

Original Research Article

Questionnaire based assessment of awareness about infection control practices regarding COVID-19 among health care workers

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ABSTRACT

Background: Healthcare workers (HCWs) are at frontline of response of the current pandemic of the COVID-19. This exposes them to risk of infection due to insufficient knowledge and unhealthy practices. The aim of the study was to assess the knowledge of infection control practices among HCWs regarding COVID-19.

Methods: A web-based cross-sectional survey was conducted between April 2020 and June 2020. A 21-questions survey was developed and distributed among study population. A total of 622 HCWs working in a dedicated COVID-19 hospital participated in this study. Descriptive statistics was applied to represent participant characteristics and Chi-square test was used to evaluate the level of association among variables with a significance level of <0.05.

Results: Out of 622 participants, 443 (71.22%) were females and 179 (28.78%) were males. Majority of the participants were nurses 308 (49.5%) followed by resident doctors 152 (24.4%), faculty doctors 108 (17.3%) and ancillary staff 54 (8.6%). Most participants 424 (68.1%) were less than 30 years of age. The overall response to survey was satisfactory with average correct responses recorded at 70.9%. Faculty doctors and resident doctors scored maximum average of 73% marks.

Conclusions: The study participants showed sufficient basic knowledge about infection control practices regarding COVID-19. It also highlights the importance of continued training and educational interventions which are required to battle the present pandemic situation.

Keywords: COVID-19, Infection control, Corona virus

INTRODUCTION

COVID-19 is a respiratory illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) which first emerged in China in December 2019. The first case of COVID-19 in India was reported on 30 January 2020 from Kerala.¹ On March 11, COVID-19, a novel corona virus was declared a pandemic by the WHO.² India is fighting the battle against COVID-19 pandemic and healthcare workers on the frontlines are particularly vulnerable to this infection.

The virus is primarily transmitted between people through

respiratory droplets, which are produced when an infected person coughs or sneezes or by touching contaminated surfaces or objects and then touching their own mouth, nose or possibly eyes.³ To date, there is no antiviral curative treatment that has been recommended for COVID-19.⁴ This is the reason why in order to minimize risk of transmission, especially in healthcare settings, HCWs are required to follow accepted infection control practices.⁵ Primary preventive measures include regular hand washing, social distancing and respiratory hygiene (covering mouth and nose while coughing or sneezing).^{6,7} A poor understanding of the disease among HCWs can result in delayed diagnosis of infection and treatment

leading to rapid spread of infection among them.⁸ It is well established that transmission of the disease among HCWs is associated with overcrowding, absence of isolation room facilities, and environmental contamination.

However, this is likely compounded by the fact that some HCWs have inadequate awareness of infection control practices.⁹ Therefore, critical preparedness, readiness and knowledge regarding COVID-19 are needed for physicians and nurses on the frontline.^{10,11} By the end of January 2020, the WHO and CDC have published recommendations for prevention and control of COVID-19 in HCWs.¹²

The COVID-19 pandemic thus offers a unique opportunity to investigate the level of knowledge and awareness about Infection prevention practices of the frontline HCWs.

The objective of this study was to assess the awareness of COVID-19 and its related IC practices among health care workers in a tertiary care teaching and dedicated COVID-19 hospital.

METHODS

This was a web-based, cross-sectional study. This study was conducted at a tertiary care teaching dedicated COVID-19 hospital and COVID-19 patients started getting admitted from mid-April 2020. The study was conducted between April 2020 and June 2020. An online questionnaire was prepared by investigators with Google forms using reference material, factsheets, and information leaflets on COVID-19 developed by WHO, CDC, Ministry of Health and Family Welfare, India. The link of this questionnaire was shared with participants after obtaining informed consent. The participants in the study included doctors from paraclinical and clinical specialties, resident doctors, nursing staff and ancillary service staff from laboratory, radiology, operation theatre, central sterile supply department.

The questionnaire comprised of 21 questions broadly related to knowledge about standard precautions in IC practices, about COVID-19, about personal protective equipment and environmental cleaning and disinfection related to prevention of COVID-19 transmission. Sufficient time was given to respondents to read, comprehend and answer the questions. Each question and each correct answer was allotted 1 mark. No marks were given for incorrect answers and there was no negative marking. Answers were shared with the participants after they had submitted the online questionnaire.

