

# THE LANCET

## Respiratory Medicine

### Supplementary appendix

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# **Tobacco product use and the risks of SARS-CoV-2 infection and COVID-19: current understanding and recommendations for future research**

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## Search strategy and selection criteria

We conducted a descriptive review of the manuscripts on COVID and tobacco that were published in the year 2020. On December 9, 2020, the UCSF librarian searched PubMed and Embase using the following terms: (Tobacco OR cigarette OR smoking OR electronic cigarettes OR e-cigarette OR tobacco OR snus OR dissolvables OR (ENDS AND nicotine) OR "nicotine delivery" OR "Tobacco Use Cessation Products" OR "nicotine replacement") AND (COVID-19 OR COVID 19 OR Coronavirus OR Coronaviridae OR SARS CoV-2 OR “Wuhan virus”) AND((cohort OR case-control OR qualitative research OR random\* OR control\* OR "clinical trial" OR cross-sectional))389Embase:(('cigarette'/exp OR cigarette OR cigarettes OR 'smoking'/exp OR smoking OR 'electronic cigarettes'/exp OR 'electronic cigarettes' OR (electronic AND cigarettes) OR 'e cigarettes'/exp OR 'e cigarettes' OR 'tobacco'/exp OR tobacco OR 'snus'/exp OR snus OR dissolvables OR (ends AND ('nicotine'/exp OR nicotine)) OR 'nicotine delivery' OR 'tobacco use cessation products'/exp OR 'tobacco use cessation products' OR 'nicotine replacement') AND ('covid 19'/exp OR 'covid 19' OR (covid AND19) OR 'coronavirus'/exp OR coronavirus OR 'coronaviridae'/exp OR coronaviridae OR 'sars cov-2'/exp OR 'sars cov-2' OR(('sars'/exp OR sars) AND 'cov 2') OR 'wuhan virus'))AND 2020:py AND ('case control study'/de OR 'clinical trial'/de OR 'cohort analysis'/de OR 'comparative study'/de OR 'controlled study'/de OR 'cross sectional study'/de OR 'human'/de OR 'human experiment'/de OR 'interview'/de OR 'longitudinal study'/de OR 'major clinical study'/de OR 'meta-analysis'/de OR 'multicenter study'/de OR 'observational study'/de OR 'practice guideline'/de OR 'prospective study'/de OR 'randomized controlled trial'/deOR 'randomized controlled trial topic'/de OR 'retrospective study'/de OR 'structured questionnaire'/de OR 'systematic review'/de OR 'telephone interview'/de) AND 'article'/itYellow were limits applied. Similar searches were also conducted on Web of Science (WoS): CINAHL: PsycINFO:Sociological Abstracts, after which duplicates and opinion pieces were then removed.

On August 30, 2021, we conducted a second descriptive review of manuscripts on COVID and tobacco. This review covered publications between December 9, 2020 and August 30, 2021. This second review utilized nearly identical search terms from the first review. The databases included were PubMed, Embrace, CINAHL, PsychInfo, Web of Science and Sociological Abstracts.

The final list consisted of 2151 articles. This list was then further assessed to remove commentaries, reviews, case reports and any articles not presenting original research findings. These decisions were confirmed or revised by an expert reviewer to produce a list of 913 research articles. These were then reviewed by two expert reviewers to remove any remaining articles that were not original research and to identify all papers that addressed “epidemiological evidence” on COVID and tobacco or “behavior changes” during the pandemic. This resulted in two final lists consisting of 389 (189 from 2020 and 200

from 2021) epidemiological papers and 248 (50 from 2020 and 198 from 2021) behavior papers. The list of “epidemiology” papers was then further reviewed by 4 expert reviewers to remove any remaining articles that did not present original research and collect the following information from the others: primary research question, if tobacco was a primary focus or included as a covariate, country of data origin, study design, sampling/recruitment, sample sizes, demographics, type of tobacco use (e.g., cigarettes, vaping, smokeless tobacco or hookah), status of tobacco use (i.e. current, past), covid outcomes measured, main findings, whether findings included multivariate ORs, univariate ORs or frequency comparisons addressing influence of tobacco on COVID-19-related outcomes (infection, hospitalization, progression, mortality). This information was then used to determine whether or not the article should be included in the review table; the 236 final articles were then categorized based on tobacco-related influence on outcomes and included in Supplemental Table 1 and the narrative summary in the text. Following the same criteria used for epidemiological studies, we reviewed 248 (50 from 2020 and 198 from 2021) behavioral studies on tobacco use during the COVID-19 pandemic, and then eliminated 161 that were not focused specifically on changes in tobacco use, stress, or perceptions of COVID-19 during the years of 2020 and 2021. The remaining 87 papers were examined by 2 expert reviewers to collect similar information as for the epidemiological studies.

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**Table 1: Studies on the relationship between COVID-19 and tobacco product use**

SAR-CoV-2 Outcomes	Tobacco (Smoking/Vaping/Smokeless Tobacco/Hookah) Effects								
	Multivariate Models			Univariate Models			Comparison of Frequencies		
Direction of Association	Positive	Negative	None	Positive	Negative	None	Positive	Negative	None
Infection (testing positive for SAR-CoV-2)	Colaneri <sup>1,iii</sup>	Colaneri <sup>1,iii</sup>	Liu, D <sup>2,ii</sup>	Albiges <sup>3,ii</sup>	Adorni <sup>4,iv</sup>		Amengual-Moreno <sup>5,iv</sup>	Auvinen <sup>5,ii</sup>	Tsigaris <sup>6,iv</sup>
	Gaiha <sup>7, A, iii</sup>	Ghinai <sup>8,iii</sup>	Zhu <sup>9,ii</sup>	Dev <sup>ii10</sup>	Cen, Y <sup>11,iii</sup>		Eapen <sup>12,i</sup>	Vila-Corcoles <sup>13,iv</sup>	Zhu <sup>9,ii</sup>
	Li, D <sup>14, A, iv</sup>	Gu <sup>15,iii</sup>	Dadgari <sup>iii16</sup>	Mostafa <sup>A,B,iii17</sup>	De Lusignan <sup>18,iii</sup>		Ramachandran <sup>19, ii</sup>	Tsai <sup>iv20</sup>	Aung <sup>A,iv21</sup>
	Liu, K <sup>22,iv</sup>	Hull <sup>23,iii</sup>	Dayem <sup>iv24</sup>	Li D <sup>iv14</sup>	Heydari <sup>iii25</sup>		Izquierdo <sup>iv26</sup>	Jose <sup>iv27</sup>	Caliskan <sup>ii28</sup>
	McQueenie <sup>29,i v</sup>	Vila-Corcoles <sup>13,iv</sup>	De Santi <sup>ii30</sup>		Holuka <sup>iii31</sup>			Kahlert <sup>iii32</sup>	Çeçen <sup>ii33</sup>
	Wang <sup>34,ii</sup>	Abdulla <sup>iv35</sup>	Del Ser <sup>ii36</sup>		Paleiron <sup>ii37</sup>			Kantele <sup>C, iii38</sup>	Jose <sup>A, iv27</sup>
	Chen, DT <sup>iv39</sup>	Costantino <sup>ii40</sup>	Dev <sup>ii10</sup>						
	Colaneri <sup>iii41</sup>	Fernandez-Fuertes <sup>ii42</sup>							
	Didikoglu <sup>iv43</sup>								
	Ho, FK <sup>iv44</sup>	Green <sup>iv45</sup>							
		Gu <sup>iv46</sup>							
	Prats-Uribe <sup>iv47</sup>	Paleiron <sup>ii37</sup>							
	Yoshikawa <sup>iv48</sup>	Prinelli <sup>iv49</sup>							
		Lee SC <sup>iii50</sup>							
	Lombardi <sup>iii51</sup>								
Hospitalization	Alguwaihes <sup>52,i i</sup>	Meini <sup>53, A, ii</sup>	Kim <sup>54,iii</sup>	Garrassino <sup>55, ii</sup>	Indes <sup>56,ii</sup>	Wang <sup>57,iv</sup>	Abohmr <sup>58,ii</sup>		Mohan <sup>59,ii</sup>
	Almazeedi <sup>60,iii</sup>	Zhou <sup>61,62,ii</sup>	Merzon <sup>63,iii</sup>	Luo <sup>64,ii</sup>			Amengual-Moreno <sup>65,iii</sup>		
	Cocconcelli <sup>66,i i</sup>	Neira <sup>iv67</sup>	Patel <sup>68,iv</sup>	Petrilli <sup>69,iii</sup>			Mirsoleymani <sup>B,ii70</sup>		
	Dashti <sup>71,iv</sup>	Prinelli <sup>iv49</sup>	Raisi <sup>72,iii</sup>	Neira <sup>iv67</sup>			Amanat <sup>ii73</sup>		
	Hamer <sup>74,iv</sup>		Suleyman <sup>75,ii</sup>						

