Review Article

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From COVID-19 Reflections; Crucial Strategies for Ensuring Healthcare Worker and Patient Safety in Developing Countries

Muhammad Saeed[1], Farhan Rasheed[2], Iqra Jamil[3], Maqsood Ahmad[4], Akhlaaq Wazeer[5], Abdul Waheed[6], Zarfeen Fatima[7], Muhammad Hidayat Rasool[8], Mohsin Khurshid[9]

[1]Consultant Medical Microbiologist, Makhdoom Diagnostic Centre Mandi Bahauddin, Pakistan
[2]Professor of Pathology (Microbiology), Allama Iqbal Medical College Lahore, Pakistan
[3]Lecturer, Department of Microbiology, University of Central Punjab Lahore, Pakistan
[4]Lab Incharge, Hepatitis Reference cum Public Health Lab & Research Centre Hepatitis Control Program Punjab Lahore, Pakistan
[5]Mirpur University of Science & Technology/ State TB Reference Laboratory, MoNHS, Regulation & Coordination, Pakistan
[6]Lecturer, College of Allied Health Professionals, Government College University Faisalabad, Pakistan
[7] Department of Biochemistry, University of Agriculture Faisalabad, Pakistan
[8]Professor of Microbiology Director Institute of Microbiology, Government College University Faisalabad, Pakistan
[9]Associate Professor of Microbiology Institute of Microbiology, Government College University Faisalabad, Pakistan

Author`s Contribution

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Address of Correspondent
Dr. Mian Muhammad Saeed
mian.muhsaeed@gmail.com
https://orcid.org/0000-0001-8602-0827

ABSTRACT

Globally, as millions of individuals stopped over at home to curtail the spread of COVID-19, healthcare workers (HCWs) remained in the field to save mankind from the deadly virus. They attended the hospitals as well as clinics, exposed themselves to risk of COVID 19. Despite multiple steps taken by global health agencies, till 2024 first quarter over 774 million confirmed cases >07 Million deaths reported around the globe. A significant proportion of transmissions was reported from health care settings among the health care workforce and patients. About 20% of the health care workforce of Italy was infected and many died in that outbreak, along with significant ratio of disease transmission to their families. Physical and mental health of HCWs were affected badly because of the nuisance of hard triage verdicts and expiry of patients and colleagues. The frequency of HCWs who have acquired COVID 19 was high among the endemic countries. The key causative factors for the healthcare-associated COVID 19 spreads included lack of personal protective equipment availability, improper use of PPEs, lack of training of HCWs, overcrowding in hospitals and lack of proper acquiescence to and acceptance of the significance of fulfilling infection prevention and control (IPC) strategies. This credence was reinforced by globally renowned agencies i.e., WHO and the CDC. The agencies facilitated and implemented adopting IPC measures.

Key words: Covid 19, Healthcare worker, Patient Safety, Outbreak Control Strategies

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Unveiling the COVID-19 Pandemic: From Emergence to Global Impact

The coronavirus named SARS-CoV was responsible for the pandemic of COVID-19 that was emerged in China dated December 2019. The closest genetic similarity of COVID-19 was found in a coronavirus that had been isolated from bats. Early hypotheses suggested it may be associated with seafood in Wuhan, a small city in China where mostly seafood, wild, as well as farmed animal species, were sold frequently.[1]

Subsequent investigations suggested that the first case of COVID-19 was reported on December 1, 2019, and had no direct linkage to the Seafood Market of Wuhan. Two possibilities were proposed in this regard, either the virus itself was introduced to the human population, or an infected human might be the cause of the spread of the virus into the seafood market of Wuhan.[2]

Unraveling COVID-19 Transmission: Routes, Risks, and Mitigation Strategies

The spread of COVID-19 was mainly by respiratory droplets or nasal discharge when a person who was infected coughs or sneezes into the air. The respiratory droplets containing virus particles can enter in the respiratory tract of the nearby persons and possibly be inhaled into the lungs. Some studies have also documented the possibility of acquiring infection if a healthy individual was in contact with the infected surface and then uses the same hand on his face. [3] When a person was in close contact with either a probable suspected case or a confirmed case of COVID 19 not more than 2 meters away for a minimum of 15 minutes or more, risk of transmission of COVID-19 increased. Engagement of unprotected person with the secretions of infected persons for instance, cough droplets also facilitated the spread of COVID-19.

