

COMPORTAMIENTO CLÍNICO DE PACIENTES CON DIABETES MELLITUS TIPO II U OBESIDAD INGRESADOS POR NEUMONÍA GRAVE POR SARS-COV-2 A UNA UNIDAD DE CUIDADOS INTENSIVOS DE BARRANQUILLA, ATLÁNTICO DURANTE LA PRIMERA OLA DE PANDEMIA

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Trabajo de Investigación presentado como requisito para optar el título de:
Medicina Crítica y Cuidados intensivos

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RESUMEN

Introducción: la enfermedad por COVID-19 (enfermedad por coronavirus 2019) se ha conocido como una patología con presentación clínica heterogénea y es por lo cual se han estudiado predictores clínicos que puedan proporcionar pistas vitales con respecto a la planificación y asignación eficientes de recursos para cada paciente, además de las poblaciones en riesgo basado en la evidencia científica, como lo es el caso de grupos sociodemográficos específicos y morbilidades como la diabetes mellitus tipo II, la obesidad, la hipertensión Arterial y otras patologías cardiometabólicas.

Objetivos: caracterizar el comportamiento de la neumonía grave por COVID-19 en pacientes con antecedentes de diabetes mellitus u obesidad ingresados a una unidad de cuidados intensivos en Barranquilla durante el segundo semestre del año 2020.

Materiales y métodos: estudio descriptivo, retrospectivo de cohorte transversal y de carácter cuantitativo en pacientes con neumonía por SARS-CoV-2 confirmado por prueba de RT-PCR a través de muestra de hisopado nasofaríngeo de diferentes

grupos etarios y género que ingresaron a una Unidad de Cuidados Intensivos de MiRed Barranquilla IPS, en Barranquilla (Colombia) desde el 1 de junio del 2020 al 31 de diciembre del 2020.

Resultados: 272 pacientes ingresaron a una unidad de cuidados intensivos de MiRed Barranquilla IPS. 26.5% (n=72) correspondían a pacientes con diabetes mellitus tipo II; el 33.1% (n=90) corresponden a pacientes con algún grado de obesidad; el 10.3% (n=28) corresponden a pacientes con diabetes mellitus tipo II acompañado de algún grado de obesidad. la mediana fue de 62 años (p. 25: 50.8 – p.75: 70), sin embargo, en presencia o ausencia de diabetes mellitus tipo II u obesos la mediana de ambos grupos no fue estadísticamente significativa. Con respecto al género, el 56.6% (n=154) eran masculino y 43.4% (n=118) eran femeninos. No obstante, al comprar ambos grupos la diferencia porcentual no fue significativa (p >0.05). En pacientes con diabetes mellitus tipo II con obesidad el 11.3% (n=24) presentaron algún tipo de desenlace fatal ya descritos. Sin embargo, no se encontraron diferencia estadísticamente significativa en presencia o ausencia de desenlaces (p >0.05). En pacientes con algún grado de obesidad el 33.5% (n=71) presentaron algún desenlace fatal y el 31.7% (n=19) no presento ningún desenlace fatal.

Conclusiones: a pesar de que fue un estudio retrospectivo, de un solo centro hospitalario, los datos son similares a muchas publicaciones correspondiente al primer periodo de pandemia que vivimos en la ciudad.

Palabras clave: COVID-19, Obesidad, Diabetes Mellitus, Unidad de cuidados intensivos, neumonía grave.

ABSTRACT

Introduction: COVID-19 disease (coronavirus disease 2019) has been known as a pathology with heterogeneous clinical presentation and that is why clinical predictors have been studied that can provide vital clues regarding the efficient planning and allocation of resources for each patient, in addition to the populations at risk based on scientific evidence, as is the case of specific sociodemographic groups and morbidities such as type II diabetes mellitus, obesity, arterial hypertension and other cardiometabolic pathologies.

Objectives: characterize the clinical outcome of severe pneumonia by COVID-19 in patients with a history of diabetes mellitus or obesity admitted to an intensive care unit in Barranquilla during the second semester of 2020.

Materials and Methods: descriptive, retrospective, cross-sectional cohort study of a quantitative nature in patients with SARS-CoV-2 pneumonia confirmed by RT-PCR test through a nasopharyngeal swab sample of different age groups and gender who were admitted to a unit. of intensive care of MiRed Barranquilla IPS, of Barranquilla (Colombia) from June 1, 2020 to December 31, 2020.

