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# Assessment of infection prevention and control measures adopted by eye care practitioners in Ghana and South Africa against COVID-19<sup>☆</sup>

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## ABSTRACT

This study investigated the infection prevention and control measures adopted by eye care practitioners in Ghana and South Africa during the lockdown phase of the COVID-19 pandemic.

A descriptive, cross-sectional study was used to investigate infection prevention and control measures by eye care practitioners in Ghana ( $n = 189$ ) and South Africa ( $n = 92$ ) during the extended lockdown phase (01 April–30 June 2020) by both countries, immediately following the WHO declaration of COVID-19 as a pandemic. Participants from both countries included Ophthalmologists, Optometrists, Ophthalmic nurses, and Opticians who were invited via email and social media platforms to complete an online questionnaire. The questionnaire assessed practitioners' general knowledge on the COVID-19, viral exposure, infection prevention and control measures adopted during eye examinations.

The majority of the practitioners from Ghana 140 (74%) and 43 (47%) South Africa reported COVID-19 screening at their facilities before the commencement of eye examinations. Few practitioners 77 (41%) and 9 (10%) from Ghana and South Africa, respectively had received any form of training (seminars and workshops) in COVID-19 infection prevention and control measures. Practitioners frequently practiced hand washing - Ghana (125, 66%), South Africa (70, 76%) -, wearing of nose masks - Ghana 126 (67%), South Africa 51 (55%), alcohol-rub on equipment - Ghana 115 (61%), South Africa 45(49%) as a means of sterilizing the hand and equipment against COVID-19 during close contact examinations.

The majority of practitioners from the two countries adhered to basic safety protocols despite receiving no additional training on COVID-19 infection prevention. Maintenance of universal safety precautions in eye care facilities is key to preventing nosocomial infections.

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## Introduction

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) which originated from Wuhan, China causes the COVID-19 disease and has rapidly evolved into a global pandemic. COVID-19 is a self-limiting respiratory tract infection that presents with symptoms such as fever, cough, sore throat, fatigue, runny nose, myalgia, dyspnoea, and diarrhoea [1]. However, in instances where the immune system of the affected person is compromised or has an underlying cardiopulmonary condition, the disease can progress to pneumonia or bronchitis [2]. COVID-19 can also manifest in other anatomical regions of the human body including the gastrointestinal tract and ocular tissues [3,4]. Although the ocular involvement of SAR-CoV-2 is still not clear, other strains of coronavirus such as the SARS-CoV-1 are known to infect ocular tissues from anterior segment pathologies such as conjunctivitis, anterior uveitis, and sight-threatening posterior segment disorders such as retinitis, optic neuritis, choroiditis, retinal detachment and retinal vasculitis [5–9].

Following the rapid spread of the disease globally after the first case was reported in December 2019, the World Health Organization (WHO) declared the disease as a pandemic on 11th March 2020 and released a set of recommendations for heightened institutional and personal protection against contracting the virus [10]. These sets of recommendations include handwashing with soap under running water (hand hygiene), wearing face masks, goggles, or face shields for the prevention of ocular transmission. Particularly, health personnel and facilities are to adhere to a strict set of practice guidelines for infection prevention and control (IPC).

Notwithstanding the increased infection prevention measures and awareness level, fatalities among health care personnel who are at the frontline have highlighted the weaknesses in infection control in healthcare settings across the globe. For eye care personnel, in particular, the ocular manifestation of COVID-19 presents safety concerns because of lapses in preventive protocols in eye clinics. Lai et al. have proposed a three-level hierarchy of control measures to help minimize the spread of infections in an eye clinic, which include: administrative control of patient attendance – triaging of patients and rescheduling of appointments, use of online consultation; environmental control to reduce droplet transmission of the disease, which can be achieved by the installation of protective shields on slit lamps, frequent disinfection of equipment, and adequate air ventilation in waiting areas; and finally appropriate use of personal protective equipment (PPE) by eye care practitioners when attending to patients [1].

