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Preventive recommendations in ophthalmology during the COVID-19 pandemic. A review

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Abstract: Introduction. The new coronavirus SARS-CoV-2 is transmitted through droplets that an infected person expels while coughing, sneezing, or talking, and it mainly affects the respiratory tract. To this date, there are no treatments, so preventive measures are necessary to restrain its spread. Materials and methods. In Mexico, authorities declared the sanitary emergency on March 30th. From this moment, we began a thorough literature review in PUBMED on the preventive measures for COVID-19 issued by ophthalmological societies. While two researchers went through the titles and abstracts, three dedicated themselves to text analysis. The search strategy is based on the MeSH terms: Wuhan, COVID-19, SARS-CoV-2, Health Workers, Prevention, Guidelines, Patients, and Ophthalmology. The focus is on four critical areas in the management of patients during the outbreak of COVID-19, expressly, user and environmental control, in addition to protection of HCP and overall administrative matters. From these, we derived 15 recommendations, which we, in turn, looked for in each paper. Results. 25 articles were analyzed. The most consistently observed recommendations were: use of personal protective equipment (PPE) (100%), disinfection of patient zones (100%), respiratory triages (96%), avoidance of crowds (96%). As for the rest of the recommendations, there was little agreement between the authors. Conclusions. There is no uniformity of recommendations in this literature review. It is necessary to carry out a greater number of systematic reviews to create validated guidelines, through the methodology of Grading of Recommendations Assessment for preventive clinical practices in order to standardize these recommendations in all ophthalmology services.

Keywords: Wuhan, COVID-19, SARS-CoV-2, health workers, prevention, guidelines, patients, ophthalmology.

Introduction

Since the epidemic outbreak of SARS-CoV-2 in Wuhan, China, there has been a constant development of the knowledge concerning this disease. It is an infection that comes from an RNA virus, member of the family Coronaviridae, with a beta gender. The incubation period is between 2 and 14 days.[1] One route of transmission is from person to person, through droplets, capable of traveling more than 6.5 feet, that an infected person expels while coughing, sneezing, or talking.[2] Besides this direct way of spread, another common possibility is to take the hands into a mucous membrane after touching a contaminated fomite. There are studies warning about the possibility that, in view of the virus' size, microdroplets can travel more than 6.5 feet.[3] Among these qualities, it can live several hours on a variety of surfaces, such as paper, plastic, and metal.[4] According to the WHO (World Health Organization), this is a highly contagious disease, owing to fact that its R_0 index is between 1.4 to 2, in comparison to Influenza A (H1N1) with a value of 1.4 or season flu with 0.1[5]

On account that this disease concerns the lower respiratory tract, the classic symptoms include high fever, dry cough, rhinorrhea, fatigue, myalgia, dysphonia, and diarrhea, to which there has been an extension to include anosmia, conjunctivitis, ageusia, and some dermatological alterations.[6] 80% of the infected people will exhibit a mild case, the remaining 20% will require hospitalization due to respiratory complications, whilst 5% of all cases will need an intensive care unit (ICU). Consequently, the case fatality rate goes from 1 to 10%.[7] The main cause of death is respiratory distress, out of a cytokine storm.[8] Relative to this, there has been a growing suspicion of cardiac and neurological injuries in this process.[9] In recent studies in search of extrapulmonary manifestations, there is increasing evidence that, amongst the previous fatal causes, are endocrine,

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renal, vascular, and hematologic disorders.[10]

As a consequence of these facts, the ophthalmic practice is one of the specialties with a higher risk of infection due to the proximity and duration involved in the explorations; on average there is a distance less than 11 inches through a period of more than 30 minutes.[11] Besides the manipulation of tear secretions, which has been identified as a way of acquiring the virus,[12,13] there are other risk factors, such as the exposure to aerosol sprays during tests of eye pressure by use of a pneumotonometer, or in surgical procedures as the phacoemulsification surgery when using ultrasound[14]. On top of that, there is a possibility that after conducting a check up on asymptomatic patients for problems unrelated to this disease[15], or on those who assist because of follicular conjunctivitis, later on they show positive results in the COVID-19 test.[16]