	Ho <sup>76,iv</sup>		Wang <sup>57,iv</sup>	Rosoff <sup>iv77</sup>					
	Izquierdo <sup>ii26</sup>		Gamboa-Cárdenas <sup>iii78</sup>						
	Kivimaki		Ho, KS <sup>iii79</sup>						
	Lassale <sup>80,iv</sup>								
	Montiero <sup>81,ii</sup>								
	Petrilli <sup>69,iii</sup>								
	Regab <sup>82,ii</sup>								
	Soares <sup>83,iv</sup>								
	Didikoglu <sup>iv43</sup>								
	Fouad <sup>ii84</sup>								
	Neira <sup>iv67</sup>								
	Rosoff <sup>iv77</sup>								
	Tenreiro <sup>iv85</sup>								
	Khalil <sup>ii86</sup>								
	Lohia <sup>iii87</sup>								
Progression of Severity	Alguwaihes <sup>52,i</sup> i	de Havenon <sup>iv</sup>	Argenziano <sup>88,ii</sup>	Albiges <sup>3,ii</sup>		Noh <sup>ii89</sup>	Al-Ani <sup>90,ii</sup>	Abdulateef B,ii91	Jing <sup>92,ii</sup>
	Hu,L <sup>93,ii</sup>	Prinelli <sup>iv49</sup>	Gu <sup>94,iii</sup>	Cocconcelli <sup>6</sup> 6,ii		Chen, Y <sup>iii95</sup>	Qu <sup>96t,ii</sup>	Ali <sup>ii97</sup>	Tortonese <sup>98,i</sup>
	Jehi <sup>99,iii</sup>		Hamer <sup>100,iv</sup>	Islam <sup>101, C,iii</sup>		Farzan <sup>ii102</sup>	Wang <sup>103,iii</sup>		Toussie <sup>104,ii</sup>
	Li, J <sup>105,ii</sup>		Ioannou <sup>106,iv</sup>	Jakob <sup>107,iii</sup>		Ghayyur <sup>ii108</sup>	Zhang <sup>109,ii</sup>		Xiong <sup>110,ii</sup>
	Liu, W <sup>111,ii</sup>		Xu <sup>112,ii</sup>	Killerby <sup>113,ii</sup>			Zhan <sup>114,ii</sup>		Xu <sup>112,ii</sup>
	Palaiodimos <sup>11</sup> 5,ii		Yanover <sup>116,iii</sup>	Tao <sup>117,ii</sup>			Abohamr <sup>ii58</sup>		Zheng <sup>118,ii</sup>
	Tao <sup>117,ii</sup>		Zhan <sup>114,ii</sup>	Yu <sup>119,ii</sup>					Zhao <sup>120-,ii</sup>
	Zhao <sup>120,ii</sup>		Chen, Y <sup>iii95</sup>	Yilmaz <sup>iii</sup>			Adams <sup>A,iii121</sup>		Abd <sup>ii</sup>
	Zhou <sup>61,iii</sup>		Han <sup>ii122</sup>	Heydari <sup>iii25</sup>			Alberca <sup>ii123</sup>		Akkoç <sup>ii124</sup>
	Abbas <sup>ii125</sup>		Ho, KS <sup>iii79</sup>	Pun <sup>iii125</sup>					
	Aboueshia <sup>ii126</sup>			Rao <sup>iv127</sup>			Ali <sup>ii97</sup>		Balaban Kocas <sup>ii128</sup>
	Adams <sup>A,iii121</sup>			Rosoff <sup>iv77</sup>			Amanat <sup>ii73</sup>		Boyd <sup>ii129</sup>

	Dai <sup>iii130</sup>			Htun <sup>ii131</sup>			Badr <sup>ii132</sup>		Noh <sup>ii89</sup>
	Del Ser <sup>ii36</sup>			Jakob <sup>iii107</sup>			Bello-Chavolla <sup>iv133</sup>		Chen, S <sup>iii134</sup>
	Galluzzi <sup>iii135</sup>			Li S <sup>iii</sup>			Caliskan <sup>ii</sup>		
	Mohsin <sup>iii136</sup>						Cho <sup>iii</sup>		
	Rachmawati <sup>ii137</sup>								
	Rosoff <sup>iv77</sup>								
	Khalil <sup>ii86</sup>								
	Limaye <sup>ii138</sup>								
	Lowe <sup>iii139</sup>								
	Mahabee-Gittens <sup>iii140</sup>								
Mortality	Abbas <sup>125,ii</sup>	Holman <sup>141,iv</sup>	Holman <sup>141,iv</sup>	Abbas <sup>125,ii</sup>		Klang <sup>142,143,iii</sup>	Abohamr <sup>58,ii</sup>	Dashti <sup>71,iv</sup>	Abohamr <sup>ii58</sup>
	Albiges <sup>3,ii</sup>	Morgenthau <sup>144,iii</sup>	Ioannou <sup>106,iv</sup>	Adrish <sup>145,iii</sup>		Ramachandran <sup>19,ii</sup>	Altschul <sup>146,ii</sup>		Al-Balas <sup>ii147</sup>
	Alguwaihes <sup>52,i</sup>	Williamson <sup>148,iv</sup>	Li, D <sup>14,iii14</sup>	Chen <sup>149,iii</sup>		Gharebaghi <sup>150,ii</sup>	Bellan <sup>151,iii</sup>		Badr <sup>ii132</sup>
	Almazeedi <sup>60,iii</sup>	Bhaskaran <sup>iv152</sup>	Liu, D <sup>2,ii2</sup>	Li <sup>105,ii</sup>		Ghazzay <sup>ii153</sup>	Islam <sup>101,iii101</sup>		
	Bellan <sup>151,iii</sup>		Palaiodimos <sup>115,ii</sup>	Garrassino <sup>55,ii</sup>			Sorci <sup>154,iii</sup>		
	Chen <sup>149,iii</sup>		Qin <sup>155,ii</sup>	Luo <sup>64,ii</sup>			Zhao <sup>120,ii</sup>		
	Garassino <sup>55,ii</sup>		Soares <sup>83,iv</sup>	Maciel <sup>156,ii</sup>			Wang <sup>157,ii</sup>		
	Kuderer <sup>158,ii</sup>		Suleyman <sup>75,ii</sup>	Williamson <sup>148,iv</sup>					
	Klang <sup>142,143,iii</sup>		Wang <sup>57,iv</sup>	Heydari <sup>iii25</sup>			Anudeep <sup>i159</sup>		
	Li, D <sup>14, A,iii</sup>		Zhao <sup>120,ii</sup>	Polverino <sup>iii160</sup>			Ayten <sup>ii161</sup>		
	Li, J <sup>105,ii</sup>		Bruce <sup>iii162</sup>	Siegler <sup>iv163</sup>			Chauhan <sup>ii164</sup>		
	Liu, K <sup>22,iv</sup>		Dayem <sup>iv24</sup>	Li D <sup>iv14</sup>					
	Abdulla <sup>iv35</sup>		Chetboun <sup>iii165</sup>	Marimuthu <sup>ii166</sup>					
	Aboueshia <sup>ii126</sup>		de Havenon <sup>iv167</sup>						
	Ahmadi <sup>iv168</sup>		Emami <sup>iii169</sup>						
	Apea <sup>iii170</sup>		Ho, KS <sup>iii79</sup>						
			Kelly <sup>iv171</sup>						
	Bhaskaran <sup>iv152</sup>								