Ghana and South Africa share common characteristics in terms of human resources for eye health with optometrists and ophthalmic nurses being the main primary eye care professionals with the limited number of ophthalmologists providing surgical and other essential eye services. Both countries recorded their first cases of COVID-19 around the same period (5th March 2020, in South Africa and 12th March 2020 in Ghana). As of 31 March 2020, a total of 95 COVID-19 cases had been confirmed in Ghana, and the total number of confirmed cases in South Africa was 1260<sup>11</sup>. These figures escalated to about 19,388 and 159,333 in Ghana and South Africa respectively as at 30th June 2020 when our study ended [12]. Despite the heightened IPC measures and COVID-19 screening at various health facilities including eye clinics across the two countries, there were concerns about the number of confirmed COVID-19 cases among health workers in both the private and public hospitals [11]. COVID-19 testing was mainly carried out by designated facilities in the two countries.

In spite of the proposed measures to deal with infection prevention and to control the spread of COVID-19 in various countries [1,10], it is unclear the extent to which these measures are being adhered to, particularly in eye facilities across Africa where cross-infection could rise exponentially if safety protocols are not enforced. The rate at which frontline health-care professionals have been infected from persons under investigation (PUI) [13,14] underscore the need to assess the infection prevention and control measures of eye care professionals to minimize the spread of the virus.

## Methods

The study employed a descriptive, cross-sectional design. A self-administered, online questionnaire was distributed to eye care professionals aged 18 years and older practicing in Ghana and South Africa from 01 April to 30 June 2020. The eye care professionals included in the survey were Ophthalmologists, Optometrists, Ophthalmic nurses, and Opticians. Participants were invited to complete the questionnaire via email (professional group mailing list) and social media platforms (professional group WhatsApp platforms). The questionnaire included questions on participants' demographic information, general knowledge relating to COVID-19 including awareness of the disease, route of transmission, signs and symptoms, high-risk patients, ocular manifestations of the disease, and the source of information about the disease. The questionnaire also solicited information on eye examination procedures which require close contact with patients such as ophthalmoscopy, refraction, intraocular pressure measurement, and other automated procedures. Finally, questions about infection prevention and control measures in the eye care facilities they work at were also asked.

The online survey was designed using Google forms and disseminated to participants through their various associations (i.e. Ghana Optometric Association, Ophthalmological Society of Ghana, Ophthalmic Nurse Group Ghana, and Opticians Association of Ghana). Similar professional associations in South Africa were also used to recruit participants from South Africa. A link was provided through emails and social media platforms for the completion of the questionnaire.

The study adhered to the tenets of the Declaration of Helsinki and commenced after approval from the Institutional Review Boards of the University of Cape Coast and the University of KwaZulu-Natal. To be eligible for participation, respondents had to be aged 18 years or older and be able to provide online consent. Informed consent was obtained from all participants prior to commencement of the study and after the study protocol has been explained. Participants consented

**Table 1**  
Demographic characteristics of participants.

Ghana	Age Mean± SD (years)	Gender N (%)	Type of practice (%)	Highest level of education
<b>Overall (189)</b>	35.11±7.70	M:107(56.7), F: 82(43.3)		
Optometrists (123)	33.19±5.76	M:84(68.3), F:39(31.7)	Public (34); Private (51); Quasi-gov (10); training inst. (5)	(OD degree) – 103 (84%) †Postgraduate – 20(16%)
Ophthalmologists (30)	42.40±8.86	M:14(46.7), F:16(53.3)	Public (40); Private (20); Quasi-gov (13); training inst. (27)	Postgraduate – 30 (100%)
Ophthalmic nurses (32)	37.25±6.64	M: 8(25), F: 24(75)	Public (78); Private (7); Quasi-gov (13); training inst. (3)	Diploma – 18 (56%), Bachelor – 9 (28%), Postgraduate – 5 (16%)
Opticians (4)	29.33±2.08	M: 1(25), F:3(75)	Public (75); Private (25); Quasi-gov (0); training inst. (0)	Diploma – 2 (50%), Bachelor – 1 (25%) Postgraduate – 1 (25%)
<b>Difference</b>	One-way ANOVA: $F_{(3184)} = 18.26$ , $P < 0.001$			
South Africa				
<b>Overall (92)</b>	38.67±12.10	M: 39(42.4) F: 53(57.6)		
Optometrists (84)	37.69±11.72	M: 34(40.5), F: 50(59.5)	Public (16); Private (77); Quasi-gov (0); training inst. (7)	Diploma – 1 (1%), Bachelor – 70 (83%) Postgraduate – 13 (16%)
Ophthalmologists (6)	50.17±12.83	M:4(66.7), F: 2(33.3)	Public (33); Private (67); Quasi-gov (0); training inst. (0)	Postgraduate – 6 (100%)
Ophthalmic nurses (1)	–	M: 0, F: 1 (100)	Public (0); Private (100); Quasi-gov (0); training inst. (0)	Diploma – 1 (100%)
Opticians (1)	–	M:1 (100)	Public (0); Private (0); Quasi-gov (0); training inst. (100)	Diploma – 1 (100%),
<b>Difference</b>	One-way ANOVA: $F_{(3,88)} = 2.67$ , $P = 0.05$ Difference in age (country): <i>t</i> -test: $t = -2.47$ , $P = 0.02$			

