

Handling the pandemic our way: A qualitative content analysis of the guidelines issued by Apex Institutes of National Importance (INIs) of India to combat COVID-19 crisis

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ABSTRACT

Introduction: The Coronavirus disease 2019 (COVID-19) pandemic created havoc within a few weeks of its outbreak affecting over 100 countries. The rapid increase in the established cases urged for the prevention and control of COVID-19 belligerently on both national and worldwide fronts to prevent the healthcare systems from collapsing. For the sake of successfully preventing and restricting a fatal pandemic outbreak such as COVID-19, it requires the apex health institutions to have a uniform, urgent, flexible and effective policy response framework ensuring strict adherence too. In this regard, the Apex Institutes of National Importance in India (INIs) have released a series of documents on COVID-19 prevention and management. **Methods:** Documents regarding COVID-19 preparedness and management were retrieved from the official websites of the INIs in India. The general population and healthcare workers' guidelines, standard operating procedures (SOPs) on COVID-19 prevention and management, action and response plans were included in the study. The full text of each document was analysed in detail and themes and subthemes were derived through content analysis. **Results:** A total of 68 documents was included in the study. Five major themes and 12 subthemes were formulated after content analysis. A major similarity was found across all INIs on screening and testing and infection prevention control measures. The INIs formulated guidelines adhering to the World Health Organization, Indian Council of Medical Research and Ministry of Health and Family Welfare Recommendations. **Conclusion:** Common measures like quarantine, social distancing, travel bans and mass gathering restrictions were adopted to prevent the spread of COVID-19 during the initial period. The INIs have developed policies and standard operating protocols on COVID-19 management based on the Government of India guidelines. Better understanding of these guidelines will help in effective implementation of the nationwide pandemic management.

Keywords: Content analysis, COVID-19, guidelines, INIs, pandemic

Introduction

It is evident to most of the world by now that the Coronavirus disease 2019 (COVID-19) is caused by a newly emergent

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Received: 06-02-2021

Revised: 01-07-2021

Accepted: 05-07-2021

Published: 29-11-2021

Coronavirus that was first reported in Wuhan, China, in December 2019. It is a beta Coronavirus closely linked to the severe acute respiratory syndrome (SARS) virus.^[1] The World Health Organization (WHO) declared the outbreak of COVID-19 as a pandemic on March 11, 2020.^[2] COVID-19 has spread more quickly around the world as compared to SARS and Middle East Respiratory Syndrome Corona virus (MERS).^[3] As per a WHO report, worldwide, approximately 180,492,131

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How to cite this article: George TJ, Shafqat N, Verma R, Bali S. Handling the pandemic our way: A qualitative content analysis of the guidelines issued by Apex Institutes of National Importance (INIs) of India to combat COVID-19 crisis. J Family Med Prim Care 2021;10:4054-65.

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_263_21

COVID-19 confirmed cases and 3,916,771 deaths have been reported. India is the second leading country after the United States of America based on the identified COVID-19 cases and experienced a massive surge of COVID-19 cases during the second wave. In India, 30,316,897 confirmed cases of COVID-19 and 397,637 deaths due to COVID-19 have been reported. Since the start of the second wave, the highest number of COVID-19 cases have been identified in India.^[4] The Second wave of COVID-19 in India overwhelmed the healthcare system and experienced an acute shortage of critical drugs and medical oxygen.

COVID-19 is distinct from SARS, MERS and influenza disease and the virus responsible for COVID-19 differs in terms of community spread and severity. Human society, public health and the environment have experienced many unexpected challenges due to COVID-19. Planning, preparedness, readiness and response actions play an essential role in mitigating the effects of COVID-19, along with an awareness of scientific and public health knowledge.^[5] Various mitigation strategies including complete or partial lockdown, travel bans, mass gathering restrictions, home quarantine within communities and other non-pharmacological interventions were adopted to contain the COVID-19 spread in India.^[6] Guidelines from the government institutions provide a fundamental resource for communities, as they guide the citizens on how to protect themselves and also provide a critical direction for policymakers and healthcare professionals for taking action to slow the spread of COVID-19.

