Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

AMERICAN ACADEMY OF OPHTHALMOLOGY®

Reports

Symptomatic COVID-19 in Eye Professionals in Wuhan, China

The novel coronavirus disease 2019 (COVID-19) pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has had a global impact.[1] Eye professionals may be at risk of contracting COVID-19 because face-to-face proximity is required to examine patients using a slit lamp or ophthalmoscope.

Herein, we report the results of a cross-sectional case-control questionnaire survey conducted in the hospitals with eye professionals demonstrating symptomatic COVID-19 in Wuhan, China. The goal of this study was to understand the incidence of symptomatic COVID-19 among eye professionals and to improve their safety as the pandemic grows.

The survey was conducted from February 26 through March 20, 2020. Using the key informant method, we received a list of eye professionals with symptomatic COVID-19 diagnosed through February 29, 2020, from the Wuhan Ophthalmology Society. This list was confirmed by the chairman of each respective ophthalmology department. Cases were diagnosed and disease severity was graded by treating pulmonologists based on the latest diagnostic criteria.[2] Control participants were selected randomly within each ophthalmology department where case(s) were identified using 3 to 4 control participants per case. All participants were ophthalmologists, ophthalmic nurses, or technicians who worked in an ophthalmology department and had been involved in patient care since the outbreak. The questionnaire, distributed to the participants through a link built into the WeChat program (Tencent Technology Co. Ltd, Shenzhen, China), included demographic information and information on personal protective equipment (PPE) and hand hygiene. After informed consent was obtained, all questionnaires were answered by the participants themselves with the exception of 2 participants: one who died and another who remained intubated through data collection. The study was conducted in accordance with the tenets of the Declaration of Helsinki and was approved by the institutional review board of Central Theater Command General Hospital.

Through February 29, 2020, a total of 28 eye professionals from 10 hospitals contracted COVID-19 with pulmonary symptoms. This included 14 ophthalmologists, 12 ophthalmic nurses, and 2 ophthalmic technicians (Table 1). Eight patients (28.5%) demonstrated severe disease, including 3 deaths. All 3 deaths were ophthalmologists who had worked in the same hospital. Besides reverse-transcriptase polymerase chain reaction (RT-PCR) analysis, serum antibody tests also were used to diagnose COVID-19. Except for 2 patients who died before receiving serum antibody testing, all patients with negative RT-PCR results showed positive results for SARS-CoV-2 antibody. Only 5 patients (17.9%) had family members with symptomatic COVID-19.

Twenty patients (71.4%), including all severe patients except one, were diagnosed before February 7, 2020: 14 days after January 23, when Wuhan was locked down, the most commonly cited latency period of COVID-19 (Fig S1A, available at www.aaojournal.org). The overall incidence of symptomatic COVID-19 among eye professionals across 10 hospitals was 2.52% (95% confidence interval, 1.68%−3.63%). The incidence of COVID-19 in ophthalmologists was similar to that seen in ophthalmic nurses and technicians (Table S2, available at www.aaojournal.org). The 2 hospitals with the highest incidences (hospitals E and G) were tertiary referral centers clustered within 4.5 kilometers of the Huanan Seafood market, where early outbreak was reported in Wuhan (Fig S1B, available at www.aaojournal.org).

All control participants showed no symptoms and negative RT-PCR results. Both case and control groups had similar gender distributions, ratios of ophthalmologists to ophthalmic staff, working environments, and PPE training for COVID-19 ($P > 0.05$). However, compared with the control group, patients in the case group were older ($P = 0.01$), had been in practice longer ($P = 0.001$), had higher rates of contact with confirmed or suspected COVID-19 patients ($P = 0.002$), and reported higher rates of lack of sleep ($P = 0.008$) and lack of PPE supply ($P = 0.02$) before January 20, 2020, when the personal protection was strictly required in regular clinics (Table 3). Both groups showed a significant increase in PPE use after January 20 (all $P < 0.0001$; Table S4, available at www.aaojournal.org). In addition, control participants more frequently avoided direct skin contact with patients by using gloves or cotton tips ($P = 0.03$).