Results: 272 patients were admitted to an intensive care unit of MiRed Barranquilla IPS. 26.5% (n=72) corresponded to patients with type II diabetes mellitus; 33.1% (n=90) correspond to patients with some degree of obesity; 10.3% (n=28) correspond to patients with type II diabetes mellitus accompanied by some degree of obesity. the median was 62 years (p. 25: 50.8 – p.75: 70), however, in the

presence or absence of type II diabetes mellitus or obesity, the median of both groups was not statistically significant. Regarding gender, 56.6% (n=154) were male and 43.4% (n=118) were female. However, when comparing both groups, the percentage difference was not significant ($p>0.05$). In patients with type II diabetes mellitus with obesity, 11.3% (n=24) presented some type of fatal outcome already described. However, no statistically significant difference was found in the presence or absence of outcomes ($p>0.05$). In patients with some degree of obesity, 33.5% (n=71) presented some fatal outcome and 31.7% (n=19) did not present any fatal outcome.

Conclusions: despite the fact that it was a retrospective study, from a single hospital, our data is similar to many publications corresponding to the first period of the pandemic that we experienced in the city.

Keywords: COVID-19, Obesity, Diabetes Mellitus, Intensive Care Unit, severe pneumonia.

REFERENCIAS

1. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *Lancet Respir Med* [Internet]. 2020 May;8(5):475–81. Available from: [https://doi.org/10.1016/S2213-2600\(20\)30079-5](https://doi.org/10.1016/S2213-2600(20)30079-5)
2. Ministerio de Salud De Colombia. COVID-19 en colombia [Internet]. Instituto Nacional de Salud. 2020 [cited 2022 Nov 27]. p. 1. Available from: <https://www.ins.gov.co/Noticias/Paginas/Coronavirus.aspx>
3. Huang I, Lim MA, Pranata R. Diabetes mellitus is associated with increased mortality and severity of disease in COVID-19 pneumonia – A systematic review, meta-analysis, and meta-regression. *Diabetes Metab Syndr Clin Res Rev* [Internet]. 2020 Jul;14(4):395–403. Available from: <https://doi.org/10.1016/j.dsx.2020.04.018>
4. Wu F, Zhao S, Yu B, Chen Y-M, Wang W, Song Z-G, et al. A new coronavirus associated with human respiratory disease in China. *Nature* [Internet]. 2020 Mar 12;579(7798):265–9. Available from: <https://doi.org/10.1038/s41586-020-2008-3>
5. Upadhyay J, Farr O, Perakakis N, Ghaly W, Mantzoros C. Obesity as a Disease. *Med Clin North Am* [Internet]. 2018 Jan;102(1):13–33. Available from: <http://dx.doi.org/10.1016/j.mcna.2017.08.004>
6. Di Angelantonio E, Bhupathiraju SN, Wormser D, Gao P, Kaptoge S, de Gonzalez AB, et al. Body-mass index and all-cause mortality: individual-participant-data meta-analysis of 239 prospective studies in four continents. *Lancet* [Internet]. 2016 Aug;388(10046):776–86. Available from: [http://dx.doi.org/10.1016/S0140-6736\(16\)30175-1](http://dx.doi.org/10.1016/S0140-6736(16)30175-1)
7. Petrova D, Salamanca-Fernández E, Rodríguez Barranco M, Navarro Pérez P, Jiménez Moleón JJ, Sánchez M-J. La obesidad como factor de riesgo en personas con COVID-19: posibles mecanismos e implicaciones. *Atención*