Identifying Risk Factors for the Chinese Healthcare Workforce Amidst COVID-19 Challenges

National Health Commission of the People's Republic of China (NHCPRC) put forward multiple teams of medical including 41,600 HCWs from a minimum of 30 different provinces and the municipalities to backing with health-related treatment in provinces of Hubei as well as Wuhan respectively. [4]

Health Commission of Guangdong Province labeled the dispersal of approximately 2431 HCWs including 60% Nurses were the leading HCWs in the frontline teams, under the supervision of 30% clinicians. Half of the clinicians with job titles were deputy chief physicians, and 25% of them were specialized in respiratory and critical medicine respectively. It is important to mention that in the year 2003, approximately 5.8% (140/2431) HCWs gave their services on the outbreak of severe acute respiratory syndrome. Newly, scientist conveyed the glitches in healthcare settings about COVID-19 IPC, emphasized the personal protection of HCWs. although, NHCPRC in a press conference on COVID-19 with WHO-China Joint Mission reported that till 24th February 2020, about 2055 HCWs had been infected with COVID 19, with 22 (1.1%) deaths. About 95% of infected Health care workers belonged to the province of Hubei and the maximum number cases occurred in winter season.[2] It is worth mentioning that the proportion of COVID 19 infected HCWs (2.7%, 95% CI: 2.6e2.8) was expressively on the lower side as compared to HCWs infected with SARS (21.1%, 95% CI: 20.2e22.0).[5]

Consequently, the National Hospital Infection Management and Quality Control Centre director abridged key factors for such a raised frequency of infected HCWs throughout the era of the COVID 19 outbreak and the key factors reported were derisory personal protection of HCWs at the start of the epidemic and delayed in the pathogen identification. Prolonged exposure to a high number of infected patients significantly results in an increased risk of infection for HCWs and lack of training on IPC especially on air-borne precautionary measures also worsened the situation.[6]

Decoding COVID-19 Clinical Presentation: Symptoms, Variations, and Diagnostic Challenges

COVID-19 virus incubation period was reported between 2-14 days after the exposure (this was based on MERS-CoV viruses incubation period). The virus affected people in multiple ways and most of the people who are infected recovered without special medical treatment. The common symptoms included the following but are not limited to fever, dry cough, tiredness, as well as shortness of breath. Bilateral infiltrates were also observed in the chest x-ray of infected patients. Secondary symptoms included sore throat, diarrhea, unexplained loss of taste as well as smell, muscle aches, and nausea, or a runny nose were also reported.[7]

In rare cases, the deadly COVID-19 presented with severe respiratory problems, kidney malfunctioning, or even lead to death. This was mostly seen in elderly patients and in whom who have an underlying medical condition.[8]

Foundational Infection Control Measures: Safeguarding Health in the Face of Contagion

B-IC defined as standards as well as transmission-based precautions, contributed an important role in preventing and controlling the spread of pathogens.[9] Some of the important measures were hand hygiene, efficient use of personal protective equipments (PPEs), effective screening of patients, management of the exposed HCWs and proper availability of essential equipments.

