

Assessing the Quality of the COVID-19 Articles Published by Persian Researchers Using the CASP Checklist

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Received: 08 April 2023

Revised: 07 May 2023

Accepted: 17 June 2023

Abstract

Background: The COVID-19 pandemic reminded scientists of the importance of designing and implementing efficient research. In this study, the frequency and quality of Iranian researchers' manuscripts about COVID-19 were evaluated.

Methods: A comprehensive search was conducted on June 30, 2020, to assess the quality of published articles. PubMed, Embase, and Scopus databases were searched. The inclusion criteria were all articles in the field of COVID-19 published by an Iranian author in English. The authors reviewed the original research articles and systematic reviews using the Critical Appraisal Skills Programme (CASP) Checklists. Descriptive statistics and frequency distributions were reported.

Results: After removing duplicates, 347 out of 871 related retrieved articles were remained. Among 35 original articles, thirty-one (88.6%) of them were Cross-sectional articles. There were only one Randomized clinical trial article, one Case-control, and two diagnostic articles. Among original researches, deficiency in reporting the sampling method, data analysis, the accuracy of the measurements, sample size calculation method, and choosing comparison groups and blinding (in RCTs) were the most common problems. Nearly 40% of original articles and 81.3% of systematic reviews and meta-analyses were classified as good-quality articles.

Conclusion: Most original articles did not have good quality, while the decisions about treatment and prevention of COVID-19 and policy-making about social restriction depend on the quality of the articles. Journals should be more careful in reviewing articles critically.

Please cite this article as: Danaei M, Taghrir MH, Askarian M, Momeni M. Assessing the Quality of the COVID-19 Articles Published by Persian Researchers Using the CASP Checklist. *J Health Sci Surveillance Sys*. 2023;11(Supplement 3):592-599.

Keywords: COVID-19, Journal article, Peer review, Research, Quality control

Introduction

The publication of an article is the first step in knowledge translation. Scientific epidemiological study design, ideal statistical methods, and scientific writing are fundamental needs of knowledge sharing and implementation.^{1,2} Scientific journal articles could build a bridge between scientists around the world. That

is the footstone of knowledge improvement in the world³

An epidemic of a novel coronavirus disease in late 2019, COVID-19, was identified in Wuhan, China. Incredibly, the World Health Organization (WHO) declared the COVID-19 pandemic in March 2020.⁴ This emerging disease has various known features, but many aspects of this infection are not unraveled precisely.⁵ The severity, transmissibility, and unknown

nature of this infectious disease have caused global and international concerns.⁶

Today, fighting this pandemic is a great responsibility of governments. Scientists worldwide have worked hard to find the mechanism of virus transmission, its clinical appearances, its rapid and accurate diagnostic tests, and preventive and treatment approaches. However, there are still many ambiguities.⁷ Many different kinds of research have been conducted worldwide, and several articles have been published on this subject.⁸⁻¹¹ Also, researchers in Iran have conducted various studies on different aspects of the COVID-19 pandemic.¹²⁻¹⁴

Glasziou et al. propounded that before the COVID-19 pandemic, approximately 85% of researchers did not have enough efficacy due to improper research questions, non-scientific study designs, and improper reporting of results. This issue is bolded in the COVID-19 pandemic considering the time limitation and improper research infrastructures. There are several non-scientific clinical trials, repeated pieces of research with the same subject, and many published low-quality articles due to rapid and non-in-depth review processes about COVID-19.¹⁵

The COVID-19 pandemic reminded scientists of the importance of designing and implementing efficient research. Iranian researchers have published several studies like other researchers in the world. The quality and quantity of articles are of great importance. Publishing low-quality manuscripts would cause financial and human resources loss. These articles could not improve human knowledge. Researchers recently evaluated the quality of articles published in Iranian medical journals and suggested their quality is not good enough.¹⁶

There are different critical appraisal tools in medical journalism. The Critical Appraisal Skills Programme (CASP) Checklist is one of them. The CASP checklist is approved by World Health Organization (WHO) and Cochrane. It is also a user-friendly tool for novice researchers in qualitative studies. The CASP tool is a nearly appropriate measure of the transparency of the study and reporting of the research.

On the other hand, it is not a very strong measure of designing and conducting the research. However, The CASP checklist is the most commonly used tool for appraising the quality of research in health sciences.¹⁷ In this study, the quality of Iranian researchers' manuscripts about the COVID-19 was evaluated by the CASP checklist.

Methods

At the beginning of the COVID-19 pandemic, due to the little scientific information about this disease, many researchers conducted different studies in this field,

and the manuscripts were published fast in different journals. Iranian researchers also published several studies with different qualities. As for the quality assessment of published articles, a comprehensive search was conducted on June 30, 2020. PubMed, Embase, and Scopus databases were searched by keywords ("COVID-19" OR "COVID19" OR "Novel Coronavirus" OR "2019-nCoV" OR "SARS-CoV-2") [Title/Abstract/keywords] AND ("Iran" OR "Iranian") [Authors' affiliation]. The search strategy was limited to October 2019 to June 2020. Then, All articles were transferred to the Endnote software, and duplications were removed. As for the inclusion criteria, we have considered all articles in the field of COVID-19 published by an Iranian author in English. Then, by screening the title and abstract, the articles were thematically categorized according to the type of publication (original research, review, systematic review, short research article, editorial, correspondence, commentary, letter, guideline/protocol, opinion/perspectives, case report, cases series, and hypothesis).