- Primaria [Internet]. 2020 Aug;52(7):496–500. Available from: <https://doi.org/10.1016/j.aprim.2020.05.003>
8. Stefan N, Birkenfeld AL, Schulze MB, Ludwig DS. Obesity and impaired metabolic health in patients with COVID-19. *Nat Rev Endocrinol* [Internet]. 2020 Jul 23;16(7):341–2. Available from: <http://dx.doi.org/10.1038/s41574-020-0364-6>
 9. Petrilli CM, Jones SA, Yang J, Rajagopalan H, O'Donnell L, Chernyak Y, et al. Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: prospective cohort study. *BMJ* [Internet]. 2020 May 22;m1966. Available from: <https://doi.org/10.1136/bmj.m1966>
 10. Caussy C, Wallet F, Laville M, Disse E. Obesity is Associated with Severe Forms of COVID-19. *Obesity* [Internet]. 2020 Jul 21;28(7):1175–1175. Available from: <http://dx.doi.org/10.1002/oby.22842>
 11. Diaz V, Martínez J, Toledo P, Pozo G, Ortega A, Rendón J, et al. Aspectos clínicos de la COVID-19 en pacientes diabéticos. *Diabetes Int y Endocrinol* [Internet]. 2020;12(1):11–6. Available from: <https://doi.org/10.5281/zenodo.4379332>
 12. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Res Clin Pract* [Internet]. 2019 Nov;157:107843. Available from: <https://doi.org/10.1016/j.diabres.2019.107843>
 13. Algarín-Lara H, Guevara-Romero E, Osorio-Rodríguez E, Patiño-Patiño J, Flórez García V, Tuesca R de J, et al. Factores relacionados con la neumonía bacteriana en pacientes con COVID-19 en una unidad de cuidados intensivos de Barranquilla, Colombia. *Acta Colomb Cuid Intensivo* [Internet]. 2022 Jun;22:S28–35. Available from: <https://doi.org/10.1016/j.acci.2021.07.002>
 14. World Health Organization. Weekly epidemiological update on COVID-19 - 26 October 2022 [Internet]. World Health Organization. 2022 [cited 2022 Nov 28]. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>
 15. Calle M, Mallqui M, Hinojosa M, Beingolea L. La situación del sobrepeso, obesidad y el impacto de la COVID-19 en los países andinos [Internet]. Organismo Andino de Salud – Convenio Hipólito Unanue. 2022 [cited 2022 Nov 28]. Available from: <https://orasconhu.org/es/node/1996>
 16. IDF. 463 millones de personas viven en el mundo padeciendo diabetes. International Diabetes Federation [Internet]. 2020; Available from: <https://www.idf.org/our-network/regions-members/south-and-central-america/south-and-central-america-news/349:463-millones-de-personas-viven-en-el-mundo-padeciendo-diabetes.html>
 17. Ministerio de Salud De Colombia. Celebración del Día Mundial de la Diabetes y su Correspondiente Semana. [Internet]. Ministerio de salud y protección social. 2022 [cited 2022 Nov 28]. Available from: <https://www.minsalud.gov.co/salud/Paginas/Semana-de-la-Diabetes.aspx>

18. Aschner P. Epidemiología de la diabetes en Colombia. Av en Diabetol [Internet]. 2010 Apr;26(2):95–100. Available from: [https://doi.org/10.1016/S1134-3230\(10\)62005-4](https://doi.org/10.1016/S1134-3230(10)62005-4)
19. Lima-Martínez MM, Carrera Boada C, Madera-Silva MD, Marín W, Contreras M. COVID-19 y diabetes mellitus: una relación bidireccional. Clínica e Investig en Arterioscler [Internet]. 2021 May;33(3):151–7. Available from: <https://doi.org/10.1016/j.arteri.2020.10.001>
20. Torres-Tamayo M, Caracas-Portillo NA, Peña-Aparicio B, Juárez-Rojas JG, Medina-Urrutia AX, Martínez-Alvarado MR. Infección por coronavirus en pacientes con diabetes. Arch Cardiol México [Internet]. 2021 Sep 30;90(91). Available from: <https://doi.org/10.24875/acm.m20000068>
21. Guo W, Li M, Dong Y, Zhou H, Zhang Z, Tian C, et al. Diabetes is a risk factor for the progression and prognosis of COVID-19. Diabetes Metab Res Rev [Internet]. 2020 Oct 7;36(7). Available from: <https://doi.org/10.1002/dmrr.3319>
22. Campoverde Espinoza RA, Vargas Olalla VP, Correa Muñoz LS. Evaluación y pronóstico de muerte en pacientes obesos con ventilación mecánica. MQRInvestigar [Internet]. 2022 Oct 23;6(4):420–37. Available from: <https://doi.org/10.56048/MQR20225.6.4.2022.420-437>
23. Watanabe M, Risi R, Tuccinardi D, Baquero CJ, Manfrini S, Gnessi L. Obesity and SARS-CoV-2: A population to safeguard. Diabetes Metab Res Rev [Internet]. 2020 Oct 11;36(7). Available from: <https://doi.org/10.1002/dmrr.3325>
24. Popkin BM, Du S, Green WD, Beck MA, Algaith T, Herbst CH, et al. Individuals with obesity and COVID-19: A global perspective on the epidemiology and biological relationships. Obes Rev [Internet]. 2020 Nov 26;21(11). Available from: <https://doi.org/10.1111/obr.13128>
25. Jibrin YB, Okwong OK, Maigari IM, Dunga JA, Ballah AM, Umar MS, et al. Clinical and laboratory characteristics of COVID-19 among adult patients admitted to the isolation centre at Abubakar Tafawa Balewa Teaching Hospital Bauchi, Northeast Nigeria. Pan Afr Med J [Internet]. 2020;37(Suppl 1):27. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/33456651>
26. Hu B, Guo H, Zhou P, Shi Z-L. Characteristics of SARS-CoV-2 and COVID-19. Nat Rev Microbiol [Internet]. 2021 Mar 6;19(3):141–54. Available from: <https://doi.org/10.1038/s41579-020-00459-7>
27. Helmy YA, Fawzy M, Elasad A, Sobieh A, Kenney SP, Shehata AA. The COVID-19 Pandemic: A Comprehensive Review of Taxonomy, Genetics, Epidemiology, Diagnosis, Treatment, and Control. J Clin Med [Internet]. 2020 Apr 24;9(4):1225. Available from: <https://doi.org/10.3390/jcm9041225>
28. Haider N, Rothman-Ostrow P, Osman AY, Arruda LB, Macfarlane-Berry L, Elton L, et al. COVID-19—Zoonosis or Emerging Infectious Disease? Front Public Heal [Internet]. 2020 Nov 26;8. Available from: <https://doi.org/10.3389/fpubh.2020.596944>
29. Bryce C, Grimes Z, Pujadas E, Ahuja S, Beasley MB, Albrecht R, et al. Pathophysiology of SARS-CoV-2: the Mount Sinai COVID-19 autopsy experience. Mod Pathol [Internet]. 2021 Aug 1;34(8):1456–67. Available from: <https://doi.org/10.1038/s41379-021-00793-y>

