Common misconceptions regarding COVID-19 among health care professionals: an online global cross-sectional survey.

Conceptos erróneos comunes sobre COVID-19 entre los profesionales de la salud: una encuesta transversal global en línea.

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Abstract: **Background:** The COVID-19 pandemic has taken the world by storm, with cases continuously increasing by the hour and with a shortage of information regarding the virus available to the general public. Despite the availability of trusted online sources, there are still misconceptions relating to the virus floating around. This study aimed to find out the level of misconceptions among healthcare professionals (HCPs) worldwide about the ensuing COVID-19 pandemic. **Materials and Methods:** A descriptive cross sectional study was conducted through a global online survey. The self-administered questionnaire was designed and registered at an online website (Kwiksurveys). A total of 652 participants from 35 different countries across the world responded. Statistical analysis was performed using SPSS version 23. Socio-demographic and discipline characteristics were compared with the help of the chi-square test and univariate and multivariate logistic regression to find significant relationships. **Results:** Among all HCPs, general physicians (61.2%) were the most common respondents. The responses from females (63.3%) almost doubled those of men, and nearly half of the participants were working in private institutes (49.2%). Additionally, the major source of information used by HCPs about COVID-19 was social media (55.4%). Regarding misconception assessment, 71.6% of participants had correct concepts regarding COVID-19. However, 28.4% had incorrect information. Female HCPs were 1.49 times more likely to have correct concepts compared to males (OR=1.49, 95% CI=1.04-2.14). **Conclusions:** The majority of the HCPs were keeping themselves up-to-date with current information concerning the knowledge, prevention, and hygiene practices of COVID-19 infection. However, some misconceptions are deeply rooted in the mindsets of HCPs worldwide and need to be addressed by the continuous professional development of HCPs. The availability of reliable sources of information on the pandemic should be encouraged, with adequate explanations also available to the general public in simple terms.

Keywords: *SARS-CoV-2; COVID-19; Health Knowledge, Attitudes, Practice; Health Personnel; Medicine; Dentistry; Surveys and Questionnaires.*

Abstract: **Antecedentes:** la pandemia de COVID-19 ha asolado al mundo, con casos que aumentan continuamente y con una escasez de información sobre el virus disponible para el público en general. A pesar de la disponibilidad de fuentes confiables en línea, todavía hay conceptos erróneos relacionados con el virus. Este estudio tuvo como objetivo dilucidar el nivel de ideas erróneas entre los profesionales de la salud (PS) en todo el mundo sobre la pandemia

de COVID-19. **Material y Métodos:** Se realizó un estudio descriptivo de corte transversal a través de una encuesta global en línea. El cuestionario autoadministrado fue diseñado y registrado en un sitio web en línea (Kwiksurveys). Respondieron un total de 652 participantes de 35 países. El análisis estadístico se realizó con el programa SPSS versión 23. Las características sociodemográficas y disciplinarias se compararon con la ayuda de la la prueba de chi-cuadrado y la regresión logística univariada y multivariada para encontrar relaciones significativas. **Resultado:** Entre todos los profesionales de la salud, los médicos generales (61,2%) fueron los que más respondieron. Las respuestas de las mujeres (63,3%) casi duplicaron las de los hombres, y casi la mitad de los participantes trabajaban en institutos privados (49,2%). Además, la principal fuente de información utilizada por los profesionales de la salud sobre COVID-19 fueron las redes sociales (55,4%). En cuanto a los conceptos erróneos, el 71,6% de los participantes tenían conceptos correctos con respecto a COVID-19. Sin embargo, el 28.4% poseía información incorrecta. Los profesionales de la salud mujeres tenían 1.49 veces más probabilidades de tener conceptos correctos en comparación con los hombres (OR = 1.49, IC 95% = 1.04-2.14). **Conclusion:** La mayoría de los profesionales de la salud se mantuvieron actualizados con la información actual sobre el conocimiento, la prevención y las prácticas de higiene de la infección por COVID-19. Sin embargo, algunos conceptos erróneos están profundamente arraigados en la mentalidad de los PS en todo el mundoy deben abordarse mediante el continuo desarrollo profesional de los PS. Se debe alentar la disponibilidad de fuentes confiables de información sobre la pandemia, con explicaciones adecuadas también disponibles para el público en general en términos simples.