Finally, the authors reviewed original research articles and systematic reviews using the CASP Checklists. This tool has special items to evaluate the quality of a paper using 10-12 items for each checklist. These checklists evaluate the strength and weaknesses of the articles, the quality of the study design, and the applicability of studies.¹⁷ The precise checklist was applied to each paper according to the type of study. For each item, the answers were "Yes", "No", and "Can't tell". two independent reviewers assessed the articles' quality separately, and discrepancies were resolved in group discussion.¹⁶ For each item, the answer "Yes" was scored as 1, and items "No" and "Can't tell" were set as 0. Therefore the maximum score of cross-sectional, Randomized Controlled Trial (RCT), and case-control studies was 11. The maximum scores for diagnostic studies and systematic review or meta-analysis were 12 and 10, respectively. Articles with scores of $\geq 75\%$ of the total score were classified as good quality. Articles with scores of 25-75% of the total score were classified as moderate quality articles, and articles with scores of $<25\%$ of the total score were classified as poor quality articles.¹⁸ Descriptive statistics and frequency distributions were reported. The qualitative data were described with numbers and percentages. Also, the Fishers' Exact Test was used to determine the significant difference between the quality of original articles and systematic review or meta-analysis using SPSS version 20.

Results

871 related articles were retrieved (PubMed: 376, Embase: 173, Scopus: 322). 374 articles remained after removing duplicates. Figure 1 presents the frequency of different types of articles. Most of the articles were letters (163 articles). The frequencies of case reports/case series,

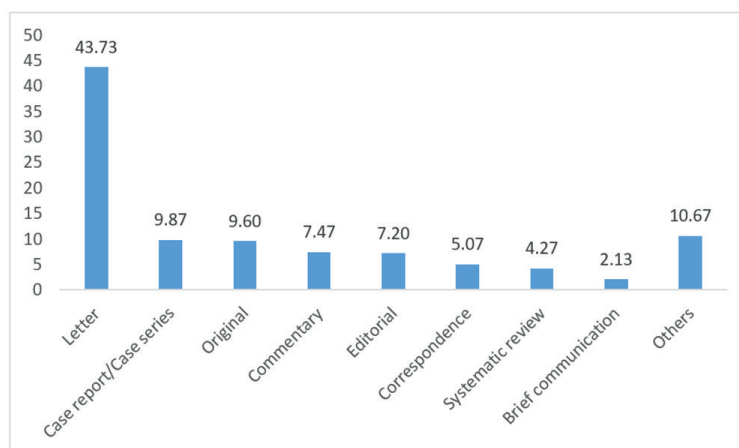


Figure 1: The frequency (percentage) of Iranian researchers' manuscripts about the COVID-19.

original articles, commentary, editorial, correspondence, systematic review, and brief communication were 37, 35, 28, 27, 19, 16, and 8, respectively. Other articles, including review, guideline or protocol, opinion or perspectives, and hypothesis, were 40.

Among 35 original articles,¹⁹⁻⁵³ thirty-one (88.6%) were Cross-sectional. There were only one Randomized clinical trial article, one Case-control, and two diagnostic articles. Among 31 Cross-sectional studies, only 6 met all criteria of the CASP checklist. The most common problems were deficiency in reporting sampling method (n: 18/31, 58.1%), data analysis (n: 16/31, 51.6%), the accuracy of the measurements (n: 15/31, 48.4%), and sample size (n: 14/31, 45.2%). Among other original studies, choosing comparison groups and blinding (in RCTs) had deficiencies in reporting (Table 1).

Among 16 Systematic reviews or Meta-analyses, only five met all criteria of the CASP checklist.⁵⁴⁻⁶⁹ The most deficiencies were about the precision of the results (8 articles) and the overall results of the review (7 articles). The quality assessment of included studies was not assessed in the four studies (Table 2).

Among 35 original articles, considering the total score of CASP and its classification, 14 articles (40%) were classified as good quality articles, and 21 (60%) were classified as moderate quality articles. None of the articles was classified as poor quality articles. Among systematic reviews or meta-analyses, 18.7% (3/16) were classified as moderate-quality articles, and 81.3% (13/16) were classified as good-quality articles. The Fishers' Exact Test results demonstrated the significant difference between the quality of original articles and systematic reviews or meta-analyses ($P=0.002$).

Discussion

Among 374 manuscripts were conducted on COVID-19 in Iran, only 35 were original, and 16 were systematic reviews or meta-analyses. Most articles were letters

(163/374). Literature showed that Iran is among the top 10 countries with the most articles published about COVID-19.^{70, 71} The meta-research on all COVID-19 literature showed that only 10% of Covid-19 medical manuscripts were original articles. COVID-19 is an emerging disease, and healthcare workers and researchers want to share their experiences with others. Therefore, most studies in the field of COVID-19 were only descriptive studies.⁷⁰

Considering the CASP checklist, among original researches, deficiency in reporting the sampling method, data analysis, the accuracy of the measurements, sample size calculation method, and choosing comparison groups and blinding (in RCTs) were the most common problems. Therefore, most articles had methodological and statistical difficulties. Evaluating the quality of the RCT articles published in Persian Nursing Journals showed that methodological and statistical deficiencies are the most pitfalls in these articles.¹⁶ Perhaps some reviewers of journals did not have enough knowledge in statistics. Besides, the methodological review is time-consuming. The emergence of the COVID-19 pandemic also multiplied these conditions.