30. Salazar M, Barochiner J, Espeche W, Ennis I. COVID-19, hipertensión y enfermedad cardiovascular. *Hipertens y Riesgo Vasc* [Internet]. 2020 Oct;37(4):176–80. Available from: <https://doi.org/10.1016/j.hipert.2020.06.003>
31. Fernández García L, Puentes Gutiérrez AB, García Bascones M. Relación entre obesidad, diabetes e ingreso en UCI en pacientes COVID-19. *Med Clin (Barc)* [Internet]. 2020 Oct;155(7):314–5. Available from: <https://doi.org/10.1016/j.medcli.2020.06.009>
32. Fantin R, Brenes-Camacho G, Barboza-Solís C. Defunciones por COVID-19: distribución por edad y universalidad de la cobertura médica en 22 países. *Rev Panam Salud Pública* [Internet]. 2021 Apr 28;45:1. Available from: <https://doi.org/10.26633/RPSP.2021.42>
33. Figueroa Triana JF, Salas Márquez DA, Cabrera Silva JS, Alvarado Castro CC, Buitrago Sandoval AF. COVID-19 y enfermedad cardiovascular. *Rev Colomb Cardiol* [Internet]. 2020 May;27(3):166–74. Available from: <https://doi.org/10.1016/j.rccar.2020.04.004>
34. Lim S, Bae JH, Kwon H-S, Nauck MA. COVID-19 and diabetes mellitus: from pathophysiology to clinical management. *Nat Rev Endocrinol* [Internet]. 2021 Jan 13;17(1):11–30. Available from: <https://doi.org/10.1038/s41574-020-00435-4>
35. Gazzaz ZJ. Diabetes and COVID-19. *Open Life Sci* [Internet]. 2021 Mar 25;16(1):297–302. Available from: <https://doi.org/10.1515/biol-2021-0034>
36. McGurnaghan SJ, Weir A, Bishop J, Kennedy S, Blackburn LAK, McAllister DA, et al. Risks of and risk factors for COVID-19 disease in people with diabetes: a cohort study of the total population of Scotland. *Lancet Diabetes Endocrinol* [Internet]. 2021 Feb;9(2):82–93. Available from: [https://doi.org/10.1016/S2213-8587\(20\)30405-8](https://doi.org/10.1016/S2213-8587(20)30405-8)
37. Chen J, Wu C, Wang X, Yu J, Sun Z. The Impact of COVID-19 on Blood Glucose: A Systematic Review and Meta-Analysis. *Front Endocrinol (Lausanne)* [Internet]. 2020 Oct 5;11. Available from: <https://doi.org/10.3389/fendo.2020.574541>
38. Palacios Cruz M, Santos E, Velázquez Cervantes MA, León Juárez M. COVID-19, una emergencia de salud pública mundial. *Rev Clínica Española* [Internet]. 2021 Jan;221(1):55–61. Available from: <https://doi.org/10.1016/j.rce.2020.03.001>
39. Lotfi M, Hamblin MR, Rezaei N. COVID-19: Transmission, prevention, and potential therapeutic opportunities. *Clin Chim Acta* [Internet]. 2020 Sep;508:254–66. Available from: <https://doi.org/10.1016/j.cca.2020.05.044>
40. Vázquez JB, Menchén DA, Lloréns MMM, Moreno JS. Manifestaciones sistémicas y extrapulmonares en la COVID-19. *Med - Programa Form Médica Contin Acreditado* [Internet]. 2022 May;13(55):3235–45. Available from: <https://doi.org/10.1016/j.med.2022.05.004>
41. Sanz JM, Gómez Lahoz AM, Martín RO. Papel del sistema inmune en la infección por el SARS-CoV-2: inmunopatología de la COVID-19. *Med - Programa Form Médica Contin Acreditado* [Internet]. 2021 May;13(33):1917–31. Available from: <https://doi.org/10.1016/j.med.2021.05.005>
42. Bottino E, Ponce AA. Respuesta inmunitaria innata pulmonar en la infección