All over the world, the mortality across health care personnel (HCP) is high. Dr. Li Wenliang, ophthalmologist, made the first report about the virus, warning about 7 abnormal cases of pneumonia in China. Unfortunately, he died of COVID-19.[17] On a preliminary study of bibliographic search about mortality within a variety of specialties, more than 50% of cases proceed from intensive care and emergency physicians, as well as from pneumologists and anaesthesiologists, as for ophthalmologists, they hold 4% and between epidemiologists and infectologists there is a 2% rate.[18]

In Mexico, the first case of a hospitalized patient for COVID-19 was registered on the 27th of February. On the 23rd of March, a newly formed general health council devised a series of actions. Among the measures were the assessment and adjustment of hospital facilities, the increase of hospital and intensive care units beds, the acquisition of medical equipment, the hiring of HCP, the implementation of continuous training programs, and the construction of units for exclusive medical attention.[19]

This study presents, through a literature review, the preventive recommendations issued by ophthalmological societies, university clinics, universities, and ophthalmology clinics. The focus is on 15 recommendations divided into four critical areas in the management of patients during the outbreak of COVID-19, expressly, user and environmental control, in addition to protection of HCP and overall administrative matters.

Methods

As a result of the statement of health emergency, published the 30th of March 2020, in Mexico,[20] we created a medical committee with the task of searching, via PUBMED, the guides and preventive recommendations issued by ophthalmological societies, university clinics, universities, and ophthalmology clinics. The time limit to this literature review is the 1st of August 2020.

The search strategy is based on the MeSH terms: Wuhan, COVID-19, SARS-CoV-2, Health Workers, Prevention, Guidelines, Patients, and Ophthalmology. General recommendations and other literature reviews were included, but any type of personal or subspeciality recommendations, letters to the editor, and surveys had to be excluded. Two researchers went through the titles and abstracts, and three to text analysis.

Results

With the approach described above, our list is composed of 32 articles. Only 25 met all requirements, in which we considered all countries. 56% come from ophthalmological societies, 24% from ophthalmology clinics, 12% of university clinics and 2% of universities alone. (**Table 1**)

This review is focused on four critical areas: user and environmental control, protection of HCP, and overall administrative matters. Out of these, we derived 15 recommendations, which, in turn, were assessed in the 25 articles. (**Table 2**) We will now show the categories in each area, and the corresponding percentage in our literature list:

- USER CONTROL. In this area there are four main recommendations: avoidance of agglomerations is in 100% of the articles, use of face masks in 84%, the same as taking the temperature at hospital admission, and 60% referenced telemedicine practice.
- ENVIRONMENTAL CONTROL. In this area there are three recommendations: chemical disinfection in patient assessment zones is at 100% of the articles, use of a protective shield in slit lamps in 88%, and with only 4% physical sterilization.
- HEALTH CARE PERSONNEL. Given the importance of this type of personnel in the supervision of patients with COVID-19, it is of utter interest their full protection. In this area there are seven recommendations: certainly 100% mentioned the use of PPE, 96% alluded the need for respiratory triages, 92% hand hygiene and the scheduling only for urgent surgeries, 64% staff training, 40% taking the temperature of HCP, and 8% proposed examine patients with a PCR test prior to surgery.
- ADMINISTRATIVE. In this area there is only one recommendation, namely, the reschedule