Elevated Infection Control Measures (E-ICMs): Advancing Protocols for Enhanced Health Protection

These A-IC can vary institution wise usually these are as followed

- Departmental meetings
- Risk Assessment strategies
- Prevention control and Infection team on-call
- Inter-hospital acceptance of patient and referral policies
- COVID 19 sample collection, transportation and testing
- Stockpiling of essential supplies
- Respirator (N95) fit testing and management of airway
- Communication and education of special staff

Fortifying Readiness Against COVID-19: Strategies for Effective Pandemic Response

The following measures can reduce the risk of COVID-19 transmission among the health care workers. All healthcare facilities should review that infection prevention and control policies are working properly and standard operating procedures are defined clearly and executed properly through the infection control committee. Ensure that all HCWs understand how to report a potential COVID-19 case to infection control and public health officials. They should know how and when to seek evaluation in case of unprotected exposure to the virus. It is also important that healthcare workers are well informed about the isolation area where COVID-19 cases are quarantined. The area should be decontaminated regularly according to SOPs. As the healthcare workers involved in direct contact with suspected or confirmed COVID-19 cases or They should use proper PPEs including a surgical mask or, if available an N95 respirator tested for fitting, full-sleeved gown, gloves, goggles, and specified shoes. Ensure that all the staff assigned in the domain of COVID-19 patients are well trained in the proper use of PPEs. HCWs should strictly follow the procedures for donning and doffing of PPE in the correct sequence and appropriate waste management procedures for their disposal. Ensure that all recommended PPEs, biomedical waste bins, antiviral hand sanitizer or soap, chlorine-based disinfectants are easily available and healthcare workers are well trained about the proper use of these supplies.[10]

Optimizing Triage Protocols: Building an Effective Structure for Emergency and Flu Clinics

Various strategies are planned and implemented by the hospitals in account of instituting triage and isolation protocols for COVID 19 suspected/confirmed patients attending emergency units, to prevent the transmission of this deadly virus to other patients. Parallel measures need to be adopted in OPDs, dental clinics, dialysis centers, and other medical facilities to ensure effective implementation of infection control measures.

The triage program involves a timely and objective assessment of all patients at admission enabling early diagnosis and transmission control (isolating patients with suspected COVID-19 cases).[11] Triage programs further includes screening of all the suspected cases, establishment of automated and well-equipped labs, well trained staff, implementation of infection control practices and well-organized, well-ventilated quarantine areas.

Comprehensive Care Pathways for Suspected and Confirmed COVID-19 Cases: Protocols and Best Practices

1. Ensuring Patient Isolation: Implementing Effective Quarantine Measures for COVID-19 Management

Suspected or confirmed cases of COVID-19 should be quarantined in airborne infection isolation room (AIIR) where negative pressure should be maintained. Doors of the COVID ICUs should be kept closed and extra objective material should be prohibited.[12] Because the lobbies of the isolation are also more prone to contamination, so they should be disinfected properly according to standard protocols. Random visits to COVID-19 patients should also be controlled. Crowding of the COVID-19 isolation areas can increased the risk of transmission of this dangerous virus.

2. Prioritizing Staff Well-being: Essential Considerations for Healthcare Professionals Amid COVID-19

HCWs should be well trained about management of emergency situations particularly in complicated cases of COVID-19.

3. Shielding Healthcare Workers: The Critical Role of Personal Protective Equipment in COVID-19 Defense

Healthcare workers should be properly trained about the use of personal protective equipment's (PPE). Proper sequence of donning and doffing of PPE should be followed to protect themselves as well as the

environment. Donning starts with the wearing of full sleeves medical gowns followed by fitted test of respirator, eyes protection and sterile gloves. While the Doffing followed the sequence of contaminated gloves and gown removal and discard them in biomedical waste bin. Then remove the respirator and discard it in proper biomedical waste. Healthcare staff should put on scrubs before donning, ensure that the hair is properly tied and remove jewellery.[13]

It is recommended that boots, masks, and eye protection should be discarded before entering the patient room and the biomedical waste bin should be disposed of. After leaving the bed, the respirator can be taken off and disposed of in a proper biomedical waste bin.