This study classified 40% of original articles and 81.3% of systematic reviews or meta-analyses as good-quality articles. A systematic review compared the quality of COVID-19 clinical articles with historical controls. It seems that the quality scores of COVID-19 articles are significantly lower than historical articles due to their shorter acceptance and publication time.⁷² In this study, Systematic reviews or meta-analysis papers have better quality than original research. This finding would be acceptable. Most original articles did not have good quality, while the decisions about treatment and prevention of COVID-19 and policy-making about social restriction depend on the quality of the articles. A case in point for chloroquine/hydroxychloroquine is an example of the effect of poor-quality articles on treatment decision-making.⁷³

This study has some limitations. Firstly, we evaluated the quality of CoVID-19 Iranian articles in the nearly first months of the COVID-19 pandemic.

Table 1: Number of compliance and non-compliance of CASP* questions for original articles

Questions	Yes	No	Can't tell
	Frequency		
Cross-sectional studies (N=31)			
1. Did the study address a clearly focused issue?	30	1	0
2. Did the authors use an appropriate method to answer their questions?	30	1	0
3. Were the subjects recruited acceptably?	13	16	2
4. Were the measures accurately measured to reduce bias?	16	12	3
5. Were the data collected in a way that addressed the research issue?	26	5	0
6. Did the study have enough participants to minimize the play of chance?	17	12	2
7. How are the results presented, and what is the main result?	31	0	0
8. Was the data analysis sufficiently rigorous?	13	16	2
9. Is there a clear statement of findings?	29	2	0
10. Can the results be applied to the local population?	26	5	0
11. How valuable is the research?	28	3	0
RCT studies**(N=1)			
1. Did the trial address a clearly focused issue?	1	0	0
2. Was the assignment of patients to treatments randomized?	1	0	0
3. Were all the patients who entered the trial properly accounted for at its conclusion?	1	0	0
4. Were patients, health workers, and study personnel 'blind' to treatment?	0	1	0
5. Were the groups similar at the start of the trial	0	0	1
6. Aside from the experimental intervention, were the groups treated equally?	0	0	1
7. How large was the treatment effect?	1	0	0
8. How precise was the estimate of the treatment effect?	0	0	1
9. Can the results be applied to the local population or your context?	0	1	0
10. Were all clinically important outcomes considered?	1	0	0
11. Are the benefits worth the harms and costs?	1	0	0
Diagnostic study (N=2)			
1. Was there a clear question for the study to address?	2	0	0
2. Was there a comparison with an appropriate reference standard?	0	2	0
3. Did all patients get the diagnostic test and reference standard?	1	1	0
4. Could the results of the test have been influenced by the results of the reference standard?	2	0	0
5. Is the disease status of the tested population clearly described?	2	0	0
6. Were the methods for performing the test described in sufficient detail?	2	0	0
7. What are the results?	1	1	0
8. How sure are we about the results? Consequences and cost of alternatives performed?	0	2	0
9. Can the results be applied to your patients/the population of interest?	2	0	0
10. Can the test be applied to your patient or population of interest?	2	0	0
11. Were all outcomes important to the individual or population considered?	2	0	0
12. What would be the impact of using this test on your patients/population?	2	0	0
Case-control (N=1)			
1. Did the study address a clearly focused issue?	1	0	0
2. Did the authors use an appropriate method to answer their questions?	1	0	0
3. Were the cases recruited acceptably?	1	0	0
4. Were the controls selected acceptably?	0	1	0
5. Was the exposure accurately measured to minimize bias?	1	0	0
6. (a) were the groups treated equally beside the experimental intervention?	1	0	0
6. (b) Have the authors taken account of the potential confounding factors in the design and/or their analysis?	1	0	0
7. How large was the treatment effect?	0	0	1
8. How precise was the estimate of the treatment effect?	1	0	0
9. Do you believe the results?	1	0	0
10. Can the results be applied to the local population?	1	0	0
11. Do the results of this study fit with other available evidence?	1	0	0

*Critical Appraisal Skills Programme; **Randomized Controlled Trial

Newer studies may have more appropriate subjects and designs. It can be a strong limitation of this study and may affect the generalizability and applicability of the findings. Secondly, The CASP checklists were used in this manuscript. There are different checklists for the quality assessment of articles. The best form

for reviewing an article is a blank paper. The reviewers can freely write down their comments on it. Using the checklists may lower the efficiency of reviewers. We suggest further research to evaluate the quality of newer articles with different critical appraisal checklists and compare the results together.