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Article title	Authors	Country	Origin	Study design	Preventive measures	Results
1.Spezielle ophthalmologische schutzmaßnahmen in der COVID-19-pandemie	Katrin Wacker.	Germany	Ophthalmology Clinics	Narrative review	**Use of masks in patients+ telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+ hand hygiene+training+ppe+triage+urgent surgery +rescheduling ordinary appointments**	Reduce the Risk of Cross-infection
2. Infection control measures in ophthalmology during the COVID-19 outbreak: A narrative review from an early experience in Italy	Daniele Veritt.	Italy	Ophthalmology Clinics	Narrative review	**Use of masks in patients+taking temperature of patients+avoid crowds+chemical disinfection +slit lamp barriers+hand hygiene+training+ppe+triage+urgent surgery+rescheduling ordinary appointments**	Reduce the Risk of Cross-infection
3. Self-protection of medical workers in phthalmology clinic during COVID 19 epidemic	Lei Hua.	China	Ophthalmology Clinics	Narrative review	**Use of masks in patients+taking temperature of patients+avoid crowds+chemical disinfection+uv disinfection+hand hygiene +ppe+triage +rescheduling ordinary appointments**	Reduce the Risk of Cross-infection
4. Facing COVID-19 in ophthalmology department	Mario R. Romano.	Italy	Ophthalmology Clinics	Narrative review	**Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection+ slit lamp barriers+ staff temperature monitoring+hand hygiene +ppe+triage+urgent surgery +rescheduling ordinary appointments**	Reduce the Risk of Cross-infection
5. StPPEing up infection control measures in ophthalmology during the novel coronavirus outbreak: an experience from Hong Kong	Tracy H. T.	China	Ophthalmology Clinics	Narrative review	**Use of masks in patients+taking temperature of patients +avoid crowds+chemical disinfection+slit lamp barriers+ staff temperature monitoring+hand hygiene+training+ppe+triage+urgent surgery+rescheduling ordinary appointments**	Reduce the Risk of Cross-infection
6. COVID-19: acciones de vigilancia y prevención recomendadas para instituciones y servicios de oftalmología	C.A.O	Argentina	Society	Recommendations	**Taking temperature of patients +avoid crowds+chemical disinfection +slit lamp barriers+ staff temperature monitoring+hand hygiene +ppe+triage+ rescheduling ordinary appointments**	Dissemination of Health Promotion Programs
7. Standard precaution measurements during ophthalmology practice in the pandemic stage of COVID-19	Ahmed Mohamed.	Egypt	University Health Services	Narrative review	**Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+ staff temperature monitoring+hand hygiene+training+ppe+triage+urgent surgery+rescheduling ordinary appointments**	Reduce the Risk of Cross-infection
8. Ophthalmology Practice During the Coronavirus Disease 2019 Pandemic: The University of Pittsburgh Experience in Promoting Clinic Safety and Embracing Video Visits	Andrew M. Williams .	USA	University Health Services	Narrative review	**Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+hand hygiene+training+ppe+triage+urgent surgery+ +rescheduling ordinary appointments**	Reduce the Risk of Cross-infection
9. Estrategias para prevenir la transmisión en las unidades de oftalmología	Carolina Sardi.	Colombia	Society	Recommendations	**Taking temperature of patients+avoid crowds+chemical disinfection +slit lamp barriers+hand hygiene+training+ppe+triage+urgent surgery+rescheduling ordinary appointments**	Dissemination of Health Promotion Programs
10. Recommendations para la atención oftalmológica durante el estado de alarma por la pandemia de enfermedad por coronavirus COVID-19	J.A. Gegúndez-Fernández.	Spain	Society	Recommendations	**Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection+ slit lamp barriers+hand hygiene+training+ppe+triage+urgent surgery+pcr antes de la qx+rescheduling ordinary appointments**	Dissemination of Health Promotion Programs
11. Ophthalmology in the time of COVID-19: experience from Hong Kong eye hospital	Stephanie S.L.	China	University Health Services	Narrative review	**Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+ staff temperature monitoring+hand hygiene+training+ppe+triage+urgent surgery +rescheduling ordinary appointments**	Reduce the Risk of Cross-infection
12. Sustainable practice of ophthalmology during COVID-19: challenges and solutions	Louisw. Lim.	Singapore	Ophthalmology Clinics	Narrative review	**Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +hand hygiene+ ppe+triage+urgent surgery +rescheduling ordinary appointments**	Dissemination of Health Promotion Programs
13. AINOS: Operational guidelines for ophthalmic	AINOS	India	Society	Recommendations	**Use of masks in patients+taking temperature of patients+ a pacientes+avoid crowds+chemical disinfection +slit lamp barriers+ staff temperature monitoring+hand hygiene+training+ppe+triage+urgent surgery+ rescheduling ordinary appointments**	Dissemination of Health

Table 1. Summary of preventive measures referred by the authors of each of the 25 articles that met the selection criteria of this review.