Palabra Clave: *SARS-CoV-2; COVID-19; Conocimientos, Actitudes y Práctica en Salud; Medicina; Odontologia; Encuestas y Cuestionarios.*

INTRODUCTION.

Ealier this year, the WHO has declared the novel coronavirus SARS-CoV-2 a pandemic due to its rapid spread and uncontrollable situation affecting the general population.[1] In December 2019, this virus was first reported among people of Wuhan city, at Hubei province in China, and within a couple of weeks, it reached other parts of the world.[2]

The virus was able to cause systemic infections in both animals and humans, although mainly targeting the respiratory system in humans.[3] Later, the evidence indicates that the mode of transmission of this contagious virus was from person to person,[4] with a high susceptibility through respiratory droplets, aspirates, close contact, and fomites.[5] The most common signs and symptoms reported for COVID-19 is fever, cough, headache, diarrhea, myalgia, and shortness of breath.[6]

The severity of disease and mortality rate varies considerably due to rapid RNA mutation of SARS-CoV-2, patient's immunity, and co-morbidities.[7] Currently, rapid detection of SARS-CoV-2 RNA through saliva, blood, nasal pharyngeal swabs, and throat washes is helping in minimizing and controlling its transmission.[8,9]

At present, electronic and digital technology has become the inordinate protagonist and is providing valuable information related to controlling the pandemic.[10] Similarly, timely sharing of information without knowing of its legitimacy and scientific basis may lead to significant controversies and misconceptions.[11]

Nowadays, a lot of scientific information circulates through social media. However, there is a tendency of false news or rumors to spread through social media resulting in behavioral and psychological effects on individuals.[12,13] Unfortunately, anxiety and fear are developing among high-risk healthcare providers due to the absence of well-structured scientific evidence and knowledge about SARS-CoV-2, time-consuming screening and diagnostic methods, insufficient personal protection equipment, unclear treatment and immunization.[14]

This leads to an imperative need for alternate solutions for upcoming obstacles.[15] Many questions arise in the human mind related to the etiology and prevention of SARS-CoV-2. Although the WHO has declared the mode of transmission, misconceptions still exist among healthcare workers most probably due to insufficient scientific evidence.[16,17] Another solace theory with no scientific evidence is that the virulence of COVID-19 would decline with higher environmental temperatures. The world is waiting for the Summer season with curiosity during this entire catastrophe.[18]

Regarding prevention, the best strategy to control the spread and mortality along with the burden on healthcare systems is to implement personal protective measures, social distancing, and isolation.[19,20]

Similarly, prophylactic drugs and agents to prevent the spread of disease are grabbing the attention of healthcare workers. However, the use of preventive

measures without any scientific evidence such as the administration of antimicrobial nasal sprays, mouthwashes, herbal supplements, and prophylactic antimicrobial drugs[21] could be hazardous, especially for vulnerable populations.

False recommendations and individual implementation of all these interventions without knowledge of their mode of action and side effects could lead to life-threatening consequences, as large clinical trials are essential to support such preventive measures.[18]

Moreover, to the best of our knowledge, no study has been performed that has gauged the common misconception regarding COVID-19 amongst health care professionals. Therefore the purpose of this online survey is to assess the misconceptions concerning COVID-19 amongst the health care professionals globally, which includes medical, dental, and allied health science professionals as they are on the front line fighting against the virus and are the ones being exposed the most.

MATERIALS AND METHODS.