- por Sars-Cov-2. Rev Fac Cienc Med Cordoba [Internet]. 2022 Mar 7;79(1):33–42. Available from: <https://doi.org/10.31053/1853.0605.v79.n1.30642>
43. Formiga F, Tarazona-Santabalbina FJ. Diabetes y COVID-19 en el adulto mayor, simbiosis nociva. Rev Esp Geriatr Gerontol [Internet]. 2020 Nov;55(6):315–6. Available from: <https://doi.org/10.1016/j.regg.2020.07.006>
 44. Bellido V, Pérez A. Consecuencias de la COVID-19 sobre las personas con diabetes. Endocrinol Diabetes y Nutr [Internet]. 2020 Jun;67(6):355–6. Available from: <https://doi.org/10.1016/j.endinu.2020.04.001>
 45. Gil R, Bitar P, Deza C, Dreyse J, Florenzano M, Ibarra C, et al. CUADRO CLÍNICO DEL COVID-19. Rev Médica Clínica Las Condes [Internet]. 2021 Jan;32(1):20–9. Available from: <https://doi.org/10.1016/j.rmcl.2020.11.004>
 46. Ye Q, Wang B, Mao J, Fu J, Shang S, Shu Q, et al. Epidemiological analysis of COVID-19 and practical experience from China. J Med Virol [Internet]. 2020 Jul 10;92(7):755–69. Available from: <https://doi.org/10.1002/jmv.25813>
 47. Rastad H, Ejtahed H-S, Mahdavi-Ghorabi A, Arzaghi M, Safari A, Shahrestanaki E, et al. Factors associated with the poor outcomes in diabetic patients with COVID-19. J Diabetes Metab Disord [Internet]. 2020 Dec 9;19(2):1293–302. Available from: <https://doi.org/10.1007/s40200-020-00646-6>
 48. Vila Muntadas M, Agustí Sunyer I, Agustí Garcia-Navarro A. Pruebas diagnósticas COVID-19: importancia del contexto clínico. Med Clin (Barc) [Internet]. 2021 Aug;157(4):185–90. Available from: <https://doi.org/10.1016/j.medcli.2021.03.007>
 49. Langa LS, Sallent LV, Díez SR. Interpretación de las pruebas diagnósticas de la COVID-19. FMC - Form Médica Contin en Atención Primaria [Internet]. 2021 Mar;28(3):167–73. Available from: <https://doi.org/10.1016/j.fmc.2021.01.005>
 50. Cortés Rubio JA, Costa Zamora MP, Canals Aracil M, Pulgar Feio M, Mata Martínez A, Carrasco Munera A. Evaluación de la prueba diagnóstica de detección rápida de antígeno de covid-19 (Panbio Covid rapid test) en atención primaria. Med Fam Semer [Internet]. 2021 Nov;47(8):508–14. Available from: <https://doi.org/10.1016/j.semerg.2021.06.001>
 51. Folgueira López MD. Use of the SARS-CoV-2 antigen detection test in nasopharyngeal swab for COVID-19 infection control. Rev Española Quimioter [Internet]. 2020 Nov 30;33(6):390–1. Available from: <https://doi.org/10.37201/req/127.2020>
 52. Gestoso-Pecellín L, García-Flores Y, González-Quintana P, Marrero-Arencibia JL. Recomendaciones y uso de los diferentes tipos de test para detección de infección por SARS-COV-2. Enfermería Clínica [Internet]. 2021 Feb;31:S40–8. Available from: <https://doi.org/10.1016/j.enfcli.2020.10.001>
 53. Cordova E, Lespada MI, Cecchini D, Nieto F, Palonski S, Badran M, et al. Evaluación de la respuesta de los anticuerpos IGG específicos contra SARS-CoV-2 en el personal de salud con el esquema completo de la vacuna Sputnik V (Gam-COVID-Vac). Vacunas [Internet]. 2022 May;23:S14–21. Available from: <https://doi.org/10.1016/j.vacun.2022.01.008>
 54. Algarín Lara H, Rodado Villa R, Aldana Roa MF, Osorio Rodríguez EL, Patiño Patiño JJ. Neumotórax espontáneo primario no asociado a ventilación