† Postgraduate qualification includes Membership, Fellowship, Masters and PhD.

to voluntarily participate in this study by answering either a 'yes' or 'no' to the question inquiring whether they voluntarily agree to participate in the survey. A 'no' response meant that the participants could not progress to answering the survey questions and were excluded from the study.

Data were analysed using the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp), and Stata (StataCorp version 14) for multiple response data. Descriptive statistics including mean (SD), frequencies, and percentages were applied to participants' demographic data such as age and professional background. Univariate analyses of categorical variables were carried out using the Chi-squared test, and confounding variables adjusted for multivariate logistic regression analyses. A two-tailed *p*-value of less than 0.05 was considered statistically significant.

## Results

### Participants' demographic profile

Overall, 281 participants from Ghana and South Africa responded to the questionnaire. They comprised 189 from Ghana and 92 from South Africa. Of the 189 participants from Ghana, 123 (65%) were Optometrists, 32 (17%) Ophthalmic nurses, 30 (16%) Ophthalmologists, and four (2%) were opticians. Other demographic characteristics of participants are summarised and presented in Table 1. Across the countries, the majority of participants 279 (99%) were aware of the COVID-19 pandemic. The awareness level was independent of the participant's country of residence (Adjusted Odds ratio (AOR) = 0.68,  $P = 0.79$ , 95% CI: 0.04- 11.03). Participants' main sources of information on COVID-19 included television/radio station 113(41%), social media 96(34%), WHO/ Local Health Service Directorate 32(12%). Coughing 275 (98%), fever 268 (95%), and sore throat 254 (90%) were the most known symptoms of the disease by participants. In total, the number of daily patient visits indicated before the COVID-19 outbreak ranged from 0 to 200 patients [median (25th-75thinterquartile range; IQR) = 18 (8–40 patients)]. However, the number of patient visits decreased during the outbreak, particularly during the lockdown period (April 2020 – June 2020), with an average patient number ranging from 0 to 142 patients [median (25th-75thinterquartile range; IQR) = 5 (2–15 patients)]. The decrease in attendance was significant ( $F_{(6281)} = 43.6$ ,  $P < 0.001p$ ), particularly for private eye care facilities in South Africa (post-hoc comparison,  $t = -2.80$ ,  $P = 0.005$ ).

### *Perception of risk of exposure to COVID-19 at the workplace*

Mean vulnerability to contract COVID-19 at the workplace, according to participants rating on a scale of 1 to 5 was ( $4.17 \pm 0.97$  risk) for participants from Ghana and ( $4.16 \pm 0.99$  risk) for participants from South Africa. The difference in vulnerability score between participants from Ghana and South Africa was not statistically significant ( $t = 0.1$ ,  $P = 0.92$ ), although few participants 20 (22%) from South Africa indicated seeing patients during the lockdown compared with 151(80%) of participants from Ghana. Participants' vulnerability score was also independent of professional background ( $F_{(3276)} = 0.60$ ,  $P = 0.61$ ). To reduce the risk of exposure to COVID-19, 49 (26%) of participants from Ghana, and 17(19%) from South Africa resorted to online consultation for patients. Moreover, the majority of participants from Ghana 132 (70%) and South Africa 71 (77%) had communicated to patients and the general public that eye care services were limited to only ocular emergencies to reduce the number of patient visits.

### *Infection prevention and control measures instituted during the outbreak of COVID-19*

The majority of the participants from Ghana 140 (74%) and 43 (47%) of participants from South Africa reported that their facilities screened patients for COVID-19 before their eyes were examined. Screening modalities frequently employed across the two countries are shown in Fig. 1.

Overall, participants indicated that hand sanitizers 272(96.8%), were the most frequently provided disinfectant by their facilities, while face shields, six (2.1%) were the least provided. Although hand sanitizers were the most frequently supplied material for hand hygiene, eye care practitioners from both countries reported that they frequently employed handwashing with soap under running water compared to hand sanitizing (Fig. 2).