	Caliskan <sup>ii28</sup>								
	Dai <sup>iii130</sup>								
	Elliott <sup>iv172</sup>								
	Estiri <sup>iv173</sup>								
	Ferrari <sup>iii174</sup>								
	Peker <sup>iv175</sup>								
	Polverino <sup>iii160</sup>								
	Prats-Uribe <sup>iv47</sup>								
	Quan <sup>iii176</sup>								
	Suzuki <sup>iv177</sup>								
	Tortolero <sup>iii178</sup>								
	Yoshikawa <sup>iv48</sup>								
	Khalil <sup>iii86</sup>								
	Magfira <sup>iv179</sup>								

Epidemiological papers were categorized through the descriptive review. Multivariate papers reported models that included tobacco and other variables, Univariate studies reported models that only examined tobacco use without other variables; comparisons of frequencies papers reported only comparisons of tobacco use frequencies. Positive association: tobacco use was harmful; negative association: tobacco use was protective; no association: no significant effects of tobacco use

All names refer to the name of the first author in the author list

Superscript – A; e-cigarette, B; hookah, and C; smokeless tobacco use. Unscripted references describe the effects of smoking combustible cigarettes

The sample size of each study is indicated (i; n=0-50, ii; n=51-1000, iii; n=1001-10000, iv; n≥10001).



## References

1. Colaneri M, Novelli V, Cutti S, et al. The experience of the health care workers of a severely hit SARS-CoV-2 referral Hospital in Italy: incidence, clinical course and modifiable risk factors for COVID-19 infection. *J Public Health (Oxf)* 2021; **43**(1): 26-34.
2. Liu D, Wang Y, Wang J, et al. Characteristics and Outcomes of a Sample of Patients With COVID-19 Identified Through Social Media in Wuhan, China: Observational Study. *J Med Internet Res* 2020; **22**(8): e20108.
3. Albiges L, Foulon S, Bayle A, et al. Determinants of the outcomes of patients with cancer infected with SARS-CoV-2: results from the Gustave Roussy cohort. *Nature Cancer* 2020; **1**(10): 965-75.
4. Adorni F, Prinelli F, Bianchi F, et al. Self-Reported Symptoms of SARS-CoV-2 Infection in a Nonhospitalized Population in Italy: Cross-Sectional Study of the EPICOV19 Web-Based Survey. *JMIR Public Health Surveill* 2020; **6**(3): e21866.
5. Auvinen R, Nohynek H, Syrjanen R, et al. Comparison of the clinical characteristics and outcomes of hospitalized adult COVID-19 and influenza patients - a prospective observational study. *Infect Dis (Lond)* 2021; **53**(2): 111-21.
6. Tsigaris P, Teixeira da Silva JA. Smoking Prevalence and COVID-19 in Europe. *Nicotine Tob Res* 2020; **22**(9): 1646-9.
7. Gaiha SM, Cheng J, Halpern-Felsher B. Association Between Youth Smoking, Electronic Cigarette Use, and COVID-19. *J Adolesc Health* 2020; **67**(4): 519-23.
8. Ghinai I, Davis ES, Mayer S, et al. Risk Factors for Severe Acute Respiratory Syndrome Coronavirus 2 Infection in Homeless Shelters in Chicago, Illinois-March-May, 2020. *Open Forum Infect Dis* 2020; **7**(11): ofaa477.
9. Zhu W, Xie K, Lu H, Xu L, Zhou S, Fang S. Initial clinical features of suspected coronavirus disease 2019 in two emergency departments outside of Hubei, China. *J Med Virol* 2020; **92**(9): 1525-32.
10. Dev N, Meena RC, Gupta DK, Gupta N, Sankar J. Risk factors and frequency of COVID-19 among healthcare workers at a tertiary care centre in India: a case-control study. *Trans R Soc Trop Med Hyg* 2021; **115**(5): 551-6.
11. Cen Y, Chen X, Shen Y, et al. Risk factors for disease progression in patients with mild to moderate coronavirus disease 2019-a multi-centre observational study. *Clin Microbiol Infect* 2020; **26**(9): 1242-7.
12. Eapen MS, Lu W, Hackett TL, et al. Dysregulation of endocytic machinery and ACE2 in small airways of smokers and COPD patients can augment their susceptibility to SARS-CoV-2 (COVID-19) infections. *Am J Physiol Lung Cell Mol Physiol* 2021; **320**(1): L158-L63.
13. Vila-Corcoles A, Ochoa-Gondar O, Torrente-Fraga C, et al. [Evaluation of incidence and risk profile for suffering Covid-19 infection by underlying conditions among middle-aged and older adults in Tarragona.]. *Rev Esp Salud Publica* 2020; **94**.
14. Li D, Croft DP, Ossip DJ, Xie Z. The association between statewide vaping prevalence and COVID-19. *Prev Med Rep* 2020; **20**: 101254.
15. Gu T, Mack JA, Salvatore M, et al. COVID-19 outcomes, risk factors and associations by race: a comprehensive analysis using electronic health records data in Michigan Medicine. *medRxiv* 2020.
16. Dadgari A, Mirrezaei SM, Talebi SS, Alaghemand Gheshlaghi Y, Rohani-Rasaf M. Investigating Some Risk Factors Related to the COVID-19 Pandemic in the Middle-aged and Elderly. *Iranian Journal of Ageing* 2021; **16**(1): 102-11.
17. Mostafa A, El-Sayed MH, El-Meteini M, et al. SARS-CoV-2 infection in never, former, and current tobacco/nicotine users: a cohort study of 4040 Egyptian healthcare workers. *BMC public health* 2021; **21**(1): 1-13.
18. de Lusignan S, Dorward J, Correa A, et al. Risk factors for SARS-CoV-2 among patients in the Oxford Royal College of General Practitioners Research and Surveillance Centre primary care network: a cross-sectional study. *Lancet Infect Dis* 2020; **20**(9): 1034-42.