The following study is a descriptive cross-sectional study conducted using a global online survey. HCPs from all over the world were invited to participate in the survey after obtaining their consent. A total number of 652 participants responded to the survey by filling an online self-administered, semi-structured questionnaire on (Avalaible at: *https://kwiksurveys.com/*).

This questionnaire was comprised of 21 open-ended questions used to investigate the current knowledge and the presumptions related to COVID-19. The questionnaire included four major components: personal information, causes and symptoms, prevention of COVID-19, and information sources. The time required to fill the provided questionnaire was 5-10 minutes. The responses of the participants were kept anonymous and confidential. The validity of the questionnaire was scrutinized by multiple experienced healthcare specialists who validated and modified it.

For the sample selection, a convenience sampling technique was used, and the time for data collection was one week. The questionnaire was disseminated through an on-line website portal from 1st April until 8th April 2020 for the completion of data collection.

For statistical analysis, IBM SPSS version 23.0 was used. To report the reliability of the questionnaire, we conducted a pilot study.

Cronbach's alpha test was done on questions related to prevention as shown in Table 2, (α=0.70).

Descriptive statistics were computed for numeric and categorical variables. A Chi-Square test was applied to assess the relation of misconceptions with age and gender. Furthermore, the Chi-Square test was applied to elaborate on the association of gender and profession with preventive measures. Univariate and multivariate logistic regression was applied to assess the significant predictors of correct concepts; $p<0.05$ was taken as statistically significant.

RESULTS.

The mean age of the healthcare providers was 30.8 years, with 76.1% of the providers aged 16-35years. About 63.3% of the HCPs were females, and 36.7% were males. Most of the healthcare providers were from Pakistan (64.9%), followed by Saudi Arabia (8.7%), United States of America (6.3%), and Australia (3.8%). Almost 61.2% of the healthcare providers were general physicians, 17.8% were consultants, 13.7% were postgraduate trainees, and 7.4% were allied science professionals. Almost half of the participants were working at private institutes (49.2%), 32.8% were government employees, and 17.9% were working independently.

More than half of the participants heard about COVID-19 from social media (55.4%), 27.8% from electronic media, 14.1% from print media, and only 2.8% heard it from friends, colleagues, and family.

About 95.6% of the participants knew about the signs and symptoms of COVID-19, wherein with respect to age (p=0.350) and gender (p=0.883) no statistically significant difference was observed among groups. Most of the female participants did not believe that COVID-19 is limited to geriatric individuals (92.8%), and statistically, a difference was found among gender (p=0.012).

About 33.1% of the participants responded that the virus is used as a bioweapon by governments, and an age-wise significant relationship was found (p=0.019).

About 8.3% of participants believed coronavirus would die in Summer, where no significant association was found with respect to age or sex for this misconception (p>0.05). Only 5.4% of participants believed that coronavirus could be transmitted through mosquitoes, wherein males have a high proportion of this misconception than females (8.4% *versus* 3.6%, p=0.007).

More than half of the participants believed that it

is an airborne virus (51.4%) and a sex-wise statistically significant association was found (*p*=0.006). (Table 1)

Male HCPs (65.3%) were more likely to believe that the thermal scanning method as a screening test is not an effective method in contrast to female HCPs (59.6%), with a significant association found with respect to sex (p=0.02). Effectiveness of personal protection elements (PPE) was recorded as 89% for N95, 68% for face shield and 60% for the surgical mask.

Hence, a significant association was found between PPE: *i.e.* N95 (*p*=0.041) and face shield (*p*=0.021) and different healthcare professions.

Participants (96.5%) responded that no prophylactic drugs should be taken for prevention while 19.5% favored taking hydroxychloroquine + azithromycin for prevention. Hence, a statistically significant association was found between different drugs and professions (*p*<0.05). (Table 2)

Furthermore, in Table 1 we have considered six questions for the overall assessment of misconceptions. For every right concept, a score of one was given and the cut-off was set at 70%. A total score of 4 or above out of 6 was labelled as correct concepts.