The majority of participants from Ghana 137 (73%) and South Africa 74 (80%) reported that hand washing was the most frequently administered protocol after seeing patients. Other safety protocols adopted after attending to patients included applying hand sanitizer (Ghana 133(70%), South Africa 68(74%), removing gloves (Ghana 126 (67%), South Africa 52 (57%), alcohol rubbing on instruments (Ghana 114(60%), South Africa 48(52%) and removing of nose mask (Ghana 70(37%), South Africa 38(41%) were always done after seeing a patient.

### *Measures to ensure patients' safety within eye care facilities*

Most of the participants from Ghana 170 (90%), and South Africa 72 (78%) indicated that their facilities had enough space to allow the patients to practice physical distancing in the waiting area. Participants also indicated that patient compliance with hygiene and safety protocols within the facilities were enforced mostly by stationed workers at vantage points in the facilities (92 (49%) in Ghana, and 26(28%) in South Africa).

### *Formal training on COVID-19 infection prevention and control measures*

During the time of the study, 110 (58%) and 80 (87%) of the participants from Ghana and South Africa respectively had not received any formal training (seminars and workshops) on COVID-19 infection prevention and control. The odds of participants receiving training in COVID-19 infection prevention and control were not related to their professional background ( $P > 0.05$ ). However, the odds of participants from South Africa, and private facilities receiving formal training on infection were low (OR: 0.28,  $P = 0.003$ , 95% CI: 0.12–0.65; and OR: 0.30,  $P = 0.04$ , 95% CI: 0.09–0.95 respectively).

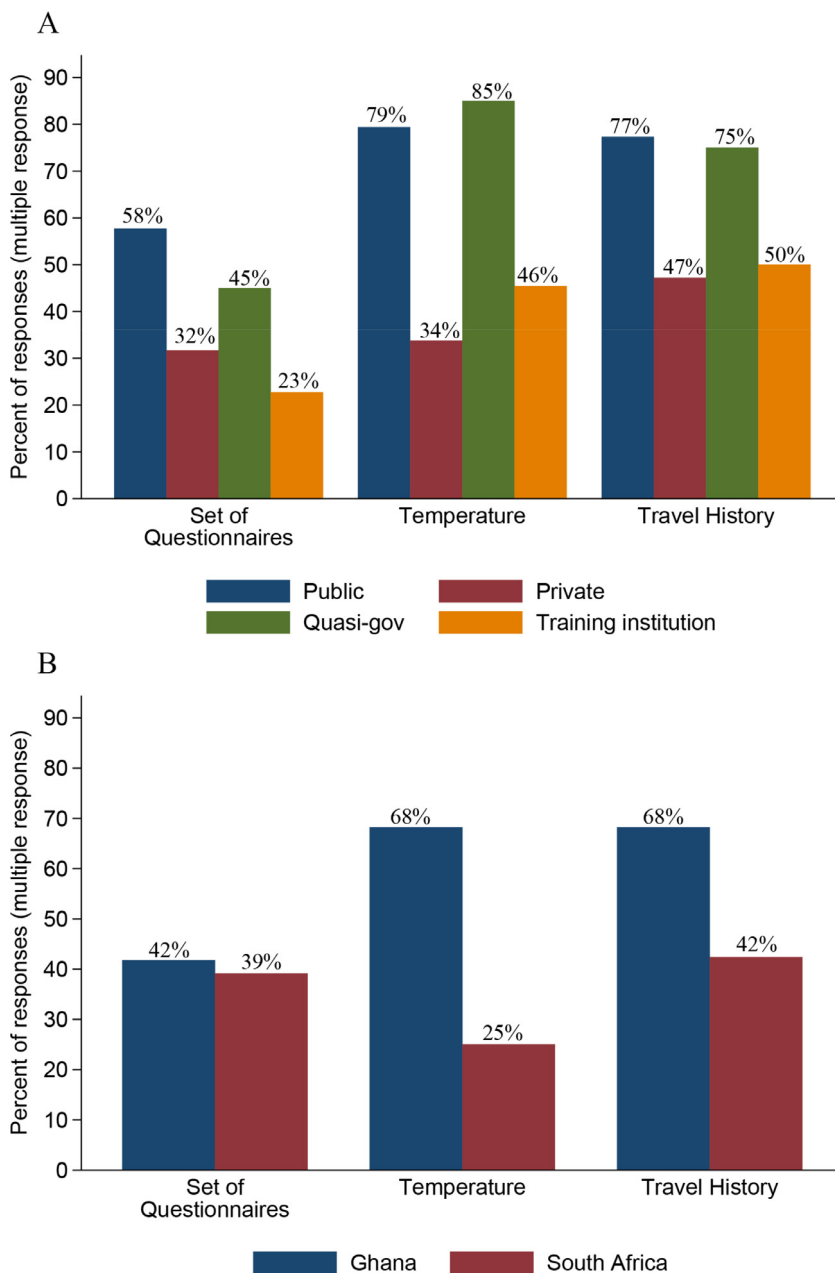
The majority of the participants from Ghana 131 (69%) and 53(58%) from South Africa reported that they engaged in health promotive activities to help in the fight against COVID-19. The most frequently undertaken health promotive activity by participants from the two countries was health education 172 (90%).