Table 2: Number of compliance and non-compliance of CASP* questions for Systematic review/Meta-analysis

Systematic review/Meta-analysis studies	Yes	No	Can't tell
1. Did the review address a clearly focused question?	16	0	0
2. Did the authors look for the right type of papers?	14	2	0
3. Do you think all the important, relevant studies were included?	14	2	0
4. Did the review's authors do enough to assess the quality of the included studies?	12	4	0
5. If the review results have been combined, was it reasonable to do so?	16	0	0
6. What are the overall results of the review?	9	7	0
7. How precise are the results?	8	8	0
8. Can the results be applied to the local population?	16	0	0
9. Were all important outcomes considered?	14	2	0
10. Are the benefits worth the harms and costs?	15	1	0

*Critical Appraisal Skills Programme

Conclusion

COVID-19 is an emerging disease. Clinical Researches are fundamental for clinicians' decision-making; therefore, their quality and accuracy are critical. Iran has experienced several picks of epidemics. Also, it is among the top 10 countries with highest published articles about COVID-19. Therefore, the quality of articles published by Iranian researchers is very important.

Acknowledgment

The ethical committee of Kerman University of Medical Sciences issued the ethical code: IR.KMU.REC.1399.228.

Conflict of interest: None declared.

References

- Graham ID, Tetroe J; KT Theories Research Group. Some theoretical underpinnings of knowledge translation. *Acad Emerg Med.* 2007;14(11):936-41. doi: 10.1197/j.aem.2007.07.004. PMID: 17967955.
- Hedges JR. The knowledge translation paradigm: historical, philosophical, and practice perspectives. *Acad Emerg Med.* 2007;14(11):924-7. doi: 10.1197/j.aem.2007.06.016. Epub 2007 Aug 17. PMID: 17704350.
- Roberts SF, Fischhoff MA, Sakowski SA, Feldman EL. Perspective: Transforming science into medicine: how clinician-scientists can build bridges across research's "valley of death". *Acad Med.* 2012;87(3):266-70. doi: 10.1097/ACM.0b013e3182446fa3. PMID: 22373616.
- Muniyappa R, Gubbi S. COVID-19 pandemic, coronaviruses, and diabetes mellitus. *Am J Physiol Endocrinol Metab.* 2020;318(5):E736-E741. doi: 10.1152/ajpendo.00124.2020. Epub 2020 Mar 31. PMID: 32228322; PMCID: PMC7191633.
- Li S, Wang Y, Xue J, Zhao N, Zhu T. The Impact of COVID-19 Epidemic Declaration on Psychological Consequences: A Study on Active Weibo Users. *Int J Environ Res Public Health.* 2020;17(6):2032. doi: 10.3390/ijerph17062032. PMID: 32204411; PMCID: PMC7143846.
- Cortegiani A, Ingoglia G, Ippolito M, Giarratano A, Einav S. A systematic review on the efficacy and safety of chloroquine for the treatment of COVID-19. *J Crit Care.* 2020;57:279-283. doi: 10.1016/j.jcrc.2020.03.005. Epub 2020 Mar 10. PMID: 32173110; PMCID: PMC7270792.
- Cascella M, Rajnik M, Aleem A, Dulebohn SC, Di Napoli R. Features, Evaluation, and Treatment of Coronavirus (COVID-19). 2023. In: *StatPearls [Internet].* Treasure Island (FL): StatPearls Publishing; 2023 Jan-. PMID: 32150360.
- Adhikari SP, Meng S, Wu YJ, Mao YP, Ye RX, Wang QZ et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. *Infect Dis Poverty.* 2020;9(1):29. doi: 10.1186/s40249-020-00646-x. PMID: 32183901; PMCID: PMC7079521.
- Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, et al. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *Int J Surg.* 2020;76:71-76. doi: 10.1016/j.ijsu.2020.02.034. Epub 2020 Feb 26. Erratum in: *Int J Surg.* 2020 May;77:217. PMID: 32112977; PMCID: PMC7105032.
- Singhal T. A Review of Coronavirus Disease-2019 (COVID-19). *Indian J Pediatr.* 2020;87(4):281-286. doi: 10.1007/s12098-020-03263-6. Epub 2020 Mar 13. PMID: 32166607; PMCID: PMC7090728.
- Sanders JM, Monogue ML, Jodlowski TZ, Cutrell JB. Pharmacologic Treatments for Coronavirus Disease 2019 (COVID-19): A Review. *JAMA.* 2020;323(18):1824-1836. doi: 10.1001/jama.2020.6019. PMID: 32282022.
- Tuite AR, Bogoch II, Sherbo R, Watts A, Fisman D, Khan K. Estimation of Coronavirus Disease 2019 (COVID-19) Burden and Potential for International Dissemination of Infection From Iran. *Ann Intern Med.* 2020;172(10):699-701. doi: 10.7326/M20-0696. Epub 2020 Mar 16. PMID: 32176272; PMCID: PMC7081176.
- Abdi M. Coronavirus disease 2019 (COVID-19) outbreak in Iran: Actions and problems. *Infect Control Hosp Epidemiol.* 2020;41(6):754-5. doi: 10.1017/ice.2020.86. PMID: 32192541; PMCID: PMC7137533.