The Institutes of National importance (INIs) in India play a significant role in developing highly skilled personnel within the specified region of the country or state and receive special recognition and funding from the Government of India. These institutes operate autonomously under the Ministry of Health and Family Welfare. All the apex institutions of India (INIs) released a series of documents to fight against the COVID-19 pandemic, which played a very pivotal role in the management of different aspects of COVID-19 including COVID-19 preparedness, planning and implementation of a varied range of management policies and protocols. These documents have contributed significantly in guiding the COVID-19 pandemic preparedness, providing multilevel pandemic prevention, formulation of the control network, implementation of appropriate infection prevention and control (IPC) measures, and clinical management of COVID-19. Despite their valuable efforts, there is a considerable lacuna in the understanding of the changes in the guidelines issued by these institutes regarding the COVID-19 pandemic management. In this context, this article compares the guidelines and standard operating procedures (SOPs) issued by INIs in India on the COVID-19 prevention and management through content analysis and theme assessment of the guidelines. For the proper management and handling of the pandemic situations across the board, we need uniform guidelines and policies, so that professionals at the operational level perform efficiently and successfully. The slightest variation in the policies and guidelines or protocols may lead to many

management issues and can change the course of action and outcomes. So, there is a need for uniform guidelines and policies for the management of the COVID-19 pandemic. This study was planned to assess the adherence of the INIs towards the standard public health policies, guidelines and protocols for the management of the COVID-19 pandemic across India. We aimed to explore the differences and similarities between the general public guidelines and healthcare professional guidelines released by the INIs in India on the COVID-19 management, and, to explore the uniformity adherence and deviations from the gold standard guidelines by the WHO, the Indian Council of Medical Research (ICMR) and the Ministry of Health and Family Welfare, Government of India (GoI).

Materials and Methods

The present review focused on document analysis of the general public guidelines and healthcare professional guidelines released by the INIs in India to evaluate the similarities and differences between the COVID-19 management guidelines. Members of the research team reviewed documents from publicly available official websites of the INIs in India.

The medical institutions of India listed on the website of the department of higher education, Ministry of Human Resource Development, GoI were included as INIs in India. These institutions include all apex institutions of India namely the seven All India Institute of Medical Sciences (AIIMS), Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, and Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum.^[7] The Documents about the COVID-19 pandemic prevention and management published from January 1, 2020, to June 30, 2021, were retrieved from the official websites of the INIs in India. The guidelines from the government websites were available in different formats, including general population and healthcare workers' guidelines, SOPs on COVID-19 prevention and management, action and response plans. Full text of each document was downloaded and screened as per the predetermined criteria. Guidelines and documents from nonofficial websites, social media, newspapers, editorials and peer-reviewed articles were excluded from the study.

The team reviewed the official websites of the INIs in India to obtain information related to the COVID-19 guidelines. After reading the full text, the basic information of the included documents was described. Each document was analysed to determine the extent to which the COVID-19 management guidelines described and identified the themes and subthemes for analysis.

Data analysis

A total of 68 documents were included in the study. Data analysis included a list of codes (themes and subthemes) and appraising and synthesising texts from guidelines, which were then organised into major themes and subthemes through content analysis. The

content analysis within the team was facilitated by a face-to-face meeting. Researchers assessed data for differences, similarities and frequency across the COVID-19 guidelines issued by the INIs in India.

Results

THEME: Disaster preparedness

Subtheme 1: COVID-19 taskforce and development of COVID-19 speciality units

When analysing the guidelines on disaster preparedness, all the INIs developed a COVID task force comprising members from various disciplines for coordination of various activities related to the COVID-19 management. Apart from this, as a part of disaster preparedness, the INIs decided to establish adequate facilities for treating the COVID-19 patients by converting the existing healthcare infrastructure to COVID-19 specific wards and ICUs and also by the closing of the routine OPDs to redirect resources to control the COVID-19 outbreak. All the INIs established special wards and blocks for the management of the COVID-19 patients.^[8-10] Most of the INIs issued circulars for closing the routine OPDs including speciality services and for postponing all non-essential and elective procedures and surgeries. But, specific order on the closure of OPDs and the establishment of separate facilities on the COVID-19 pandemic management in AIIMS, Rishikesh and Jodhpur is not available on the official websites.

JIPMER, Puducherry, prepared a 300-bedded newly-built super speciality block annexe with 30 ICU beds and 110 beds with piped oxygen supply for treating COVID-19 patients.^[11] Moreover, SCTIMST and Modulus (a start-up in the IITM Research Park) decided for collaborative endeavours for developing deployable isolation hospitals to fight COVID-19.^[12]

