The Daily COVID-19 Literature Surveillance Summary

December 18, 2020

COVID-19 LST

DISCLAIMER

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COVID-19 LST

COVID-19 Daily Literature Surveillance

COVID19LST

Bringing you real time, distilled information for guiding best practices during the COVID-19 pandemic

LEVEL OF EVIDENCE

Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence

Question	Step 1 (Level 1*)	Step 2 (Level 2*)	Step 3 (Level 3*)	Step 4 (Level 4*)	Step 5 (Level 5)
How common is the problem?	Local and current random sample surveys (or censuses)	Systematic review of surveys that allow matching to local circumstances**	Local non-random sample**	Case-series**	n/a
Is this diagnostic or monitoring test accurate? (Diagnosis)	Systematic review of cross sectional studies with consistently applied reference standard and blinding	Individual cross sectional studies with consistently applied reference standard and blinding	Non-consecutive studies, or studies without consistently applied reference standards**	Case-control studies, or "poor or non-independent reference standard**	Mechanism-based reasoning
What will happen if we do not add a therapy? (Prognosis)	Systematic review of inception cohort studies	Inception cohort studies	Cohort study or control arm of randomized trial*	Case-series or case-control studies, or poor quality prognostic cohort study**	n/a
Does this intervention help? (Treatment Benefits)	Systematic review of randomized trials or *n*-of-1 trials	Randomized trial or observational study with dramatic effect	Non-randomized controlled cohort/follow-up study**	Case-series, case-control studies, or historically controlled studies**	Mechanism-based reasoning
What are the COMMON harms? (Treatment Harms)	Systematic review of randomized trials, systematic review of nested case-control studies, *n*-of-1 trial with the patient you are raising the question about, or observational study with dramatic effect	Individual randomized trial or (exceptionally) observational study with dramatic effect	Non-randomized controlled cohort/follow-up study (post-marketing surveillance) provided there are sufficient numbers to rule out a common harm. (For long-term harms the duration of follow-up must be sufficient.)**	Case-series, case-control, or historically controlled studies**	Mechanism-based reasoning
What are the RARE harms? (Treatment Harms)	Systematic review of randomized trials or *n*-of-1 trial	Randomized trial or (exceptionally) observational study with dramatic effect			
Is this (early detection) test worthwhile? (Screening)	Systematic review of randomized trials	Randomized trial	Non -randomized controlled cohort/follow-up study**	Case-series, case-control, or historically controlled studies**	Mechanism-based reasoning

*** Level may be graded down on the basis of study quality, imprecision, indirectness (study PICO does not match questions PICO), because of inconsistency between studies, or because the absolute effect size is very small; Level may be graded up if there is a large or very large effect size.**

**** As always, a systematic review is generally better than an individual study.**

How to cite the Levels of Evidence Table
OCEBM Levels of Evidence Working Group*. "The Oxford 2011 Levels of Evidence".
Oxford Centre for Evidence-Based Medicine. http://www.cebm.net/index.aspx?o=5653
** OCEBM Table of Evidence Working Group = Jeremy Howick, Iain Chalmers (James Lind Library), Paul Glasziou, Trish Greenhalgh, Carl Heneghan, Alessandro Liberati, Ivan Moschetti, Bob Phillips, Hazel Thornton, Olive Goddard and Mary Hodgkinson*

EXECUTIVE SUMMARY

Understanding the Pathology

- Exercise scientists from Appalachian State University compared the vascular function of young adults (mean age 23) three to four weeks after SARS-CoV-2 positive PCR test (n=11) to healthy young adults (n=20) using doppler ultrasound. They found reduced brachial artery flow-mediated dilation (FMD, 2.71±1.21% vs 8.81±2.96%) and femoral artery single passive limb movement (sPLM, 0.04±0.02 AU vs 0.13±0.06 AU) along with increased carotid-femoral pulse wave velocity (PWVcf, 5.83±0.62 m/s vs 5.17±0.66 m/s) in patients recovering from SARS-CoV-2 compared to controls (p<0.01). Authors suggest SARS-CoV-2 infection is associated with reduced vascular function and increased arterial stiffness, possibly heightening cardiovascular risk in young adults in the weeks following infection.

- Laboratory and diagnostic researchers from Africa and infection researchers from Germany retrospectively tested serum samples of 135 healthcare workers collected in 2014 for reactivity against SARS-CoV-2 nucleocapsid (N) antigen and found 23.7% (32/135) were reactive, indicating strong cross-reactivity between SARS-CoV-2 and other more common coronaviruses. Further research is needed to assess if these pre-existing antibodies to the nucleocapsid (N) antigen offer protection against COVID-19, or possibly cause harm by provoking an increased immune/inflammatory reaction.

