INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH AND ANALYSIS

ISSN(print): 2643-9840, ISSN(online): 2643-9875

Volume 04 Issue 08 August 2021

DOI: 10.47191/ijmra/v4-i8-14, Impact Factor: 6.072

Page No.- 1159-1167

COVID19 Long Term Effects in Patients Treated with Chlorine Dioxide

Manuel Aparicio-Alonso[1], Carlos A. Domínguez-Sánchez[2], Marina Banuet-Martínez[3]

[1,2,3]CentroMédicoJurica, Querétaro, México

ABSTRACT: The coronavirus disease 2019 (COVID19) has generated widespread healthcare concerns and has overburdened healthcare institutions. As the number of COVID19 patients recovers, so does the frequency of reports of COVID19-like symptoms following discharge. A telephone survey with standardized questions was undertaken in which participants were asked if they had had any of 25 possible sequelae after being diagnosed with COVID19 and treated with a Chlorine Dioxide Solution (CDS). One hundred sixty-one people completed the survey. We discovered that rising age is a risk factor (OR = 1.035, p = 0.028, 95% CI = 1.004-1.069), and the odds of having any symptoms in moderate patients is 0.077 compared to mild patients (*P* = 0.003). It was predicted that 64.6 percent of patients treated with CDS for SARS-CoV-2 infection experienced an average of 3.41 long-term effects. There were no variations in the number of sequelae reported by sex, age, COVID19 severity, or therapy method. The five most prevalent manifestations of the 25 distinct long-term symptoms observed in this study were fatigue, hair loss, dyspnea, concentration problem, and sleep difficulties. In addition, individuals treated with multiple drugs (COVID19 conventional treatment plus a CDS) had 2.7 fewer cases of sequelae, and patients treated exclusively with CDS had 6.14 fewer incidences of long-term effects. People who get a CDS are 19% less likely to experience long-term health effects than patients who receive standard COVID19 therapy. According to the findings of this study, patients who receive a CDS have a reduced probability of developing sequelae. Furthermore, the incidence of long-term effects is lower in individuals treated exclusively with a CDS. The recent findings involving Chlorine Dioxide support the development of clinical studies to evaluate its efficacy in preventing the development of COVID19 long-term effects.

KEYWORDS: Chlorine Dioxide, Chronic COVID19, COVID19, Pandemic, Long-term effects, sequelae

I. INTRODUCTION

The coronavirus disease 2019 (COVID19) pandemic is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and has led to health care problems around the world and overloaded health facilities (Al-Jahdhami, Al-Naamani, and Al-Mawali 2021; Yu et al. 2020). As the number of COVID19 patients recovers, people are being discharged from the hospital without a thorough assessment of recovery and the need for rehabilitation, so understanding the chronic healthcare challenges they may encounter is critical (Mandal et al. 2021). COVID19 is recognized as a multi-organ disease with many symptoms, mainly fever, cough, shortness of breath, and fatigue (Barman et al. 2020; da Rosa Mesquita et al. 2021). Although there is no clear and precise definition of chronic COVID19, it has been defined as the persistence or appearance of symptoms similar to COVID19 at least three weeks after remission of symptoms (Datta, Talwar, and Lee 2020; Greenhalgh et al. 2020). According to a recent study, while the symptom burden in patients recovering from a COVID19 hospitalization decreased with early follow-up, patients reported chronic dyspnea, cough, and fatigue after discharge (Mandal et al. 2021). These cases of acute COVID19 long-term sequelae are comparable to documented post-acute viral symptoms in survivors of previous virulent coronavirus outbreaks (Moldofsky and Patcai 2011). Here, we investigate the long-term symptoms of COVID19 in patients treated with an aqueous solution of chlorine dioxide in this study.

II. METHODS

Subjects of study

A database of patients with COVID19 treated with a Chlorine Dioxide solution (CDS) was reviewed, and 200 people were chosen randomly to participate in this study. Age, gender, comorbidities, number of days of symptoms, the severity of COVID19 (mild, moderate and severe), and the type of treatment: 1) Multidrug: patients consuming drugs usually used for treating COVID19 (Azytromicine, Dexamethasone, Ivermectin, and hydroxychloroquine) plus a CDS, and 2) Exclusively CDS: Patients treated only

with a CDS; was obtained from the clinical record of each patient. All the persons included in this study were discharged at least three months before the survey.

A telephone survey was conducted with standardized questions with dichotomous answers (yes/no) in which patients were asked if they had presented any of 25 different sequelae after having COVID19 and being treated with CDS. We deliberately kept the questionnaire short due to anticipated time pressures from the respondent. The questions were read to the respondents, and the interviewer wrote their answers verbatim. The survey was conducted by trained personnel from March 15, 2021, to April 19, 2021. All patients included in this study provided verbal consent to allow the collected data for research purposes. All the data were translated into English before analysis, and all authors had full access to it.