Generally, ophthalmologists might have been considered to be a low-risk subspecialty in the pandemic. However, our data showed at least a similar risk of symptomatic COVID-19 among eye professionals when compared with healthcare workers in general in Wuhan. Extrapolated from data available from the Chinese Red Cross Foundation and Wuhan Health Commission,[3,4] we estimated that the overall COVID-19 incidence among all healthcare workers in the 10 hospitals was 2.27% (713 contracted health workers of 31 367).

The incidence of symptomatic COVID-19 and associated severe cases or death peaked during the early phase of the pandemic and decreased significantly 2 weeks after the lockdown, consistent with the incidence curve of symptomatic COVID-19 among healthcare workers in Wuhan.[5] During the city's lockdown, only urgent cases were seen in eye clinics, leading to less SARS-CoV-2 exposure for eye professionals. This observed clustering effect seems to support the effectiveness of stopping transmission and controlling disease spread.

Given the risk of COVID-19 among the eye professionals, PPE use is highly recommended. After using PPE, only 2 new symptomatic COVID-19 cases were reported in hospitals E and G (those closest to Wuhan Seafood market), compared with 9 cases before

Table 1. Characteristics of 28 Eye Professionals Infected with Symptomatic COVID-19 in Wuhan, China

Patient No.	Hospital	Age (yrs)	Gender	Occupation	Subspecialty	Years in Practice	Severity	Chest Computed Tomography Findings	SARS-CoV-2 Test Results: *Antibody Test*	SARS-CoV-2 Test Results: *Reverse-Transcriptase Polymerase Chain Reaction Nasopharyngeal Swab*
2	G	31	F	Ophthalmologist	Comprehensive	< 5	Mild	Unilateral infiltration		Positive
5	A	41	F	Ophthalmologist	Comprehensive	> 15	Mild	Bilateral infiltration		Positive
11	D	49	M	Ophthalmologist	Retina	> 15	Mild	Bilateral infiltration		Positive
12	G	63	M	Ophthalmologist	Retina	> 15	Death	Bilateral infiltration	NA	Negative
13	G	53	M	Ophthalmologist	Anterior segment	> 15	Death	Bilateral infiltration	NA	Negative
15	H	47	F	Ophthalmologist	Comprehensive	> 15	Mild	Unilateral infiltration	Positive	Negative
16	F	40	M	Ophthalmologist	Comprehensive	> 15	Mild	Bilateral infiltration		Positive
17	B	37	M	Ophthalmologist	Retina	10–15	Mild	Bilateral infiltration	Positive	Negative
21	B	42	F	Ophthalmologist	Cornea	> 15	Mild	Bilateral infiltration	Positive	Negative
22	C	49	F	Ophthalmologist	Cornea	> 15	Mild	Bilateral infiltration		Positive
25	G	39	F	Ophthalmologist	Comprehensive	10–15	Mild	Unilateral infiltration	Positive	Negative
26	I	70	M	Ophthalmologist	Anterior segment	> 15	Severe	Bilateral infiltration		Positive
27	G	34	M	Ophthalmologist	Comprehensive	5–10	Death	Bilateral infiltration		Positive
28	J	33	M	Ophthalmologist	Comprehensive	< 5	Mild	Bilateral infiltration		Positive
1	D	29	F	Nurse		5–10	Mild	Normal		Positive
3	G	35	F	Nurse		10–15	Mild	Bilateral infiltration	Positive	Negative
4	G	33	F	Nurse		10–15	Mild	Unilateral infiltration	Positive	Negative
6	D	33	F	Nurse		10–15	Mild	Bilateral infiltration	Positive	Negative
7	E	34	F	Nurse		10–15	Mild	Bilateral infiltration		Positive
8	E	37	F	Nurse		> 15	Mild	Bilateral infiltration		Positive
9	E	39	F	Nurse		> 15	Severe	Bilateral infiltration	Positive	Negative
10	E	32	F	Nurse		10–15	Severe	Bilateral infiltration	Positive	Negative
14	D	59	M	Technician		> 15	Mild	Bilateral infiltration		Positive
18	B	37	F	Nurse		10–15	Mild	Bilateral infiltration	Positive	Not performed
19	B	32	F	Nurse		5–10	Mild	Bilateral infiltration		Positive
20	B	38	F	Nurse		> 15	Severe	Bilateral infiltration	Positive	not done
23	C	67	F	Technician		> 15	Severe	Bilateral infiltration		Positive
24	D	31	F	Nurse		5–10	Mild	Bilateral infiltration		Positive