Transmission & Prevention

- A team including Canadian specialists in Infectious Disease, Critical Care, and Occupational and Environmental Safety and Health compared the efficacy of various mask decontamination techniques: vaporized hydrogen peroxide (VHP), autoclaving, moist heat, peracetic acid dry fogging system (PAF), ethylene oxide (EtO), ultraviolet light C radiation (UV-C), and low temperature hydrogen peroxide gas plasma (LT-HPGP). They treated N95 masks with VSV and SARS-CoV-2, decontaminated them, recovered viral titers, and then repeated fit testing. They found that autoclaving, VHP, PAF, EtO, LT-HPGP, and moist heat successfully sterilized masks. However, the masks which underwent LT-HPGP and EtO could not pass fit testing after only two and three cycles of decontamination, respectively, while the other methods continued to pass testing. Based on these results, they suggest VHP, moist heat, autoclaving, and PAF could be utilized for 5 decontamination cycles to inactivate SARS-CoV-2 on N95 masks without altering N95 masks' filtration ability.

Mental Health & Resilience Needs

- A team from the Researcher Centre for Evidence-Based Practice in Belgium conducted a systematic review of 33 observational studies (29,266 participants) reporting on modifiable risk factors for mental health outcomes in healthcare workers during coronavirus epidemics. They found amount of disease exposure (i.e. direct patient contact or working in high risk units) and risk perception/fear (e.g. fear of infection or infecting others) were associated with worse mental health outcomes (seen in 88% [95%CI: 73-97%, p<0.001] and 92% [95%CI: 64-100%, p=0.003] of included studies, respectively). Clear communication and support from the organization (92%, 95%CI: 62-100%, p=0.006), social support (85%, 95%CI: 55-98%, p =0.022) and personal sense of control (100%, 95%CI: 54-100%, p=0.031) were protective (Table 2). Though authors acknowledge the limited interpretability of their findings due to overall low-quality of included evidence, they suggest that an integrated protective approach is needed to safeguard the mental health of healthcare workers during the COVID-19 pandemic.

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VASCULAR ALTERATIONS AMONG YOUNG ADULTS WITH SARS-COV-2

Ratchford SM, Stickford JL, Province VM, Stute N, Augenreich MA, Koontz LK, Bobo LK, Stickford ASL.. Am J Physiol Heart Circ Physiol. 2020 Dec 11. doi: 10.1152/ajpheart.00897.2020. Online ahead of print.
Level of Evidence: 3 - Local non-random sample

BLUF

Exercise scientists from Appalachian State University compared the vascular function of young adults (mean age 23) three to four weeks after SARS-CoV-2 positive PCR test (n=11) to healthy young adults (n=20) using doppler ultrasound. They found reduced brachial artery flow-mediated dilation (FMD, 2.71±1.21% vs 8.81±2.96%) and femoral artery single passive limb movement (sPLM, 0.04±0.02 AU vs 0.13±0.06 AU) along with increased carotid-femoral pulse wave velocity (PWVcf, 5.83±0.62 m/s vs 5.17±0.66 m/s) in patients recovering from SARS-CoV-2 compared to controls (p<0.01) (Figures 1, 2, 3). Authors suggest SARS-CoV-2 infection is associated with reduced vascular function and increased arterial stiffness, possibly heightening cardiovascular risk in young adults in the weeks following infection.

ABSTRACT

BACKGROUND: While SARS-CoV-2 primarily affects the lungs, the virus may be inflicting detriments to the cardiovascular system, both directly through angiotensin converting enzyme 2 receptor as well as initiating systemic inflammation. Persistent systemic inflammation may be provoking vascular dysfunction, an early indication of cardiovascular disease risk. METHODS: In order to establish the potential effects of SARS-CoV-2 on the systemic vasculature in the arms and legs, we performed a cross-sectional analysis of young healthy adults (Control: 5M/15F, 23.0+-1.3y, 167+-9cm, 63.0+-7.4kg) and young adults who, 3-4 weeks prior to testing, had tested positive for SARS-CoV-2 (SARS-CoV-2: 4M/7F, 20.2+-1.1y, 172+-12cm, 69.5+-12.4kg) (mean+-SD). Using Doppler ultrasound, brachial artery flow-mediated dilation (FMD) in the arm and single passive limb movement (sPLM) in the leg were assessed as markers of vascular function. Pulse wave velocity (PWVcf) was assessed as a marker of arterial stiffness. RESULTS: FMD was lower in the SARS-CoV-2 group (2.71+-1.21%) compared to the Control group (8.81+-2.96%) (P<0.01) and when made relative to the shear stimulus (SARS-CoV-2: 0.04+-0.02AU, Control: 0.13+-0.06AU, P<0.01). The femoral artery blood flow response, as evidenced by the area under the curve, from the sPLM was lower in the SARS-CoV-2 group (-3+-91ml) compared with the Control group (118+-114ml) (P<0.01). PWVcf was higher in the SARS-CoV-2 group (5.83+-0.62m/s) compared with the Control group (5.17+-0.66m/s) (P<0.01). CONCLUSIONS: Significantly lower systemic vascular function and higher arterial stiffness are evident weeks after testing positive for SARS-CoV-2 among young adults compared to controls.

