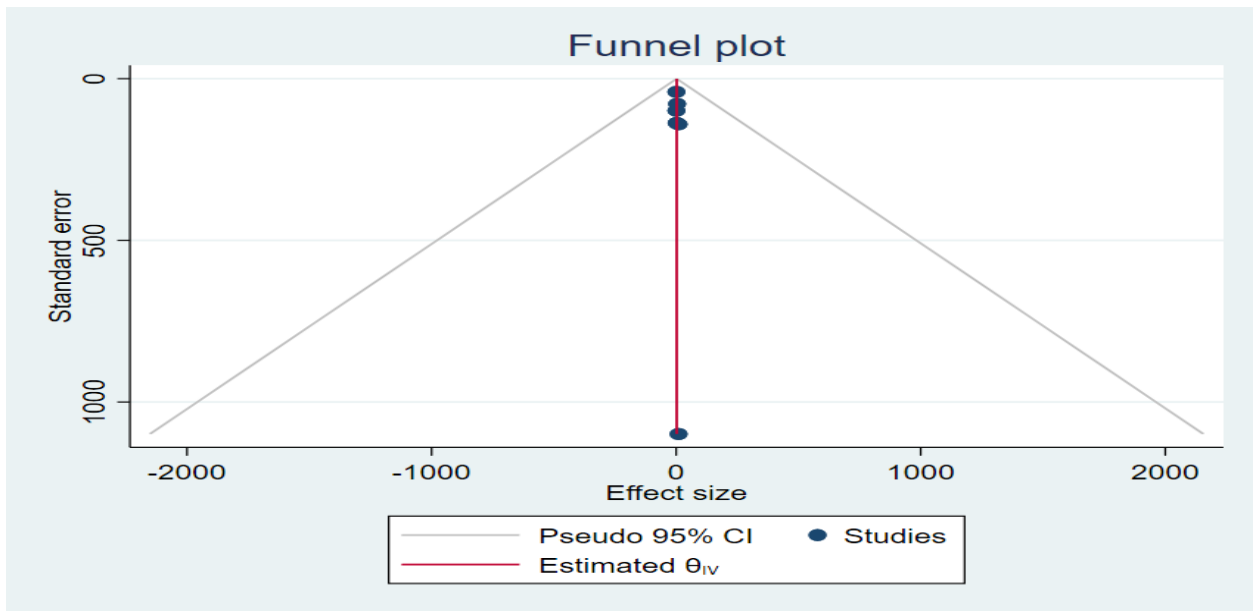


Figure 3. The Funnel plot of the malignancy prevalence among patients with COVID-19.