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practice during COVID 19 outbreak						Promotion Programs
14. Statement by the malaysian society of ophthalmology regarding the ongoing COVID-19 pandemic and implications on ophthalmology services	O.S Malasya	Malasya	Society	Recommendations	Use of masks in patients+taking temperature of patients+avoid crowds+chemical disinfection+ slit lamp barriers+ staff temperature monitoring+ppe+triage+urgent surgery+ +rescheduling ordinary appointments	Dissemination of Health Promotion Programs
15. Nepal ophthalmic society COVID19 ophthalmology practice guidelines	O.S.Nepal	Nepal	Society	Recommendations	Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+ staff temperature monitoring+hand hygiene+training+ppe+triage+urgent surgery+ rescheduling ordinary appointments	Dissemination of Health Promotion Programs
16. Ophthalmological society of Nigeria advisory on COVID-19	O.S.Nigeria	Nigeria	Society	Recommendations	Use of masks in patients+taking temperature of patients+ avoid crowds+chemical disinfection +slit lamp barriers+ +hand hygiene+training+ppe+triage+urgent surgery +rescheduling ordinary appointments	Dissemination of Health Promotion Programs
17. Recommandations COVID-19 pour les ophtalmologistes	O.S.Francia	France	Society	Recommendations	Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+hand hygiene+ppe+triage+urgent surgery+ rescheduling ordinary appointments	Dissemination of Health Promotion Programs
18. Coronavirus COVID-19 guideline	R.C.O.Australia Y Nz	Australia y N.Z	Society	Recommendations	Use of masks in patients+ +avoid crowds+chemical disinfection+ +hand hygiene+ppe+triage+urgent surgery+ rescheduling ordinary appointments	Dissemination of Health Promotion Programs
19. Guidelines for ophthalmic care during COVID-19 pandemic	O.S.Canadá	Canada	Society	Recommendations	Use of masks in patients+ telemedicine in patients+ s+chemical disinfection+slit lamp barriers+ +training+ppe+urgent surgery +rescheduling ordinary appointments	Dissemination of Health Promotion Programs
20. Preparedness among ophthalmologists: during and beyond the COVID-19 pandemic	A.A.O.	USA	Society	Recommendations	Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+ staff temperature monitoring+hand hygiene+training+ppe+triage+urgent surgery +rescheduling ordinary appointments	Dissemination of Health Promotion Programs
21. Recopilación de las recommendations para el manejo de pacientes que requieren atención oftalmológica durante la pandemia de sars-cov-2.	M. O.S	Mexico	Society	Recommendations	Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+hand hygiene+ppe+triage+urgent surgery +rescheduling ordinary appointments	Dissemination of Health Promotion Programs
22. Coronavirus RCOPHT update – need to know points	R.C.OPHTH	UK	Society	Recommendations	Use of masks in patients + toma de taking temperature of patients +telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+ hand hygiene+training+ppe+triage+urgent surgery +rescheduling ordinary appointments	Dissemination of Health Promotion Programs
23. COVID-19: precautionary guidelines for ophthalmologists	Hani B. Albalawi	Sau	University	Recommendations	Use of masks in patients+taking temperature of patients+ avoid crowds+chemical disinfection +slit lamp barriers+hand hygiene+training+ppe+triage+urgent surgery+rescheduling ordinary appointments	Dissemination of Health Promotion Programs
24. Protecting yourself and your patients from COVID-19 in eye care	Victor Hu.	Various	Society	Recommendations	Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+ staff temperature monitoring+hand hygiene +ppe+triage+urgent surgery +rescheduling ordinary appointments	Dissemination of Health Promotion Programs
25. COVID-19: preliminary clinical guidelines for ophthalmology practices	Reza Gharebaghi.	Iran, USA	University	Recommendations	Use of masks in patients+taking temperature of patients+telemedicine in patients+avoid crowds+chemical disinfection +slit lamp barriers+hand hygiene+training+ppe+triage+urgent surgery+pcr antes de la qx+rescheduling ordinary appointments	Dissemination of Health Promotion Programs

C.A.O: Consejo Argentino De Oftalmología, AINOS: All India Ophthalmology Society, M.O.S Mexican Society of Ophthalmology A.A.O. American Academy of Ophthalmology, R.C.O.HPTH: Royal College of Ophthalmology R.C.O: Royal Australian and New Zealand College of Ophthalmologists

Table 1. (Continued)