The study protocol was approved by Institutional Ethics Committee. The obtained data was analyzed using SPSS, version 17. Descriptive analysis was applied to calculate the frequencies, percentages and mean scores. The Chi-square test was used to investigate the level of association among variables.

A p value of less than 0.05 was considered statistically significant.

RESULTS

A total of 622 HCWs participated in the study. Out of 622, 443 (71.22%) were females and 179 (28.78%) were males. Participants included 308 (49.5%) nurses, 152 (24.4%) resident doctors, 108 (17.3%) faculty and 54 (8.6%) ancillary staff. Majority of the participants 424 (68.1%) were <30 years of age. Table 1 shows the socio-demographic characteristics of respondents. As far as area of work is concerned, HCWs working in critical care units participated the most with 202 (32.5%) questionnaire forms filled followed by surgical wards 158 (25.4%) and medical wards 132 (21.2%). Majority 520 (83.6%) participants had received infection control training pertaining to COVID-19 at the time of answering the questionnaire.

Table 1 shows sociodemographic details of participants and their average scores. It also shows the average correct responses by different participants to various questions in the questionnaire. The overall response to survey was satisfactory with average correct responses recorded as 70.9%. Faculty doctors and resident doctors scored a maximum average of 73% marks each followed by ancillary staff (70%) and then nurses at 69%.

Table 1: Sociodemographic details of participants and their average scores.

Participant information	Frequency (N=622) (%)	Average score out of 21 (overall average=70.9%) (%)
Gender		
Male	179 (28.8)	14.5 (69.0)
Female	443 (71.2)	15 (71.4%)
Age (years)		
<30	424 (68.2)	14.84 (71.0)
31-40	101 (16.2)	15.08 (72.0)
41-50	45 (7.2)	16.0 (76.0)
51-60	23 (3.7)	13.47 (64.0)
>60	29 (4.7)	13.06 (62.0)
Qualification		
Faculty doctors	108 (17.4)	15.3 (73)
Resident doctors	152 (24.4)	15.3 (73)
Staff nurses	308 (49.5)	14.4 (69)
Ancillary staff	54 (8.7)	14.7 (70)
Area of work		
Critical care units	202 (32.5)	14.8 (70.5)
Surgical ward	158 (25.4)	14.4 (68.6)
Medical ward	132 (21.2)	15.1 (71.9)
Miscellaneous	72 (11.6)	15.3 (72.9)
OPD	58 (9.3)	15.1 (71.9)
Infection control training related to COVID-19		
Received training	520 (83.6)	15 (71.4)
Not received training	102 (16.4)	13.7 (65.2)

General knowledge about standard precautions in infection control

On the questions pertaining to hand hygiene, nurses were able to answer better than other participants. 83.8% nurses correctly answered about WHO recommended 6 steps and 5 moments of hand hygiene. They also had better (77.6%) knowledge about WHO recommended duration of hand wash and hand rub than other participants. 93.2% nurses correctly answered question about biomedical waste disposal (Figure 1).

Knowledge about COVID-19

On an average, only 42.1% of participants could correctly answer the difference between self-quarantine, self-isolation and physical distancing. 78.9% participants were aware about the mode of transmission of COVID-19. Regarding precautions to be taken while travelling in hospital elevator, 96.7% resident doctors answered

correctly with overall average correct responses at 78.9% (Figure 2).

Knowledge about personal protective equipment

75% faculty doctors could correctly answer meaning of ‘N95’ in an N95 mask, whereas 88.1% resident doctors answered meaning of 3-ply mask. 96.0% resident doctors and 95.3% faculty doctors could correctly identify Aerosol Generating Procedures (AGPs).

75% faculty doctors answered N95 masks can be stored in paper bag before reuse. 89% nurses said washing of N95 mask should not be done before reuse. 97.2% faculty doctors answered correctly regarding use of face shields for protection of eyes and N95 mask from splashes.

Overall, 55.8% and 44.0% were the average correct responses regarding identifying donning and doffing sequence (Figure 3).