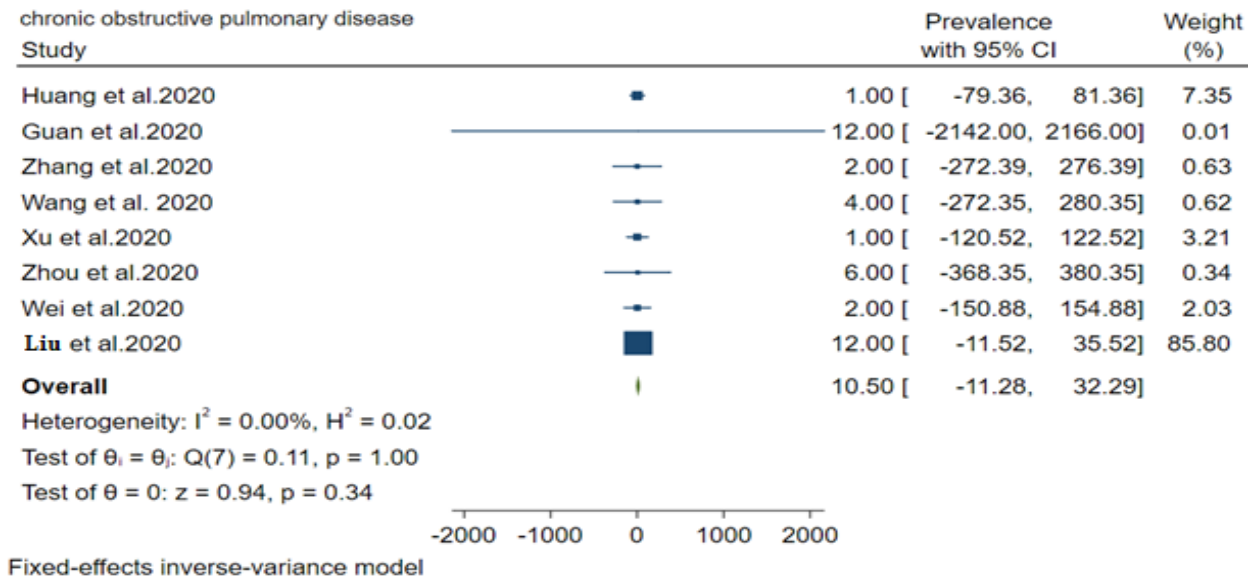


Figure 4. Forest plots showed the prevalence of the chronic obstructive pulmonary disease amongst COVID-19 patients.

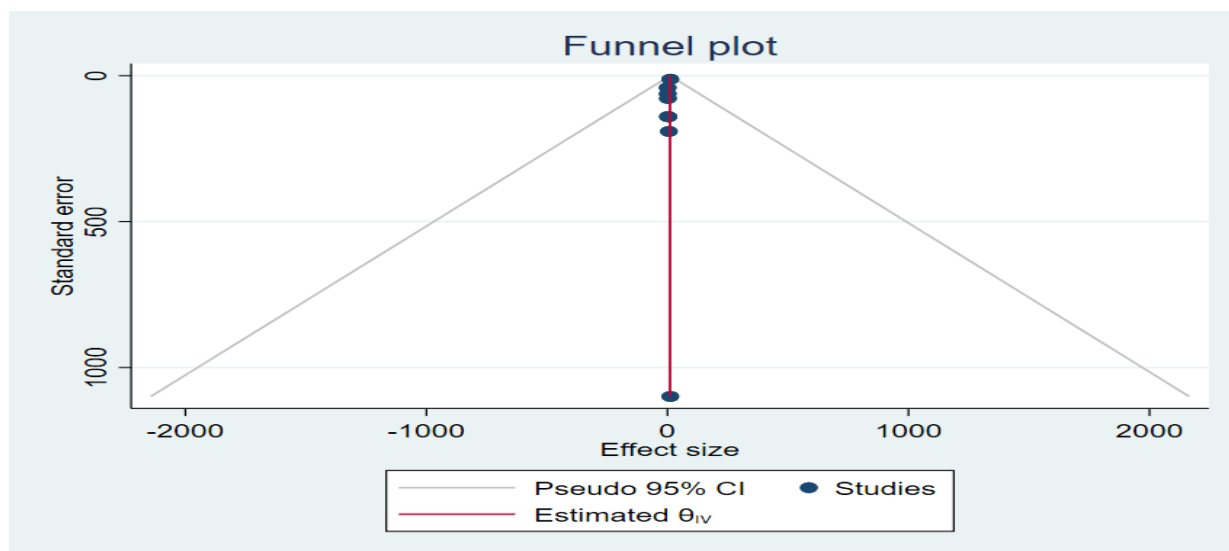


Figure 5. Funnel plot of the prevalence of the chronic obstructive pulmonary disease amongst the COVID-19 patients.

4. Discussion

As mentioned earlier, SARS-CoV-2 has been introduced as one of the newly specified pathogens that humans have no immunity to, and no definitive treatment has been reported to stop or reduce its rapid spread. These factors make human society vulnerable. This is doubly important for people with immune system problems, especially the elderly. There have been many studies on the timing of the history and transmission rout of the COVID-19, the symptoms of the disease, and the potential for pathogenicity, and prevention strategies have been proposed. Still, no definitive path has yet been taken.^[24] According to the present systematic review and meta-analysis, the chronic obstructive pulmonary disease and malignancy have been amongst the most prevalent underlying diseases among the patients infected by COVID-19. Results are very similar to MERS.^[23] Studies of MERS-CoV-2 have considered Dipetidyl Peptidase IV (DPP4) as one of the particular receptors for the virus and is higher in COPDs.^[25] In investigations conducted on COVID-19, researchers did not find any robust documents for COPD with COVID-19. However, it is noteworthy that SARS-CoV-2 infection has more severe outcomes in patients with COPD.^[26, 27] The research confirmed that patients with malignancy are more at risk than patients without tumors, and anti-cancer therapies such as chemotherapy and surgery suppress the immune system and thus increase the risk of developing COVID-19. These results are also shown in previous studies on MERS-CoV-2.^[28-29]