19. Ramachandran P, Kathirvelu B, Chakraborti A, et al. COVID-19 in Cancer Patients From New York City: A Comparative Single Center Retrospective Analysis. *Cancer Control* 2020; **27**(1): 1073274820960457.
20. Tsai S, Nguyen H, Ebrahimi R, et al. COVID-19 associated mortality and cardiovascular disease outcomes among US women veterans. *Scientific reports* 2021; **11**(1): 1-10.
21. Aung S, Vittinghoff E, Nah G, et al. Characteristics and Behaviors Associated with Prevalent SARS-CoV-2 Infection. *International Journal of General Medicine* 2021; **14**: 1063.
22. Liu K, He M, Zhuang Z, He D, Li H. Unexpected positive correlation between human development index and risk of infections and deaths of COVID-19 in Italy. *One Health* 2020; **10**: 100174.
23. Hull SA, Williams C, Ashworth M, Carvalho C, Boomla K. Prevalence of suspected COVID-19 infection in patients from ethnic minority populations: a cross-sectional study in primary care. *Br J Gen Pract* 2020; **70**(699): e696-e704.
24. Dayem Ullah AZM, Sivapalan L, Kocher HM, Chelala C. COVID-19 in patients with hepatobiliary and pancreatic diseases: a single-centre cross-sectional study in East London. *BMJ Open* 2021; **11**(4): e045077.
25. Heydari G, Arfaenia H. COVID-19 and smoking: More severity and death - An experience from Iran. *Lung India* 2021; **38**(Supplement): S27-S30.
26. Izquierdo JL, Almonacid C, González Y, et al. The impact of COVID-19 on patients with asthma. *European Respiratory Journal* 2021; **57**(3).
27. Jose T, Croghan IT, Hays JT, Schroeder DR, Warner DO. Electronic Cigarette Use Is Not Associated with COVID-19 Diagnosis. *Journal of Primary Care & Community Health* 2021; **12**: 21501327211024391.
28. Caliskan T, Saylan B. Smoking and comorbidities are associated with COVID-19 severity and mortality in 565 patients treated in Turkey: a retrospective observational study. *Rev Assoc Med Bras (1992)* 2020; **66**(12): 1679-84.
29. McQueenie R, Foster HME, Jani BD, et al. Multimorbidity, polypharmacy, and COVID-19 infection within the UK Biobank cohort. *PLoS One* 2020; **15**(8): e0238091.
30. De Santi M, Diotallevi A, Brandi G. Seroprevalence of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) infection in an Italian cohort in Marche Region, Italy. *Acta Bio Medica: Atenei Parmensis* 2021; **92**(1).
31. Holuka C, Snoeck CJ, Mériaux SB, et al. Adverse Life Trajectories Are a Risk Factor for SARS-CoV-2 IgA Seropositivity. *Journal of clinical medicine* 2021; **10**(10): 2159.
32. Kahlert CR, Persi R, Güsewell S, et al. Non-occupational and occupational factors associated with specific SARS-CoV-2 antibodies among Hospital Workers—a multicentre cross-sectional study. *Clinical Microbiology and Infection* 2021.
33. Çeçen A, Bayraktar C, Özgür A, Akgül G, Günel Ö. Evaluation of nasal mucociliary clearance time in COVID-19 patients. *The Journal of Craniofacial Surgery* 2021; **32**(8): e702.
34. Wang R, Pan M, Zhang X, et al. Epidemiological and clinical features of 125 Hospitalized Patients with COVID-19 in Fuyang, Anhui, China. *Int J Infect Dis* 2020; **95**: 421-8.
35. Abdulla F, Nain Z, Karimuzzaman M, Hossain MM, Rahman A. A Non-Linear Biostatistical Graphical Modeling of Preventive Actions and Healthcare Factors in Controlling COVID-19 Pandemic. *Int J Environ Res Public Health* 2021; **18**(9).
36. Del Ser T, Fernández-Blázquez MA, Valentí M, et al. Residence, clinical features, and genetic risk factors associated with symptoms of COVID-19 in a cohort of older people in Madrid. *Gerontology* 2021; **67**(3): 281-9.
37. Paleiron N, Mayet A, Marbac V, et al. Impact of Tobacco Smoking on the risk of COVID-19. A large scale retrospective cohort study. *Nicotine Tob Res* 2021.
38. Kantele A, Lääveri T, Kareinen L, et al. SARS-CoV-2 infections among healthcare workers at Helsinki University Hospital, Finland, spring 2020: Serosurvey, symptoms and risk factors. *Travel medicine and infectious disease* 2021; **39**: 101949.

39. Chen DT-H, Kyriakos CN. Cigarette and E-Cigarettes Dual Users, Exclusive Users and COVID-19: Findings from Four UK Birth Cohort Studies. *Int J Environ Res Public Health* 2021; **18**(8): 3935.
40. Costantino F, Bahier L, Tarancón LC, et al. COVID-19 in French patients with chronic inflammatory rheumatic diseases: clinical features, risk factors and treatment adherence. *Joint Bone Spine* 2021; **88**(1): 105095.
41. Colaneri M, Novelli V, Cutti S, et al. The experience of the health care workers of a severely hit SARS-CoV-2 referral Hospital in Italy: incidence, clinical course and modifiable risk factors for COVID-19 infection. *Journal of Public Health* 2021; **43**(1): 26-34.
42. Fernandez-Fuertes M, Corma-Gomez A, Torres E, et al. Incidence of and factors associated with SARS-CoV-2 infection among people living with HIV in Southern Spain. *medRxiv* 2021.
43. Didikoglu A, Maharani A, Pendleton N, Canal MM, Payton A. Early life factors and COVID-19 infection in England: A prospective analysis of UK Biobank participants. *Early human development* 2021; **155**: 105326.
44. Ho FK, Celis-Morales CA, Gray SR, et al. Modifiable and non-modifiable risk factors for COVID-19, and comparison to risk factors for influenza and pneumonia: results from a UK Biobank prospective cohort study. *BMJ open* 2020; **10**(11): e040402.
45. Green I, Merzon E, Vinker S, Golan-Cohen A, Magen E. COVID-19 susceptibility in bronchial asthma. *The Journal of Allergy and Clinical Immunology: In Practice* 2021; **9**(2): 684-92. e1.
46. Gu T, Mack JA, Salvatore M, et al. Characteristics associated with racial/ethnic disparities in COVID-19 outcomes in an academic health care system. *JAMA network open* 2020; **3**(10): e2025197-e.
47. Prats-Uribe A, Xie J, Prieto-Alhambra D, Petersen I. Smoking and COVID-19 Infection and Related Mortality: A Prospective Cohort Analysis of UK Biobank Data. *Clin Epidemiol* 2021; **13**: 357-65.
48. Yoshikawa Y, Kawachi I. Association of Socioeconomic Characteristics With Disparities in COVID-19 Outcomes in Japan. *JAMA Netw Open* 2021; **4**(7): e2117060.
49. Prinelli F, Bianchi F, Drago G, et al. Association Between Smoking and SARS-CoV-2 Infection: Cross-sectional Study of the EPICOID19 Internet-Based Survey. *JMIR public health and surveillance* 2021; **7**(4): e27091.
50. Lee SC, Son KJ, Kim DW, et al. Smoking and the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. *Nicotine & Tobacco Research* 2021.
51. Lombardi A, Mangioni D, Consonni D, et al. Seroprevalence of anti-SARS-CoV-2 IgG among healthcare workers of a large university hospital in Milan, Lombardy, Italy: a cross-sectional study. *BMJ open* 2021; **11**(2): e047216.
52. Alguwaihes AM, Al-Sofiani ME, Megdad M, et al. Diabetes and Covid-19 among hospitalized patients in Saudi Arabia: a single-centre retrospective study. *Cardiovasc Diabetol* 2020; **19**(1): 205.
53. Meini S, Fortini A, Andreini R, Sechi LA, Tascini C. The Paradox of the Low Prevalence of Current Smokers Among Covid-19 Patients Hospitalized in Non-Intensive Care Wards: Results From an Italian Multicenter Case-Control Study. *Nicotine Tob Res* 2020.
54. Kim HJ, Han D, Kim JH, et al. An Easy-to-Use Machine Learning Model to Predict the Prognosis of Patients With COVID-19: Retrospective Cohort Study. *J Med Internet Res* 2020; **22**(11): e24225.
55. Garassino MC, Whisenant JG, Huang LC, et al. COVID-19 in patients with thoracic malignancies (TERAVOLT): first results of an international, registry-based, cohort study. *Lancet Oncol* 2020; **21**(7): 914-22.
56. Indes JE, Koleilat I, Hatch AN, et al. Early experience with arterial thromboembolic complications in patients with COVID-19. *J Vasc Surg* 2021; **73**(2): 381-9 e1.
57. Wang QQ, Kaelber DC, Xu R, Volkow ND. COVID-19 risk and outcomes in patients with substance use disorders: analyses from electronic health records in the United States. *Mol Psychiatry* 2021; **26**(1): 30-9.
58. Abohamr SI, Abazid RM, Aldossari MA, et al. Clinical characteristics and in-hospital mortality of COVID-19 adult patients in Saudi Arabia. *Saudi Med J* 2020; **41**(11): 1217-26.

