

MARKS OF THE COVID-19 PANDEMIC ON FORENSIC MEDICINE: A SYSTEMATIC REVIEW

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Abstract: Since the end of 2019, humanity has been facing a pandemic generated by the SARS-COV-2 virus, which is felt in most functioning domains. Thus, the goal is to see how much forensic medicine has been affected by this virus and how it has reacted to this pandemic, given the fact that this domain can be of key importance in the fight against COVID-19. A number of 7 articles that met the inclusion and exclusion criteria were thus analysed, initially starting from a number of 414 articles of so, searched in the PubMed database. The analysis of the specialized literature shows us that the number of autopsies performed, as well as of the publications in this sense is a low one.

Keywords: pandemic, forensic medicine, COVID -19, SARS-COV-2, autopsy.

INTRODUCTION

Since the end of the year 2019, humanity has been facing a new type of virus, SARS-COV-2, which has brought great changes in people's lives. The COVID-19 pandemic began in late 2019 and spread rapidly around the world, affecting the entire population of the planet, being first documented in China, in December 2019 [1]. On 13.11.2020, at a worldwide level, 52,899,849 cases of SARS-COV-2 virus infections were reported and a number of 1,295,841 deaths, due to this virus [2]. Given that people working in the field of forensic medicine are directly related to this virus, it is important to see how this virus had / has an impact on this field, how they have adapted to changes produced, and finally but not least, how were autopsies realized on deceased people, which were confirmed with COVID-19 and how these could offer answers to better understand the manner in which the virus affected people.

Since the beginning, the COVID-19 virus has been epidemiologically associated with the Huanan Seafood Wholesale Market, where wild animals are also sold locally [3]. Subsequent evidence of this clinical infection suggests that SARS-CoV-2 is transmitted from person to person [4]. Massive alveolar damage and progressive respiratory failure can

lead to severe death, and the number of lymphocytes, monocytes, leukocytes, biomarkers related to infection, inflammatory cytokines and T cells are also altered in patients with severe conditions [3, 4].

According to the World Health Organization, the most common symptoms of COVID-19 are: fever, dry cough, fatigue, and some of the most common symptoms include throat pain, sore throat, diarrhea, conjunctivitis, headache, loss of taste or smell, rash on the skin or discoloration of the toes. The most serious symptoms that require immediate attention are shortness of breath and difficulty breathing, chest pain or pressure, loss of speech and movement [5].

According to Pinheiro, forensic medicine is also a broad medical field today, which includes many subdomains. However, in general, when someone thinks or speaks about it, they immediately associate it with death, autopsies and related problems. These are only part of forensic medicine, as new approaches and subspecialties emerging due to advances in medical science and socio-political changes throughout the world [6].

In most cases, forensic doctors are required to perform autopsies in cases of sudden, unnatural, unexpected death. However, a role overlooked by forensic pathologists refers to public health and public safety issues, for example, when societies face threats

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due to contagious infections, with a high fatality rate [7, 8], as is the case with the present situation, where the role of forensic medicine can become crucial.

Although autopsies are an essential tool for understanding new diseases, in this context, it is incomprehensible that there is a global reluctance to perform autopsies on patients with COVID-19 [9]. Thus, by the end of April 2020, when 150,000 patients were declared dead due to COVID-19 infection, only 16 cases of autopsy were reported in the specialized literature, with nine publications presenting limited autopsies. In the absence of reliable data on the degree of SARS-COV-2 infectivity in deceased individuals, various authorities have discouraged autopsies [10]. Thus the objective is to analyze the works that reported the cases in which autopsy was performed and see to what extent they encountered difficulties and what these difficulties were.

METHOD

Literature review

An exclusively electronic search was performed searching for articles published until November 9, 2020 without a specific starting point. The identified studies were searched in the PubMed database. The key words used in this search were: Corona, forensic medicine, COVID-19, SARS-COV-2, Coronavirus, Covid pandemics, COVID-19 pandemics. The search phrase was: Corona and forensic medicine or COVID-19 and forensic medicine or SARS-COV-2 and forensic medicine or Coronavirus and forensic medicine or Covid pandemics and forensic medicine or COVID-19 pandemics and forensic medicine (Fig. 1).