Statistical Analysis

Descriptive statistics were used to gain an overall understanding of the basic characteristics of the baseline data. Before performing inferential analyses, normality, heteroscedasticity, and independence were examined. The variables deviated from a normal distribution, and heteroscedasticity and independence were observed. The incidence of COVID19 long-term effects was calculated by dividing the number of non-successful cases (people who had at least one sequel) by the total number of people who completed the survey multiplied by 100 to estimate the percentage. The Kruskal-Wallis test was used to compare outcomes based on disease severity (mild, moderate, and severe) and age. The Wilcoxon rank-sum test was used to compare the number of sequels based on treatment type and gender. A linear regression model was used to investigate the relationship between sequels and days of symptoms. The odds ratio (OR) was calculated to compare the odds of presenting sequelae, given sex, type of treatment, age and severity of the disease. Risk Ratio (RR) was calculated to compare the sequelae-incidence of our study against the outcomes of a long-term effect meta-analysis (Lopez-Leon et al. 2021). A p-value <0.05 was considered statistically significant. Continuous outcomes were measured as the mean difference and 95% confidence intervals (CI). The treating physician was not involved in digitization or statistical analysis to reduce information bias. All analyses were conducted using R v.3.6.1 (R Core Team, 2020).

Ethical approval

The Ethics Committee of the Centro Medico Jurica waived the need for ethical approval and the need to obtain consent for the collection, analysis, and publication of retrospectively obtained data because this survey research is a non-experimental research approach used to gather information about the incidence of long term effect of COVID19 in patients treated with a CDS while maintaining patient anonymity.

Data availability

The datasets used and analyzed during the current investigation are accessible upon reasonable request from the corresponding author.

III. RESULTS

A total of 161 subjects completed the survey (response rate = 80.5%). Basic information of sex, age, severity and type of treatment is described in Table 1. We found that sex was not associated with sequels development (OD = 0.23, 95% CI = 0.63-1.24, p = 0.09), and increasing age is a risk factor (OR = 1.035, p = 0.028, 95% CI = 1.004-1.069), and the odds of having any sequelae in moderate patients is 0.077 compared to mild patients (p=0.003, 95% CI = 0.014-0.423). Additionally, the type of treatment does not influence the development of sequelae (OD = 0.96, 95% CI = 0.38-2.44, p = 0.941).

It was estimated that 104 (64.6%) of the patients treated with CDS against SARS-CoV-2 infection developed one or more sequelae (on average 3.41 [95% IC, 3.03 – 3.79] sequels each person; Table 2). There were no differences in the number of sequelae presented between sex (Wilcoxon rank-sum, W = 1388.5, p = 0.816), age (Kruskal.Wallis, x^2 = 1.607, df = 6, p = 0.950), severity (Kruskal.Wallis, x^2 = 1.171, df = 2, p = 0.556), nor type of treatment (Wilcoxon rank-sum, W = 371.5, p = 0.973). Neither was identified a correlation between the number of sequelae and the days of symptoms (p = 0.339).

Of the 25 different long-term effects analyzed in this study (Fig. 1), fatigue (29.81%), hair loss (21.74%), dyspnea (14.91), attention disorder (13.66%) and sleep disorders (13.04%) were the five most common manifestation but had different incidence depending on sex, age, type of treatment and the severity of COVID19 (Fig. 2). When the incidence of each sequela was compared to a meta-analysis of long-term effects in COVID19 patients (Lopez-Leon et al. 2021), it was discovered that people treated with a CDS against COVID19 had fewer sequelae (Kruskal.Wallis, x^2 = 31.862, df = 3, p <0.0001; Fig. 1). Additionally, it was found that patients treated with multidrug plus a CDS have 2.7 fewer incidences of sequelae (Dunn, Z = 3.259, p = 0.007), and 6.14 less incidence those who were treated only with a CDS (Dunn, Z = 5.458p <0.0001); however there was no difference in the

presentation of sequelae between the type of treatment (Dunn, Z = 2.198, p = 0.167; Fig. 3). Patients treated with a CDS are 19% (RR = 0.81, 95% CI = 0.72-0.91) less likely to have long-term health consequences than patients treated with conventional COVID19 treatment.

IV. DISCUSSION

As cases of SARS-CoV-2 infection increase worldwide, it is necessary to assess the long-term effects in patients who have experienced COVID19 (Hellmuth et al. 2021). It is unknown why some people's recovery is prolonged (Greenhalgh et al. 2020). However, it has been proposed that it may be due to reinfection (Lan et al. 2020), long or Chronic COVID19 (Nalbandian et al. 2021; Say et al. 2021; Sisó-Almirall et al. 2021), lack of antibodies that lead to persistent viremia (Dispinseri et al. 2021), and inflammatory and other immune reactions (Tay et al. 2020). Furthermore, long-term respiratory, musculoskeletal and neurological disorders have been reported after infection with other coronaviruses (SARS and MERS; Lam *et al.*, 2009; Das *et al.*, 2017; Hosseiny *et al.*, 2020). In this study, the incidence of long-term COVID19 was 64.60%, less than findings reported from studies in Europe with the persistence of symptoms in 87.4% of patients recovered from COVID19 (Carfì, Bernabei, and Landi 2020) and a meta-analysis that reported 80% of long-term effects (Lopez-Leon et al. 2021). Fatigue, hair loss, dyspnea, attention disorder and sleep disorders were the most common manifestation reported by the patients, symptoms that had been reported in other studies (Carfì et al. 2020; Datta et al. 2020; Lopez-Leon et al. 2021; Nalbandian et al. 2021; Say et al. 2021). Fatigue, the most common symptom of prolonged COVID19 reported by patients, was associated with headache, joint pain, and sleep, mood and attention disorders also reported by patients in this study. These symptoms partly resemble chronic fatigue syndrome, suggesting that chronic COVID19 can cause an autonomic dysfunction that could lead to physical and cognitive alterations (Vink and Vink-Niese 2020; Wostyn 2021).