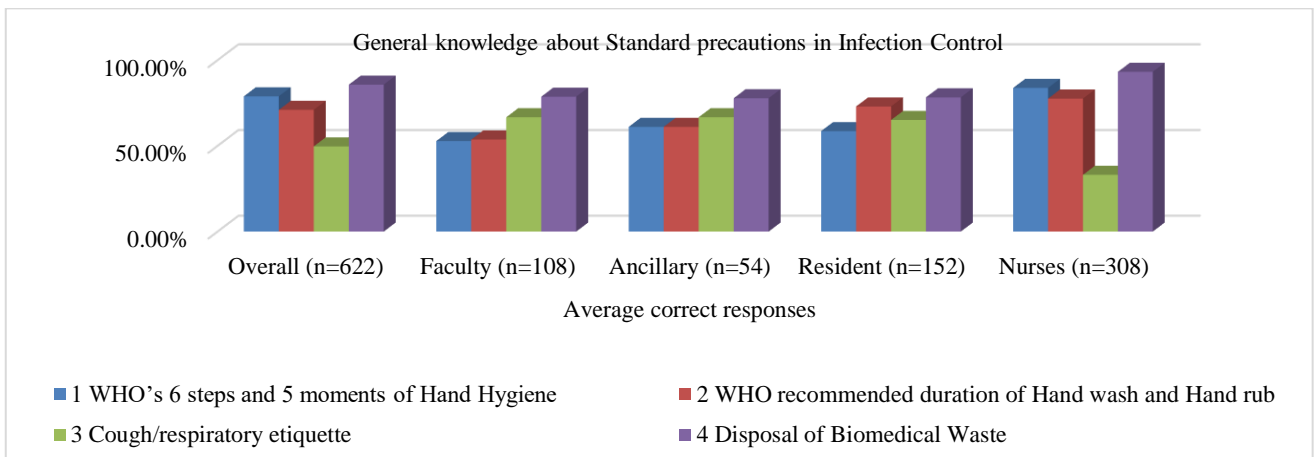


Figure 1: Average correct responses of participants to questions pertaining to general knowledge about standard precautions in infection control.

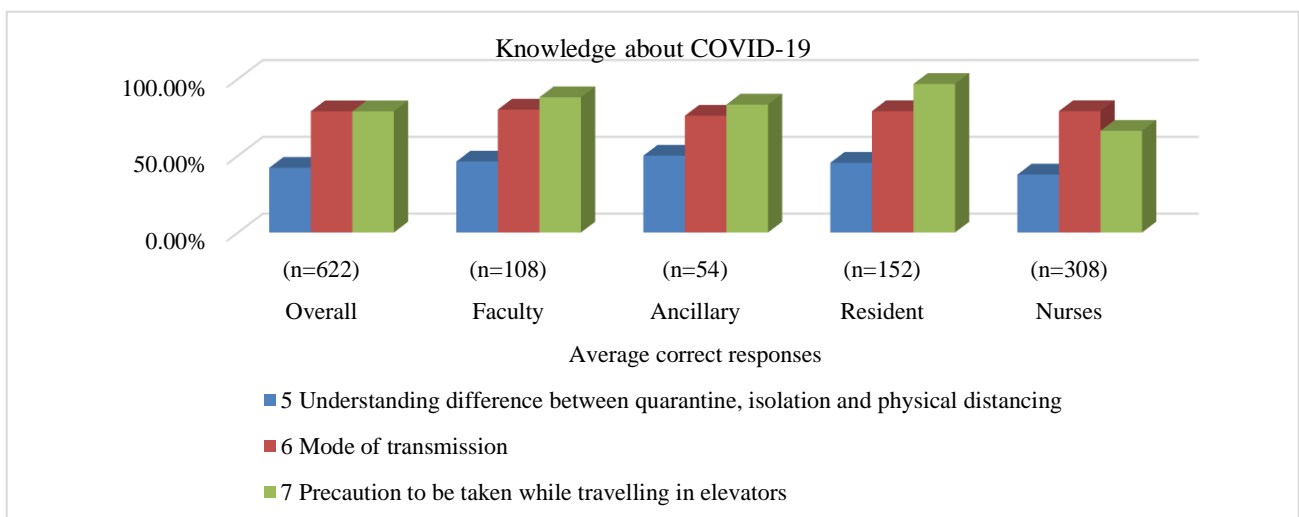


Figure 2: Average correct responses of participants to questions pertaining to knowledge about COVID-19.