59. Mohan A, Tiwari P, Bhatnagar S, et al. Clinico-demographic profile & hospital outcomes of COVID-19 patients admitted at a tertiary care centre in north India. *Indian J Med Res* 2020; **152**(1 & 2): 61-9.
60. Almazeedi S, Al-Youha S, Jamal MH, et al. Characteristics, risk factors and outcomes among the first consecutive 1096 patients diagnosed with COVID-19 in Kuwait. *EClinicalMedicine* 2020; **24**: 100448.
61. Zhou Y, He Y, Yang H, et al. Exploiting an early warning Nomogram for predicting the risk of ICU admission in patients with COVID-19: a multi-center study in China. *Scand J Trauma Resusc Emerg Med* 2020; **28**(1): 106.
62. Zhou W, Qin X, Hu X, Lu Y, Pan J. Prognosis models for severe and critical COVID-19 based on the Charlson and Elixhauser comorbidity indices. *Int J Med Sci* 2020; **17**(15): 2257-63.
63. Merzon E, Green I, Shpigelman M, et al. Haemoglobin A1c is a predictor of COVID-19 severity in patients with diabetes. *Diabetes Metab Res Rev* 2020: e3398.
64. Luo J, Rizvi H, Preeshagul IR, et al. COVID-19 in patients with lung cancer. *Ann Oncol* 2020; **31**(10): 1386-96.
65. Amengual-Moreno M, Calafat-Caules M, Carot A, et al. [Social determinants of the incidence of Covid-19 in Barcelona: a preliminary ecological study using public data.]. *Rev Esp Salud Publica* 2020; **94**.
66. Cocconcelli E, Biondini D, Giraudo C, et al. Clinical Features and Chest Imaging as Predictors of Intensity of Care in Patients with COVID-19. *J Clin Med* 2020; **9**(9).
67. Neira DP, Watts A, Seashore J, Polychronopoulou E, Kuo Y-F, Sharma G. Smoking and risk of COVID-19 hospitalization. *Respiratory medicine* 2021; **182**: 106414.
68. Patel AP, Paranjpe MD, Kathiresan NP, Rivas MA, Khera AV. Race, socioeconomic deprivation, and hospitalization for COVID-19 in English participants of a national biobank. *Int J Equity Health* 2020; **19**(1): 114.
69. Petrilli CM, Jones SA, Yang J, 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* 2020; **369**: m1966.
70. Mirsoleymani S, Nekooghadam SM, Marzaleh MA, et al. Assessment of risk factors for severe Coronavirus Disease 2019 among Iranian patients. *Iranian Red Crescent Medical Journal* 2020; **22**(9).
71. Dashti H, Roche EC, Bates DW, Mora S, Demler O. SARS2 simplified scores to estimate risk of hospitalization and death among patients with COVID-19. *Sci Rep* 2021; **11**(1): 4945.
72. Raisi-Estabragh Z, McCracken C, Bethell MS, et al. Greater risk of severe COVID-19 in Black, Asian and Minority Ethnic populations is not explained by cardiometabolic, socioeconomic or behavioural factors, or by 25(OH)-vitamin D status: study of 1326 cases from the UK Biobank. *J Public Health (Oxf)* 2020; **42**(3): 451-60.
73. Amanat M, Rezaei N, Roozbeh M, et al. Neurological manifestations as the predictors of severity and mortality in hospitalized individuals with COVID-19: a multicenter prospective clinical study. *BMC neurology* 2021; **21**(1): 1-12.
74. Hamer M, Kivimaki M, Gale CR, Batty GD. Lifestyle risk factors, inflammatory mechanisms, and COVID-19 hospitalization: A community-based cohort study of 387,109 adults in UK. *Brain Behav Immun* 2020; **87**: 184-7.
75. Suleyman G, Fadel RA, Malette KM, et al. Clinical Characteristics and Morbidity Associated With Coronavirus Disease 2019 in a Series of Patients in Metropolitan Detroit. *JAMA Netw Open* 2020; **3**(6): e2012270.
76. Ho FK, Celis-Morales CA, Gray SR, et al. Modifiable and non-modifiable risk factors for COVID-19, and comparison to risk factors for influenza and pneumonia: results from a UK Biobank prospective cohort study. *BMJ Open* 2020; **10**(11): e040402.
77. Rosoff DB, Yoo J, Lohoff FW. A genetically-informed study disentangling the relationships between tobacco smoking, cannabis use, alcohol consumption, substance use disorders and respiratory infections, including COVID-19. *medRxiv* 2021.

78. Gamboa-Cárdenas R-V, Barzola-Cerrón S, Toledo-Neira D, et al. Predictors of hospitalization for COVID-19 in patients with autoimmune rheumatic diseases: results from a community cohort follow-up. *Clinical Rheumatology* 2021; **40**(11): 4725-34.
79. Ho KS, Narasimhan B, Sheehan J, Wu L, Fung JY. Controversy over smoking in COVID-19-A real world experience in New York city. *J Med Virol* 2021; **93**(7): 4537-43.
80. Lassale C, Gaye B, Hamer M, Gale CR, Batty GD. Ethnic disparities in hospitalisation for COVID-19 in England: The role of socioeconomic factors, mental health, and inflammatory and pro-inflammatory factors in a community-based cohort study. *Brain Behav Immun* 2020; **88**: 44-9.
81. Monteiro AC, Suri R, Emeruwa IO, et al. Obesity and smoking as risk factors for invasive mechanical ventilation in COVID-19: A retrospective, observational cohort study. *PLoS One* 2020; **15**(12): e0238552.
82. Ragab E, Mahrous AH, El Sheikh GM. COVID-19 infection: epidemiological, clinical, and radiological expression among adult population. *Egyptian Journal of Radiology and Nuclear Medicine* 2020; **51**(1).
83. Soares RCM, Mattos LR, Raposo LM. Risk Factors for Hospitalization and Mortality due to COVID-19 in Espirito Santo State, Brazil. *Am J Trop Med Hyg* 2020; **103**(3): 1184-90.
84. Fouad SH, Allam MF, Ibrahim S, et al. ICU admission of COVID-19 patients: Identification of risk factors. *Egyptian Journal of Anaesthesia* 2021; **37**(1): 202-7.
85. Tenreiro P, Ramalho A, Santos P. COVID-19 patients followed in Portuguese Primary Care: a retrospective cohort study based on the national case series. *Family Practice* 2021; **1**: 7.
86. Khalil A, Dhingra R, Al-Mulki J, Hassoun M, Alexis N. Questioning the sex-specific differences in the association of smoking on the survival rate of hospitalized COVID-19 patients. *PLoS One* 2021; **16**(8): e0255692.
87. Lohia P, Sreeram K, Nguyen P, et al. Preexisting respiratory diseases and clinical outcomes in COVID-19: a multihospital cohort study on predominantly African American population. *Respir Res* 2021; **22**(1): 37.
88. Argenziano MG, Bruce SL, Slater CL, et al. Characterization and clinical course of 1000 patients with coronavirus disease 2019 in New York: retrospective case series. *Bmj* 2020; **369**: m1996.
89. Noh CS, Kim WY, Baek MS. Risk factors associated with the need for oxygen therapy in patients with COVID-19. *Medicine (Baltimore)* 2021; **100**(18): e25819.
90. Al-Ani RM, Acharya D. Prevalence of Anosmia and Ageusia in Patients with COVID-19 at a Primary Health Center, Doha, Qatar. *Indian J Otolaryngol Head Neck Surg* 2020: 1-7.
91. Abdulateef DS, Rahman HS, Salih JM, et al. COVID-19 severity in relation to sociodemographics and vitamin D use. *Open Med (Wars)* 2021; **16**(1): 591-609.
92. Jing X, Fengde Z, Mingfeng H, Lei M, Ting Z. Analysis of the clinical characteristics and early warning model construction of severe/critical coronavirus disease 2019 patients. *Zhonghua Wei Zhong Bing Ji Jiu Yi Xue* 2020; **32**(4): 401-6.
93. Hu L, Chen S, Fu Y, et al. Risk Factors Associated With Clinical Outcomes in 323 Coronavirus Disease 2019 (COVID-19) Hospitalized Patients in Wuhan, China. *Clin Infect Dis* 2020; **71**(16): 2089-98.
94. Gu T, Mack JA, Salvatore M, et al. Characteristics Associated With Racial/Ethnic Disparities in COVID-19 Outcomes in an Academic Health Care System. *JAMA Netw Open* 2020; **3**(10): e2025197.
95. Chen YJ, Jian WH, Liang ZY, et al. Earlier diagnosis improves COVID-19 prognosis: a nationwide retrospective cohort analysis. *Ann Transl Med* 2021; **9**(11): 941.
96. Qu J, Chang LK, Tang X, et al. Clinical characteristics of COVID-19 and its comparison with influenza pneumonia. *Acta Clin Belg* 2020; **75**(5): 348-56.
97. Ali MR, Hasan MA, Rahman MS, et al. Clinical manifestations and socio-demographic status of COVID-19 patients during the second-wave of pandemic: A Bangladeshi experience. *J Infect Public Health* 2021; **14**(10): 1367-74.
98. Tortonese S, Scriabine I, Anjou L, et al. COVID-19 in Patients on Maintenance Dialysis in the Paris Region. *Kidney Int Rep* 2020; **5**(9): 1535-44.