The initial search resulted in 414 articles and the first two criteria for inclusion in the research was for the studies to be quantitative and published in English. The other criteria for inclusion in the study were: (3)

Inclusion/ exclusion criteria

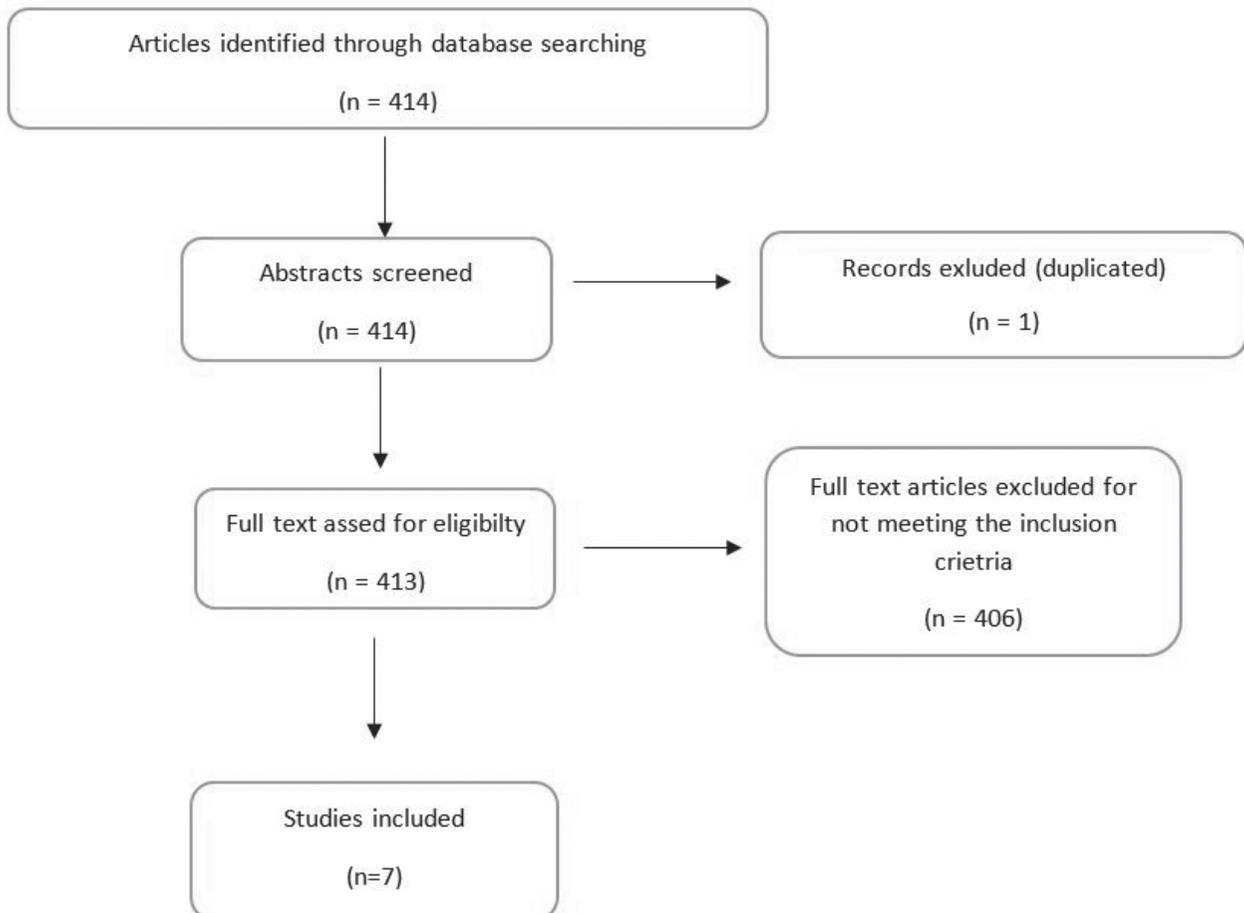


Figure 1. Number of articles included in the analysis

Table 1. Summary of studies included in the meta-analysis

| Study | Country | Study format | Number of examinations | Deceased average age | % Women |
|------------------------|---|--------------|------------------------|----------------------|---------|
| Basso, 2020 [11] | Italy | descriptive | 22 | 80.6 ± 8.4 | 31.82 |
| D'Errico, 2020 [12] | USA, Germany, Italy, Austria, Switzerland, Belgium, UK, China | review | 407 | ns | 25.31 |
| Khoo, 2020 [13] | Malaysia | descriptive | 102 | 63.31 | ns |
| Hanley, 2020 [14] | UK | review | ns | ns | ns |
| McGuone, 2020 [15] | USA | descriptive | ns | ns | ns |
| Sakelliadis, 2020 [16] | Greece | descriptive | 231 | 64.76±20.03 | 35.2 |
| Sperhake, 2020 [17] | Germany | descriptive | ns | ns | ns |

forensic actions to be clearly defined; (4) not be related to other coronaviruses or pandemics / epidemics; (5) to investigate a link between the pandemic and forensic medicine. Based on the inclusion / exclusion criteria, a number of 7 articles met these criteria (Table 1).

RESULTS

Of the 7 studies analyzed, three show the importance of performing autopsies, three show the procedures to be followed by forensic doctors due to the risk of infection with the new coronavirus, and the seventh compares the characteristics of pre-pandemic autopsy and pandemic autopsy.

Basso *et al.* [11], D'Errico *et al.* [12] and Sperhake [17] advocate their studies for the importance of complete autopsies as a way to determine how comprehensively as possible, the organic effects of the new pathogen (SARS-CoV-19). D'Errico *et al.* [12] underlined that this analysis should be a priority for the medical system in order to be able to fight the new coronavirus. Both Khoo *et al.* [13] and Hanley *et al.* [14] and McGuone *et al.* [15] sustained the importance of using personal protective equipment (PPE) and compliance with national and international protection standards. Khoo *et al.* [13] mentioned the fact that after completion of the autopsy, the bodies must be prepared to be removed by wrapping them into 3 layers, thus reducing any chance of infection with SARS-Cov-2 among those who subsequently come into contact with the body. In addition to the other studies, Hanley *et al.