DOI 10.17605/OSF.IO/PGWUB

ASPECTS	PREVENTIVE RECOMMENDATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
USERS	Use of masks in patients	X	X	X	X	X	NO	X	X	NO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Taking temperature of patients	NO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NO	NO	X	X	X	X	X	X
	Telemedicine in patients	X	NO	NO	X	NO	NO	X	X	NO	X	X	X	NO	NO	X	NO	X	NO	X	X	X	X	NO	X	X
	Avoid crowds	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NO	X	X	X	X	X	X
ENVIROMENT	Chemical disinfection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Uv disinfection	NO	NO	X	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Slit lamp barriers	X	X	NO	X	X	X	X	X	X	X	X	NO	X	X	X	X	X	NO	X	X	X	X	X	X	X
HEALTHCARE STAFF	Staff temperature monitoring	NO	NO	NO	X	X	X	X	NO	NO	NO	X	NO	X	X	X	NO	NO	NO	NO	X	NO	NO	NO	X	NO
	Hand hygiene	X	X	X	X	X	X	X	X	X	X	X	X	X	NO	X	X	X	X	NO	X	X	X	X	X	X
	Staff training	X	X	NO	NO	X	NO	X	X	X	X	X	NO	X	NO	X	X	NO	NO	X	X	NO	X	X	NO	X
	PPE	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Triage	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NO	X	X	X	X	X	X
	Urgent surgery	X	X	NO	X	X	NO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	PCR before surgery	NO	NO	NO	NO	NO	NO	NO	NO	NO	X	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	X
ADMINISTRATIVE	Rescheduling ordinary appointments	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 2. Search recommendations divided into 4 main aspects: Users, Enviroment, Health and Administrative personnel. Fifteen preventive recommendations were derived from these which were intentionally sought in each reviewed article and then listed from 1 to 25 corresponding to the order of the articles described in Table 1. The "X" represent the articles that comply with each recommendation and "NO" represent those that did not accomplish it.

of appointments, a basic aspect to diminish the possibility of patient clusters with no urgent pathology. This proposal is present a 100% in all revised articles.

Discussion

Considering that the SARS-CoV-2 disease represents an unprecedented human health problem to which there is not, to date, an effective treatment, preventive measures are necessary to restrain any propagation of the virus.

In statements issued by some of the main ophthalmological societies, such as the American Academy of Ophthlamology (AAO) and the Royal College of Ophthalmologists (RCOphth),[21,22] they urge the implementation of administrative measures in clinics and hospitals, in order to diffuse the agglomeration of users, as this is one of the main ways to transmit the virus. These measures include the staggering and reschedule of appointments, the deferral of elective surgery, the use of face masks, taking the temperature at hospital admissions, and the use of telemedicine as a form to avoid the physical examination to non-urgent patients. In our review, most articles comply with the administrative recommendations to users, as we observe that 96% recommend the avoidance of agglomerations, 92% the use of face masks, 88% taking temperature, and 60% telemedicine. We consider that an explanation to the fact that face masks are not recommended in 100% of the articles is that, at the beginning of the pandemic, the WHO did not recommend its use in all cases.

A case to consider is the low recommendation rate of telemedicine, which can be linked to the cost of implementation relative to the budget of some countries.[23]

In regard to the preventive environmental measures, we observe that chemical disinfection in patient assessment zones is in a 100% of the articles, which, in turn, leaves with 4% to physical sterilization, like the employment of UV-C light. The utilization of both methods results in an excellent technique of disinfection, as some authors recommend.[24] (**Figure 1**).

Figure 1. "Germibot" Robotized ultraviolet C light emission system used in the ophtalmology service in conjunction with chemical disinfection in patient care areas.