99. Jehi L, Ji X, Milinovich A, et al. Development and validation of a model for individualized prediction of hospitalization risk in 4,536 patients with COVID-19. *PLoS One* 2020; **15**(8): e0237419.
100. Hamer M, Gale CR, Kivimaki M, Batty GD. Overweight, obesity, and risk of hospitalization for COVID-19: A community-based cohort study of adults in the United Kingdom. *Proc Natl Acad Sci U S A* 2020; **117**(35): 21011-3.
101. Islam MZ, Riaz BK, Islam A, et al. Risk factors associated with morbidity and mortality outcomes of COVID-19 patients on the 28th day of the disease course: a retrospective cohort study in Bangladesh. *Epidemiol Infect* 2020; **148**: e263.
102. Farzan N, Vahabi S, Foroghi Ghomi SY, et al. Evaluation of invasive ventilation (intubation) prognosis in patients with Covid-19 symptoms. *Int J Surg Open* 2020; **27**: 149-53.
103. Wang T, Tang C, Chen R, et al. Clinical Features of Coronavirus Disease 2019 Patients With Mechanical Ventilation: A Nationwide Study in China. *Crit Care Med* 2020; **48**(9): e809-e12.
104. Toussie D, Voutsinas N, Finkelstein M, et al. Clinical and Chest Radiography Features Determine Patient Outcomes in Young and Middle-aged Adults with COVID-19. *Radiology* 2020; **297**(1): E197-E206.
105. Li J, Long X, Zhang Q, et al. Tobacco smoking confers risk for severe COVID-19 unexplainable by pulmonary imaging. *J Intern Med* 2021; **289**(4): 574-83.
106. Ioannou GN, Locke E, Green P, et al. Risk Factors for Hospitalization, Mechanical Ventilation, or Death Among 10131 US Veterans With SARS-CoV-2 Infection. *JAMA Netw Open* 2020; **3**(9): e2022310.
107. Jakob CEM, Borgmann S, Duygu F, et al. First results of the "Lean European Open Survey on SARS-CoV-2-Infected Patients (LEOSS)". *Infection* 2021; **49**(1): 63-73.
108. Ghayyur A, Hussain SS, Salam E, Saeed S, Shahid S, Salaam TU. Less disease severity of COVID-19 among smokers: An indication of investigating nicotine as preventive measure. *Pak J Pharm Sci* 2021; **34**(1(Supplementary)): 321-5.
109. Zhang J, Li J, Su L, et al. [Clinical characteristics and risk factors of acute kidney injury in coronavirus disease 2019]. *Zhonghua Wei Zhong Bing Ji Jiu Yi Xue* 2020; **32**(4): 407-11.
110. Xiong GL, Atkin A, Moquin K, et al. COVID-19 Transmission in a Psychiatric Long-Term Care Rehabilitation Facility: An Observational Study. *Prim Care Companion CNS Disord* 2020; **22**(6).
111. Liu W, Tao ZW, Wang L, et al. Analysis of factors associated with disease outcomes in hospitalized patients with 2019 novel coronavirus disease. *Chin Med J (Engl)* 2020; **133**(9): 1032-8.
112. Xu J, Zhao F, Han M, Ma L, Zhang T. [Analysis of the clinical characteristics and early warning model construction of severe/critical coronavirus disease 2019 patients]. *Zhonghua Wei Zhong Bing Ji Jiu Yi Xue* 2020; **32**(4): 401-6.
113. Killerby ME, Link-Gelles R, Haight SC, et al. Characteristics Associated with Hospitalization Among Patients with COVID-19 - Metropolitan Atlanta, Georgia, March-April 2020. *MMWR Morb Mortal Wkly Rep* 2020; **69**(25): 790-4.
114. Zhan T, Liu M, Tang Y, et al. Retrospective analysis of clinical characteristics of 405 patients with COVID-19. *J Int Med Res* 2020; **48**(8): 300060520949039.
115. Palaiodimos L, Kokkinidis DG, Li W, 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* 2020; **108**: 154262.
116. Yanover C, Mizrahi B, Kalkstein N, et al. What Factors Increase the Risk of Complications in SARS-CoV-2-Infected Patients? A Cohort Study in a Nationwide Israeli Health Organization. *JMIR Public Health Surveill* 2020; **6**(3): e20872.
117. Tao PY, Leng L, Liu K, et al. Determination of risk factors for predicting the onset of symptoms in asymptomatic COVID-19 infected patients. *Int J Med Sci* 2020; **17**(14): 2187-93.
118. Zheng Y, Xiong C, Liu Y, et al. Epidemiological and clinical characteristics analysis of COVID-19 in the surrounding areas of Wuhan, Hubei Province in 2020. *Pharmacol Res* 2020; **157**: 104821.
119. Yu T, Cai S, Zheng Z, et al. Association Between Clinical Manifestations and Prognosis in Patients with COVID-19. *Clin Ther* 2020; **42**(6): 964-72.
120. Zhao Z, Chen A, Hou W, et al. Prediction model and risk scores of ICU admission and mortality in COVID-19. *PLoS One* 2020; **15**(7): e0236618.