Although there was no difference in the number of sequelae reported by men and women, paranoia, new hypertension and weight loss, there are sequelae that occur more in men; and hair loss, fatigue, and dizziness had a higher incidence in women (Fig. 2A). It is known that there are genetic variants that carry a different risk in women and men; also, it has been shown that post-acute COVID19 syndrome is more common in women (Al-Jahdhami et al. 2021) and that men have more physical-biological sequelae, while women develop more neurological problems (Turabian, 2020). However, in this study, we find no evidence of this. It is important to continue collecting information on the long-term effects of COVID19 in order to understand its dynamics on men and women better. Over 40 years of age had a higher risk of developing any sequelae (incidence range 61.90% to 100%; Table 1) compared to children and adolescents. Common persistent COVID19 symptoms in adults are respiratory sequelae (mainly dyspnea) and persistent fatigue. In young people, joint pain and mood disorders were the main symptoms (Fig. 2B). These findings are similar to COVID19 studies in adults, which have identified more significant multisystem complications and a greater prevalence and severity of long-term effects in elderly persons (Greenhalgh et al. 2020; Nalbandian et al. 2021; Say et al. 2021). It is essential to conduct more studies on the long-term effects of COVID19 in different age groups to comprehensively describe the post COVID19 manifestations.

Regarding the severity of COVID-19, patients that presented severe COVID19 had more sequels incidence (Fig. 2C). Fatigue, breathlessness (dyspnea), and chest pain were symptoms reported mainly in severe patients and could be due to the pulmonary fibrosis caused by SARS-CoV-2, which increases the risk of pulmonary embolisms and affects pulmonary function (Al-Jahdhami et al. 2021). Moreover, new hypertension and renal failure were only presented by patients (n = 2) who had presented severe COVID19; this may be because hypovolemia and dehydration are frequent in severe COVID19 patients and are the leading causes of acute kidney injury in hospitalized patients (Tarragón et al. 2021). An increasing number of healthy people who did not require hospitalization continue to have symptoms months after mild and moderate cases of COVID19 (Vink and Vink-Niese 2020). Physicians and researchers have focused on the acute phase of COVID19, but it is vital to continuously monitor patients after discharge to detect chronic effects and establish relationships with the degree of the disease presented.

The patients of the two treatment types had a different incidence in each of the 25 different sequelae (Fig. 2D). Patients in this study consumed CDS as a treatment for COVID19 and had a 19% lower risk of presenting one or more sequelae than reported in a meta-analysis (Lopez-Leon et al. 2021). Considering the average incidence in the 25 sequelae, patients medicated with multidrug plus a CDS and patients who exclusively consumed a CDS against COVID19 had 2.70 and 6.14 times less sequelae incidence, respectively; compared to patients treated with conventional drugs against this disease (Lopez-Leon et al. 2021). The Chlorine Dioxide aqueous solutions have been used for more than 60 years as a water purifier (Kály-Kullai et al. 2020; Ma et al. 2017; U.S. Environmental Protection Agency 2000); and its virucidal potential against influenza virus (Ogata 2012; Ogata et al. 2016) and SARS-CoV-2 (Kály-Kullai et al. 2020; Ogata and Miura 2021) has recently been suggested. Additionally, this compound is safe for use in humans in adequate concentrations. (Kály-Kullai et al. 2020; Lubbers and Bianchine 1984; Lubbers, Chauhan, and

Bianchine 1981; Noszticzius et al. 2013). It is important to continue conducting studies on the potential effect of various compounds to prevent or reduce the development of chronic covid19-like symptoms in patients who survive infection with SAR-CoV-2. This study indicates that aqueous solutions of Chlorine Dioxide can reduce the long-term effects caused by COVID19. However, it is crucial to design randomized clinical trials that allow the practical evaluation of this compound.

V. LIMITATIONS

Although the findings of this study are promising, they are not definitive because it is a single-center study with no control group, making it difficult to discern differences in the incidence of COVID19 long-term effects in patients treated with CDS compared to those treated with other medications (control). Furthermore, comparisons with other research should be cautioned because the populations are not comparable, and the inclusion criteria differed.

VI. CONCLUSION

This is the first study that compares the incidence of post-COVID19 long-term effects in patients treated with conventional drugs and patients who consumed a CDS against COVID19. We showed that patients treated for acute COVID19 exclusively with CDS have 6.14 times less incidence of sequelae. It was shown that the elderly and those who presented severe COVID19 have a higher risk of developing secondary symptoms in the long term. More research needs to be done to identify the exact risk factors and mechanisms that lead to the development of prolonged COVID syndrome. Multinational and interdisciplinary studies are essential to understand the risk factors associated with presenting chronic symptoms of COVID19.