So according to this metric, 71.6% of the HCPs had right concepts regarding COVID-19 whereas 28.4% had incorrect concepts. Univariate logistic regression was applied to assess the significant factors for correct concepts.

The odds of correct concepts among females were 1.67 times more as compared to odds of correct concepts among males (OR=1.67, 95% CI=1.18-2.37). The odds of correct concepts among private HCPs were 2.54 times higher (OR=2.54, 95% CI=1.72-3.74) and odds of correct concepts among independent HCPs were 1.45 times higher (OR=1.45, 95%CI=0.90-2.34) as compared to odds of correct concepts among government HCPs.

The factors that were statistically significant (*p*<0.10), were added in a single multivariate model to ascertain the effect of factors on the likelihood that healthcare professionals have correct concepts. Female HCPs were 1.49 times more likely to have correct concepts as compared to males (OR=1.49, 95% CI=1.04-2.14). Private HCPs were 2.40 times more likely to exhibit correct information as compared to public and independent HCPs (AOR=2.40, 95% CI=1.62-3.55). (Table 3)

Table 1. Age and gender-wise comparison of different misconceptions.

| Items | | Age groups (years) | | | *p*-value | Gender | | *p*-value |
		16-35	36-55	Above 55		Male	Female	
Signs and symptoms of Covid-19 are flu-like, cough, fever, breathing difficulties.	Yes	475(95.8%)	132(95%)	16(94.1%)	0.883	226(94.6%)	397(96.1%)	0.35
	No	21 (4.2%)	7(5%)	1(5.9%)		13(5.4%)	16(3.9%)	
Covid-19 is limited to geriatric individuals	Yes	10(2%)	4(2.9%)	1(5.9%)	0.555	10(4.2%)	5(1.2%)	0.012
	No	463(93.3%)	126(90.6%)	16(94.1%)		213(89.1%)	605(92.8%)	
	Unsure	23(4.6%)	9(6.5%)	0		16(6.7%)	32(4.9%)	
Covid-19 is used as bioweapon	Yes	178(35.9%)	30(21.6%)	8(47.1%)	0.019	75(31.4%)	141(34.1%)	0.771
	No	147(29.6%)	48(34.5%)	4(23.5%)		75(31.4%)	124(30%)	
	Unsure	171(34.5%)	61(43.9%)	5(29.4%)		89(37.2%)	148(35.8%)	
Covid-19 dies in Summer	Yes	42(8.5%)	10(7.2%)	2(11.8%)	0.279	24(10%)	30(7.3%)	0.298
	No	322(64.9%)	79(56.8%)	11(64.7%)		143(59.8%)	269(65.1%)	
	Unsure	132(26.6%)	50(36%)	4(23.5%)		72(30.1%)	114(27.6%)	
Covid-19 is transmitted through mosquitos	Yes	25(5%)	10(7.2%)	0	0.366	20(8.4%)	15(3.6%)	0.007
	No	417(84.1%)	115(82.7%)	17(100%)		188(78.7%)	361(87.4%)	
	Unsure	54(10.9%)	14(10.1%)	0		31(13%)	37(9%)	
Covid-19 is an airborne disease	Yes	247(49.8%)	77(55.4%)	11(64.7%)	0.34	124(51.9%)	211(51.1%)	0.006
	No	186(37.5%)	43(30.9%)	3(17.6%)		72(30.1%)	160(38.7%)	
	Unsure	63(12.7%)	19(13.7%)	3(17.6%)		43(18%)	42(10.2%)	

Table 2. Profession and Sex Wise Comparison of Preventive Measures.