FIGURES

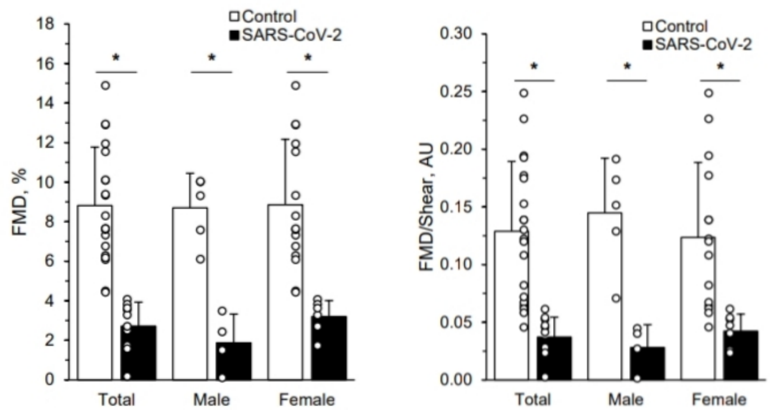

Figure 1: " Brachial artery flow-mediated dilation (FMD) expressed as percent change (A) and normalized to shear (B). Two-tailed student's t-tests for two samples of equal variance were performed between Control (n=5M/15F) and SARS-CoV-2 (n=4M/7F) groups. *P<0.01, between groups. Data are Mean±SD".

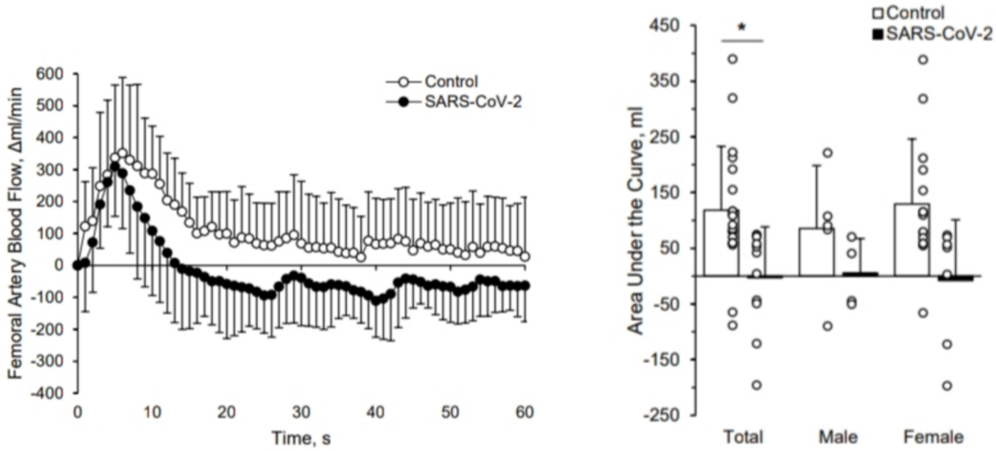

Figure 2: "Single passive limb movement. Common femoral artery blood flow change from baseline following a single passive limb movement (A) with the 60-second area under the curve (B). Two-tailed student's t-tests for two samples of equal variance were performed between Control (n=5M/15F) and SARS-CoV-2 (n=4M/7F) groups. *P<0.01, between groups. Data are Mean±SD".

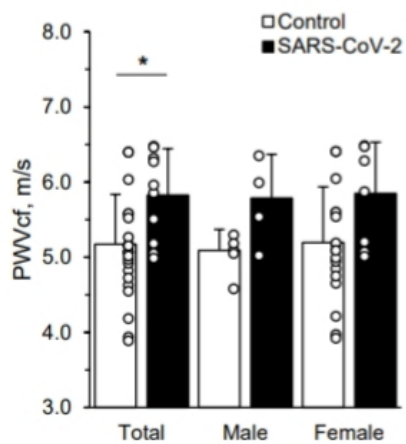

Figure 3: "Carotid-femoral pulse wave velocity. Two-tailed student's t-tests for two samples of equal variance were performed between Control (n=5M/15F) and SARS-CoV-2 (n=4M/7F) groups. *P<0.01, between groups. Data are Mean±SD".

IN VITRO

EVIDENCE AND IMPLICATIONS OF PRE-EXISTING HUMORAL CROSS-REACTIVE IMMUNITY TO SARS-COV-2

Mveang Nzoghe A, Essone PN, Leboueny M, Maloupazoa Siawaya AC, Bongho EC, Mvoundza Ndjindji O, Avome Houechenou RM, Agnandji ST, Djoba Siawaya JF.. Immun Inflamm Dis. 2020 Dec 15. doi: 10.1002/iid3.367. Online ahead of print.
Level of Evidence: 3 - Local non-random sample

BLUF

Laboratory and diagnostic researchers from Africa and infection researchers from Germany retrospectively tested serum samples of 135 healthcare workers collected in 2014 for reactivity against SARS-CoV-2 nucleocapsid (N) antigen and found 23.7% (32/135) were reactive (See Figure 1 and Figure 2). This indicates strong cross-reactivity between SARS-CoV-2 and other more common coronaviruses. Further research is needed to assess if these pre-existing antibodies to the nucleocapsid (N) antigen offer protection against COVID-19, or possibly cause harm by provoking an increased immune/inflammatory reaction.