It is very important to understand that the order to put on (donning) PPE is less crucial than the order to put off (doffing) to reduce the risk of cross-contamination. [14]

Standard measures for the use of PPEs: Train, reinforce and supervise all persons and HCWs to use PPE (glove, mask, respirator, and eye protection) properly and consistently. Use of N-95 respirators should be mandatory for every person who worked in the covid-19 patients' area. It is also important to wear fluid-resistant, full-sleeved, one-time useable gown, disposable gloves and eye protection. A leak-proof biomedical waste bin must be used to discard the clinical waster by following proper SOPs which included categorization of the contaminants and proper and effective disinfection and cleaning of the surrounding environment to control the SARS-CoV-2 transmission.[15]

4. Hand Hygiene Essentials: Key Practices for Preventing COVID-19 Transmission

Follow WHOs slogan of "My 5 Moments for Hand Hygiene approach" before dealing with a patient, before doing any medical procedure, soon after exposure to secretion from the body of patients, after surrounding, contacting, and touching patients. Accomplish hand hygiene with an Alcohol-based hand rub (ABHR) approach, in case of hands are not stained or with water and soap if visibly stained. HCWs are strongly advised not to wear rings (excluding a simple smooth band), hand watches.[16]

5. Aerosol-Generating Procedures: Mitigating Risks and Ensuring Safety Amid COVID-19

Any procedure that produces aerosols, such as open suction, extubation, bronchoscopy, induced cough, intubation, and ventilation with positive pressure through a face mask, has a high risk of spreading. If medically required, such procedures should be performed in an AIIR, if appropriate, or in a single room with the door closed. Only the necessary and well-trained medical staff should be present in the procedure room, and everybody should wear PPE as prescribed. It is advised that the entrance and exit of the room be minimized during the procedure. If an aerosol-producing procedure is performed in the patient's space, the same area should be disinfected 20 minutes after completion of the practice (as less than 1 percent of aerosols should be present after 20 minutes after the starting load).[17]

6. Optimizing Equipment Utilization: Strategies for Efficient Resource Management in COVID-19 Response

To reduce the chance of cross-contamination, use of extra equipment's and essentials should be minimized. Otherwise, as per the hospital policy of waste management, all kinds of products or equipment of single-use must be disposed of. Equipment or supplies that are reusable; should be washed and disinfected as per the manufacturer's instructions before leaving the space after use.

7. Cleaning & Decontamination: Essential Steps for COVID-19 Safety.

It is recommended that a well-trained domestic HWC will perform cleaning and decontamination wearing the appropriate PPE. After washing with ordinary detergent, a chlorine-based disinfectant solution (with a minimum chlorine availability intensity of 1000 ppm) should be used for decontamination as per the Health Care Policy. The cleaning and decontamination of the patient room should be done at least once a day. It is highly advised that the isolation areas be cleaned and decontaminated separately for certain areas to be cleaned.

8. Effective Waste Management in COVID-19 Response

Large amounts of waste is produced through repeated use of PPE; so it need to be wasted according to the recommendations from the hospital waste management team. All waste should be disposed of in compliance with clinical infectious waste. While waste from a suspected

or confirmed case is strictly disposed of as per waste management category B.[18]

9. Specimen Handling in COVID-19 Testing

For effective disposal of specimens, a biohazard label should be tagged on all samples and request forms. The specimens should be double packed in the same sampling room where the sample was obtained by an HCW wearing PPE. Transportation of samples between laboratories should be conducted as per the recommendation of Category B transportation.

10. Mobile Equipment Deployment in COVID-19 Response

The use of medical mobile devices such as portable ECG, X-ray machines, etc. should be restricted to the required area. Technicians who are not regularly active in-patient care should be advised to wear the proper PPE for the avoidance of infections. Any kind of mobile device in the patient area must be cleaned and decontaminated before existing the lobby as per policy. In addition to the devices, any external objects such as a digital detector or tape, regardless of their direct interaction with the patient, should be decontaminated.[19]

11. Critical Care in COVID-19 Management

High-efficiency filters should be used to protect all respiratory devices used for COVID patients. Such filters are recommended to be disposed of after use. Single-use respiratory devices should be used to the maximum. If not, reusable equipment must be washed and disinfected according to the manufacturer's instructions before re-use. A closed suction system should be used. Ventilators should be kept in standby mode when carrying out bagging. Air humidifiers usage should be avoided in critical care units while heat and moisture exchangers could be used. All HCWs should wear acceptable or recommended PPE.