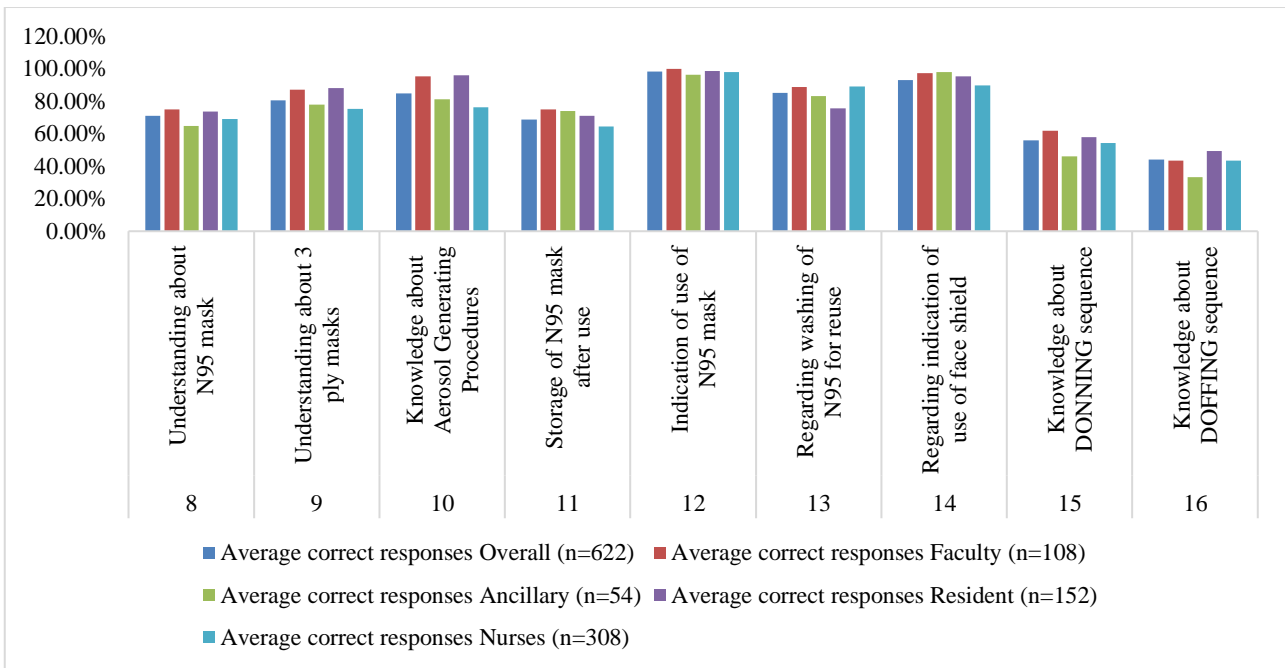


Figure 3: Average correct responses of participants to questions pertaining knowledge about personal protective equipment.