- mecánica invasiva en pacientes con neumonía por COVID-19. Presentación de 2 casos. Acta Colomb Cuid Intensivo [Internet]. 2022 Apr;22(2):149–53. Available from: <https://doi.org/10.1016/j.acci.2021.03.002>
55. Martínez Chamorro E, Díez Tascón A, Ibáñez Sanz L, Ossaba Vélez S, Borruel Nacenta S. Diagnóstico radiológico del paciente con COVID-19. Radiología [Internet]. 2021 Jan;63(1):56–73. Available from: <https://doi.org/10.1016/j.rx.2020.11.001>
 56. Ashtari S, Vahedian-Azimi A, Shojaee S, Pourhoseingholi MA, Jafari R, Bashar FR, et al. Características en tomografía computarizada de la neumonía por coronavirus-2019 (COVID-19) en tres grupos de pacientes iraníes: estudio de un solo centro. Radiología [Internet]. 2021 Jul;63(4):314–23. Available from: [s://doi.org/10.1016/j.rx.2021.03.002](https://doi.org/10.1016/j.rx.2021.03.002)
 57. Fernández-Pérez GC, Oñate Miranda M, Fernández-Rodríguez P, Velasco Casares M, Corral de la Calle M, Franco López Á, et al. SARS-CoV-2: cómo es, cómo actúa y cómo se expresa en la imagen. Radiología [Internet]. 2021 Mar;63(2):115–26. Available from: <https://doi.org/10.1016/j.rx.2020.10.006>
 58. López Zúñiga D, López Zúñiga MÁ. El diagnóstico COVID-19 a través de la imagen. Med Clin (Barc) [Internet]. 2020 Aug;155(3):140. Available from: <https://doi.org/10.1016/j.medcli.2020.04.006>
 59. Calvo I, SantaCruz-Calvo S, Aranzana MG, Mármol P, Luque JÁ, Peral I, et al. Tomografía digital y COVID-19: un avance en la valoración de opacidades pulmonares. Arch Bronconeumol [Internet]. 2020 Nov;56(11):761–3. Available from: <https://doi.org/10.1016/j.arbres.2020.06.017>
 60. World Health Organization. WHO COVID-19 case definition [Internet]. World Health Organization. 2020 [cited 2022 Nov 28]. Available from: <https://apps.who.int/iris/handle/10665/333912>
 61. Marta-Enguita J, Corroza-Laviñeta J, Ostolaza A. Factores de riesgo y predictores de gravedad en pacientes hospitalizados por COVID-19: análisis de 52 casos. Med Clin (Barc) [Internet]. 2020 Oct;155(8):360–1. Available from: <https://doi.org/10.1016/j.medcli.2020.06.012>
 62. Tarazona-Santabalbina FJ, de la Cámara de las Heras JM, Vidán MT, García Navarro JA. Enfermedad por coronavirus 2019 (COVID-19) y edadismo: revisión narrativa de la literatura. Rev Esp Geriatr Gerontol [Internet]. 2021 Jan;56(1):47–53. Available from: <https://doi.org/10.1016/j.regg.2020.08.002>
 63. Salinas-Aguirre JE, Sánchez-García C, Rodríguez-Sánchez R, Rodríguez-Muñoz L, Díaz-Castaño A, Bernal-Gómez R. Características clínicas y comorbilidades asociadas a mortalidad en pacientes con COVID-19 en Coahuila (México). Rev Clínica Española [Internet]. 2022 May;222(5):288–92. Available from: <https://doi.org/10.1016/j.rce.2020.12.006>
 64. Nassar M, Daoud A, Nso N, Medina L, Ghernautan V, Bhangoo H, et al. Diabetes Mellitus and COVID-19: Review Article. Diabetes Metab Syndr Clin Res Rev [Internet]. 2021 Nov;15(6):102268. Available from: <https://doi.org/10.1016/j.dsx.2021.102268>
 65. Sen S, Chakraborty R, Kalita P, Pathak MP. Diabetes mellitus and COVID-19: Understanding the association in light of current evidence. World J Clin Cases [Internet]. 2021 Oct 6;9(28):8327–39. Available from:

- <https://doi.org/10.12998/wjcc.v9.i28.8327>
66. Bretón I, de Hollanda A, Vilarrasa N, Rubio Herrera MA, Lecube A, Salvador J, et al. Obesidad y COVID-19. Un posicionamiento necesario. *Endocrinol Diabetes y Nutr* [Internet]. 2021 Oct;68(8):573–6. Available from: <https://doi.org/10.1016/j.endinu.2021.02.001>
 67. Katsiki N, Gómez-Huelgas R, Mikhailidis DP, Pérez-Martínez P. Narrative review on clinical considerations for patients with diabetes and COVID-19: More questions than answers. *Int J Clin Pract* [Internet]. 2021 Nov 21;75(11). Available from: <https://doi.org/10.1111/ijcp.14833>
 68. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, et al. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA* [Internet]. 2020 May 26;323(20):2052. Available from: <https://doi.org/10.1001/jama.2020.6775>
 69. Alberti A, Schuelter-Trevisol F, Iser Betine PM, Traebert E, Freiburger V, Ventura L, et al. Obesity in people with diabetes in COVID-19 times: Important considerations and precautions to be taken. *World J Clin Cases* [Internet]. 2021 Jul 16;9(20):5358–71. Available from: <https://doi.org/10.12998/wjcc.v9.i20.5358>
 70. Hendren NS, de Lemos JA, Ayers C, Das SR, Rao A, Carter S, et al. Association of Body Mass Index and Age With Morbidity and Mortality in Patients Hospitalized With COVID-19. *Circulation* [Internet]. 2021 Jan 12;143(2):135–44. Available from: <https://doi.org/10.1161/CIRCULATIONAHA.120.051936>
 71. Jin S, Hu W. Severity of COVID-19 and Treatment Strategy for Patient With Diabetes. *Front Endocrinol (Lausanne)* [Internet]. 2021 Apr 30;12. Available from: <https://doi.org/10.3389/fendo.2021.602735>
 72. Ng WH, Tipih T, Makoah NA, Vermeulen J-G, Goedhals D, Sempa JB, et al. Comorbidities in SARS-CoV-2 Patients: a Systematic Review and Meta-Analysis. Griffin DE, editor. *MBio* [Internet]. 2021 Feb 23;12(1). Available from: <https://doi.org/10.1128/mBio.03647-20>
 73. Zhou Y, Chi J, Lv W, Wang Y. Obesity and diabetes as high-risk factors for severe coronavirus disease 2019 (Covid-19). *Diabetes Metab Res Rev* [Internet]. 2021 Feb 20;37(2). Available from: <https://doi.org/10.1002/dmrr.3377>
 74. Abad CL, Sandejas JCM, Poblete JB, Malundo AFG, Salamat MSS, Alejandria MM. Bacterial Co-infection and Antimicrobial Use Among Patients with COVID-19 Infection in a Referral Center in the Philippines: A Retrospective Cohort Study. *IJID Reg* [Internet]. 2022 Jul; Available from: <https://doi.org/10.1016/j.ijregi.2022.07.003>
 75. Yan Y, Yang Y, Wang F, Ren H, Zhang S, Shi X, et al. Clinical characteristics and outcomes of patients with severe covid-19 with diabetes. *BMJ Open Diabetes Res Care* [Internet]. 2020 Apr 27;8(1):e001343. Available from: <https://doi.org/10.1136/bmjdr-2020-001343>
 76. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China. *JAMA* [Internet].