Questions		n (%)	Profession				p-value	Sex		p-value
			GP	PG	C	AS		Male	Female	
Thermal scanning is an effective screening method?	Yes	120(18.4)	78(19.5)	12(13.5)	19(16.4)	11(22.9)	0.107	49(20.5)	71(17.2)	0.02
	No	402(61.7)	230(57.6)	61(68.5)	82(70.7)	29(60.4)		34(14.2)	115(27.8)	
	Unsure	130(19.9)	91(22.8)	16(18)	15(12.9)	8(16.7)				
Herbal therapy/food items would decrease the risk of infection?	Yes	171(26.2)	110(27.6)	17(19.1)	29(25)	15(31.3)	0.361	56(23.4)	115(278)	0.27
	No	311(47.7)	182(45.6)	52(58.4)	58(50)	19(39.6)		113(47.3)	198(47.9)	
	Unsure	170(26.1)	107(26.8)	20(22.5)	29(25)	14(29.2)		70(29.3)	100(24.2)	
Hot drinks would reduce the risk of infection	Yes	252(38.7)	154(38.6)	25(28.1)	52(44.8)	21(43.8)	0.323	89(37.2)	163(39.5)	0.34
	No	280(42.9)	174(43.6)	44(49.4)	43(37.1)	19(39.6)		111(46.4)	169(40.9)	
	Unsure	120(18.4)	71(17.8)	20(22.5)	21(18.1)	8(6.7)		39(16.3)	81(19.6)	
Hot water bath(37C) would reduce the risk of infection	Yes	168(25.8)	109(27.3)	15(16.9)	29(25)	15(31.3)	0.335	60(25.1)	108(26.2)	0.46
	No	343(52.6)	208(52.1)	50(56.2)	59(50.9)	26(54.2)		121(50.6)	222(53.8)	
	Unsure	141(21.6)	82(20.6)	24(27)	28(24.1)	7(14.6)		58(24.3)	83(20.1)	
Multi-vitamin supplements would provide resistance against covid-19 virus.	Yes	386(59.6)	236(59.1)	52(58.4)	69(59.5)	19(60.4)	0.972	137(57.3)	249(60.3)	0.19
	No	166(25.5)	101(25.3)	25(28.1)	30(25.9)	10(20.8)		70(29.3)	96(23.2)	
	Unsure	100(15.3)	62(15.5)	12(13.5)	17(14.7)	9(18.8)		32(13.4)	68(16.5)	
Vitamin-E&D supplements would provide resistance against covid-19 virus?	Yes	221(39.9)	137(34.3)	34(38.2)	36(31)	14(29.2)	0.445	74(31)	147(35.6)	0.49
	No	188(28.8)	108(27.1)	28(31.5)	33(28.4)	19(39.6)		72(30.1)	116(28.1)	
	Unsure	243(37.3)	154(38.6)	27(30.3)	47(40.5)	15(31.3)		93(38.9)	150(36.3)	
Which of the following provide you protection?	N95*	580(89.0)	356(89.2)	80(89.9)	107(92.2)	37(77.1)	0.041	212(88.7)	368(89.1)	0.88
	Surgical*	262(40.2)	158(39.6)	38(42.7)	41(35.3)	25(52.1)	0.236	103(43.1)	159(38.5)	0.25
	Cloth *	26(4.0)	17(4.3)	4(4.5)	4(3.4)	1(2.1)	0.878	9(3.8)	17(4.1)	0.83
	Face**	211(32.4)	118(29.6)	41(46.1)	39(33.6)	13(27.1)	0.021	87(36.4)	124(30)	0.09
Using hot air hand dryer would reduce the risk of infection?	Yes	79(12.1)	50 (12.5)	5 (5.6)	16(13.8)	8 (16.7)	0.184	31(13)	48(11.6)	0.61
	No	573(87.9)	349(87.5)	84(94.4)	100(86.2)	40(83.3)		208(87)	365(88.4)	
Rinsing nose with normal saline would benefit in prevention?	Yes	139(21.3)	80(20.1)	19(21.3)	26(22.4)	14(29.2)	0.526	45(18.8)	94(22.8)	0.24
	No	513(78.7)	319(79.9)	70(78.7)	90(17.5)	34(70.8)		194(81.2)	319(77.2)	
Mouthwash gargling would reduce the risk of infection	Yes	177(27.1)	119(29.8)	18(20.2)	26(22.4)	14(29.2)	0.171	59(24.7)	118(28.6)	0.28
	No	475(72.9)	280(70.2)	71(79.8)	90(77.6)	34(70.8)		180(75.3)	295(71.4)	
Pneumococcus vaccine would help in prevention of covid-19?	Yes	30(4.6)	19(4.8)	7(7.9)	3(2.6)	1(2.1)	0.276	8(3.3)	22(5.3)	0.25
	No	622(95.4)	380(95.2)	82(92.1)	113(97.4)	47(97.9)		231(96.7)	391(94.7)	
Prophylactic antibiotic would benefit in prevention	Yes	23(3.5)	21(5.3)	1(1.1)	0	1(2.1)	0.023	5(2.1)	18(4.4)	0.13
	No	629(96.5)	378(94.7)	88(98.9)	116(100)	47(97.9)		234(97.9)	395(95.6)	
For healthcare providers which of following drugs would help in prevention against covid-19 infection?	Panadol	48(7.4)	33(8.3)	7(7.9)	3(2.6)	5(10.4)	0.016	15(6.3)	33(8)	0.10
	Chloroquine	86(13.2)	59(14.8)	6(6.7)	16(13.8)	5(10.4)		32(13.4)	54(13.1)	
	Hydroxy chloroquine azithromycin	127(19.5)	75(18.8)	13(14.6)	23(19.8)	16(33.3)		52(21.8)	75(18.2)	
	Anti-viral drugs	43(6.6)	32(8)	5(5.6)	3(2.6)	3(6.3)		8(3.3)	35(8.5)	
	No prophylactic drugs	348(53.4)	200(50.1)	58(65.2)	71(61.2)	19(39.6)		132(55.2)	216(52.3)	