Moreover, patients with lung cancer are more at risk than any other group, and these people must follow the precautionary instructions against any contact with the infected areas or infected people.^[30] According to the present systematic review and meta-analysis, findings showed the prevalence of the chronic obstructive pulmonary disease of 2.26% with an effect size (ES 10.50 95% CI -11.28, 32.29. $P = 0.95$) and the incidence of malignancy equalled 1.56%. In this regard, Emami et al. (2020)^[31] in a systematic review and meta-analysis reported high blood pressure, cardiovascular disease, smoking, diabetes mellitus, malignancy, chronic kidney disease as well as chronic obstructive pulmonary disease (COPD) have been among the commonest underlying diseases amongst the hospitalized patients with COVID-19, which in some cases is consistent with the results of the present study. The two factors studied in this study showed that the potential risk of COVID-19 is higher than others. However, any obvious document of the risks of transmission of COVID-19 has been not published yet, and any

particular therapeutic option has been not provided. Hence, the pathophysiology of the mentioned situation should be discovered.^[32, 33] Consequently, the best way to prevent these patients from developing COPD and malignancy, as well as the general public, is to take preventive measures, including frequent hand washing and to avoid rubbing of the eyes, nose, face, or contact with people who have a fever and cough.^[34] It is important to note that all humans know the extended incubation period of COVID-19 so that the infected patient may transmit the virus without exhibiting any symptoms in the course of the incubation time. Hence, the recommendation of the experts in the field for the COPD patients suffering from malignancy and all underlying diseases is to prevent close contact with others, especially in the epidemic areas.

5. Conclusion

According to the research, meta-analysis has been introduced as one of the methods for obtaining a weighted average of the outcomes obtained from diverse investigations. Besides to the pooling of the effect size, it is possible to utilize meta-analysis for the estimation of the frequency of disease like the occurrence as well as prevalence. Therefore, our meta-analysis of the prevalence showed malignancy and COPD amongst the COVID-19 patients. Overall, features of the patients, who died due to the disease, have been consistent with the MuLBSTA score that has been considered as one of the initial warning models to anticipate the rate of mortalities in viral pneumonia. Hence, additional investigations must be performed for exploring the utility of MuLBSTA score to predict the rate of the mortality risk in 2019-nCoV infection. Finally, the primary group's epidemiology, the clinical spectrum of the disease, as well as the duration of the human transmission should be focused on by the coming researchers.

Conflict of Interest

The authors declared that there is no conflict of interest.