REFERENCES

1) Al-Jahdhami, Issa, Khalid Al-Naamani, and Adhra Al-Mawali. 2021. "The Post-Acute COVID-19 Syndrome (Long COVID)." *Oman Medical Journal* 36:e220.
2) Barman, Manash Pratim, Tousifur Rahman, Krishnarjun Bora, and Chandan Borgohain. 2020. "COVID-19 Pandemic and Its Recovery Time of Patients in India: A Pilot Study." *Diabetes and Metabolic Syndrome: Clinical Research and Reviews* 14(5):1205–11.
3) Carfì, Angelo, Roberto Bernabei, and Francesco Landi. 2020. "Persistent Symptoms in Patients after Acute COVID-19." *JAMA - Journal of the American Medical Association* 324(6):603–5.
4) Das, Karuna, Edward Lee, Rajvir Singh, Mushira Enani, Khalid Al Dossari, Klaus Van Gorkom, Sven Larsson, and Ruth Lange. 2017. "Follow-up Chest Radiographic Findings in Patients with MERS-CoV after Recovery." *Indian Journal of Radiology and Imaging* 27:342–49.
5) Datta, Deblina, Amish Talwar, and James Lee. 2020. "A Proposed Framework and Timeline Ofthe Spectrum of Disease Due to SARS-CoV-2 Infection." *JAMA* 324(22):2251–52.
6) Dispinseri, Stefania, Massimiliano Secchi, Maria Franca Pirillo, Monica Tolazzi, Martina Borghi, Cristina Brigatti, Maria Laura De Angelis, Marco Baratella, Elena Bazzigaluppi, Giulietta Venturi, Francesca Sironi, Andrea Canitano, Ilaria Marzinotto, Cristina Tresoldi, Fabio Ciceri, Lorenzo Piemonti, Donatella Negri, Andrea Cara, Vito Lampasona, and Gabriella Scarlatti. 2021. "Neutralizing Antibody Responses to SARS-CoV-2 in Symptomatic COVID-19 Is Persistent and Critical for Survival." *Nature Communications* 12(1):2670.
7) Greenhalgh, Trisha, Matthew Knight, Christine A'Court, Maria Buxton, and Laiba Husain. 2020. "Management of Post-Acute Covid-19 in Primary Care." *BMJ* 370:m3026.
8) Hellmuth, Joanna, T. Allen Barnett, Breton M. Asken, J. Daniel Kelly, Leonel Torres, Melanie L. Stephens, Bryan Greenhouse, Jeffrey N. Martin, Felicia C. Chow, Steven G. Deeks, Meredith Greene, Bruce L. Miller, Wesley Annan, Timothy J. Henrich, and Michael J. Peluso. 2021. "Persistent COVID-19-Associated Neurocognitive Symptoms in Non-Hospitalized Patients." *Journal of NeuroVirology* 27(1):191–95.
9) Hosseiny, Melina, Soheil Kooraki, Ali Gholamrezanezhad, Sravanthi Reddy, and Lee Myers. 2020. "Radiology Perspective of Coronavirus Disease 2019 (COVID-19): Lessons From Severe Acute Respiratory Syndrome and Middle East Respiratory Syndrome." *Cardiopulmonary Imaging* 1078–82.
10) Kály-Kullai, K., M. Wittmann, Z. Noszticzius, and László Rosivall. 2020. "Can Chlorine Dioxide Prevent the Spreading of Coronavirus or Other Viral Infections? Medical Hypotheses." *Physiology International* 107(1):1–11.
11) Lam, Marco Ho Bun, Yun Kwok Wing, Mandy Wai Man Yu, Chi Ming Leung, Ronald C. W. Ma, Alice P. S. Kong, W. Y. So, Samson Yat Yuk Fong, and Siu Ping Lam. 2009. "Mental Morbidities and Chronic Fatigue in Severe Acute Respiratory Syndrome Survivors." *Archives of Internal Medicine* 169(22):2142–47.
12) Lan, Lan, Dan Xu, Guangming Ye, Chen Xia, Shaokang Wang, Yirong Li, and Haibo Xu. 2020. "Positive RT-PCR Test Results in

Patients Recovered from COVID-19." *JAMA - Journal of the American Medical Association* 323(15):1502–3.