Subtheme 2: Guidance and education for the general public

Increased awareness and education can encourage the general public to take active measures to become advocates for pandemic prevention and control in homes and communities by adopting safe and healthy practices. Adequate and accurate information about COVID-19 reduces psychological trauma, fear and anxiety. All INIs in India issued various guidelines and public education materials for the general public to raise their awareness on the COVID-19 management. AIIMS Delhi,^[13-15] Raipur,^[16] and JIPMER, Puducherry,^[17] issued public information materials on COVID-19 in regional languages and English. But AIIMS, Jodhpur,^[18,19] and SCTIMST prepared public education guidelines in English. AIIMS, Rishikesh, released public education material on COVID-19 in Hindi.^[20] AIIMS, Rishikesh,^[21] and AIIMS, Raipur,^[22] published information guidelines in the form of questions and answers. JIPMER, Puducherry, also published a special advisory for the public on the management of stress during the COVID-19 pandemic.^[23] AIIMS, Jodhpur, has initiated programmes like Namaste campaign, No mask no entry and Badlav—A step towards sustainable behaviour change to raise

public awareness on COVID-19 prevention.^[24] the ‘Namaste campaign’ initiated to achieve a handshake-free hospital by focusing on the importance of hand hygiene. ‘Badlav—A step towards sustainable behaviour change’ was initiated to attain a positive behaviour change among the general population by adopting health-promoting skills to fight COVID-19. Additionally, AIIMS, New Delhi and JIPMER, Puducherry, has issued a special advisory for the protection of senior citizens during the COVID-19 times with instructions for senior citizens and caregivers.^[25] Most of the INIs also prepared instructional videos on the COVID-19 management for improving public awareness.

Subtheme 3: Triage and mock drill

It is very important to implement effective triaging to prevent the transmission of SARS-CoV-2 to patients and healthcare workers. Furthermore, during an infectious disease outbreak, triaging plays a vital role to separate the patients likely to be infected with a particular pathogen. All the INIs established special areas for examination and screening of the COVID-19 suspected and confirmed cases. While comparing disaster preparedness strategies, only AIIMS, Delhi, Patna^[9] and Bhubaneswar^[8] published separate guidelines on triaging of the COVID-19 patients and categorisation of patients based on severity. JIPMER, Puducherry, released the SOP on fire safety preparedness and fire mock drill with guidelines for emergency evacuation, steps to be performed during a fire mock drill procedure and SOPs for ‘CODE RED Uncontrolled’ fire or rescue-related calls.^[26] AIIMS, Raipur, organised a preparedness mock drill for better management and control of COVID-19 cases.^[27]

THEME: Screening and testing

Subtheme 1: Screening criteria

While analysing the screening testing criteria of COVID-19, AIIMS, Delhi, has taken precautionary measures immediately after the outbreak of COVID-19 in Wuhan, China, by releasing guidelines with a clear definition of the cases, contacts and sample collection procedures. As per this, the nasopharyngeal and oropharyngeal swab was collected for 2019-nCoV by Real-Time– Polymerase Chain Reaction (PCR) only for symptomatic persons with a history of travel to China and symptomatic or asymptomatic persons with a history of travel to Wuhan, China.^[28]

However, later, most of the INIs followed the ICMR and Ministry of Health and Family Welfare, GoI guidelines for COVID-19 testing which includes a definition of a suspect and laboratory-confirmed case, high-risk and low-risk contacts, designated screening area, screening questionnaire, screening and holding area.^[8,9,29,30] According to these guidelines, RT-PCR was done within 7 days for all symptomatic Influenza Like Illness (ILI) cases and high-risk contacts were tested between day 5 and day 14 of contact. The oropharyngeal and nasopharyngeal swab was collected for PCR testing and bronchoalveolar lavage, tracheal aspirate or sputum collection was advised if the lower

respiratory specimen collection was needed. The respiratory samples should be collected in proper containers and should be sealed and made leak-proof using a parafilm and absorbent material. It must be appropriately labelled and secured in a zip-lock pouch further placed in a sturdy plastic container and its neck should be sealed with a biohazard label. AIIMS, Patna, has issued guidelines for rapid antibody testing for persons with symptomatic influenza-like illness in containment zones and large migration gatherings.^[9] Especially, SCTIMST, Trivandrum, has developed Reverse Transcription Loop Mediated Isothermal Amplification (RT-LAMP) for COVID-19 testing^[31] and a magnetic nanoparticle-based RNA extraction kit for use during the testing for the detection of COVID-19.^[32]

SCTIMST, Trivandrum, given only patient risk grading according to exposure and no separate screening criteria were mentioned for COVID-19 suspected cases.^[33,34] Furthermore, AIIMS, New Delhi^[35] and JIPMER, Puducherry,^[36] developed separate guidelines for perioperative screening and testing for perioperative management of suspected or positive COVID-19 patients. But specific screening and testing criteria for the COVID-19 suspected patients are not available on the official websites of AIIMS Bhopal, Rishikesh, Raipur and Jodhpur.