### *Challenges faced by eye care practitioners in the prevention and control of COVID-19*

In Ghana, the majority of the practitioners reported a lack of or inadequate supply of PPEs as the major challenge in the fight against COVID-19, whereas, in South Africa, the inability to enforce physical distancing was cited as the main challenge. Other reported challenges faced by eye care practitioners are shown in Fig. 3.

## **Discussion**

The present study sought to investigate routine infection prevention and control measures adopted by eye care professionals from two African countries; Ghana and South Africa, during the extended lockdown period of the COVID-19 pandemic (01 April – 30 June 2020). This was the period of an increased number of infections of the disease in the two countries. The results of the study showed high levels of awareness about the COVID-19 pandemic among eye care professionals in the two countries. The level of awareness was not statistically significantly different between the different cadres of eye care professionals in the two countries. This finding is inconsistent with a study conducted in Nigeria [15] which found that Ophthalmologists and Optometrists were more knowledgeable about COVID-19 than Opticians. It is possible that at the time of the extended lockdown, information sources on COVID-19 such as social media, television/radio, and local health



**Fig. 1.** (Panel A) A bar graph showing the distribution of various instruments used to screen patients for COVID-19 disease according to the type of facility where participants were practicing. (Panel B) A bar graph showing the distribution of various instruments used to screen patients for COVID-19 disease according to the country of residence of participants.

directorates, were available to all cadres of eye care, and no special training (seminars and workshops) had been received by any group of professionals who took part in the present study.

Participants in the current study perceived eye care professionals to be vulnerable to contracting the SARS-CoV-2 virus. The sense of vulnerability could be informed by the fact that participants in this study, like other eye care workers elsewhere [15,16], perceived that the anatomical and physiological proximity of the eyes to patient’s nose, mouth, and ocular surfaces during the examination and the nature of the ophthalmic procedures present higher transmission risk to eye care professionals [17,18]. Perhaps, this informed the decision by some participants during the peak transmission period to resort to online consultation to reduce the risk of being infected. Telemedicine (eye care) and other virtual consultations have been adopted elsewhere to reduce patient attendance at the peak of the COVID-19 pandemic [15,19,20]. Similarly, emergency-only consultation was adopted by some participants as a means of reducing patient numbers and the associated risk.