12. Interdepartmental Patient Transfers: COVID-19 Response Protocols

All diagnostic tests and procedures should be carried out, where possible, in a single negative pressure room with the participation of minimum and necessary HCWs. Following producer should be taken to transfer the patient to other departments such as the bed or trolley used to transfer the patient from one department's room to another department should be decontaminated by an HCW before entering the patient's room. The department where the patient is to be moved should be notified in advance. Every unwanted equipment or object must be removed from the room of the procedure or treatment. The patient must be transferred directly to and from the room of the procedure or treatment and not placed in a shared area. The operation or treatment area, bed, trolley or chair, and other used equipment should be washed and disinfected immediately after use. Ensure that everyone involved in the operation, shifting the patient, or any other activity within 6 feet needs to wear the PPE.

13. Deceased Patient Protocol: Handling Bodies in COVID-19 Context

An appropriate body bag should be used to transfer the body into the sanitized body bag and HCWs should use PPE while handling the dead body. Keeping the procedures of environmental disinfection, the exterior surface of the body bag and the trolley holding the body should be decontaminated. This procedure involves at least two people wearing both PPE-wear and protective clothing. When entering the lobby, HCWs should discard their protective clothing. HCWs will use all PPE when opening the body bag in the mortuary hospital. Working techniques should be safe (e.g., manual rather than power tools) with complete PPE wearing is recommended when postmortem is required; Using high-security postmortem suites if needed. Empty body bags must be disposed of as per Category B waste management regulations.[20]

14. Environmental and Engineering Controls: Enhancing Safety in COVID-19 Response.

The basic infrastructure of the health care facility should be addressed with these controls which help to ensure enough ventilation and proper environmental sanitation in all parts of the healthcare facility. Both insulation and proper ventilation in the healthcare setting will mitigate the spread of infection. Air circulation should be handled in such a way that diseases with the least potential transmission should not be transmitted inside the hospital and properly drained to the atmosphere. Ensure washing and disinfection should be performed regularly and strictly in compliance with guidelines.

15. Healthcare Institution and Local Government Reporting Protocols for COVID-19

For effective control of disease, implement policies that warn local or state health authorities promptly of a

suspected or confirmed COVID-19 outbreak. It would be beneficial to nominate a team or individual from the facility be named to collect and disseminate information inside the facility to public health authorities and HCWs.

16. Infrastructure Readiness for COVID-19 Preparedness

As a severely ill proportion of COVID 19 patients need critical care interventions, precise groundwork is desired in ICUs. This preparation comprises an assessment of ICU bed strength, the aptitude to expand ICU-level bed capacity with alternate units, such as step-down post-anesthesia care units, mechanical ventilator stock, and supply chains, and the logistics of isolating and cohorting patients. During the influenza pandemic in 2009, unconventional modalities such as extracorporeal membrane oxygenation (ECMO) were adopted for numerous patients with severe acute respiratory distress syndrome (ARDS). Standards to practice ECMO for COVID-19 (resources allowing) should be established at ARDS managing units Furthermore, hospital strategies concerning crisis standards of care and provision of unusual possessions should be established.

Lesson learned from influenza outbreak, studies suggested that HCWs safety was achievable without PAPR or N95 respirator. Furthermore, CDC recommended masks environmental hygiene, and hand hygiene for the safety of HCWs. Numerous further questions and alarms remain, particularly in high-risk areas and clinical settings.

In the emergency unit, crowding was a major issue, strict implementation of recommended precautions for every patient with respiratory disease is needed, place a surgical mask on the arrival of the patient, supply tissue papers, endorse cough etiquette, ensure hand hygiene, and overall surface decontamination.