ABSTRACT

BACKGROUND: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has emerged throughout the world. Building knowledge around Covid-19 is crucial to devise facts based approaches to respond efficiently against this pandemic. AIM: We aimed to investigate pre-existing humoral cross-reactive immunity to SARS-CoV-2. METHOD: We have tested the reactivity against SARS-CoV-2 nucleocapsid (N) antigen of sera collected from healthy healthcare volunteers in 2014. We assessed immunoglobulins reactive against SARS-CoV-2 N-antigen using a well-validated serological platform; Elecsys assay. RESULTS: Sera from 32 subjects (out of 135 [23.7%]) were reactive to SARS-CoV-2 N-antigen, suggesting the presence of anti-SARS-CoV-2 N-antigen antibodies. CONCLUSION: Although the clinical relevance of the observed reactivity can only be speculated and needs to be investigated, the implication of this finding for coronavirus disease 2019 seroepidemiological survey and vaccines' clinical trials is critical.

FIGURES

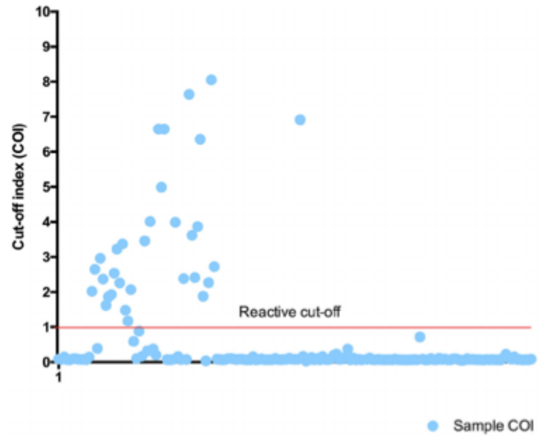

FIGURE 1 Cutoff index (COI) of sera collected from the community years before the coronavirus disease 2019 (COVID-19) pandemic.A COI ≥ 1.0 indicates a reactive sample (positive for anti-severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2] antibodies)

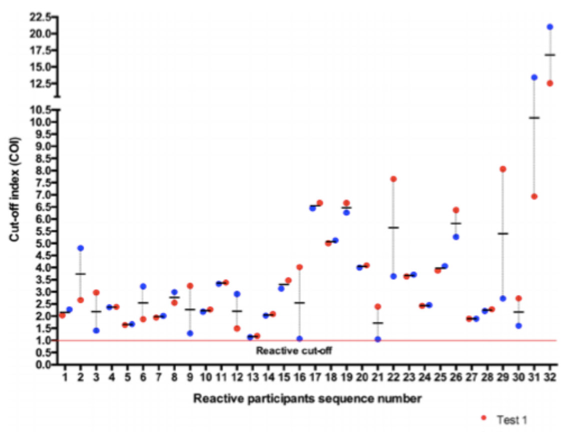

FIGURE 2: COI of reactive samples collected years before the COVID-19 pandemic. The figure shows the results of two independent tests. COI, cutoff index; COVID-19, coronavirus disease 2019

INFLUENZA VACCINATION AMONG INFECTION CONTROL TEAMS: A EUCIC SURVEY PRIOR TO COVID-19 PANDEMIC

Keske Ş, Mutters NT, Tsioutis C, Ergönül Ö; EUCIC influenza vaccination survey team.. Vaccine. 2020 Dec 14;38(52):8357-8361. doi: 10.1016/j.vaccine.2020.11.003. Epub 2020 Nov 5.
Level of Evidence: 3 - Local non-random sample

BLUF

A multinational team of infectious disease researchers surveyed infection control team (ICT) members (n=899) from 56 countries to study Influenza vaccination rates within these ICT's. Results indicate that the overall reported vaccination rate was 76%, most of whom decided to receive the vaccine due to personal vaccine experience, scientific authorities, self-protection, or to protect patients (Table 3). They found that vaccinating the ICT leader and offering a free vaccine were associated with higher ICT team vaccination rate, emphasizing the importance of leadership and affordability in terms of vaccinations.