- 14 Arab-Mazar Z, Sah R, Rabaan AA, Dhama K, Rodriguez-Morales AJ. Mapping the incidence of the COVID-19 hotspot in Iran—Implications for Travellers. *Travel Med Infect Dis*. 2020. ;34:101630. doi: 10.1016/j.tmaid.2020.101630. Epub 2020 Mar 14. PMID: 32184130; PMCID: PMC7118655.
- 15 Glasziou PP, Sanders S, Hoffmann T. Waste in covid-19 research. *BMJ*. 2020;369:m1847. doi: 10.1136/bmj.m1847. PMID: 32398241.
- 16 Adib-Hajbaghery M, Adib M, Eshraghi Arani N. Evaluating the quality of randomized trials published in Persian nursing journals with more than 10 years of publishing using the CASP checklist. *Iran Journal of Nursing*. 2017;30(109):1-9. (Persian)
- 17 Long HA, French DP, Brooks JM. Optimising the value of the critical appraisal skills programme (CASP) tool for quality appraisal in qualitative evidence synthesis. *Research Methods in Medicine & Health Sciences*. 2020 Sep;1(1):31-42. doi.org/10.1177/2632084320947559.
- 18 Tao P, Coates R, Maycock B. Investigating marital relationship in infertility: a systematic review of quantitative studies. *J Reprod Infertil*. 2012;13(2):71-80. PMID: 23926528; PMCID: PMC3719332.
- 19 Tabibzadeh A, Zamani F, Laali A, Esghaei M, Tameshkel FS, Keyvani H, et al. SARS-CoV-2 Molecular and Phylogenetic analysis in COVID-19 patients: A preliminary report from Iran. *Infect Genet Evol*. 2020;84:104387. doi: 10.1016/j.meegid.2020.104387. Epub 2020 May 30. PMID: 32485332; PMCID: PMC7832360.
- 20 Taghrir MH, Borazjani R, Shiraly R. COVID-19 and Iranian medical students; a survey on their related-knowledge, preventive behaviors and risk perception. *Arch Iran Med*. 2020;23(4):249-254. doi: 10.34172/aim.2020.06. PMID: 32271598.
- 21 Ahmadi M, Sharifi A, Dorosti S, Ghoushchi SJ, Ghanbari N. Investigation of effective climatology parameters on COVID-19 outbreak in Iran. *Sci Total Environ*. 2020;729:138705. doi: 10.1016/j.scitotenv.2020.138705. Epub 2020 Apr 17. PMID: 32361432; PMCID: PMC7162759.
- 22 Ammar A, Brach M, Trabelsi K, Chtourou H, Boukhris O, Masmoudi L, et al. Effects of COVID-19 home confinement on eating behaviour and physical activity: results of the ECLB-COVID19 international online survey. *Nutrients*. 2020;12(6):1583. doi: 10.3390/nu12061583. PMID: 32481594; PMCID: PMC7352706.
- 23 Moftakhar L, Mozghan S, Safe MS. Exponentially increasing trend of infected patients with COVID-19 in Iran: a comparison of neural network and ARIMA forecasting models. *Iran J Public Health*. 2020;49(Suppl 1):92-100. doi: 10.18502/ijph.v49iS1.3675. PMID: 34268211; PMCID: PMC8266002.
- 24 Moghanibashi-Mansourieh A. Assessing the anxiety level of Iranian general population during COVID-19 outbreak. *Asian J Psychiatr*. 2020 Jun;51:102076. doi: 10.1016/j.ajp.2020.102076. Epub 2020 Apr 18. PMID: 32334409; PMCID: PMC7165107.