Supporting Exhausted and Anxious Frontline Healthcare Workers: Strategies for Resilience and Well-being

It is possible through the amalgamation of administrative approaches, engineering controls, continuous medical education of hospital staff, and proper use of PPEs.

The standard precautionary measures should be used knowing that every patient is possible to have an organism infection that may spread through the system of healthcare. Following standard precautions should be taken to instruct, enable and supervise all personals belongs to a health care facility, patients, and their caregivers.[21]

According to WHO the management of HCWs varies according to risk classifications. COVID 19 high-risk HCWs shall stop direct patient care for a minimum period of 14 days after the last exposure with laboratory-confirmed COVID 19 case. Exposed HCWs should also proceed for COVID 19 testing and self-quarantine for 14 days is recommended.

Health care facilities shall provide psychological support during quarantine or the whole disease period along with financial/job compensation. After quarantine, every HCWs shall train on IPC strategies.

Similarly, all those HCWs at low risk for COVID 19 shall monitor temperature and respiratory symptoms for 14 days after the final exposure with laboratory-confirmed COVID 19. Positive case, in case of any COVID 19 related symptom immediately call to a respective health care facility. HCWs must follow standard precautionary measures for all patients while strengthening contact and droplet safeguards when treating acute respiratory illness. Although COVID 19 is not an airborne virus however airborne protective measures shall Reinforce when proceeding with any aerosol-generating actions COVID 19 suspect/confirmed cases as well as reinforce the balanced, precise, and regular use of PPEs. HCWs should also follow five-step hand hygiene practice and respiratory etiquette.[22]

In Solidarity: Supporting Healthcare Workers Fighting COVID-19

In conjunction with personal safety, HCWs are concerned about the transmission of the infection to their families. The social distancing protocols, school closures, disrupt food supply and other needs of other essentials will drastically affect the HCWs owning elder parents and young children. Although the health care system of the globe could be possibly working at its maximum capacity for the last several months, while the health care force, despite wards or ventilators, cannot be instantly manufactured or run at 100% tenancy for extensive durations of time. It is critically very important that governments should see HCWs not merely as pawns to be positioned, but as living human beings. Worldwide, the safety of HCWs should be guaranteed. The Adequate supply of PPEs is just the first phase; other useful actions must be reflected, comprising abandoning non-essential events to priorities resources including the provision of food additionally rest as well as family support; and most

importantly psychological support. Healthcare workers are a valuable resource presently in every country on the globe. Multiple reports have proven the disease spread from asymptomatic individuals to their many family members; highlight the necessity for deterrence of cross-infection. There are significant consequences of delayed diagnosis of COVID 19 suspects, HCWs should cogitate themselves at imminent risk of exposure. Self-monitoring of HCWs is recommended, if there is any sort of infectious symptom it should report and self-quarantine is the best solution, stop direct patient care, to maintain workforce safety as the top priority, training of barrier precaution and hygiene practices is recommended, furthermore when testing, vaccination, and treatments become available, HCWs should be a priority.[23]

As practically it is difficult to eliminate the entire risk, but careful adjustments may be defensible, new places may need physician and nurse expertise, including telemedicine services, patient advice lines, and augmented telephone triage systems. Knowing the risk of HCWs shortages, partial stoppage of medical meetings, conferences, non-essential travel is recommended.[24,25]

Conclusion

Origin of SARS-CoV-2 outbreak was disastrous with the relative potential for human-to-human transmission through droplet contamination as well as direct contact. There has no clear cure and vaccine, except that a new antiviral has hope. Prevention and control of infections is, therefore, the key to addressing this health problem, which includes the new updated SOP of SARS-CoV-2 prevention and control of infections. Sufficient use of PPE, daily hand hygiene and proper waste management can also reduce the risk of infection. Frequent environmental cleaning and decontamination can break the chain of transmission.

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