GP: General physician. **PG:** Postgraduate trainee. **C:** Consultant. **AS:** Allied sciences. *: Mask. **: Shield.

Table 3. Univariate and Multivariate Logistic Regression for Identifying Significant Factors of Correct Concepts.

Factors		Univariate			Multivariate		
		p-value	OR	95% CI	*p*-value	AOR	95% CI
Age groups	16-35	Reference					
	36-55	0.068	0.688	0.46-1.02			
	Above 55	0.798	0.870	0.301-2.51			
Gender	Male	Reference			Reference		
	Female	0.004	1.674	1.18-2.37	0.026	1.499	1.04-2.14
Profession	General physician	Reference					
	post graduate trainee	0.927	1.024	0.61-1.70			
	Consultant	0.489	0.854	0.54-1.33			
	Allied sciences	0.154	1.733	0.81-3.69			
Work place	Government	Reference			Reference		
	Private	0.001	2.545	1.72-3.74	0.001	2.404	1.62-3.55
	Independent	0.126	1.454	0.90-2.34	0.107	1.485	0.918-2.40
Source of information	Electronic media	Reference					
	Social media	0.931	0.983	0.66-1.45			
	Print media	0.217	1.451	0.80-2.62			
	Family, friends or colleague	0.172	0.504	0.18-1.34			

DISCUSSION.

COVID-19 has become a major concern worldwide for the past few months.

The WHO has declared COVID-19 as a controllable pandemic in March 2020.[22] Due to the availability of a massive reservoir of information regarding the disease through various media platforms, it is difficult to discern true information from false, especially when the manner the information relating to the disease and mortality takes a psychological toll on the user.

Our study aimed to elucidate the common misconceptions, aiming at the knowledge of health-care professionals (HCPs), through media and misinformed sources regarding the ensuing pandemic.