- 25 Moradzadeh R. The challenges and considerations of community-based preparedness at the onset of COVID-19 outbreak in Iran, 2020. *Epidemiol Infect*. 2020;148:e82. doi: 10.1017/S0950268820000783. PMID: 32242790; PMCID: PMC7167485.
- 26 Nikpouraghdam M, Farahani AJ, Alishiri G, Heydari S, Ebrahimmia M, Samadinia H, et al. Epidemiological characteristics of coronavirus disease 2019 (COVID-19) patients in IRAN: A single center study. *J Clin Virol*. 2020;127:104378. doi: 10.1016/j.jcv.2020.104378. Epub 2020 Apr 21. PMID: 32353762; PMCID: PMC7172806.
- 27 Omrani-Nava V, Maleki I, Ahmadi A, Moosazadeh M, Hedayatizadeh-Omran A, et al. Evaluation of Hepatic Enzymes Changes and Association with Prognosis in COVID-19 Patients. *Hepat Mon*. 2020;20(4):e103179. doi:10.5812/hepatmon.103179.
- 28 Soltani J, Sedighi I, Shalchi Z, Sami G, Moradveisi B, Nahidi S. Pediatric coronavirus disease 2019 (COVID-19): An insight from west of Iran. *North Clin Istanbul*. 2020;7(3):284-291. doi: 10.14744/nci.2020.90277. PMID: 32478302; PMCID: PMC7251275.
- 29 Aghaali M, Kolifarhood G, Nikbakht R, Saadati HM, Hashemi Nazari SS. Estimation of the serial interval and basic reproduction number of COVID-19 in Qom, Iran, and three other countries: A data-driven analysis in the early phase of the outbreak. *Transbound Emerg Dis*. 2020;67(6):2860-2868. doi: 10.1111/tbed.13656. Epub 2020 Jun 16. PMID: 32473049; PMCID: PMC7300937.
- 30 Ayyoubzadeh SM, Ayyoubzadeh SM, Zahedi H, Ahmadi M, Kalhori SRN. Predicting COVID-19 incidence through analysis of google trends data in iran: data mining and deep learning pilot study. *JMIR Public Health Surveill*. 2020;6(2):e18828. doi: 10.2196/18828. PMID: 32234709; PMCID: PMC7159058.
- 31 Bashirian S, Jenabi E, Khazaei S, Barati M, Karimi-Shahanjarini A, Zareian S, et al. Factors associated with preventive behaviours of COVID-19 among hospital staff in Iran in 2020: an application of the Protection Motivation Theory. *J Hosp Infect*. 2020;105(3):430-433. doi: 10.1016/j.jhin.2020.04.035. Epub 2020 Apr 28. PMID: 32360337; PMCID: PMC7194681.
- 32 Ducournau F, Arianni M, Awwad S, Baur E-M, Beaulieu J-Y, Bouloudhine M, et al. COVID-19: Initial experience of an international group of hand surgeons. *Hand Surg Rehabil*. 2020;39(3):159-166. doi: 10.1016/j.hansur.2020.04.001. Epub 2020 Apr 9. PMID: 32278932; PMCID: PMC7194873.
- 33 Naghibzadeh M, Savari H, Savadi A, Saadati N, Mehrzain E. Developing an ultra-efficient microsatellite discoverer to find structural differences between SARS-CoV-1 and Covid-19. *Inform Med Unlocked*. 2020;19:100356. doi: 10.1016/j.imu.2020.100356. Epub 2020 May 21. Erratum in: *Inform Med Unlocked*. 2020;20:100435. PMID: 32501423; PMCID: PMC7241407.
- 34 Bhagavathula AS, Aldhaleei WA, Rahmani J, Mahabadi MA, Bandari DK. Knowledge and perceptions of COVID-19 among health care workers: cross-sectional study. *JMIR Public Health Surveill*. 2020;6(2):e19160.