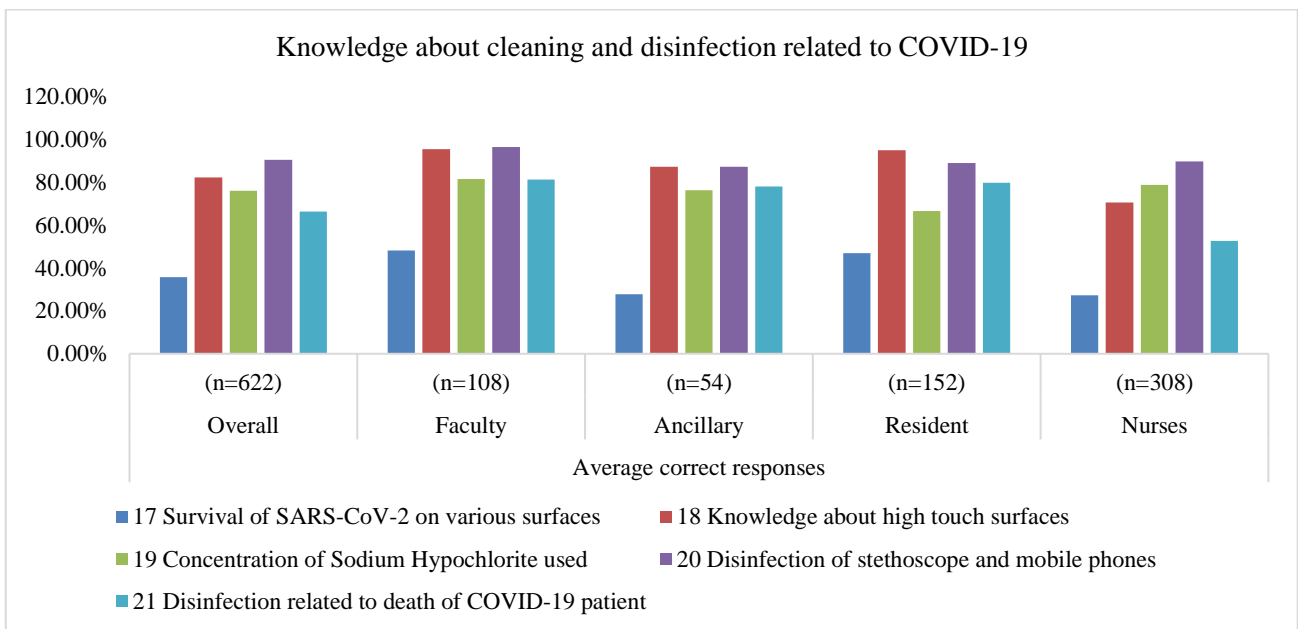


Figure 4: Average correct responses of participants to questions pertaining to knowledge about cleaning and disinfection related to COVID-19.

Knowledge about cleaning and disinfection related to COVID-19

Only 35.7% participants could correctly identify the survival time of Sars-Cov-2 virus on various surfaces. However, faculty doctors scored most marks with regard to knowledge about high touch surfaces (95.3%), appropriate concentration of sodium hypochlorite used for disinfection (81.4%), knowledge about disinfection of stethoscope and mobile phones (96.2%) to prevent

transmission of Sars-Cov-2 virus and infection control during dead body management of COVID-19 patient (81.0%) (Figure 4).

DISCUSSION

This study was conducted in 831 bedded tertiary care teaching hospital which was designated as a Dedicated COVID-19 Hospital since 14 April 2020. The hospital has NABH, NABH Safe-I and NABL accreditations. Regular training sessions related to infection control practices by

way of lectures, demonstrations, bed side training, etc. are conducted to increase awareness and adherence among HCWs.

Overall, 622 HCWs answered the online questionnaire designed by Infection Control Department. Female participants 443 (71.2%) clearly outnumbered male participants. This was also recorded by other workers.¹³⁻¹⁶ However, male preponderance was noted by Olum et al and Zhang et al.^{8,17} High number of female participants in this study can be explained by majority of the participants 308 (49.5%) being nursing staff. In this study, more than two-thirds 424 (68.1%) of participants were <30 years of age which has also been observed by Modi et al.¹⁸ This study comprised of participants from various professions but nursing staff 308 (49.5%) showed maximum enrollment. Other researchers have also included multi-disciplinary participants while some workers studied only single discipline.^{14,17-20} Including participants from various disciplines gives us a better idea about knowledge of participants as all HCWs have a specific role to play in this COVID-19 pandemic.

In this study, maximum participation was recorded from the critical care unit 202 (32.5%) followed by surgical wards 158 (25.4%). Similar participation was seen by Elhadi et al where intensive care units recorded 29.9% participation.¹³

In this study, responses were also analyzed with regards to whether the participants had received infection control training related to COVID-19 before answering the questionnaire. Participants who received training (71.4%) performed better than those who hadn't (65.2%). However, on application of Chi square test to study the significance, it is observed that this association is not significant. This could be due to the regular and continuous infection control training which is conducted in hospital, as described earlier, increasing their baseline awareness. This study did not find any statistically significant association of knowledge with demographic variables like gender, age, qualification, area of work and infection control training regarding COVID-19.