121. Adams SH, Park MJ, Schaub JP, Brindis CD, Irwin CE, Jr. Medical Vulnerability of Young Adults to Severe COVID-19 Illness-Data From the National Health Interview Survey. *J Adolesc Health* 2020; **67**(3): 362-8.
122. Han H, Peng X, Zheng F, Deng G, Cheng X, Peng L. Association of Gender With Outcomes in Hospitalized Patients With 2019-nCoV Infection in Wuhan. *Front Public Health* 2021; **9**: 619482.
123. Alberca RW, Lima JC, de Oliveira EA, et al. COVID-19 Disease Course in Former Smokers, Smokers and COPD Patients. *Front Physiol* 2020; **11**: 637627.
124. Akkoc G, Akgun O, Kizilirmak C, Yildiz F, Duru HNS, Elevli M. Demographic and Clinical Characteristics of COVID-19 in Children and the Effect of Household Tobacco Smoke Exposure on COVID-19. *Turk Arch Pediatr* 2021; **56**(4): 322-7.
125. Abbas HM, Nassir KF, Al Khames Aga QA, et al. Presenting the characteristics, smoking versus diabetes, and outcome among patients hospitalized with COVID-19. *J Med Virol* 2021; **93**(3): 1556-67.
126. Aboueshia M, Hussein MH, Attia AS, et al. Cancer and COVID-19: analysis of patient outcomes. *Future Oncology* 2021; **17**(26): 3499-510.
127. Abouzid M, El-Sherif DM, Elteawy NK, et al. Influence of COVID-19 on lifestyle behaviors in the Middle East and North Africa Region: a survey of 5896 individuals. *Journal of translational medicine* 2021; **19**(1): 129.
128. Balaban Kocas B, Cetinkal G, Ser OS, et al. The relation between left ventricular global longitudinal strain and troponin levels in patients hospitalized with COVID-19 pneumonia. *Int J Cardiovasc Imaging* 2021; **37**(1): 125-33.
129. Boyd S, Martin-Loeches I. The incidence of venous thromboembolism in critically ill patients with COVID-19 compared with critically ill non-COVID patients. *Irish Journal of Medical Science (1971-)* 2021: 1-4.
130. Dai M, Tao L, Chen Z, et al. Influence of Cigarettes and Alcohol on the Severity and Death of COVID-19: A Multicenter Retrospective Study in Wuhan, China. *Front Physiol* 2020; **11**: 588553.
131. Htun YM, Win TT, Aung A, et al. Initial presenting symptoms, comorbidities and severity of COVID-19 patients during the second wave of epidemic in Myanmar. *Trop Med Health* 2021; **49**(1): 62.
132. Badr OI, Alwafi H, Elrefaey WA, et al. Incidence and Outcomes of Pulmonary Embolism among Hospitalized COVID-19 Patients. *Int J Environ Res Public Health* 2021; **18**(14).
133. Bello-Chavolla OY, Gonzalez-Diaz A, Antonio-Villa NE, et al. Unequal Impact of Structural Health Determinants and Comorbidity on COVID-19 Severity and Lethality in Older Mexican Adults: Considerations Beyond Chronological Aging. *J Gerontol A Biol Sci Med Sci* 2021; **76**(3): e52-e9.
134. Chen S, Jones PB, Underwood BR, et al. Risk factors for excess deaths during lockdown among older users of secondary care mental health services without confirmed COVID-19: A retrospective cohort study. *Int J Geriatr Psychiatry* 2021; **36**(12): 1899-907.
135. Galluzzi F, Rossi V, Bosetti C, Garavello W. Risk Factors for Olfactory and Gustatory Dysfunctions in Patients with SARS-CoV-2 Infection. *Neuroepidemiology* 2021; **55**(2): 154-61.
136. Mohsin FM, Tonmon TT, Nahrin R, et al. Association Between Smoking and COVID-19 Severity: Evidence from Bangladesh. *J Multidiscip Healthc* 2021; **14**: 1923-33.
137. Rachmawati E, Listiowati E, Kurniawan DW, Suraya I, Ahsan A, Nurmansyah MI. Significance of Chronic Diseases and Smoking Behavior in the Development of Acute Respiratory Distress Syndrome Among Hospitalized COVID-19 Patients in Indonesia. *Asia Pac J Public Health* 2021; **33**(4): 427-30.
138. Limaye MA, Roman AS, Trostle ME, et al. Predictors of severe and critical disease in pregnant women with SARS-CoV-2. *J Matern Fetal Neonatal Med* 2021: 1-5.
139. Lowe KE, Zein J, Hatipoglu U, Attaway A. Association of Smoking and Cumulative Pack-Year Exposure With COVID-19 Outcomes in the Cleveland Clinic COVID-19 Registry. *JAMA Intern Med* 2021; **181**(5): 709-11.
140. Mahabee-Gittens EM, Mendy A, Merianos AL. Assessment of Severe COVID-19 Outcomes Using Measures of Smoking Status and Smoking Intensity. *Int J Environ Res Public Health* 2021; **18**(17).

141. Holman N, Knighton P, Kar P, et al. Risk factors for COVID-19-related mortality in people with type 1 and type 2 diabetes in England: a population-based cohort study. *Lancet Diabetes Endocrinol* 2020; **8**(10): 823-33.
142. Klang E, Kassim G, Soffer S, Freeman R, Levin MA, Reich DL. Severe Obesity as an Independent Risk Factor for COVID-19 Mortality in Hospitalized Patients Younger than 50. *Obesity (Silver Spring)* 2020; **28**(9): 1595-9.
143. Klang E, Soffer S, Nadkarni G, et al. Sex Differences in Age and Comorbidities for COVID-19 Mortality in Urban New York City. *SN Compr Clin Med* 2020: 1-4.
144. Morgenthau AS, Levin MA, Freeman R, Reich DL, Klang E. Moderate or Severe Impairment in Pulmonary Function is Associated with Mortality in Sarcoidosis Patients Infected with SARS-CoV2. *Lung* 2020; **198**(5): 771-5.
145. Adrish M, Chilimuri S, Mantri N, et al. Association of smoking status with outcomes in hospitalised patients with COVID-19. *BMJ Open Respir Res* 2020; **7**(1).
146. Altschul DJ, Esenwa C, Haranhalli N, et al. Predictors of mortality for patients with COVID-19 and large vessel occlusion. *Interv Neuroradiol* 2020; **26**(5): 623-8.
147. Al-Balas M, Al-Balas HI, Alqassieh R, et al. Clinical Features of COVID-19 Patients in Jordan: A Study of 508 Patients. *Open Respir Med J* 2021; **15**: 28-34.
148. Williamson EJ, Walker AJ, Bhaskaran K, et al. Factors associated with COVID-19-related death using OpenSAFELY. *Nature* 2020; **584**(7821): 430-6.
149. Chen L, Yu J, He W, et al. Risk factors for death in 1859 subjects with COVID-19. *Leukemia* 2020; **34**(8): 2173-83.
150. Gharebaghi N, Farshid S, Boroofeh B, et al. Evaluation of epidemiology, clinical features, prognosis, diagnosis and treatment outcomes of patients with COVID-19 in West Azerbaijan Province. *International journal of clinical practice* 2021; **75**(6): e14108.
151. Bellan M, Patti G, Hayden E, et al. Fatality rate and predictors of mortality in an Italian cohort of hospitalized COVID-19 patients. *Sci Rep* 2020; **10**(1): 20731.
152. Bhaskaran K, Rentsch CT, MacKenna B, et al. HIV infection and COVID-19 death: a population-based cohort analysis of UK primary care data and linked national death registrations within the OpenSAFELY platform. *Lancet HIV* 2021; **8**(1): e24-e32.
153. Ghazzay H, Al-Ani RM, Khalil MA, Hammad AF. Socio-clinical Characteristics of COVID-19 Pandemic in Anbar Governorate, Iraq. 2021.
154. Sorci G, Faivre B, Morand S. Explaining among-country variation in COVID-19 case fatality rate. *Sci Rep* 2020; **10**(1): 18909.
155. Qin L, Li X, Shi J, et al. Gendered effects on inflammation reaction and outcome of COVID-19 patients in Wuhan. *J Med Virol* 2020; **92**(11): 2684-92.
156. Maciel EL, Jabor P, Goncalves Junior E, et al. Factors associated with COVID-19 hospital deaths in Espirito Santo, Brazil, 2020. *Epidemiol Serv Saude* 2020; **29**(4): e2020413.
157. Wang ZH, Shu C, Ran X, Xie CH, Zhang L. Critically Ill Patients with Coronavirus Disease 2019 in a Designated ICU: Clinical Features and Predictors for Mortality. *Risk Manag Healthc Policy* 2020; **13**: 833-45.
158. Kuderer NM, Choueiri TK, Shah DP, et al. Clinical impact of COVID-19 on patients with cancer (CCC19): a cohort study. *Lancet* 2020; **395**(10241): 1907-18.
159. Anudeep A, Somu C, Kumar J. Clinical profile and outcomes of critically ill covid-19 patients admitted in a tertiary care hospital. *Annals of Tropical Medicine and Public Health* 2020; **23**: 232-141.
160. Polverino F, Stern DA, Ruocco G, et al. Comorbidities, Cardiovascular Therapies, and COVID-19 Mortality: A Nationwide, Italian Observational Study (ItaliCO). *Front Cardiovasc Med* 2020; **7**: 585866.
161. Ayten O, Saylan B. Retrospective analysis of severe COVID-19 pneumonia patients treated with lopinavir/ritonavir: A comparison with survivor and non-survivor patients. *S Afr J Infect Dis* 2020; **35**(1): 233.
162. Bruce E, Carter B, Quinn TJ, et al. Multiple House Occupancy is Associated with Mortality in Hospitalised Patients with Covid-19. *Eur J Public Health* 2021.