Acknowledgments

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

- [1] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The lancet*. 2020;395(10223):497-506. [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5).
- [2] Thompson R. Pandemic potential of 2019-nCoV. *The Lancet Infectious Diseases*. 2020;20(3):280. [https://doi.org/10.1016/S1473-3099\(20\)30068-2](https://doi.org/10.1016/S1473-3099(20)30068-2).
- [3] Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, evaluation and treatment coronavirus (COVID-19). *InStatpearls [internet]: StatPearls Publishing*; 2020.
- [4] Borges do Nascimento IJ, Cacic N, Abdulazeem HM, von Groote TC, Jayarajah U, Weerasekara I, Esfahani MA, Civile VT, Marusic A, Jeroncic A, Carvas Junior N. Novel coronavirus infection (COVID-19) in humans: a scoping review and meta-analysis. *Journal of clinical medicine*. 2020;9(4):941.
- [5] Gorbalenya AE, Baker SC, Baric RS, de Groot RJ, Drosten C, Gulyaeva AA, Haagmans BL, Lauber C, Leontovich AM, Neuman BW. Severe acute respiratory syndrome-related coronavirus: The species and its viruses—a statement of the Coronavirus Study Group. *bioRxiv* 2020. DOI: 2020.10(2020.02):07-937862.
- [6] COVID C. global cases by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). ArcGIS. Johns Hopkins CSSE. Retrieved April. 19;8:2020.
- [7] Restrepo MI, Mortensen EM, Pugh JA, Anzueto A. COPD is associated with increased mortality in patients with community-acquired pneumonia. *European Respiratory Journal*. 2006;28(2):346-51. DOI: 10.1183/09031936.06.00131905.
- [8] Restrepo MI, Sibila O, Anzueto A. Pneumonia in patients with chronic obstructive pulmonary disease. *Tuberculosis and respiratory diseases*. 2018;81(3):187-97. <https://doi.org/10.4046/trd.2018.0030>.
- [9] Wan Y, Shang J, Graham R, Baric RS, Li F. Receptor recognition by the novel coronavirus from Wuhan: an analysis based on decade-long structural studies of SARS coronavirus. *Journal of virology*. 2020;94(7). DOI: 10.1128/JVI.00127-20.
- [10] Penn I. Malignancy. *Surgical Clinics of North America*. 1994;74(5):1247-57. [https://doi.org/10.1016/S0039-6109\(16\)46444-3](https://doi.org/10.1016/S0039-6109(16)46444-3).
- [11] Yahalom J, Dabaja BS, Ricardi U, Ng A, Mikhaeel NG, Vogelius IR, Illidge T, Qi S, Wirth A, Specht L. ILROG emergency guidelines for radiation therapy of hematological malignancies during the COVID-19 pandemic. *blood*. 2020;135(21):1829-32. <https://doi.org/10.1182/blood.2020006028>.
- [12] Bai X, Fang C, Zhou Y, Bai S, Liu Z, Xia L, Chen Q, Xu Y, Xia T, Gong S, Xie X, et al. Predicting COVID-19 malignant progression with AI techniques. 2020.
- [13] Moher D, Liberati A, Tetzlaff J, Altman DG, Altman D, Antes G, Atkins D, Barbour V, Barrowman N, Berlin JA, Clark J. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement (Chinese edition). *Journal of Chinese Integrative Medicine*. 2009;7(9):889-96.
- [14] Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. *European journal of epidemiology*. 2010;25(9):603-5. <https://doi.org/10.1007/s10654-010-9491-z>.
- [15] Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, Liu L, Shan H, Lei CL, Hui DS, Du B, et al. Clinical characteristics of coronavirus disease 2019 in China. *New England journal of medicine*. 2020;382(18):1708-20. DOI: 10.1056/NEJMoa2002032.
- [16] Zhang JJ, Dong X, Cao YY, Yuan YD, Yang YB, Yan YQ, Akdis CA, Gao YD. Clinical characteristics of 140 patients infected with SARS - CoV - 2 in Wuhan, China. *Allergy*. 2020. <https://doi.org/10.1111/all.14238>.
- [17] Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Yu T. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*. 2020;395(10223):507-13. [https://doi.org/10.1016/S0140-6736\(20\)30211-7](https://doi.org/10.1016/S0140-6736(20)30211-7).
- [18] Liu K, Fang YY, Deng Y, Liu W, Wang MF, Ma JP, Xiao W, Wang YN, Zhong MH, Li CH, Li GC. Clinical characteristics of novel coronavirus cases in tertiary hospitals in Hubei Province. *Chinese medical journal*. 2020. doi: 10.1097/CM9.0000000000000744.
- [19] Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, Zhao Y. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *Jama*. 2020;323(11):1061-9. doi:10.1001/jama.2020.1585.
- [20] Xu XW, Wu XX, Jiang XG, Xu KJ, Ying LJ, Ma CL, Li SB, Wang HY, Zhang S, Gao HN, Sheng JF. Clinical findings in a group of patients infected with the 2019 novel coronavirus (SARS-Cov-2) outside of Wuhan, China: retrospective case series. *bmj*. 2020 Feb 19;368.
- [21] Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, Xiang J, Wang Y, Song B, Gu X, Guan L, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The lancet*. 2020. [https://doi.org/10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3).
- [22] Liu W, Tao ZW, Wang L, Yuan ML, Liu K, Zhou L, Wei S, Deng Y, Liu J, Liu HG, Ming Y, et al. Analysis of factors associated with disease outcomes in hospitalized patients with 2019 novel coronavirus disease. *Chinese medical journal*. 2020. doi: 10.1097/CM9.0000000000000775.
- [23] Liu Y, Yang Y, Zhang C, Huang F, Wang F, Yuan J, Wang Z, Li J, Li J, Feng C, Zhang Z, et al. Clinical and biochemical indexes from 2019-nCoV infected patients linked to viral loads and lung injury. *Science China Life Sciences*. 2020;63(3):364-74. <https://doi.org/10.1007/s11427-020-1643-8>.
- [24] Khan N, Fahad S. Critical review of the present situation of corona virus in China. Available at SSRN 3543177. 2020.
- [25] Seys LJ, Widagdo W, Verhamme FM, Kleinjan A, Janssens W, Joos GF, Bracke KR, Haagmans BL, Brusselle GG. DPP4, the Middle East respiratory syndrome coronavirus receptor, is upregulated in lungs of smokers and chronic obstructive pulmonary disease patients. *Clinical Infectious Diseases*. 2018;66(1):45-53. <https://doi.org/10.1093/cid/cix741>.
- [26] Zhang JJ, Dong X, Cao YY, Yuan YD, Yang YB, Yan YQ, Akdis CA, Gao YD. Clinical characteristics of 140 patients infected with SARS - CoV - 2 in Wuhan, China. *Allergy*. 2020. <https://doi.org/10.1111/all.14238>.
- [27] Li J, Long X, Luo H, Fang F, Lv X, Zhang D, Sun Y, Luo F, Li N, Zhang Q, Fang X. Clinical characteristics of deceased patients infected with SARS-Cov-2 in Wuhan, China. 2020.
- [28] Xia Y, Jin R, Zhao J, Li W, Shen H. Risk of COVID-19 for cancer patients. *Lancet Oncol*. 2020;21(4). DOI:10.1101/2020.02.06.20020974.
- [29] Kotecha RS. Challenges posed by COVID-19 to children with cancer. *The Lancet Oncology*. 2020;21(5):e235. DOI:[https://doi.org/10.1016/S1470-2045\(20\)30205-9](https://doi.org/10.1016/S1470-2045(20)30205-9).