Understandably, HCPs including doctors, dentists, nurses, and associated paramedical staff are at the frontline of this disease, caring for patients and simultaneously taking necessary precautions not to get infected themselves.

In turn, the same HCPs are also responsible for taking care to not transmit the disease to their friends and family as a result, which takes a toll on their mental health.[23,24] Be that as it may, although the use of personal protective equipment protects the HCPs from acquiring the virus, an increasing number of infections,[25,26] and mortality,[27,28] is still being reported among the healthcare at the front lines.

A semi-structured questionnaire was developed with face validation from experts in the field. The questionnaire was administered online globally through a website to HCPs through a convenience sampling technique.

The authors spread the link among their contacts who were then asked to forward the link further to their contacts in the healthcare field, and information was thus collected. Data was collected for the duration of one week (1st to 8th April 2020).

A total of 652 responses were recorded and analyzed. The questionnaire was administered in English to all those HCPs who had an internet connection and were fluent enough in English to actually answer the questions.

The findings in this study are to be interpreted with caution due to the differing cultural and circumstantial government directives in different countries.

According to the findings of our study, 71.6% of the HCPs had adequate knowledge regarding COVID-19, as opposed to another cross-sectional study conducted which showed that 93.2% (n=386) HCPs had relatively good knowledge about COVID-19.[27]

Postgraduate trainees (OR=1.024, 95% CI=0.61-1.70) and allied healthcare professionals (OR=1.733, 95% CI=0.81-3.69) scored good overall knowledge as opposed to consultants, but the results, however, were insignificant. This reflects the emergent need for regular training of HCPs for continuous education as

more is discovered regarding the virus.[22]

Furthermore, it was also found that female HCPs generally were keeping themselves updated compared to males regarding this disease, which can be due to the fact that 63.3% of the responses were from females as opposed to males.

Most of the responses were from HCPs in Pakistan (64.9%), followed by Saudi Arabia (8.7%), United States of America (6.3%), Australia (3.8%), United Kingdom (2.1%), Thailand and the United Arab Emirates (1.2%), Myanmar (1.0%), and Jordan, Canada, and Bahrain (0.9%), India and Germany (0.8%).

A cumulative 6.3% of responses came from countries with less than 5 responses each. Those countries were Argentina (1), Azerbaijan (1), Bangladesh (1), Brazil (2), China (2), the Democratic Republic of the Congo(1), Egypt (4), Finland (1), Hungary (2), Iran (1), Iraq (2), Italy (1), Malaysia (3), Mexico (3), Nepal (2), The Netherlands (2), New Zealand (2), Nigeria (1), Qatar (4), South Africa (3), Sudan (1), and Switzerland (1).

As the majority of the contacts of authors resided in Pakistan, followed by Saudi Arabia and the United States, further snowballing of the questionnaire was done with adequate responses from other countries as demonstrated.

A positive finding concurred that majority of the sample in our study (95.6%) had significant knowledge regarding signs and symptoms of COVID-19 which wasn't affected by the age or sex of the participants, which is in accordance with a study conducted among Iranian nurses by Nemati *et al.*[30]

The SARS-CoV-2 virus seems to be of fatal consequences to geriatric individuals, particularly those over the age of 60. In our study, 4.2% of male HCPs, as opposed to 1.2% of females HCPs (p=0.012), believed that the disease is limited to geriatric individuals even though the literature states that if acquired, the virus can be deadly to geriatric individuals presenting with comorbidities,[31,32] but it is definitely not limited to just people of old age acquiring the infection.

An alarming finding was the belief that the SARS-CoV-2 virus is being used as a bioweapon (33.1%, p=0.019). This finding is in line with a study done on Nigerians who also claimed in the results of their survey that the virus is a bioweapon developed by China[33] or some specific government/terrorist organization.[32]

Misinformation has accompanied the COVID-19 pandemic, and actions must be taken to inform the general public about the origin an source of the virus itself. As highlighted by Sun *et al.*,[34] and animal-to-human transmission of the virus that occurred from bats, the intermediate host remains yet to be determined. Though some have postulated that snakes were the intermediate species between the transmission from bats to humans,[35,36] the governments and media of various countries should actively incorporate correct information regarding the source of the virus to the masses so that misconceptions are addressed, and the public consciously accepts and adopts precautionary measures without biases.