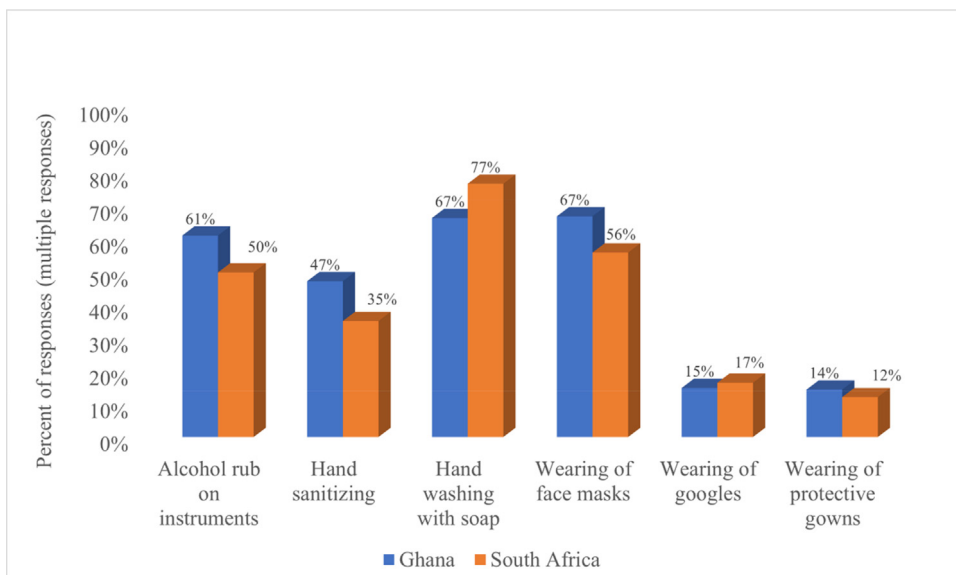


Fig. 2. A bar graph showing participants' most frequently administered safety protocol before attending to a patient.

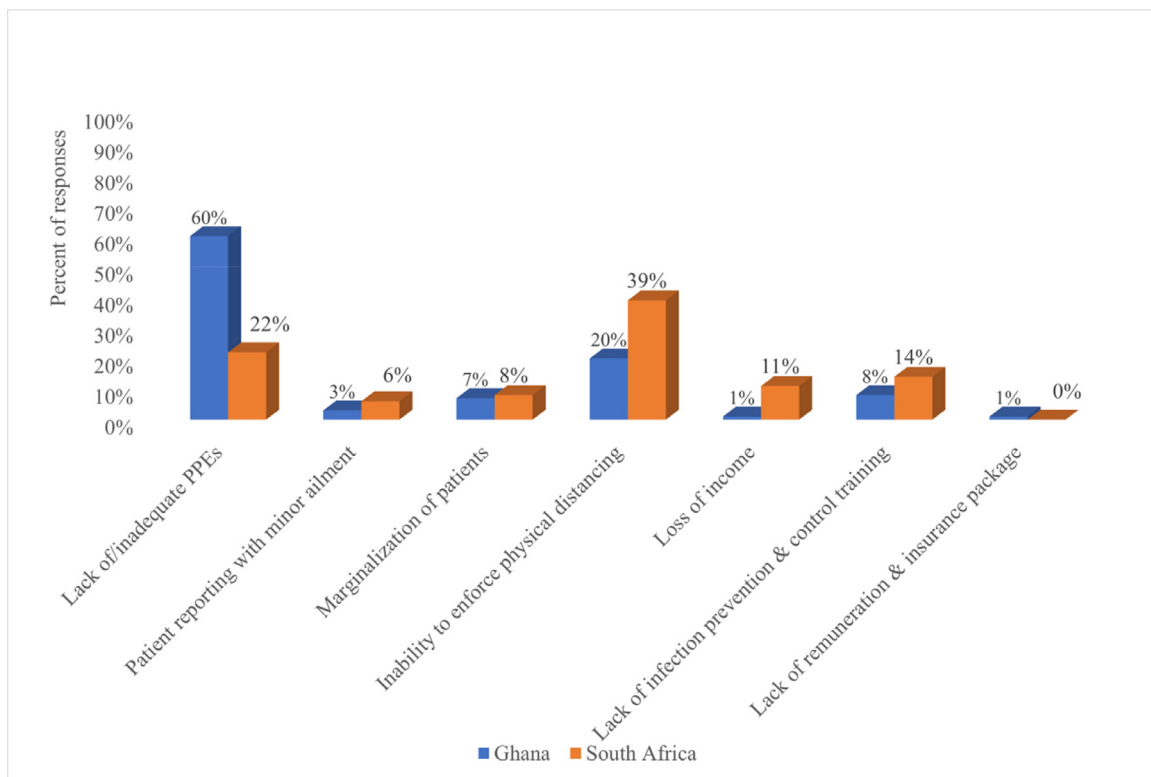


Fig. 3. A bar graph showing the challenges faced by eye care practitioners in the fight against COVID-19.

However, 80.0% of participants from Ghana reported seeing patients as against 22.0% from South Africa during the lockdown. This may be due to the varying degrees of the strictness of lockdown measures as well as the extent of the lockdown in the two countries. For example, there was a partial lockdown in Ghana; only the Greater Accra and Greater Kumasi regions out of the 16 regions in Ghana underwent a lockdown whereas South Africa underwent a national lockdown. Health workers in Ghana including eye care practitioners both in the public and private sector remained at post during this period. It is therefore possible that the practitioners in the other regions that were not locked down did not adhere strictly to the

emergency only consultations as was announced by the Ministry of Health. The difference could also be attributable to the effectiveness of the educational campaigns on the importance of seeking health services only under emergency situations during the full or partial lockdowns in the two countries.