ABSTRACT

We aimed to describe the influenza vaccination rate and its determinants among infection control team (ICT) across different countries. Online multilingual survey consisting of 23 items, between 17 May -15 July of 2019 targeting the opinions and practices of ICTs regarding the 2018-2019 influenza season was employed. Participants were reached via European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and European Union Certificate for Infection Control (EUCIC) newsletters,social media, and national societies. In total, 899 participants from 56 countries responded to the survey. The overall vaccination rate was 76%, being the highest in Finland, Portugal, Norway, and Israel (100%), whereas the lowest in Italy (68%) and Turkey (39%). Influenza vaccination rate was 86% among IC physicians and 52% among IC nurses. The most significant factors affecting participants' decision were personal influenza vaccine experience (49%) and attitude of the scientific authorities (48%). In multivariate analysis, vaccination of the ICT head (OR: 16.04, 95%CI: 8.4-30.8, p < 0.001) and having free vaccine (OR: 7.56, 95%CI: 2.1-27.4, p = 0.02) were found to be the strongest predictors for influenza vaccination, whereas working in Turkey (OR: 0.41, 95%CI: 0.22-0.77, p = 0.006) and being an IC nurse (OR:0.43, 95%CI: 0.24-0.80, p = 0.007) were significantly associated with not having been vaccinated. In conclusion, COVID-19 pandemic increased the importance of protection against respiratory viruses including influenza. Vaccination strategies should have a special emphasis on IC nurses, who have a relatively lower vaccination rate, should enhance the vaccination of the ICT leaders, and put effort to provide free availability of the influenza vaccine.

FIGURES

Leading reasons for vaccination n = 675 (%)		Leading reasons for not being vaccinated n = 213 (%)	
To protect myself	564 (84)	Don't belong in a risk group	68 (32)
To protect patients	502 (74)	Do not believe efficacy of vaccine	53 (25)
I believe efficacy of vaccine	465 (69)	To have influenza is better than vaccination	34 (16)
To protect my family and friends	454 (67)	I had influenza like illness despite vaccination	33 (16)
To be a role model	420 (62)	Different views by press and/or scientific areas	21 (10)
The vaccine is free of charge	83 (12)	Vaccine has serious adverse events	20 (10)
Positive comments of press and scientific authorities	38 (6)	I experienced vaccine related adverse events	20 (10)
Because of chronic disease	23 (3)	I had influenza despite vaccination	16 (8)
Other reasons	34 (5)	Influenza is not fatal	13 (6)
		Being pregnant	8 (4)
		Being an anti-vaxxer	4 (2)
		Other reasons	63 (30)

Table 3. Leading reasons for vaccination or not in 2018-2019 season.

DECONTAMINATION OF N95 MASKS FOR RE-USE EMPLOYING 7 WIDELY AVAILABLE STERILIZATION METHODS

Kumar A, Kasloff SB, Leung A, Cutts T, Strong JE, Hills K, Gu FX, Chen P, Vazquez-Grande G, Rush B, Lother S, Malo K, Zarychanski R, Krishnan J.. PLoS One. 2020 Dec 16;15(12):e0243965. doi: 10.1371/journal.pone.0243965. eCollection 2020.
Level of Evidence: 5 - Mechanism-based reasoning

BLUF

A team including Canadian specialists in Infectious Disease, Critical Care, and Occupational and Environmental Safety and Health compared the efficacy of various mask decontamination techniques: vaporized hydrogen peroxide (VHP), autoclaving, moist heat, peracetic acid dry fogging system (PAF), ethylene oxide (EtO), ultraviolet light C radiation (UV-C), and low temperature hydrogen peroxide gas plasma (LT-HPGP). They treated N95 masks with VSV and SARS-CoV-2, decontaminated them, recovered viral titers, and then repeated fit testing (Figure 1). They found that autoclaving, VHP, PAF, EtO, LT-HPGP, and moist heat successfully sterilized masks (Table 1). However, the masks which underwent LT-HPGP and EtO could not pass fit testing after only two and three cycles of decontamination, respectively (Table 2) while the other methods continued to pass testing. Based on these results, they suggest VHP, moist heat, autoclaving, and PAF could be utilized for 5 decontamination cycles to inactivate SARS-CoV-2 on N95 masks without altering N95 masks' filtration ability.

ABSTRACT

The response to the COVID-19 epidemic is generating severe shortages of personal protective equipment around the world. In particular, the supply of N95 respirator masks has become severely depleted, with supplies having to be rationed and health care workers having to use masks for prolonged periods in many countries. We sought to test the ability of 7 different decontamination methods: autoclave treatment, ethylene oxide gassing (ETO), low temperature hydrogen peroxide gas plasma (LT-HPGP) treatment, vaporous hydrogen peroxide (VHP) exposure, peracetic acid dry fogging (PAF), ultraviolet C irradiation (UVCI) and moist heat (MH) treatment to decontaminate a variety of different N95 masks following experimental contamination with SARS-CoV-2 or vesicular stomatitis virus as a surrogate. In addition, we sought to determine whether masks would tolerate repeated cycles of decontamination while maintaining structural and functional integrity. All methods except for UVCI were effective in total elimination of viable virus from treated masks. We found that all respirator masks tolerated at least one cycle of all treatment modalities without structural or functional deterioration as assessed by fit testing; filtration efficiency testing results were mostly similar except that a single cycle of LT-HPGP was associated with failures in 3 of 6 masks assessed. VHP, PAF, UVCI, and MH were associated with preserved mask integrity to a minimum of 10 cycles by both fit and filtration testing. A similar result was shown with ethylene oxide gassing to the maximum 3 cycles tested. Pleated, layered non-woven fabric N95 masks retained integrity in fit testing for at least 10 cycles of autoclaving but the molded N95 masks failed after 1 cycle; filtration testing however was intact to 5 cycles for all masks. The successful application of autoclaving for layered, pleated masks may be of particular use to institutions globally due to the virtually universal accessibility of autoclaves in health care settings. Given the ability to modify widely available heating cabinets on hospital wards in well-resourced settings, the application of moist heat may allow local processing of N95 masks.