* [14] emphasized that the need to be declared different if the main cause of death is a comorbidity of the patient and differently if this is the cause of the infection with the new coronavirus. The need for decontamination, both of the person who performed the autopsy and of the laboratory where it was performed, is indicated by McGuone [15], who also presented the decontamination procedure, emphasizing the importance of taking care not to remove any protective equipment from any potentially contaminated surface, including the personal

protective equipment used by the person performing the autopsy.

Finally, Sakelliadis *et al.* [16] say that there are no significant differences between the characteristics of the procedures used to perform autopsies in Greece before and during the COVID-19 pandemic.

DISCUSSION

From the analysis of specialty literature one can observe that specialists in the field encourage forensic doctors to perform and publish as much information as possible about the autopsies they perform, emphasizing the importance of these in the fight against the new Corona virus.

Most of the studies analyzed indicate that certain standards of protection are required, given that we do not yet have very clear data on the transmission of the virus post-mortem, to prevent infection of those in key positions, who can determine the organic effects of COVID-19.

The results of the analysis indicated that there were places where no differences in protocol were observed between the pre-pandemic period and the period of the pandemic, which may be due to the fact that, by its nature, medicine can also deal with various pathogens and aggressions[17].

The limitations of the present study are given by the low number of autopsies reported in the specialty literature and by the low number of studies analyzing the procedures of these autopsies. For these reasons, it is absolutely vital that part of the efforts to combat the pandemic to be directed to the same medical authority in order to perform as many autopsies as possible and to have an overall picture, in order to observe the effects of SARS-VOC-2 on the human body [18].

In conclusion, this article emphasizes on the basis of literature reviews, the vitality of understanding diseases in fighting the pandemic and the importance of forensic medicine in this endeavor.

Conflict of interest

The authors declare that they have no conflict of interest.