The overall response to this survey was satisfactory with average correct responses recorded at 70.9%. This was similar to responses observed by Olum et al, Nallani et al, Modi et al and Joshi et al.^{8,15,18,20} Poor knowledge levels among physicians and nurses were noted by Elhadi et al in a study conducted in Libya which was attributed to lack of focused official courses or training programs.¹³

General knowledge about standard precautions in infection control

In this study, 78.9% participants were aware about WHO's 6 steps and 5 moments of hand hygiene. Similarly, 71% participants knew about WHO recommended duration of hand washing and hand rub. These findings are similar to Joshi et al who showed 83.5% participants had knowledge about hand hygiene.²⁰

Regarding knowledge about cough/respiratory etiquette, in this study average correct responses were recorded at 49.7%. Although faculty, ancillary staff and resident doctors had correct responses in the range of 65-66%, nurses showed correct responses in only 33.1%. Modi et al recorded an average 75% correct response regarding awareness of various infection control measures which include rapid triage, respiratory hygiene, cough etiquette among other questions.¹⁸ This difference could be due to different locations where the studies were performed.

Knowledge about COVID-19

In this study, 42.1% participants were aware about difference between self-isolation, self-quarantine and physical distancing. This finding is similar to that observed by Joshi et al who recorded correct awareness about the same from 47.67% respondents.²⁰

Approximately 80% participants in this study had correct knowledge about mode of transmission of COVID-19. Lower performance of 53.71% and 70% was recorded by Kushalkumar et al and Joshi et al respectively while higher performance was recorded at 98.8%, 95.9% by Bhagavathula et al and Zhong et al respectively.^{12,16,20,21} This wide variation could be due to different study populations.

Knowledge about personal protective equipment

Health care professionals should place a high value on wearing personal protective equipment (PPE) and procedure for discarding PPE to prevent contamination and infection.²² Regarding knowledge of PPE, in this study 70.9% participants were aware about meaning of N95 mask, 98.3% knew indication for use of N95 mask, 80.7% had awareness of layers of 3 ply masks, 68.8% knew about storage of N95 mask after use and 85.2% knew that washing of N95 mask for reuse is not recommended. In study conducted by Elhadi et al only 52.7% doctors and 45.3% nurses had knowledge about PPE.¹³ On the other hand, high proportion of participants (82.06%) had knowledge about various PPE as recorded by Joshi et al and Modi et al too recorded as low as 45.4% participants were aware of correct sequence of application of mask/respirator. We observed participants had poor knowledge of donning (55.8%) and doffing (44.0%) sequence of PPE in our study.^{18,20} This issue was addressed by repeat training and paying more attention during donning and doffing of PPE with help of infection control nurses.

Knowledge about cleaning and disinfection related to COVID-19

Proper environmental cleaning and disinfection is necessary to prevent COVID-19 transmission. We observed only 35.7% participants had knowledge about survival of SARS-COV-2 on various surfaces. However, 82.1% respondents were aware of high touch surfaces. MoHFW recommends 1% sodium hypochlorite to be used for disinfection. We also tested participants knowledge

about method of disinfection of stethoscopes and mobile phones and also infection control during COVID-19 related dead body management.

CONCLUSION

Perhaps this was the only study where knowledge of infection control practices related to COVID-19 has been recorded extensively. The study participants showed sufficient basic knowledge about infection control practices regarding COVID-19. This study also highlights specific aspects of knowledge where incorrect responses were noted. These would be addressed through continued training and educational interventions which are required to battle the present pandemic situation. This would definitely improve the knowledge and confidence of health care workers to provide right care to their patients and protect themselves from COVID-19.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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QUESTIONNAIRE

Email: _____ **Age group (years):** <30 / 31-40 / 41-50 / 51-60 / >60
Ward / Unit: _____ **Faculty / Resident / Staff Nurse / Ancillary**
Gender: Female / Male **Received COVID-19 IC training: Yes / No**