- [30] Liang W, Guan W, Chen R, Wang W, Li J, Xu K, Li C, Ai Q, Lu W, Liang H, Li S. Cancer patients in SARS-CoV-2 infection: a nationwide analysis in China. *The Lancet Oncology*. 2020;21(3):335-7. DOI: [https://doi.org/10.1016/S1470-2045\(20\)30096-6](https://doi.org/10.1016/S1470-2045(20)30096-6).
- [31] Emami A, Javanmardi F, Pirbonyeh N, Akbari A. Prevalence of underlying diseases in hospitalized patients with COVID-19: a systematic review and meta-analysis. *Archives of academic emergency medicine*. 2020;8(1).
- [32] Favre G, Pomar L, Musso D, Baud D. 2019-nCoV epidemic: what about pregnancies?. *Lancet (London, England)*. 2020;395(10224):e40. doi: 10.1016/S0140-6736(20)30311-1.
- [33] Schwartz DA, Graham AL. Potential maternal and infant outcomes from (Wuhan) coronavirus 2019-nCoV infecting pregnant women: lessons from SARS, MERS, and other human coronavirus infections. *Viruses*. 2020;12(2):194. <https://doi.org/10.3390/v12020194>.
- [34] Lin HT, Xiang YF, Cui TX, Chen JJ. Online learning-related visual impairment and preventive measures during the 2019 novel coronavirus outbreak. [*Zhonghua yan ke za zhi*] Chinese journal of ophthalmology. 2020;56:E004.

How to Cite this Article: Jamali S, Marcella C, Prakash P, Moradkhani A, Kasraei E. Prevalence of Malignancy and Chronic Obstructive Pulmonary Disease among Patients with COVID-19: A Systematic Review and Meta-analysis. *International Journal of Scientific Research in Dental and Medical Sciences*. 2020;2(2):52-58. doi: 10.30485/IJSDMS.2020.233746.1062.