COVID-19 = novel corona virus disease 2019; F = female; M = male; NA = not available; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

Table 3. Comparison of Characteristics between Symptomatic COVID-19 Patients and Control Participants

Characteristics	Patients (n = 26)	Control Participants (n = 96)	*P* Value*
Age (yrs)			**0.01**
Mean ± SD	40.8 ± 10.3	35.1 ± 5.5	
Range	29–67	26–52	
Female gender, no. (%)	19 (73.1)	80 (83.3)	0.26
Years of clinical practice, no. (%)			**0.001**
< 5	1 (3.9)	14 (14.6)	
5–9	4 (15.4)	32 (33.3)	
10–15	8 (30.8)	31 (32.3)	
> 15	13 (50.0)	19 (19.8)	
Occupation, no. (%)			0.18
Ophthalmologist	12 (46.2)	47 (49.0)	
Ophthalmic nurse	12 (46.2)	48 (50.0)	
Ophthalmic technician	2 (7.7)	1 (1.0)	
Workplace environment, no. (%)			
Outpatient clinic	14 (53.9)	57 (59.4)	0.66
Inpatient wards	13 (50.0)	54 (56.3)	0.65
Front line	9 (4.6)	30 (31.3)	0.81
Contact with COVID-19 patient, no. (%)	22 (84.6)	48 (50.0)	**0.002**
Lack of PPE, no. (%)	14 (53.9)	26 (27.1)	**0.02**
No sufficient sleep, no. (%)	11 (42.3)	16 (16.7)	**0.008**
Received COVID-19 PPE training, no. (%)	20 (76.9)	79 (82.3)	0.58

COVID-19 = novel corona virus disease 2019; PPE: personal protective equipment; SD = standard deviation.
Boldface indicates statistical significance.
*Two-sample *t* test for comparison of means and Fisher exact test for comparison of proportions.

using PPE. Older age, lack of PPE, lack of sufficient sleep, and less diligent hand hygiene were the risk factors for symptomatic COVID-19 contraction in this study.

Our study has several limitations. First, providers with symptomatic COVID-19 were identified through contact with key informants. Ascertainment bias can inflate the proportion of severe cases by missing those asymptomatic or mildly symptomatic cases. Thus, results from this study apply only to symptomatic COVID-19 among eye professionals. Second, although control participants showed negative RT-PCR results, SARS-CoV-2 antibody tests were not performed; as such, we cannot rule out the possibility of asymptomatic COVID-19 among control participants. In addition, recall bias is an important concern in studies based on questionnaire data, with a risk of affected individuals overreporting symptoms, inadequate PPE, and hand hygiene.

In conclusion, this study reported the incidence of symptomatic COVID-19 among eye professionals in Wuhan, China, and demonstrated that decrease in patient volume coinciding with city lockdown, adequate PPE, and diligent hand hygiene are important in preventing disease transmission.

Chunyan Qiao, MD, PhD[1]
Hui Zhang, MD, PhD[1]
Mingguang He, MD, PhD[2]
Guishuang Ying, MD, PhD[3]
Changzheng Chen, MD, PhD[4]
Yanping Song, MD[5]
Julius Oatts, MD[6]
Zhonghua Liu, MD[7]
Yiqiao Xing, MD[8]
Zefeng Xiao, MD[9]
Min Ke, MD[10]
Ya Ye, MD[5]
Xiaoniao Chen, MD, PhD[1]
Jihong Luo, MD, PhD[11]
Ying Han, MD, PhD[6]
Ningli Wang, MD, PhD[1]