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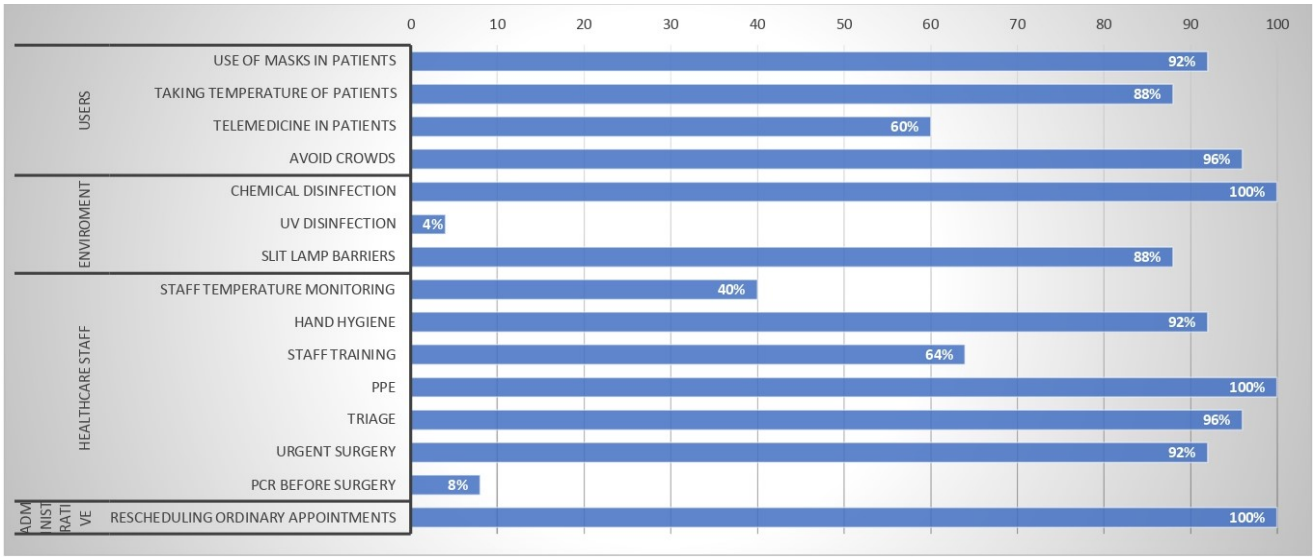

Figure 2. Each bar represents the total percentage of each preventive recommendation investigated in the 25 reviewed articles.

Regarding the usage of protective shields in slit lamps, we found that 88% of articles recommend it. This is a simple and cost-effective method to avoid the contact with the saliva of patients, hence this should be a recommendation to all cases.[25]

All preventive measures are important. Nonetheless, the protection of HCP and the management of patients is a crucial point to such an extent that it draws our attention the strong set of recommendations for the use of PPE (100%), for respiratory triages (96%), hand hygiene (92%), and the scheduling only for urgent surgeries (92%). However, we found few mentions on staff training (64%), taking the temperature of HCP (40%), and PCR tests prior to surgery (8%). A cause of the latter might be the sudden appearance of this disease. Despite that, it is noteworthy to point out that most HCP has been infected due to a lack of adequate training.[26,27]

As the analysis points out, there is low uniformity between the preventive recommendations issued by the institutions present in this review. We believe that an explanation to this variation can be due to the urgency to emit a set of guidelines. (**Figure 2**)

In a revised article that reviewed a collection of guidelines and clinical recommendations from an array of ophthalmological societies, the authors withdrew 51 recommendations from 14 articles, to which they concluded a lack of consistency and a complete absence of validation strategies.[28] Another literature review published in Hong Kong, conducted by the ophthalmology departments in two tertiary hospitals at the Kowloon peninsula, they researched the preventive measures in those hospitals with the addition of the questionnaire on Fever, Travel, Occupation, Contact and Clustering (FTOCC), that was able to prevent cross infection amongst HCP.[29]

Conclusion

There are meaningful variations regarding the preventive recommendations for the safe management of patients with COVID-19 issued by different ophthalmological institutions. For the most part, this problem arose because of the unpredictability of this pandemic, which brought to collapse the economy and the healthcare systems, and, in response, hospitals had to expand their capacity, by acquiring beds, medical equipment, as well as HCP. It is necessary to carry out a greater number of systematic reviews to create guidelines for preventive clinical practices. A lot of experience and knowledge is gathering around the treatment to this disease, to which there is not a specific treatment, nor vaccine. These potential recommendations, as well as their results, need vast amounts of evidence, which, in turn, must be validated through the methodology of Grading of Recommendations Assessment, Development and Evaluation (GRADE) and Appraisal of Guidelines for Research and Evaluation II (AGREE II). The ultimate purpose must be the generalization and standardization of these recommendations in all services for ophthalmic patients.

As this was a brief revision, the results have their limitations. In spite of that, this revision is helpful due to the fact this is a disease in constant transformation.

Conflicts of interest

No conflicts of interest, nor financial disclosures or affiliations related to this study.

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