Subtheme 2: Specimen collection and transportation

AIIMS, New Delhi and JIPMER, Puducherry, have prepared separate SOPs for the collection and handling of haematology, histopathology and cytopathology samples of COVID-19 suspected and confirmed cases.^[37,38] As per the guidelines, all specimens should be labelled clearly and must be received in a large plastic box with a biohazard label (COVID-19) and all histopathology specimens should be processed only after 24 h of fixation in formalin. Centrifugation, vigorous shaking and mixing of the haematology specimen were not advised. But in JIPMER, Puducherry, bio-safety cabinet level II was advised for the centrifugation of the cytopathology specimens and all fresh or partially-fixed specimens. JIPMER, Puducherry, has given separate SOPs for collection, packaging, transport and processing of blood samples of COVID-19-suspected and COVID-19-positive cases for haematology investigations, biochemistry investigations and coagulation studies.^[34,39,40] All samples should be packed in a zip-lock bag or plastic container, labelled with a biohazard symbol and the persons who are handling the samples should wear Personal Protective Equipment and follow all biosafety precautions. But, no specific guidelines for collection and transportation of haematology, histopathology and cytopathology samples of the COVID-19 suspected and confirmed cases are available from the official websites of AIIMS, Bhopal, Patna, Bhubaneswar, Jodhpur, Raipur and Rishikesh.

THEME: Infection prevention and control protocols

Subtheme 1: Quarantine and isolation

AIIMS, Delhi,^[41] Raipur,^[42] Rishikesh,^[43] Bhubaneswar,^[8] Patna^[9] and SCTIMST, Trivandrum,^[44] have given 14 days home quarantine guidelines for the COVID-19-suspected contacts. JIPMER, Puducherry, has given a recommendation of 14 days

of quarantine of exposed healthcare workers in a designated setting along with psychosocial support through social workers and support groups.^[45] Additionally, AIIMS, Raipur, has given separate quarantine guidelines for institutional quarantine for healthcare workers including instructions for contacts, family members, environmental sanitation, duration and instructions to be followed after the quarantine.^[46] Moreover, AIIMS Delhi,^[47] Patna,^[9] and Bhubaneswar^[8] have given separate guidelines for home isolation of asymptomatic and mild COVID-19 patients and healthcare workers as per the Ministry of Health and Family Welfare, GoI guidelines. Home quarantine was advised for COVID-19-positive healthcare workers below 60 years of age, having no comorbidities and ready to monitor health status. AIIMS, Delhi, issued a separate quarantine policy for healthcare workers exposed to COVID-19-positive patients with or without personal protective equipment (PPE). The policy recommended COVID-19 testing between days 5 and 14 or anytime if the symptoms appeared.^[48] On the other hand, AIIMS Bhopal has not given any specific quarantine guidelines.

Subtheme 2: Hand Hygiene and respiratory hygiene

Hand hygiene is very important for the prevention and control of COVID-19. SOPs issued by AIIMS, New Delhi,^[49] Patna,^[9] Bhubaneswar,^[8] and JIPMER, Puducherry,^[50] emphasised the importance of hand hygiene with alcohol-based hand rub and soap and water for preventing COVID-19 with duration, steps of handwashing and indications for the use of hand rub and handwashing with soap and water. Hand rub was recommended if the hands are not visibly dirty or not contaminated. No specific guidelines on hand and respiratory hygiene are available on the official websites of AIIMS Bhopal, Jodhpur and Rishikesh.

Subtheme 3: Personal Protective Equipment

AIIMS, Delhi,^[49] Patna^[9] and Bhubaneswar,^[8] have given guidelines for the rational use of PPE in different COVID care areas for each category of healthcare personnel based on the types of procedures to be performed. The healthcare workers involved in the direct care of patients should use gowns, gloves, N-95 masks and goggles or face shields. These policies mentioned the principles of PPE use, specific guidelines for the use of different types of PPE and steps of PPE donning and doffing. SCTIMST, Trivandrum,^[33,34] has given PPE usage guidelines according to the patient risk category and type of procedures to be carried out (aerosol-generating procedures or not). This emphasises the measures to be taken while performing aerosol-generating procedures in the operating rooms (ORs), Cath labs and ICUs for healthcare workers to prevent the generation of aerosols. Besides this, AIIMS, New Delhi, has given guidelines for the extended use of five N-95 masks for 20 days by healthcare personals involved in non-COVID areas based on the Centre for Disease Control and Prevention (CDC) guidelines.