13) Lopez-Leon, Sandra, Talia Wegman-Ostrosky, Carol Perelman, Rosalinda Sepulveda, Paulina Rebolledo, Angelica Cuapio, and Sonia Villapol. 2021. "More than 50 Long-Term Effects of COVID-19: A Systematic Review and Meta-Analysis." *MedRxiv* doi: 10.1101/2021.01.27.21250617.
14) Lubbers, Judith R., and Joseph R. Bianchine. 1984. "Effects of the Acute Rising Dose Administration of Chlorine Dioxide, Chlorate and Chlorite to Normal Healthy Adult Male Volunteers." *Journal of Environmental Pathology, Toxicology and Oncology : Official Organ of the International Society for Environmental Toxicology and Cancer* 5:215—228.
15) Lubbers, Judith R., Sudha Chauhan, and Joseph R. Bianchine. 1981. "Controlled Clinical Evaluations of Chlorine Dioxide, Chlorite and Chlorate in Man." *Toxicological Sciences* 1(4):334–38.
16) Ma, Jui Wen, Bin Syuan Huang, Chu Wei Hsu, Chun Wei Peng, Ming Long Cheng, Jung Yie Kao, Tzong Der Way, Hao Chang Yin, and Shan Shue Wang. 2017. "Efficacy and Safety Evaluation of a Chlorine Dioxide Solution." *International Journal of Environmental Research and Public Health* 14(3).
17) Mandal, Swapna, Joseph Barnett, Simon E. Brill, Jeremy S. Brown, Emma K. Denneny, Samanjit S. Hare, Melissa Heightman, Toby E. Hillman, Joseph Jacob, Hannah C. Jarvis, Marc C. I. Lipman, Sindhu B. Naidu, Arjun Nair, Joanna C. Porter, Gillian S. Tomlinson, and John R. Hurst. 2021. "Long-COVID: A Cross-Sectional Study of Persisting Symptoms, Biomarker and Imaging Abnormalities Following Hospitalisation for COVID-19." *Thorax* 76(4):396–98.
18) Moldofsky, Harvey, and John Patcai. 2011. "Chronic Widespread Musculoskeletal Pain, Fatigue, Depression and Disordered Sleep in Chronic Post-SARS Syndrome; a Case-Controlled Study." *BMC Neurology* 11:1–7.
19) Nalbandian, Ani, Kartik Sehgal, Aakriti Gupta, Mahesh V. Madhavan, Claire McGroder, Jacob S. Stevens, Joshua R. Cook, Anna S. Nordvig, Daniel Shalev, Tejasav S. Sehrawat, Neha Ahluwalia, Behnood Bikdeli, Donald Dietz, Caroline Der-Nigoghossian, Nadia Liyanage-Don, Gregg F. Rosner, Elana J. Bernstein, Sumit Mohan, Akinpelumi A. Beckley, David S. Seres, Toni K. Choueiri, Nir Uriel, John C. Ausiello, Domenico Accili, Daniel E. Freedberg, Matthew Baldwin, Allan Schwartz, Daniel Brodie, Christine Kim Garcia, Mitchell S. V. Elkind, Jean M. Connors, John P. Bilezikian, Donald W. Landry, and Elaine Y. Wan. 2021. "Post-Acute COVID-19 Syndrome." *Nature Medicine* 27(4):601–15.
20) Noszticzius, Zoltán, Maria Wittmann, Kristóf Kály-Kullai, Zoltán Beregvári, István Kiss, László Rosivall, and János Szegedi. 2013. "Chlorine Dioxide Is a Size-Selective Antimicrobial Agent." *PLoS ONE* 8(11):e79157.
21) Ogata, Norio. 2012. "Inactivation of Influenza Virus Haemagglutinin by Chlorine Dioxide: Oxidation of the Conserved Tryptophan 153 Residue in the Receptor-Binding Site." *Journal of General Virology* 93:2558–63.
22) Ogata, Norio, and Takanori Miura. 2021. "Inhibition of the Binding of Spike Protein of SARS-CoV-2 Coronavirus to Human Angiotensin-Converting Enzyme 2 by Chlorine Dioxide." *Annals of Pharmacology and Pharmaceutics* 6(1):1–3.
23) Ogata, Norio, Miyusse Sakasegawa, Takanori Miura, Takashi Shibata, Yasuhiro Takigawa, Kouichi Taura, Kazuhiko Taguchi, Kazuki Matsubara, Kouichi Nakahara, Daisuke Kato, Koushirou Sogawa, and Hiroshi Oka. 2016. "Inactivation of Airborne Bacteria and Viruses Using Extremely Low Concentrations of Chlorine Dioxide Gas." *Pharmacology* 97(5–6):301–6.
24) da Rosa Mesquita, Rodrigo, Luiz Carlos Francelino Silva Junior, Fernanda Mayara Santos Santana, Tatiana Farias de Oliveira, Rafaela Campos Alcântara, Gabriel Monteiro Arnozo, Etvaldo Rodrigues da Silva Filho, Aisla Graciele Galdino dos Santos, Euclides José Oliveira da Cunha, Saulo Henrique Salgueiro de Aquino, and Carlos Dornels Freire de Souza. 2021. "Clinical Manifestations of COVID-19 in the General Population: Systematic Review." *The Central European Journal of Medicine* 133(377):382.
25) Say, Daniela, Nigel Crawford, Sarah McNab, Danielle Wurzel, Andrew Steer, and Shidan Tosif. 2021. "Post-Acute COVID-19 Outcomes in Children with Mild and Asymptomatic Disease." *The Lancet Child & Adolescent Health* 5:e22–23.
26) Sisó-Almirall, Antoni, Pilar Brito-Zerón, Laura Conangla Ferrín, Belchin Kostov, Anna Moragas Moreno, Jordi Mestres, Jaume Sellarès, Gisela Galindo, Ramon Morera, Josep Basora, Antoni Trilla, and Manuel Ramos-Casals. 2021. "Long Covid-19: Proposed Primary Care Clinical Guidelines for Diagnosis and Disease Management." *International Journal of Environmental Research and Public Health* 18(8):1–20.
27) Tarragón, Blanca, María Valdenebro, Maria Luisa Serrano, Alba Maroto, M. Rosario Llópez-Carratalá, Antonio Ramos, Esther Rubio, Ana Huerta, María Marques, and Jose Portolés. 2021. "Acute Kidney Failure in Patients Admitted Due to COVID-19." *Nefrologia* 41(1):34–40.
28) Tay, Matthew Zirui, Chek Meng Poh, Laurent Rénia, Paul A. MacAry, and Lisa F. P. Ng. 2020. "The Trinity of COVID-19: Immunity, Inflammation and Intervention." *Nature Reviews Immunology* 20(6):363–74.
29) U.S. Environmental Protection Agency. 2000. "Toxicological Review of Chlorine Dioxide and Chlorite." *CAS Nos. 10049-04-4 and 7758-19-2* (September):1–49.
30) Vink, Mark, and Alexandra Vink-Niese. 2020. "Could Cognitive Behavioural Therapy Be an Effective Treatment for Long