Table 2. Quantitative fit testing results of N95 masks after repeat decontamination cycles.

PortaCount Result (normal & deep breathing exercises only)					
Groups	**Masks**				
Control	3M 1860	pass			
	3M Aura 1870	pass			
	3M Vflex 1804S	pass			
	AO Safety 1054S	pass			
	3M 8210	pass			
	3M 9210	pass			
		# of cycles			
		1	3	5	10
Autoclave	3M 1860	pass	fail	fail	fail
	3M Aura 1870	pass	pass	pass	pass
	3M Vflex 1804S	pass	pass	pass	pass
	AO Safety 1054S	pass	pass	pass	pass
	3M 8210	pass	fail	fail	fail
	3M 9210	pass	pass	pass	pass
		1	3		
EtO	3M 1860	pass	pass		
	3M Aura 1870	pass	pass		
	3M Vflex 1804S	pass	pass		
	AO Safety 1054S	pass	pass		
		1	2	5	10
LT-HPGP	3M 1860	pass	fail	fail	fail
	3M Aura 1870	pass	fail	fail	fail
	3M Vflex 1804S	pass	fail	fail	fail
	AO Safety 1054S	pass	pass	fail	fail
	3M 8210	pass	fail	fail	fail
	3M 9210	pass	fail	fail	fail
		1	3	5	10
VHP	3M 1860	pass	pass	pass	pass
	3M Aura 1870	pass	pass	pass	pass
	3M Vflex 1804S	pass	pass	pass	pass
	AO Safety 1054S	pass	pass	pass	pass
		1	3	5	10
PAF	3M 1860	pass	pass	pass	pass
	3M Aura 1870	pass	pass	pass	pass
	3M Vflex 1804S	pass	pass	pass	pass
	AO Safety 1054S	pass	pass	pass	pass
		1	3	5	10
UV-C (1120 mJ/cm^2)	3M 1860	pass	pass	pass	ND
	3M Aura 1870	pass	pass	pass	ND
	3M Vflex 1804S	pass	pass	pass	ND
	AO Safety 1054S	pass	pass	pass	ND
	3M 8210	pass	pass	pass	ND
	3M 9210	pass	pass	pass	ND
		1	3	5	10

(Continued)

Table 2. (Continued)

PortaCount Result (normal & deep breathing exercises only)					
Groups	**Masks**				
Moist Heat (75˚C & 22% RH X 3 hr)	3M 1860	ND	pass	ND	pass
	3M Aura 1870	ND	pass	ND	pass
	3M Vflex 1804S	ND	pass	ND	pass
	AO Safety 1054S	ND	pass	ND	pass
	3M 8210	ND	pass	ND	pass
	3M 9210	ND	pass	ND	pass

PAF: Peracetic acid dry fogging system, VHP = vaporous hydrogen peroxide, EtO = ethylene oxide.
LT-HPGP: Low temperature hydrogen peroxide gas plasma.
UV-C: Ultraviolet light-C radiation (254 nm wavelength).