- doi: 10.2196/19160. PMID: 32320381; PMCID: PMC7193987.
- 35 Enayatkhani M, Hasaniazad M, Faezi S, Gouklani H, Davoodian P, Ahmadi N, et al. Reverse vaccinology approach to design a novel multi-epitope vaccine candidate against COVID-19: An in silico study. *J Biomol Struct Dyn*. 2021;39(8):2857-2872. doi: 10.1080/07391102.2020.1756411. Epub 2020 May 2. PMID: 32295479; PMCID: PMC7196925.
 - 36 Safavi F, Nourbakhsh B, Azimi AR. B-cell depleting therapies may affect susceptibility to acute respiratory illness among patients with multiple sclerosis during the early COVID-19 epidemic in Iran. *Mult Scler Relat Disord*. 2020;43:102195. doi: 10.1016/j.msard.2020.102195. Epub 2020 May 13. PMID: 32460086; PMCID: PMC7219389.
 - 37 Ganji A, Farahani I, Khansarinejad B, Ghazavi A, Mosayebi G. Increased expression of CD8 marker on T-cells in COVID-19 patients. *Blood Cells Mol Dis*. 2020;83:102437. doi: 10.1016/j.bcmd.2020.102437. Epub 2020 Apr 13. PMID: 32325421; PMCID: PMC7194879.
 - 38 Samadipour E, Ghardashi F. Factors Influencing Iranians' Risk Perception of Covid-19. *Journal Mil Med*. 2020;22(2):122-9. (Persian)
 - 39 Haseli S, Khalili N, Bakhshayeshkaram M, Taheri MS, Moharramzad Y. Lobar distribution of COVID-19 pneumonia based on chest computed tomography findings; a retrospective study. *Arch Acad Emerg Med*. 2020 ;8(1):e55. PMID: 32440666; PMCID: PMC7212068.
 - 40 Shadmehr M, Ramak N, Sangani A. The role of perceived mental stress in the health of suspected cases of COVID-19. *Journal Mil Med*. 2020;22(2):115-21. doi:10.30491/JMM.22.2.115. (Persian)
 - 41 Singh RK, Rani M, Bhagavathula AS, Sah R, Rodriguez-Morales AJ, Kalita H, et al. Prediction of the COVID-19 pandemic for the top 15 affected countries: Advanced autoregressive integrated moving average (ARIMA) model. *JMIR Public Health Surveill*. 2020;6(2):e19115. doi: 10.2196/19115. PMID: 32391801; PMCID: PMC7223426.
 - 42 Reiner Ž, Hatamipour M, Banach M, Pirro M, Al-Rasadi K, Jamialahmadi T, et al. Statins and the COVID-19 main protease: in silico evidence on direct interaction. *Arch Med Sci*. 2020;16(3):490-496. doi: 10.5114/aoms.2020.94655. PMID: 32399094; PMCID: PMC7212226.
 - 43 Khafaie MA, Rahim F. Cross-country comparison of case fatality rates of COVID-19/SARS-COV-2. *Arch Med Sci*. 2020;16(3):490-496. doi: 10.5114/aoms.2020.94655. PMID: 32399094; PMCID: PMC7212226.
 - 44 Maleki M, Mahmoudi MR, Wraith D, Pho K-H. Time series modelling to forecast the confirmed and recovered cases of COVID-19. *Travel Med Infect Dis*. 2020;37:101742. doi: 10.1016/j.tmaid.2020.101742. Epub 2020 May 13. PMID: 33081974.
 - 45 Mirzaei M, Harismah K, Da'i M, Salarrezaei E, Roshandel Z. Screening efficacy of available HIV protease inhibitors on COVID-19 protease. *Journal Mil Med*. 2020;22(2):100-7. doi:10.30491/JMM.22.2.100. (Persian)
 - 46 Moftakhar L, Seif M. The exponentially increasing rate of patients infected with COVID-19 in Iran. *Arch Iran Med*. 2020;23(4):235-238. doi: 10.34172/aim.2020.03. PMID: 32271595.
 - 47 Yousefpour A, Jahanshahi H, Bekiros S. Optimal policies for control of the novel coronavirus disease (COVID-19) outbreak. *Chaos Solitons Fractals*. 2020;136:109883. doi: 10.1016/j.chaos.2020.109883. Epub 2020 May 16. PMID: 32427205; PMCID: PMC7229919.
 - 48 Zareie B, Roshani A, Mansournia MA, Rasouli MA, Moradi G. A model for COVID-19 prediction in Iran based on China parameters. *Arch Iran Med*. 2020 Apr 1;23(4):244-248. doi: 10.34172/aim.2020.05. PMID: 32271597.
 - 49 Zolfaghari Emameh R, Nosrati H, Taheri RA. Combination of biodata mining and computational modelling in identification and characterization of ORF1ab polyprotein of SARS-CoV-2 isolated from Oronasopharynx of an Iranian patient. *Biol Proced Online*. 2020;22:8. doi: 10.1186/s12575-020-00121-9. PMID: 32336957; PMCID: PMC7171442.
 - 50 Moein ST, Hashemian SM, Mansourafshar B, Khorram-Tousi A, Tabarsi P, Doty RL. Smell dysfunction: a biomarker for COVID-19. *Int Forum Allergy Rhinol*. 2020;10(8):944-950. doi: 10.1002/alr.22587. Epub 2020 Jun 18. PMID: 32301284; PMCID: PMC7262123.
 - 51 Mardani R, Vasmehjani AA, Zali F, Gholami A, Nasab SDM, Kaghazian H, et al. Laboratory parameters in detection of COVID-19 patients with positive RT-PCR; a diagnostic accuracy study. *Arch Acad Emerg Med*. 2020;8(1):e43. PMID: 32259132; PMCID: PMC7130449.
 - 52 Ardakani AA, Kanafi AR, Acharya UR, Khadem N, Mohammadi A. Application of deep learning technique to manage COVID-19 in routine clinical practice using CT images: Results of 10 convolutional neural networks. *Comput Biol Med*. 2020;121:103795. doi: 10.1016/j.compbmed.2020.103795. Epub 2020 Apr 30. PMID: 32568676; PMCID: PMC7190523.
 - 53 Mohammadzadeh A. Effectiveness of electronic health care and drug monitoring program to prevent COVID-19 and adherence to therapeutic regimen in patients with ischemic heart disease-a pilot study. *Journal Mil Med*. 2020;22(2):139-46. doi: 10.30491/JMM.22.2.139. (Persian)
 - 54 Abdollahpour S, Khadivzadeh T. Improving the quality of care in pregnancy and childbirth with coronavirus (COVID-19): a systematic review. *J Matern Fetal Neonatal Med*. 2022;35(8):1601-1609. doi: 10.1080/14767058.2020.1759540. Epub 2020 May 14. PMID: 32408776.
 - 55 AminJafari A, Ghasemi S. The possible of immunotherapy for COVID-19: A systematic review. *Int Immunopharmacol*. 2020;83:106455. doi: 10.1016/j.