The practice of Telemedicine and emergency only consultation after the pandemic, in low resource countries such as Ghana and South Africa would be desirable to reduce long queues within facilities due to face-to-face consultations. However, the effectiveness of online consultation in addressing patients' complaints, ethical aspects of such virtual consultation, and technical factors such as availability of good internet connectivity would have to be addressed. Emergency-only eye care services include patients with sight-threatening conditions such as acute retinal detachment, severe uveitis, significant trauma, and chemical injuries, acute glaucoma, who need immediate care to prevent sight loss [21,22]. Although several eye care professional bodies recommended urgently and emergency consultations to their members during the peak of the pandemic, it is not yet clear what the cumulative effect on the visual outcome would be for patients who could not be attended to because their cases were considered less urgent.

Facility screening of patients and personnel had been part of the various measures enlisted by WHO to protect patients and the eye care professionals against the COVID-19 pandemic. In the present study, a significant number of practitioners reported that their facilities screened patients before administering care. Temperature checks and inquiries about travel history were the main modalities used to screen patients for COVID-19. This finding is consistent with the practice of other eye care professionals surveyed in other studies [15,17,23]. The triaging of patients in eye care facilities in developing countries for potential infectious diseases could be adopted as a routine procedure post-COVID-19 pandemic.

Although the majority of participants from the two countries did not receive any formal training on infection prevention and control against the COVID-19 virus, many indicated that they frequently adhered to safety protocols and utilization of personal protective equipment before and after seeing patients. Hand sanitizers were frequently provided by the facilities where participants worked, however, the majority of the participants preferred hand washing to the use of hand sanitizers. Wearing of face masks was frequently administered before examining a patient and removed after an examination. Disinfecting ophthalmic instruments before and after an examination has been a traditional practice in most eye care facilities even before the onset of the COVID-19 pandemic [24,25]. However, the results of the present study suggest that most practitioners might have increased the frequency of this practice in the wake of the COVID-19 pandemic. These findings are in accord with the practice of other eye care workers previously surveyed [15,17,26]. However, an assessment of eye care professionals' comfort and the effect of artifacts from the use of PPEs on ophthalmic examinations remain to be determined. Also, the question of whether eye care practitioners in developing countries will continue to implement these safety measures post-COVID-19 is unknown. A previous study reported that eye care practitioners in Europe planned to continue the use of PPEs to ensure safety to patients and themselves [27].

In Africa, enforcing physical distancing protocols have proven to be cumbersome due to smaller sizes of health facilities leading to overcrowding [28]. However, most participants from both countries in this study, indicated that eye care facilities had sufficient space to allow the practice of physical distancing protocols in the waiting areas. Adequate space in the waiting areas also allows optimal air ventilation – one of the recommended environmental control measures to limit the spread of the COVID-19 virus [1]. However, there was no direct question on the nature of ventilations in the facilities in this study. The use of stationed workers at vantage areas within eye care facilities particularly in Ghana also enabled enforcement of physical distancing and other safety protocols. This practice has been reported in a similar study in Uganda, which also reported higher adherence rates to COVID-19 safety protocols [23].

The majority of participants from Ghana reported a lack of or inadequate PPEs as the main challenge in the fight against the COVID-19 pandemic. The shortage of PPEs was a general problem across Africa [28], not limited only to eye care, which could have potentially exposed eye care professionals to the virus. In South Africa, however, the main challenge was the inability to enforce physical distancing protocols between patients. This was mainly because few facilities had personnel stationed to ensure compliance with physical distancing protocols as indicated by participants.

## Conclusions

Eye care professionals from Ghana and South Africa showed high levels of awareness of the COVID-19 pandemic. The study shows that the provision and administration of PPE's, adherence to physical distancing protocols, and enforcement of patient compliance with basic hygiene protocols were practiced in eye care facilities in Ghana and South Africa. Eye care practitioners are encouraged to continue abiding by all the COVID-19 protocols especially as most countries experience a surge in infections coupled with uncertainties about the availability and pace of vaccinations.

## Declaration of Competing Interest

The authors declare no conflict of interest.



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