https://doi.org/10.1371/journal.pone.0243965.t002

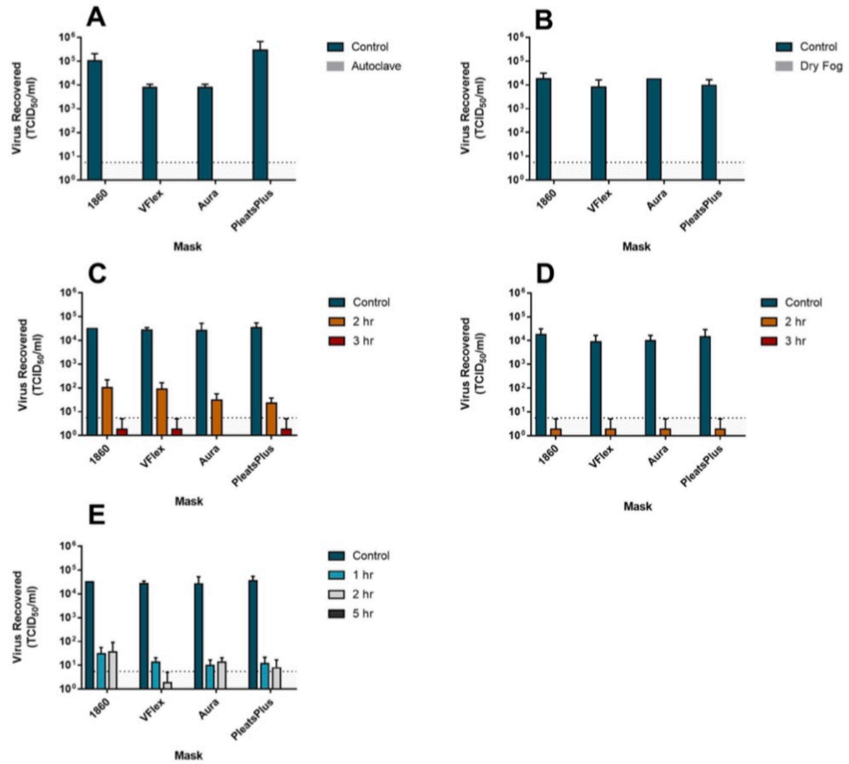

Fig 1. Inactivation efficacy of various decontamination methods against SARS-CoV-2 on experimentally contaminated N-95 masks. Coupons of inoculated N-95 masks (n = 4 models) were subjected to (A) autoclaving at 121˚C for 15 minutes; (B) peracetic acid dry fogging; (C) exposure to 70˚C + 22% RH for 2–3 hours; (D) exposure to 75˚C +22% RH for 2–3 hours; and (E) VHP treatment for 1,2 or 5 hour cycle times. Virus recovery post-treatment was determined by elution of coupons in culture medium and endpoint titration in Vero E6 cells via $TCID_{50}$ assay. Inoculated, untreated drying controls of each mask material were included as positive controls in all experiments. Results indicate means +/- standard deviations of three biological replicates. Dotted lines indicate quantification limits of the $TCID_{50}$ assay.

Table 1. Sterilization efficacy of decontamination methods.

Mean virus recovery post-decontamination ($LogTCID_{50}$ ± SD) compared to drying controls									
Virus	**Mask**	**Control**	**Autoclave**	**VHP***	**PAF**	**EtO**	**LT-HPGP**	**UV-C**	**Moist Heat†**
VSV	3M 1860	6.1 ± 0.3	0	0	0	0	0	2.2 ± 2.2	0
	3M Aura 1870	6.5 ± 0.8	0	0	0	0	0	1.8 ± 2.0	0
	3M Vflex 1804	6.4 ± 0.2	0	0	0	0	0	1.4 ± 1.5	0
	AO Safety 1054	6.5 ± 0.3	0	0	0	0	0	1.5 ± 1.4	0
SARS-CoV-2	3M 1860	4.4 ± 0.2	0	0	0	ND	ND	ND	0
	3M Aura 1870	4.5 ± 0.4	0	0	0	ND	ND	ND	0
	3M Vflex 1804	4.4 ± 0.4	0	0	0	ND	ND	ND	0
	AO Safety 1054	4.4 ± 0.4	0	0	0	ND	ND	ND	0

ND = not done, 0 = no growth.

VHP*: Vaporized hydrogen peroxide -VHP® ARD System, 1 hour program cycle (VSV) or 5 hour program cycle (SARS-CoV-2).

Moist Heat†: 70˚C with 22% relative humidity X 1 hr (VSV) or 75˚C with 22% relative humidity X 3 hrs (SARS-CoV-2).

PAF: Peracetic acid dry fogging system, VHP = vaporous hydrogen peroxide, EtO = ethylene oxide.

LT-HPGP: Low temperature hydrogen peroxide gas plasma.

UV-C: Ultraviolet light-C radiation (254 nm wavelength).

$TCID_{50}$: Median tissue culture infectious dose (per mL).

Control: Virus-inoculated mask materials subjected to air-drying only for 1–2 hrs.

FACTORS AFFECTING MENTAL HEALTH OF HEALTH CARE WORKERS DURING CORONAVIRUS DISEASE OUTBREAKS (SARS, MERS & COVID-19): A RAPID SYSTEMATIC REVIEW

De Brier N, Stroobants S, Vandekerckhove P, De Buck E.. PLoS One. 2020 Dec 15;15(12):e0244052. doi: 10.1371/journal.pone.0244052. eCollection 2020.
Level of Evidence: 2 - Systematic review of surveys that allow matching to local circumstances

BLUF

A team from the Researcher Centre for Evidence-Based Practice in Belgium conducted a systematic review of 33 observational studies (29,266 participants) reporting on modifiable risk factors for mental health outcomes in healthcare workers during coronavirus epidemics (Figure 1). They found amount of disease exposure (i.e. direct patient contact or working in high risk units) and risk perception/fear (e.g. fear of infection or infecting others) were associated with worse mental health outcomes (seen in 88% [95%CI: 73-97%, p<0.001] and 92% [95%CI: 64-100%, p=0.003] of included studies, respectively). Clear communication and support from the organization (92%, 95%CI: 62-100%, p=0.006), social support (85%, 95%CI: 55-98%, p =0.022) and personal sense of control (100%, 95%CI: 54-100%, p=0.031) were protective (Table 2). Though authors acknowledge the limited interpretability of their findings due to overall low-quality of included evidence, they suggest that an integrated protective approach is needed to safeguard the mental health of healthcare workers during the COVID-19 pandemic.