Covid and Post Covid-19 Fatigue Syndrome? Lessons from the Qure Study for q-Fever Fatigue Syndrome." *Healthcare* 8(4):1–17.

31) Wostyn, Peter. 2021. "COVID-19 and Chronic Fatigue Syndrome: Is the Worst yet to Come?" *Medical Hypotheses* 146:110469.
32) Yu, Xiaoqi, Dong Wei, Yongyan Chen, Donghua Zhang, and Xinxin Zhang. 2020. "Retrospective Detection of SARS-CoV-2 in Hospitalized Patients with Influenza-like Illness." *Emerging Microbes and Infections* 9:1–12.

TABLE 1. Sequelae description by sex, age, COVID19 severity and type of treatment

	n	%	Sequels incidence (%)	Number of sequels (95% CI)
Sex				
Female	77	47.83	64.29	2.66-3.86
Male	84	52.17	64.93	2.83-4.29
Age				
0-9	5	3.28	0.00	0
10-19	5	3.28	40.00	1.53-3.47
20-29	13	8.20	15.38	4.05-7.95
30-39	11	6.56	36.36	0.56-6.44
40-49	29	18.03	90.91	2.46-5.54
50-59	55	34.43	61.90	2.03-5.97
60-69	16	9.84	100.00	1.34-5.66
>70	27	16.39	66.67	1.52-5.61
Severity				
Mild	72	45.05	64.52	2.53-4.36
Moderate	34	20.88	36.84	1.58-4.41
Severe	55	34.07	78.05	3.23-5.21
Type of treatment				
Multidrug	111	69.23	64.29	3.02-4.68
Exclusively CDS	50	30.77	65.08	2.73-4.71