[1]*Beijing Tongren Eye Center, Beijing Tongren Hospital, Capital Medical University, Beijing Ophthalmology & Visual Science Key Lab, Beijing Institute of Ophthalmology, Beijing, China;* [2]*Centre for Eye Research Australia, University of Melbourne, Royal Victorian Eye and Ear Hospital, East Melbourne, Australia;* [3]*Department of Ophthalmology, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania;* [4]*Department of Ophthalmology, Renmin Hospital of Wuhan University, Wuhan, China;* [5]*Department of Ophthalmology, Central Theater Command General Hospital, Wuhan, China;* [6]*Department of Ophthalmology, University of California, San Francisco, San Francisco, California;* [7]*Department of Ophthalmology, HanKou Hospital, Wuhan, China;* [8]*Department of Ophthalmology, Aier Eye Hospital of Wuhan University, Wuhan, China;* [9]*Department of Ophthalmology, Wuhan No. 1 Hospital, Wuhan, China;* [10]*Department of Ophthalmology, Zhongnan Hospital, Wuhan University, Wuhan, China;* [11]*Department of Ophthalmology, Hubei Provincial Hospital of Traditional Chinese Medicine, Affiliated Hospital of Hubei University of Chinese Medicine, Hubei Province Academy of Traditional Chinese Medicine, Wuhan, China*

Financial Disclosure(s):
The author(s) have no proprietary or commercial interest in any materials discussed in this article.

Supported by the National Natural Science Foundation of China (grant no.: 81570837); the National Natural Science Foundation of China (grant no.: 81730027); the Beijing Municipal Institute of Public Medical Research Development and Reform Pilot Project (grant no.: 2018-2); and the Beijing Institute of Ophthalmology Key Program (grant no.: 2019003). This research was supported in part by an unrestricted grant from Research to Prevent Blindness, New York, NY.

HUMAN SUBJECTS: Human subjects were included in this study. The human ethics committees at Central Theater Command General Hospital approved the study. All research adhered to the tenets of the Declaration of Helsinki. All participants provided informed consent.

No animal subjects were included in this study.

Author Contributions:
Conception and design: Qiao, Zhang, Ying, Han, Wang
Analysis and interpretation: Qiao, Zhang, He, Ying, Han, Wang
Data collection: Qiao, Zhang, He, Ying, C.Chen, Song, Liu, Xing, Xiao, Ke, Ye, X.Chen, Luo, Han, Wang
Obtained funding: Qiao, Wang, Han
Overall responsibility: Qiao, Zhang, He, Ying, Oatts, Han, Wang

Correspondence:
Ying Han, MD, PhD, Department of Ophthalmology, University of California, San Francisco, 10 Koret Way, San Francisco, CA 94143. E-mail: ying.han@ucsf.edu; and Ningli Wang, MD, PhD, Beijing Tongren Eye Center, Beijing Tongren Hospital, Capital Medical University, Beijing Ophthalmology & Visual Science Key Lab, Beijing Institute of Ophthalmology, No. 1 Dongjiaominxiang Street, Dongcheng District, Beijing 100730, China. E-mail: wningli@vip.163.com.

References

1. World Health Organization. Coronavirus disease 2019 (COVID-19) pandemic 2019. https://www.who.int/emergencies/diseases/novel-coronavirus-2019; Accessed April 3, 2020.
2. National Health Commission of the PRC, National Administration of Traditional Chinese Medicine of the PRC. Diagnosis and treatment plan for COVID-19 (trial version 6). *Chin Med J (Engl)*. 2020. Mar 17 (Epub ahead of print).
3. Chinese Red Cross Foundation. Byte beat humanitarian aid fund for medical workers. https://new.crcf.org.cn/. Accessed March 23, 2020.
4. Wuhan Health Commission. Health development bulletin of Wuhan City 2018. http://wjw.wuhan.gov.cn/upload/file/20191205/1575536693972018707.pdf; Accessed March 23, 2020.
5. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;382(18):1708–1720.

Intralesional Rituximab Injection for Low-Grade Conjunctival Lymphoma Management

Low-grade extranodal marginal zone, mucosal-associated lymphoid tissue (MALT) lymphoma is the most common conjunctival lymphoma, followed by follicular, large B-cell, and mantle cell lymphoma.[1] All of these lymphomas contain B-lymphocytes expressing CD20 surface antigen. Depending on the extent of local or systemic involvement, the management of