1. What are modes of transmission of COVID-19 infection?
 - a. Contact
 - b. Aerosol
 - c. Droplet
 - d. b and c
 - e. All of the above
2. How should you store N95 mask before reuse?
 - a. Peel pouch bag
 - b. Paper bag
 - c. Plastic box
 - d. Keep open
3. What are indications for use of N95 mask?
 - a. Open suctioning
 - b. Fundoscopy
 - c. Intubation
 - d. Tracheostomy
 - e. All of the above
4. Can you wash N95 mask?
 - a. Yes
 - b. No
 - c. Maybe
5. What is the correct sequence of donning personal protective equipment?
 - a. Hand wash, cap, hand rub, shoe cover, inner glove, mask, cover all/gown, goggles, hood, outer gloves
 - b. Hand wash, cap, shoe cover, hand rub, inner glove, cover all/gown, mask, goggles, hood, outer gloves
 - c. Hand wash, inner glove, cap, shoe cover, mask, cover all/gown, goggles, outer gloves, hood
 - d. Hand wash, shoe cover, hand rub, inner glove, cover all/gown, goggles, hood, outer gloves, mask, cap
6. What is the correct sequence of doffing personal protective equipment?
 - a. Outer gloves, hood, coverall/gown, shoe cover, hand rub (gloved hands), goggles, mask, cap, inner glove, hand wash
 - b. Outer gloves, hood, hand rub (gloved hands), coverall/gown, shoe cover, goggles, mask, cap, inner glove, hand wash
 - c. Outer gloves, hood, coverall/gown, hand rub (gloved hands), goggles, mask, cap, inner glove, shoe cover, hand wash
 - d. Outer gloves, hood, coverall/gown, shoe cover, hand rub (gloved hands), cap, inner glove, goggles, mask, hand wash
7. What is the percentage of sodium hypochlorite used for disinfecting floor and surfaces to prevent COVID-19 transmission?
 - a. 10%
 - b. 0.1%
 - c. 1%
 - d. 2.5%
8. How will you disinfect stethoscope and your mobile?
 - a. Wipe with Dettol
 - b. Wipe with Normal saline
 - c. Wipe with 70% alcohol
 - d. Wipe with 2% Gluteraldehyde
9. How you will protect N95 mask from splashes?
 - a. Wearing surgical mask over N95 mask
 - b. Wearing face shield
 - c. Wearing goggles
 - d. Wearing cloth mask over N95 mask
10. Which of the following is not cough etiquette?
 - a. Cough into bent elbow sleeve
 - b. Cough into cupped hands

- c. Turn head away from people while coughing
 - d. All of the above
11. Following precautions to take in lift except?
- a. Stand facing the wall
 - b. Minimum 1 m distance between 2 people
 - c. Save electricity and fit in as many people in lift as possible
 - d. Use elbow to press lift button
12. How many steps and moments of hand hygiene by WHO?
- a. 6 moments, 5 steps
 - b. 6 moments, 6 steps
 - c. 6 steps, 5 moments
 - d. 5 moments, 5 steps
13. Following are Aerosol Generating Procedures except
- a. Tracheostomy
 - b. Fundoscopy
 - c. Intubation
 - d. Extubation
14. All are true about dead body management of COVID-19 patient except
- a. Body bag should be disinfected with 1% sodium hypochlorite solution externally
 - b. Post mortem not allowed
 - c. Bathing of body can be allowed as per religious ritual
 - d. Tubing to be removed and puncture holes cleaned with 1% sodium hypochlorite
15. To who does self-isolation, self-quarantine & physical distancing respectively applies?
- a. People who are ill, people who are not ill, everyone
 - b. Everyone, people who are ill, people who are not ill
 - c. People who are not ill, people who are ill, everyone
 - d. People who are ill, Everyone, people who are not ill
16. After using tissue to cover mouth/nose while sneezing /coughing
- a. Discard tissue in red bag and use hand rub
 - b. Discard tissue in red bag, use hand rub & then wash hands with soap and water
 - c. Discard tissue in black bag
 - d. Discard tissue in yellow bag and wash hands with soap and water
17. How long does COVID-19 virus survive on surfaces?
- a. Upto 72 hours on cardboard, <4 hours on copper, 24 hours on plastic and stainless steel
 - b. 24 hours on copper, upto 72 hours on plastic and stainless steel, 4 hours on cardboard
 - c. upto 72 hours on plastic and stainless steel, <4 hours on copper and <24 hours on cardboard
 - d. None of the above
18. High touch surface in hospital is all except
- a. Telephone
 - b. Bed rail
 - c. Door knob
 - d. Ceiling fan
19. As per WHO what is recommended duration of Hand rub and Hand wash respectively?
- a. 15 seconds and 30 seconds
 - b. 10 seconds and 30 seconds
 - c. 30 seconds and 60 seconds
 - d. 60 seconds and 30 seconds
20. What does N & 95 in N95 mask stand for?
21. What is meaning of '3 ply' mask?