- 2020 Apr 7;323(13):1239. Available from:
<https://doi.org/10.1001/jama.2020.2648>
77. de Almeida-Pititto B, Dualib PM, Zajdenverg L, Dantas JR, de Souza FD, Rodacki M, et al. Severity and mortality of COVID 19 in patients with diabetes, hypertension and cardiovascular disease: a meta-analysis. *Diabetol Metab Syndr* [Internet]. 2020 Dec 31;12(1):75. Available from: <https://doi.org/10.1186/s13098-020-00586-4>
78. Hehar J, Todter E, Lahiri SW. Association of Patient Characteristics, Diabetes, BMI, and Obesity With Severe COVID-19 in Metropolitan Detroit, MI. *Clin Diabetes* [Internet]. 2022 Apr 1;40(2):141–52. Available from: <https://doi.org/10.2337/cd21-0065>
79. Algarin-Lara H, Osorio-Rodríguez E, Patiño-Patiño J, Solano-Roperero J, Rodado-Villa R. Hipercapnia refractaria en paciente con síndrome de obesidad-hipoventilación maligno y COVID-19. Reporte de caso y propuesta de manejo. *Acta Colomb Cuid Intensivo* [Internet]. 2022 Jun;22:S117–22. Available from: <https://doi.org/10.1016/j.acci.2021.09.005>
80. Gao F, Zheng KI, Wang X-B, Sun Q-F, Pan K-H, Wang T-Y, et al. Obesity Is a Risk Factor for Greater COVID-19 Severity. *Diabetes Care* [Internet]. 2020 Jul;43(7):e72–4. Available from: <https://doi.org/10.2337/dc20-0682>
81. Lighter J, Phillips M, Hochman S, Sterling S, Johnson D, Francois F, et al. Obesity in Patients Younger Than 60 Years Is a Risk Factor for COVID-19 Hospital Admission. *Clin Infect Dis* [Internet]. 2020 Jul 28;71(15):896–7. Available from: <https://doi.org/10.1093/cid/ciaa415>
82. Smati S, Tramunt B, Wargny M, Caussy C, Gaborit B, Vatieer C, et al. Relationship between obesity and severe COVID-19 outcomes in patients with type 2 diabetes: Results from the CORONADO study. *Diabetes, Obes Metab* [Internet]. 2021 Feb 6;23(2):391–403. Available from: <https://doi.org/10.1111/dom.14228>
83. Palaodimos L, Kokkinidis DG, Li W, Karamanis D, Ognibene J, Arora S, et al. Severe obesity, increasing age and male sex are independently associated with worse in-hospital outcomes, and higher in-hospital mortality, in a cohort of patients with COVID-19 in the Bronx, New York. *Metabolism* [Internet]. 2020 Jul;108:154262. Available from: <https://doi.org/10.1016/j.metabol.2020.154262>
84. Sahin I, Haymana C, Demir T, Demirci I, Tasci I, Atmaca A, et al. Clinical Characteristics and Outcomes of COVID-19 Patients with Overweight and Obesity: Turkish Nationwide Cohort Study (TurCObesity). *Exp Clin Endocrinol Diabetes* [Internet]. 2022 Feb 12;130(02):115–24. Available from: <https://doi.org/10.1055/a-1552-4449>
85. Dixon AE, Peters U. The effect of obesity on lung function. *Expert Rev Respir Med* [Internet]. 2018 Sep 2;12(9):755–67. Available from: <https://doi.org/10.1080/17476348.2018.1506331>
86. Honce R, Karlsson EA, Wohlgemuth N, Estrada LD, Meliopoulos VA, Yao J, et al. Obesity-Related Microenvironment Promotes Emergence of Virulent Influenza Virus Strains. *Moscona A*, editor. *MBio* [Internet]. 2020 Apr 28;11(2). Available from: <https://doi.org/10.1128/mBio.03341-19>

87. Vassilopoulou E, Bumbacea RS, Pappa AK, Papadopoulos AN, Bumbacea D. Obesity and Infection: What Have We Learned From the COVID-19 Pandemic. *Front Nutr* [Internet]. 2022 Jul 22;9. Available from: <https://doi.org/10.3389/fnut.2022.931313>
88. Corrao S, Pinelli K, Vacca M, Raspanti M, Argano C. Type 2 Diabetes Mellitus and COVID-19: A Narrative Review. *Front Endocrinol (Lausanne)* [Internet]. 2021 Mar 31;12. Available from: <https://doi.org/10.3389/fendo.2021.609470>
89. Cariou B, Hadjadj S, Wargny M, Pichelin M, Al-Salameh A, Allix I, et al. Phenotypic characteristics and prognosis of inpatients with COVID-19 and diabetes: the CORONADO study. *Diabetologia* [Internet]. 2020 Aug 29;63(8):1500–15. Available from: <https://doi.org/10.1007/s00125-020-05180-x>