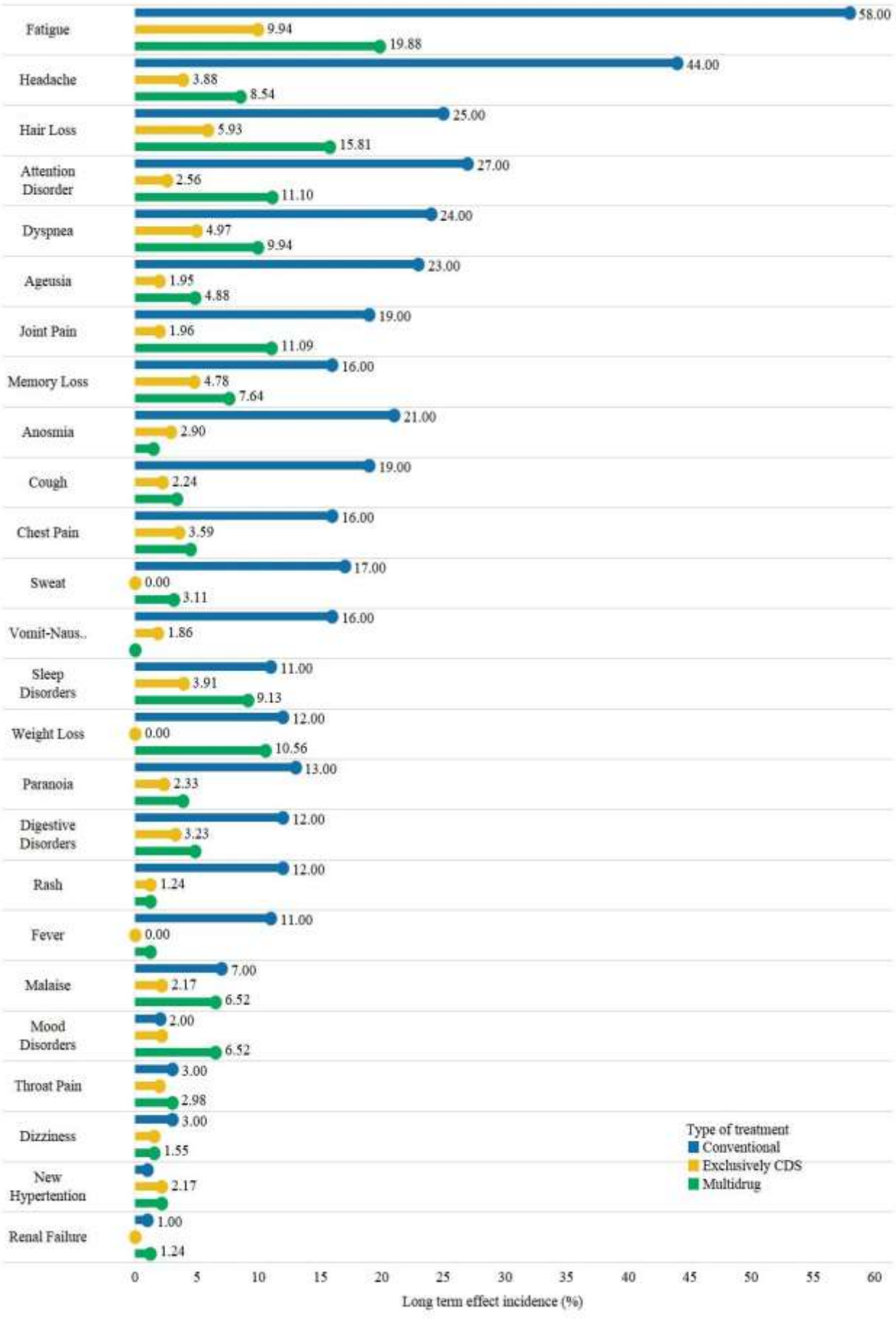

FIGURE 1. Incidence of the 25 different COVID19 long-term effects depending on the type of treatment. The incidence reported in a previously conducted study (Lopez-Leon et al. 2021) is blue (Conventional).