163. Sieglar JE, Cardona P, Arenillas JF, et al. Cerebrovascular events and outcomes in hospitalized patients with COVID-19: The SVIN COVID-19 Multinational Registry. *Int J Stroke* 2021; **16**(4): 437-47.
164. Chauhan NK, Shadrach BJ, Garg MK, et al. Predictors of Clinical Outcomes in Adult COVID-19 Patients Admitted to a Tertiary Care Hospital in India: an analytical cross-sectional study. *Acta Biomed* 2021; **92**(3): e2021024.
165. Chetboun M, Raverdy V, Labreuche J, et al. BMI and pneumonia outcomes in critically ill covid-19 patients: An international multicenter study. *Obesity (Silver Spring)* 2021; **29**(9): 1477-86.
166. Marimuthu Y, Kunnavil R, Anil NS, et al. Clinical profile and risk factors for mortality among COVID-19 inpatients at a tertiary care centre in Bengaluru, India. *Monaldi Arch Chest Dis* 2021; **91**(3).
167. de Havenon A, Ney JP, Callaghan B, et al. Characteristics and Outcomes Among US Patients Hospitalized for Ischemic Stroke Before vs During the COVID-19 Pandemic. *JAMA Netw Open* 2021; **4**(5): e2110314.
168. Ahmadi MN, Huang BH, Inan-Eroglu E, Hamer M, Stamatakis E. Lifestyle risk factors and infectious disease mortality, including COVID-19, among middle aged and older adults: Evidence from a community-based cohort study in the United Kingdom. *Brain Behav Immun* 2021; **96**: 18-27.
169. Emami A, Javanmardi F, Akbari A, et al. Survival rate in hypertensive patients with COVID-19. *Clin Exp Hypertens* 2021; **43**(1): 77-80.
170. Apea VJ, Wan YI, Dhairyawan R, et al. Ethnicity and outcomes in patients hospitalised with COVID-19 infection in East London: an observational cohort study. *BMJ Open* 2021; **11**(1): e042140.
171. Kelly JD, Bravata DM, Bent S, et al. Association of Social and Behavioral Risk Factors With Mortality Among US Veterans With COVID-19. *JAMA Netw Open* 2021; **4**(6): e2113031.
172. Elliott J, Bodinier B, Whitaker M, et al. COVID-19 mortality in the UK Biobank cohort: revisiting and evaluating risk factors. *Eur J Epidemiol* 2021; **36**(3): 299-309.
173. Estiri H, Strasser ZH, Klann JG, Naseri P, Wagholikar KB, Murphy SN. Predicting COVID-19 mortality with electronic medical records. *NPJ Digit Med* 2021; **4**(1): 15.
174. Ferrari BL, Ferreira CG, Menezes M, et al. Determinants of COVID-19 Mortality in Patients With Cancer From a Community Oncology Practice in Brazil. *JCO Glob Oncol* 2021; **7**: 46-55.
175. Peker EK, Bektemur G, Baydili KN, Aktaş M. Comparison of COVID-19 Case-Fatality-Rates by Socio-Demographic Factors. *Journal of Academic Research in Medicine* 2020; **10**(3).
176. Quan D, Luna Wong L, Shallal A, et al. Impact of Race and Socioeconomic Status on Outcomes in Patients Hospitalized with COVID-19. *J Gen Intern Med* 2021; **36**(5): 1302-9.
177. Suzuki A, Efirid JT, Redding TSt, et al. COVID-19-Associated Mortality in US Veterans with and without SARS-CoV-2 Infection. *Int J Environ Res Public Health* 2021; **18**(16).
178. Tortolero GA, Brown MR, Sharma SV, et al. Leveraging a health information exchange for analyses of COVID-19 outcomes including an example application using smoking history and mortality. *PLoS One* 2021; **16**(6): e0247235.
179. Magfira N, Helda H. Correlation between adult tobacco smoking prevalence and mortality of Coronavirus Disease-19 across the world. *medRxiv* 2020.

## Panel 1: Approaches to tobacco cessation

BEHAVIORAL INTERVENTIONS			COVID-19 context
Population-level approaches	Brief Advice	Advice to stop using all tobacco (including chewing tobacco and e-cigarettes) during a course of routine consultation and/or interaction with health care worker	Vaccination Testing Hospitalization
	Quit Lines	Telephone counseling service to provide both proactive and reactive counseling with follow up to provide ongoing support	During quarantine Outpatient care
	Internet and mobile Tobacco cessation	Interventions delivered by internet, mobile phone texts to provide personalized tobacco cessation support.	During quarantine Outpatient care
Individual specialist approaches	Intensive behavioral support	Multiple sessions of individual or group counseling. Cessation assistance and support to develop skills and strategies for changing behavior	Following COVID-19 treatment, long term support
	Cessation clinics	To offer intensive behavioral support, and where appropriate medications or advice, by specially trained practitioners	Following COVID-19 treatment, long term support
PHARMACOLOGICAL INTERVENTIONS			
Nicotine replacement therapies (NRTs)		Gums, lozenges, patches, inhalers and nasal spray used as aids to cessation with gradual reduction of use over time	During COVID-19 hospitalization and treatment
Non-nicotine pharmacotherapies		Varenicline, Cytisine (not approved the US), Bupropion	During COVID-19 treatment Following treatment, second line

Adopted in part from WHO Framework on Tobacco Control.

Cessation resources in the US include the [North American Quitline Consortium](#), National Cancer Institute [smokefree.gov](#) website; and the BecomeAnEX from the Truth Initiative. World Health Organization provides [training and resources for cessation](#) internationally.

Cessation programs geared towards adolescents and young adults include – My Life, My Quit From National Jewish Health; This is Quitting from the Truth Initiative, Not-on-Tobacco from the American Lung Association; Smokefree TXT from the National Center Institute; Aspire from MD Anderson, and Healthy Futures from Stanford Tobacco Prevention Toolkit.

**Panel 2: Assessment of tobacco product use**

**A. Brief Tobacco Use Reporting (e.g., during hospital admission)**

**Former = No use in the past 12 months**

1. Smoker (tobacco):  Current  Former  Never
2. Vaping:  Current  Former  Never
  - 2a. If currently vaping, specify type:
    - Nicotine
    - Marijuana, THC/Concentrates, hash oil, wax
    - Other substance, please specify
3. Hookah:  Current  Former  Never
4. Cigars/Cigarillos:  Current  Former  Never
5. Chewing Tobacco (snus, snuff):  Current  Former  Never

**B. Self-Reported measures for Epidemiologic Studies**

1. Screening for Current Use:

In the past 30 days have you ever used, even just a puff....?

- Cigarettes
- Cigarillos/little cigars
- Large Cigars
- Vape Device
- Hookah
- Chewing

tobacco/Snus/Snuff

- None of the above
- Prefer to not answer

2. Detailed measures of use for Current Users in Q1.

[If current cigarette smoker]

2a. Have you smoked more than 100 cigarettes over lifetime (yes/no)

2b. On days you smoke, about how many cigarettes per day do you smoke \_\_\_\_\_

2c. Lifetime Pack-years of cigarette use \_\_\_\_\_

[If current cigarillo user]

2d. On days you smoke, how many cigarillos do you smoke per day

\_\_\_\_\_

[If current cigar user]

2e. How many large cigars per month \_\_\_\_\_

[If current Electronic Nicotine Device user]

2f. How many puffs per day \_\_\_\_\_