Several other misconceptions surfaced in our study, where almost half of our sample (51.4%) believed that the virus is airborne and 5.4% of them believed that the virus could be transmitted through mosquitoes. Accessing reliable websites and being exposed to media which relays verified information regarding certain myths related to the virus is of crucial importance. As the WHO[37] has busted the myth that mosquitoes can most certainly not spread the virus between humans, the main transmission being through respiratory droplets from person-to-person.

An experimental study reported by van Doremalen *et al.*,[38] demonstrates the presence of aerosol particles generated using a three-jet collison nebulizer under well-controlled laboratory conditions. It is however to be considered that these circumstances do not depict regular human coughing and subsequent aerosol generation.

Even though there is potential transmission of the virus in environments where aerosol-generating procedures are carried out,[39] studies have shown the absence of viral RNA in air samples from settings of symptomatic patients.[40,41] This actually goes to show that SARS-CoV-2 should not be feared to be transmitted as aerosolized particles in well-ventilated environments.

Personal protective equipment, used to interrupt the transmission chain of the virus, was made mandatory for healthcare providers and the general public, at first when in contact with an affected person, but later was made a rule by many governments around the world for individuals whenever leaving the house.[25] 89% of our sample stated that the N95 respirator was the best choice for PPE, 68% mentioned face shield, followed the surgical mask (60%).

The effectiveness of N95 respirators and surgical

masks for reducing inhalation exposure is well-known, as demonstrated in our study response, but face shield also has been demonstrated to reduce the virus being inhaled by up to 92%.[42]

In addition to that, the face shield also doesn't hamper the display of facial expressions as opposed to the face masks, which is an added advantage. As shortages of PPE ensued following the pandemonium caused by COVID-19, mass production of face shields was taken up by companies like Apple and Nike as raw materials and an extensive product line was not a hassle.[42]

As the world continues to grapple with the consequences of the virus, the interminable wait for the discovery of a suitable vaccine and drug for the prevention and treatment of COVID-19 continues. Although 96.5% of the HCPs responded that no prophylactic drugs are required for the prevention of the virus, 19.5% still favored the combination of hydroxychloroquine and azithromycin for preventing infection.

It was imminent in other surveys as well[32] that due to the absence of no medication or vaccine for the disease, fear makes people look for alternative therapies and medicines to treat the virus.

Limitations

Our survey was conducted online; hence only those people who were literate in the English language and had access to the internet through computers/laptops or mobile phones were able to participate, which is a selection bias. As different countries have different problems with regards to the pandemic, most HCPs who responded to our survey were from Pakistan, which also hampers the generalizability of our results. Furthermore, the short duration of data collection translated to a relatively low response rate and a smaller sample size than was actually expected.

CONCLUSION.

HCPs are generally aware of COVID-19, keeping updated knowledge which helps in their practices. Most of the HCPs are keeping themselves abreast of the knowledge regarding COVID-19 with online sources of information, social and print media, and colleagues and friends at work. Though these sources can spread misinformation and rumors that harbour prejudices and biases and many individuals and HCPs can form misconceptions in aspects of the disease. Authentic information resources, continued professional education, and professional training courses are of utmost need in order to fight this pandemic.

Message of the study:

1) False information or information lacking scientific evidence, may deeply influence and have consequences among individuals.

2) Persistent continuous professional education, training of healthcare providers using evidence-based research results are of utmost need in order to fight against the pandemic.

3) The best strategy to control the spread and mortality along with the burden on healthcare systems is the implementation of effective personal protective equipment and measures.

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