- intimp.2020.106455. Epub 2020 Apr 2. PMID: 32272396; PMCID: PMC7128194.
- 56 Asadi-Pooya AA, Simani L. Central nervous system manifestations of COVID-19: a systematic review. *J Neurol Sci.* 2020;413:116832. doi: 10.1016/j.jns.2020.116832. Epub 2020 Apr 11. PMID: 32299017; PMCID: PMC7151535.
 - 57 Banaei M, Ghasemi V, Saei Ghare Naz M, Kiani Z, Rashidi-Fakari F, Banaei S, et al. Obstetrics and neonatal outcomes in pregnant women with covid-19: A systematic review. *Iran J Public Health.* 2020;49(Suppl 1):38-47. doi: 10.18502/ijph.v49iS1.3668. PMID: 34268204; PMCID: PMC8266025.
 - 58 Borges do Nascimento IJ, Cacic N, Abdulazeem HM, von Groote TC, Jayarajah U, Weerasekara I, et al. Novel coronavirus infection (COVID-19) in humans: a scoping review and meta-analysis. *J Clin Med.* 2020;9(4):941. doi: 10.3390/jcm9040941. PMID: 32235486; PMCID: PMC7230636.
 - 59 Couper K, Taylor-Phillips S, Grove A, Freeman K, Osokogu O, Court R, et al. COVID-19 in cardiac arrest and infection risk to rescuers: a systematic review. *Resuscitation.* 2020;151:59-66. doi: 10.1016/j.resuscitation.2020.04.022. Epub 2020 Apr 20. PMID: 32325096; PMCID: PMC7169929.
 - 60 Emami A, Javanmardi F, Pirbonyeh N, Akbari A. Prevalence of underlying diseases in hospitalized patients with COVID-19: a systematic review and meta-analysis. *Arch Acad Emerg Med.* 2020;8(1):e35. PMID: 32232218; PMCID: PMC7096724.
 - 61 Kasraeian M, Zare M, Vafaei H, Asadi N, Faraji A, Bazrafshan K, et al. COVID-19 pneumonia and pregnancy; a systematic review and meta-analysis. *J Matern Fetal Neonatal Med.* 2022;35(9):1652-1659. doi: 10.1080/14767058.2020.1763952. Epub 2020 May 19. PMID: 32429786.
 - 62 Miri SM, Roozbeh F, Omranirad A, Alavian SM. Panic of buying toilet papers: a historical memory or a horrible truth? Systematic review of gastrointestinal manifestations of COVID-19. *Hepat Mon.* 2020;20(3). doi:10.5812/hepatmon.102729
 - 63 Muhidin S, Moghadam ZB, Vizheh M. Analysis of maternal coronavirus infections and neonates born to mothers with 2019-nCoV; a systematic review. *Arch Acad Emerg Med.* 2020;8(1):e49. PMID: 32440660; PMCID: PMC7211430.
 - 64 Panahi L, Amiri M, Pouy S. Clinical characteristics of COVID-19 infection in newborns and pediatrics: a systematic review. *Arch Acad Emerg Med.* 2020;8(1):e50. PMID: 32440661; PMCID: PMC7212072.
 - 65 Parohan M, Yaghoubi S, Seraji A. Liver injury is associated with severe coronavirus disease 2019 (COVID-19) infection: a systematic review and meta-analysis of retrospective studies. *Hepatol Res.* 2020;50(8):924-935. doi: 10.1111/hepr.13510. Epub 2020 Jun 25. PMID: 32386449; PMCID: PMC7273097.
 - 66 Sokouti M, Sadeghi R, Pashazadeh S, Eslami S, Sokouti M, Ghojzadeh M, et al. Comparative global epidemiological investigation of SARS-CoV-2 and SARS-CoV diseases using meta-MUMS tool through incidence, mortality, and recovery rates. *Arch Med Res.* 2020;51(5):458-463. doi: 10.1016/j.arcmed.2020.04.005. Epub 2020 Apr 15. PMID: 32331787; PMCID: PMC7158781.
 - 67 Yousefifard M, Zali A, Ali KM, Neishaboori AM, Zarghi A, Hosseini M, et al. Antiviral therapy in management of COVID-19: a systematic review on current evidence. *Arch Acad Emerg Med.* 2020;8(1):e45. PMID: 32309809; PMCID: PMC7156260.
 - 68 Yousefifard M, Zali A, Zarghi A, Madani Neishaboori A, Hosseini M, Safari S. Non-steroidal anti-inflammatory drugs in management of COVID-19; a systematic review on current evidence. *Int J Clin Pract.* 2020;74(9):e13557. doi: 10.1111/ijcp.13557. Epub 2020 Jun 14. PMID: 32460369; PMCID: PMC7267090.
 - 69 Ye Z, Wang Y, Colunga-Lozano LE, Prasad M, Tangamornsuksan W, Rochweg B, et al. Efficacy and safety of corticosteroids in COVID-19 based on evidence for COVID-19, other coronavirus infections, influenza, community-acquired pneumonia and acute respiratory distress syndrome: a systematic review and meta-analysis. *Cmaj.* 2020;192(27):E756-E67. doi: 10.1503/cmaj.200645. Epub 2020 May 14. PMID: 32409522; PMCID: PMC7828900.
 - 70 Raynaud M, Zhang H, Louis K, Goutaudier V, Wang J, Dubourg Q, et al. COVID-19-related medical research: a meta-research and critical appraisal. *BMC Med Res Methodol.* 2021;21(1):1. doi: 10.1186/s12874-020-01190-w. PMID: 33397292; PMCID: PMC7780085.
 - 71 Arab-Zozani M, Hassanipour S. Features and limitations of LitCovid hub for quick access to literature about COVID-19. *Balkan Med J.* 2020;37(4):231-232. doi: 10.4274/balkanmedj.galenos.2020.2020.4.67. Epub 2020 Apr 15. Erratum in: *Balkan Med J.* 2020 Aug 11;37(5):303. PMID: 32292015; PMCID: PMC7285668.
 - 72 Jung RG, Di Santo P, Clifford C, Prosperi-Porta G, Skanes S, Hung A, et al. Methodological quality of COVID-19 clinical research. *Nat Commun.* 2021;12(1):943. doi: 10.1038/s41467-021-21220-5. PMID: 33574258; PMCID: PMC7878793.
 - 73 Alexander PE, Debono VB, Mammen MJ, Iorio A, Aryal K, Deng D, et al. COVID-19 coronavirus research has overall low methodological quality thus far: case in point for chloroquine/hydroxychloroquine. *J Clin Epidemiol.* 2020;123:120-126. doi: 10.1016/j.jclinepi.2020.04.016. Epub 2020 Apr 21. PMID: 32330521; PMCID: PMC7194626.