Journal of Hospital Infection 105 (2020) 104–105

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Letter to the editor

Association between 2019-nCoV transmission and N95 respirator use

Sir,

Cases of a novel type of contagious pneumonia were first reported in December 2019 in Wuhan, China. The Centers for Disease Control and Prevention (CDC) and Chinese health authorities have determined that a novel coronavirus (CoV), denoted as 2019-nCoV (SARS-CoV-2), is the cause of this pneumonia outbreak (COVID-19) [1,2]. Existing evidence has confirmed the human-to-human transmission of 2019-nCoV [3].

We retrospectively collected infection data from 2 to 22 January 2020 at six departments (Respiratory, Intensive Care Unit (ICU), Infectious Disease, Hepatobiliary Pancreatic Surgery, Trauma and Microsurgery and Urology) from Zhongnan Hospital of Wuhan University. Medical staff (doctors and nurses) followed differential routines of occupational protection: (1) staff at the Departments of Respiratory Medicine, ICU, and Infectious Disease (mainly quarantined area) wore N95 respirators, and disinfected and cleaned their hands frequently (the N95 group); (2) medical staff in the other three departments wore no medical masks, and disinfected and cleaned their hands only occasionally (the no-mask group). The difference was because the latter departments were not considered to be high risk in the early days of the outbreak.

Suspected cases of 2019-nCoV infection were investigated by chest computed tomography, and confirmed by molecular diagnosis. In total, 28 and 58 patients had confirmed and suspected 2019-nCoV-infection, respectively. Patient exposure was significantly higher for the N95 group compared with the no-mask group (for confirmed patients, difference: 733%; exposure odds ratio: 8.33, Table I).

Among the 493 medical staff, none of the 278 staff (56 doctors and 222 nurses) in the N95 group became infected, but 10 of 213 staff (77 doctors and 136 nurses) from the no-mask group were confirmed as infected (Table I). Regardless of their lower risk of exposure, the 2019-nCoV infection rate for medical staff was significantly increased in the no-mask group compared with the N95 respirator group (difference: 4.65%, (95% confidence interval: 1.75%–infinite); $P<2.2e-16$) (adjusted odds ratio: 464.82, (95% confidence interval: 97.73–infinite); $P<2.2e-16$).

Likewise, we analysed the medical staff infection data from Huangmei People's Hospital (12 confirmed patients) and Qichun People's Hospital (11 confirmed patients), and observed a similar phenomenon. No medical staff wearing the N95 respirators and following routines of frequent disinfection and hand washing were infected by 2019-nCoV up until 22 January 2020.

A randomized clinical trial has reported that the N95 respirators vs medical masks resulted in no significant difference in the incidence of laboratory confirmed influenza [4]. In our study, we observed that the N95 respirators, disinfection and hand washing appeared to help reduce the infectious risk of 2019-nCoV in doctors and nurses. Interestingly, departments with a high proportion of male doctors seemed to have a higher risk of infection. Our results emphasize the need for strict occupational protection measures in fighting COVID-19.

https://doi.org/10.1016/j.jhin.2020.02.021

Table I
The infection data of patients and medical staff at Zhongnan Hospital of Wuhan University (2–22 January 2020)

Environment	Department	Protection mask	Protective clothing	Surgical cap	2019-nCoV patient exposure	Medical staff										
						Doctors					Nurses			Total		
					Confirmed/ suspected cases	Total no.	Age (years)	Sex (M/F, %)	Confirmed/ suspected cases (*n*, %)	Total#	Age (years)	Sex (M/F, %)	Confirmed/ Suspected cases (*n*,%)	Confirmed cases (*n*/ total, %)	Per-group confirmed cases (*n*, %)	*P* (adjusted OR, 95% CI)
Quarantined area	Respiratory	N95	-	+	6/9	11	44.0 ± 9.5	6/5 (55%/ 45%)	0/0 (0%/0%)	59	29.0 ± 5.7	3/56 (3%/ 95%)	0/0 (0%/0%)	0/70 (0%)	N95 group: 0/278 (0%)	<2.2E-16 (464.82, 97.73-inf)
	ICU	N95	+	+	8/7	30	35.2 ± 8.7	16/14 (53%/ 47%)	0/0 (0%/0%)	139	27.4 ± 4.2	39/100 (28%/72%)	0/0 (0%/0%)	0/169 (0%)		
	Infectious diseases	N95	-	-	11/42	15	41.4 ± 8.6	7/8 (46%/ 54%)	0/0 (0%/0%)	24	30.7 ± 5.7	0/24 (0%/ 100%)	0/0 (0%/0%)	0/39 (0%)		
Open area	Hepatobiliary pancreatic surgery	-	-	-	1/0	25	44.0 ± 11.1	24/25 (96%/ 4%)	7/1 (28%/4%)	49	31.0 ± 8.4	1/48 (2%/ 98%)	1/1 (2%/2%)	8/74 (11%)	No-mask group: 10/ 215 (4.651%)	
	Trauma and microsurgery	-	-	-	1/0	18	41.0 ± 9.8	18/18 (100%/0%)	1/1 (6%/6%)	26	34.0 ± 8.0	1/26 (4%/ 96%)	0/0 (0%/0%)	1/44 (2%)		
	Urology	-	-	-	1/0	36	40.1 ± 10.3	35/1 (97%/ 3%)	1/1 (3%/3%)	61	28.2 ± 8.2	6/56 (2%/ 98%)	0/4 (0%/7%)	1/97 (1%)		

CI, confidence interval; F, female; ICU, intensive care unit; M, male; OR, odds ratio.

Conflict of interest statement
None declared.

Funding sources
This study was supported by the Medical Science Advancement Program (Clinical Medicine) of Wuhan University (TFLC2018002).

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Available online 3 March 2020