ABSTRACT

INTRODUCTION: The novel Coronavirus Disease (COVID-19) outbreak currently puts health care workers at high risk of both physical and mental health problems. This study aimed to identify the risk and protective factors for mental health outcomes in health care workers during coronavirus epidemics. METHODS: A rapid systematic review was performed in three databases (March 24, 2020) and a current COVID-19 resource (May 28, 2020). Following study selection, study characteristics and effect measures were tabulated, and data were synthesized by using vote counting. Meta-analysis was not possible because of high variation in risk factors, outcomes and effect measures. Risk of bias of each study was assessed and the certainty of evidence was appraised according to the GRADE methodology. RESULTS: Out of 2605 references, 33 observational studies were selected and the identified risk and protective factors were categorized in ten thematic categories. Most of these studies (n = 23) were performed during the SARS outbreak, seven during the current COVID-19 pandemic and three during the MERS outbreak. The level of disease exposure and health fear were significantly associated with worse mental health outcomes. There was evidence that clear communication and support from the organization, social support and personal sense of control are protective factors. The evidence was of very low certainty, because of risk of bias and imprecision. CONCLUSION: Safeguarding mental health of health care workers during infectious disease outbreaks should not be treated as a separate mental health intervention strategy, but could benefit from a protective approach. This study suggests that embedding mental health support in a safe and efficient working environment which promotes collegial social support and personal sense of control could help to maximize resilience of health care workers. Low quality cross-sectional studies currently provide the best possible evidence, and further research is warranted to confirm causality.

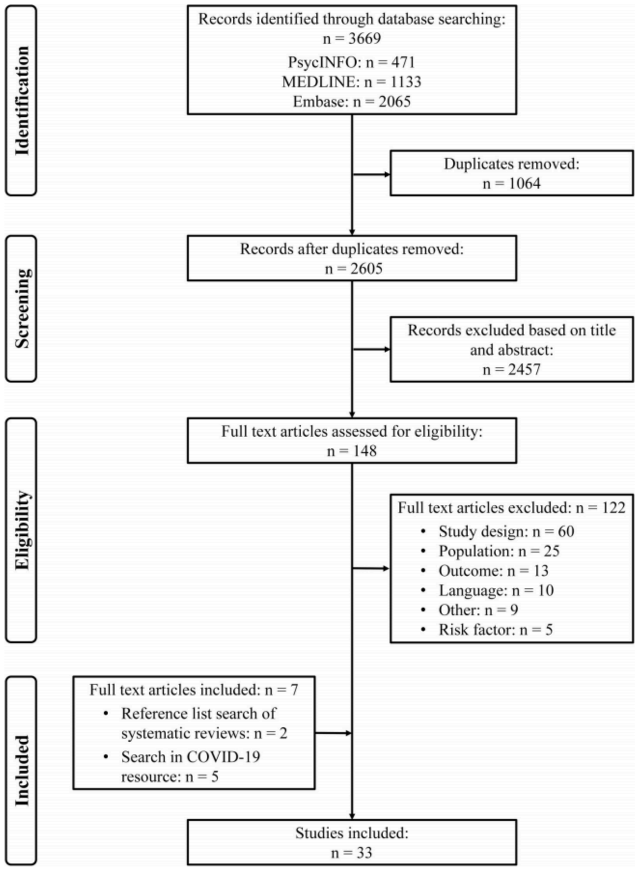

Fig 1. PRISMA flowchart for the selection of eligible studies.

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Table 2. Synthesis of the impact of identified risk and protective factors on the development of mental health problems based on vote counting of the direction of effect. The unknown directions of effect represent the factors which did not significantly contribute to the multivariate regression analyses and of which the direction of effect was not reported.

	Direction of effect			Vote counting		
Variable	**Risk (# comparisons)**	**Protective (# comparisons)**	**Unknown (# comparisons)**	**Proportion**	**95% CI**	**P value**
Risk factors						
Level of disease exposure	30	4	12	88%	[73;97]	<0.001
Being quarantined	5	0	3	100%	[48;100]	0.063
Job stress and dissatisfaction	9	2	1	82%	[48;98]	0.065
Risk perception and fear	12	1	2	92%	[64;100]	0.003
Stigma	4	0	4	100%	[40;100]	0.125
Loss of control and emotional disruption	3	0	0	100%	[29;100]	0.250
Protective factors						
Organizational communication and support	1	11	2	92%	[62;100]	0.006
Physical safety and training	3	8	7	73%	[39;94]	0.227
Social support	2	11	3	85%	[55;98]	0.022
Sense of control and coping ability	0	6	0	100%	[54;100]	0.031

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CONTRIBUTORS

Ankita Dharmendran
Jonathan Baker
Julia Ghering
Krithika Kumarasan
Renate Meckl

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