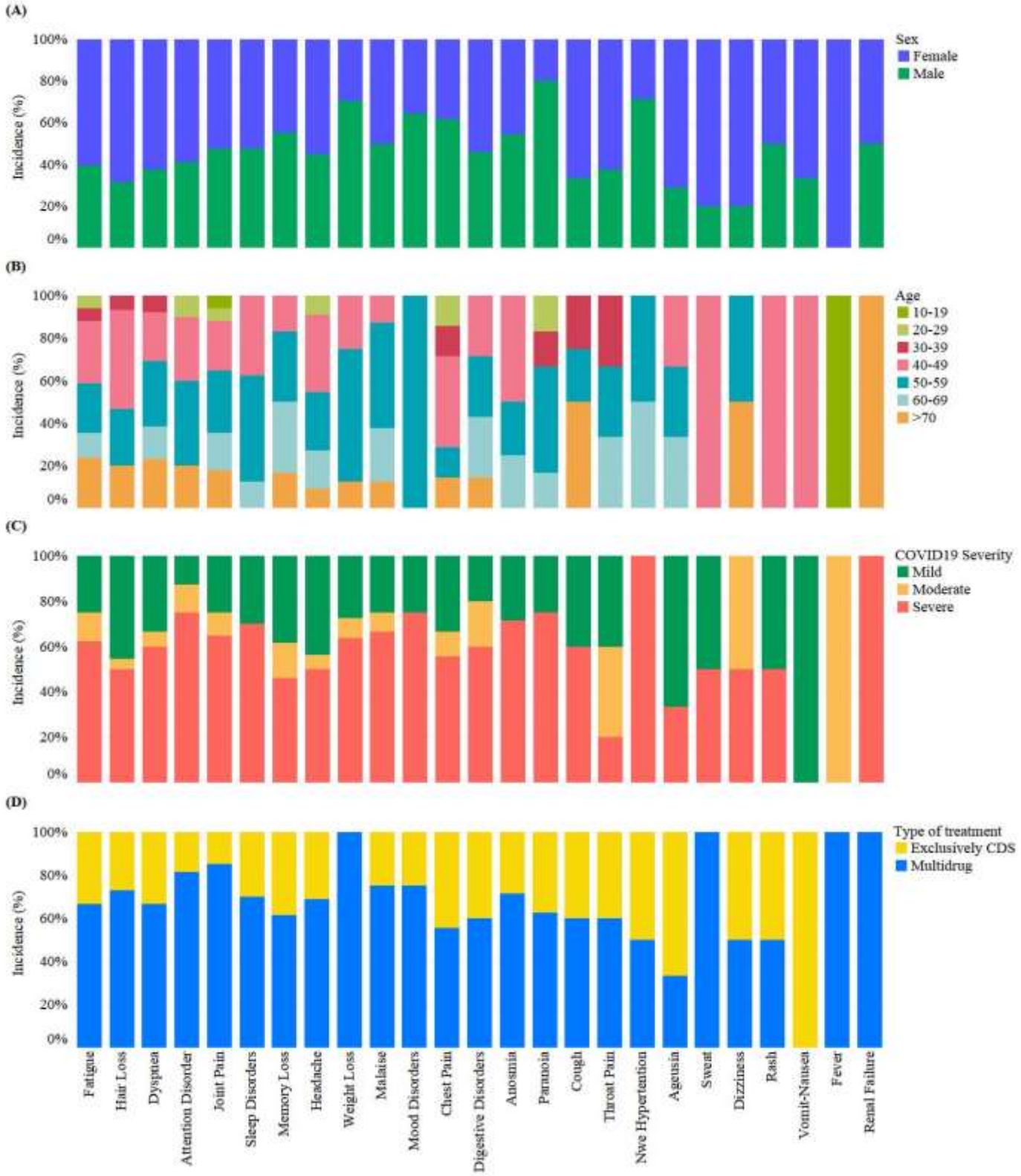

FIGURE 2. Incidence of the 25 different COVID19 long-term effects depending on (A) sex, (B) age, (C) COVID19 severity, and (D) Type of treatment.

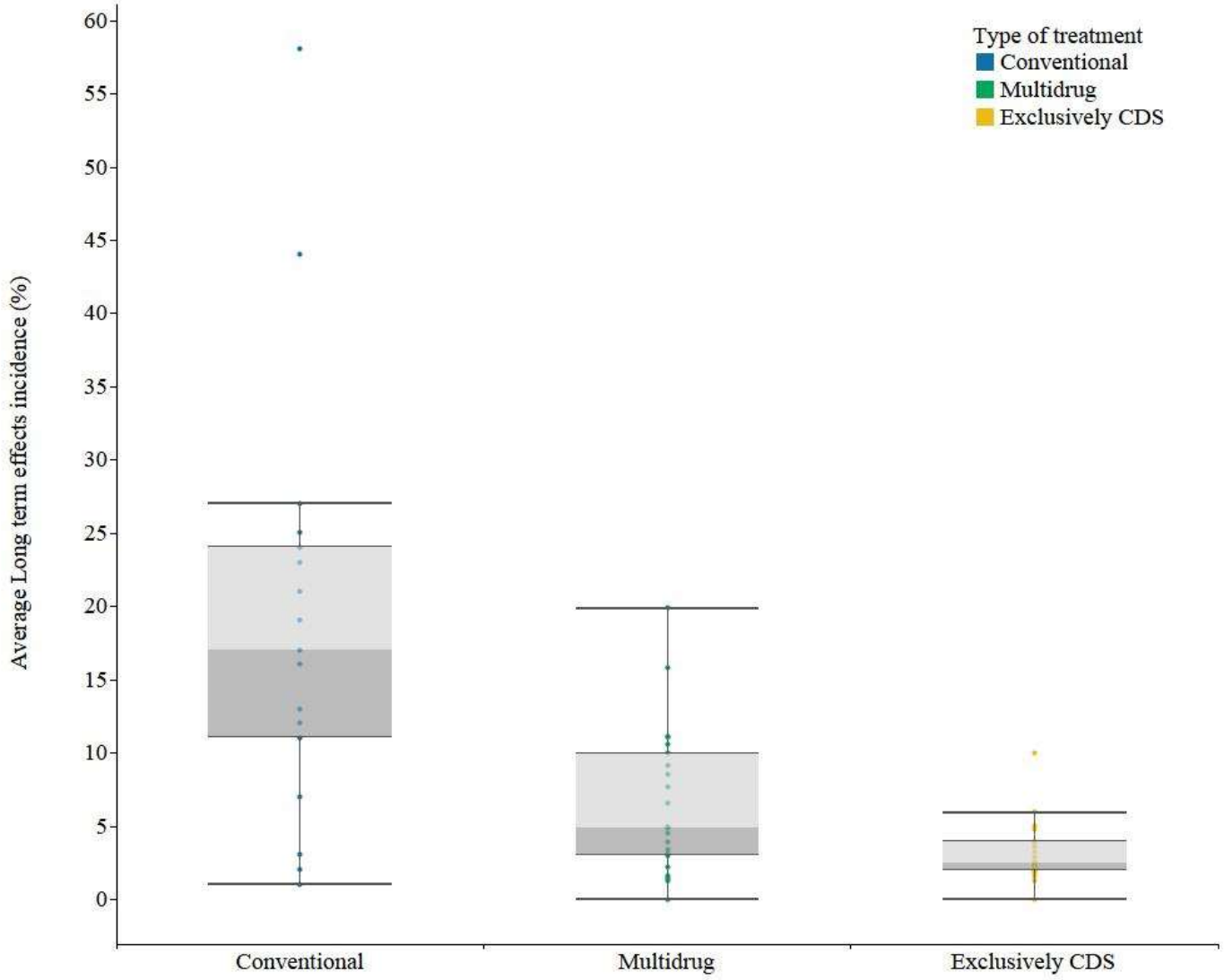

FIGURE 3. **The average incidence of COVID19 long term-effects depending on the type of treatment. Data analyzed from a previously conducted meta-analysis (Lopez-Leon et al. 2021) is blue (Conventional).**