References

1. World Health Organization. WHO announces COVID-19 outbreak a pandemic. 2020. <https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/news/news/2020/3/who-announces-covid-19-outbreak-a-pandemic>.
2. Johns Hopkins Center for Systems Science and Engineering Coronavirus COVID-19 Global Cases. 2020 <https://coronavirus.jhu.edu/map.html>. accessed on November 13, 2020.
3. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z, Yu T, Xia J, Wei Y, Wu W, Xie X, Yin W, Li H, Liu M, Xiao Y, Gao H, Guo L, Xie J, Wang G, Jiang R, Gao Z, Jin Q, Wang J, Cao B. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020; 395(10223):497-506.
4. Wang R, Zhang X, Irwin DM, Shen Y. Emergence of SARS-like coronavirus poses new challenge in China. *J Infect*. 2020;80(3):350-371.
5. https://www.who.int/health-topics/coronavirus#tab=tab_3
6. Pinheiro J. Introduction to forensic medicine and pathology. *Forensic anthropology and medicine: complementary sciences from recovery to cause of death*. 2006: 13-37.
7. Franks TJ, Chong PY, Chui P, Galvin JR, Lourens RM, Reid AH, Selbs E, McEvoy CP, Hayden CD, Fukuoka J, Taubenberger JK, Travis WD. Lung pathology of severe acute respiratory syndrome (SARS): a study of 8 autopsy cases from Singapore. *Hum Pathol*. 2003; 34 (8):743-748.
8. Reichert CM, O'Leary TJ, Levens DL, Simrell CR, Macher AM. Autopsy pathology in the acquired immune deficiency syndrome. *Am J Pathol*. 1983; 112(3):357-382.
9. Spherhake JP. Autopsies of COVID-19 deceased? Absolutely! *Legal medicine (Tokyo, Japan)*. 2020; 47; 101769.
10. Tzankov A, Jonigk D. Unlocking the lock-down of science and demystifying COVID-19: how autopsies contribute to our understanding of a deadly pandemic. *Virchows Archive: an international journal of pathology*. 2020; 477(3), 331-333.
11. Basso C, Calabrese F, Sbaraglia M, Del Vecchio C, Carretta G, Saieva A, Donato D, Flor L, Crisanti A, Dei Tos AP. Feasibility of postmortem examination in the era of COVID-19 pandemic: the experience of a Northeast Italy University Hospital. *VirchowsArchiv: an international journal of pathology*. 2020; 477(3), 341-347.
12. D'Errico, S, Zanon M, Montanaro M, Radaelli D, Sessa F, Di Mizio G, Montana A, Corrao S, Salerno M, Pomara C. More than Pneumonia: Distinctive Features of SARS-Cov-2 Infection. From Autopsy Findings to Clinical Implications: A Systematic Review. *Microorganisms*. 2020; 8(11), E1642.
13. Khoo LS, Hasmi AH, Ibrahim MA, Mahmood MS. Management of the dead during COVID-19 outbreak in Malaysia. *Forensic Science, Medicine and Pathology*. 2020; 16(3), 463-470.
14. Hanley B, Lucas SB, Youd E, Swift B, Osborn M. Autopsy in suspected COVID-19 cases. *Journal of Clinical Pathology*. 2020; 73(5), 239-242.
15. McGuone D, Sinard J, Gill JR, Masters A, Liu C, Morotti R, Parkash V. Autopsy Services and Emergency Preparedness of a Tertiary Academic Hospital Mortuary for the COVID-19 Public Health Emergency: The Yale Plan. *Advances in Anatomic Pathology*. 2020; 27(6), 355-362.
16. Sakelliadis EI, Katsos KD, Zouzia EI, Spiliopoulou CA, Tsiodras S. Impact of Covid-19 lockdown on characteristics of autopsy cases in Greece. Comparison between 2019 and 2020. *Forensic Science International*. 2020; 313, 110365.
17. Spherhake JP. Autopsies of COVID-19 deceased? Absolutely! *Legal Medicine (Tokyo, Japan)*. 2020; 47, 101769.
18. Rus M, Sandu LM, Tănase T, Boumediene S, Delcea C. The effect of the coronavirus (COVID-19) on Mental Health. *Int J Advanced Studies in Sexology*. 2020; 2(2): 116-120.