Subtheme 4: Biomedical Waste Management

AIIMS, Delhi,^[51] Bhubaneswar,^[8] Patna^[9] and JIPMER, Puducherry,^[50] released guidelines with an emphasis on the steps to ensure safe handling and disposal of biomedical waste in

COVID-19 patient-care areas. All COVID-19 biomedical waste has to be collected and segregated in double-layered colour-coded polythene bags and labelled as COVID-19 waste. AIIMS, Delhi, developed a separate proforma for the management of COVID-19 biomedical waste. SCTIMST, Thiruvananthapuram, especially developed canister bags lined with a super-absorbent material containing an effective disinfectant named 'AcryloSorb' for disposing of respiratory secretions of patients suffering from highly contagious diseases like COVID-19 and tuberculosis. These canister bags can absorb 500 mL of secretions and solidify them immediately and the whole system will be decontaminated within no time due to the presence of the disinfectant.^[52] However, no specific guidelines on COVID-19 biomedical waste management are available on the official websites of AIIMS, Bhopal, Jodhpur, Rishikesh and Raipur.

THEME: Healthcare worker safety and preparedness

Subtheme 1: Medical risk stratification and insurance coverage for healthcare workers

Healthcare workers are at high risk for developing SARS-CoV-2 infection because of greater exposure to the COVID-19 confirmed cases in the healthcare setting. JIPMER, Puducherry,^[53,54] and AIIMS, Patna,^[55] have given risk stratification based on age and comorbid disease conditions and persons with comorbidities were exempted from COVID duty on the basis of medical ground after a medical board review. JIPMER, Puducherry,^[54] also issued guidelines for health monitoring of staff by checking temperature when reporting for duty and at the end of a shift. A questionnaire was administered to the healthcare workers on COVID-19 symptoms as well as potential contacts outside duty hours when reporting for duty and possible contact with patients and breach in PPE use at the end of the shift. Based on this, the healthcare workers exposed to COVID-19 were categorised as low-risk category, medium-risk category and high-risk and the management was done according to the risk categorisation.^[54] The Ministry of Health and Family Welfare announced the Pradhan Mantri Garib Kalyan Package for healthcare workers fighting COVID-19 to cover insurance of 50 lakhs for 90 days.^[56-58]

Subtheme 2: Training programme for healthcare workers

Healthcare workers' training on the best practices and guidelines are considered an integral part of disaster preparedness to ensure safety. AIIMS, Delhi, has successfully planned and implemented training for faculty, residents, interns, nurses, technicians, paramedical staff, housekeeping and other support staff for effective COVID-19 management by forming a special training committee with an emphasis on practices to prevent COVID-19 infections and delivery of quality intensive care to the patients.^[59]

AIIMS, Patna, has made arrangements for compulsory training for all Corona warriors to ensure safety and prevention of COVID-19.^[9] AIIMS, Rishikesh^[60,61] and AIIMS, Bhubaneswar have published information on COVID-19 management for healthcare professionals. AIIMS, Bhubaneswar^[8] and Patna^[9] have developed mental health interventions to address the

psychological needs of the staff during COVID-19. AIIMS, Delhi, has issued an advisory for the healthcare personals to ensure self-care and well-being during COVID-19.^[62] No relevant data are available from the websites of other INIs on the training of healthcare workers on COVID-19.

Subtheme 3: Quarantine and postexposure prophylaxis

Public health strategies to minimise the transmission of rapid COVID-19 infection includes observation and quarantine for 14 days. All the INIs have issued strategies for quarantine for exposed healthcare workers and other persons to reduce the COVID-19 spread. JIPMER, Puducherry, has released guidelines to ensure social contact of healthcare workers during the quarantine period by instructing social workers and buddies to regularly contact them during the quarantine period.^[55]

AIIMS, Patna, has also issued occupational exposure guidelines for healthcare workers' skin exposure, mucous membrane exposure, sharp object injury and direct exposure of the respiratory tract. All the healthcare workers with occupational exposure other than intact skin exposure were quarantined for 14 days.^[9] AIIMS, Bhubaneswar^[8] and Patna^[9] have given home isolation for asymptomatic COVID-19-positive healthcare workers below 60 years with no comorbid conditions, having isolation facilities in the home and ready to monitor his or her health conditions. Hydroxychloroquine was recommended for the prophylaxis of COVID-19 after an initial Electrocardiogram (ECG) evaluation.^[8,9,63]

THEME: Management of COVID-19

Subtheme: Medical management

AIIMS, Bhubaneswar,^[8] Patna,^[9] and JIPMER, Puducherry^[63] have stratified cases according to severity as mild, moderate and severe. Medical management was prescribed as per the category. Mild cases were symptomatically managed with adequate hydration. Home isolation for 14 days was recommended for very mild or asymptomatic cases as per the Ministry of Health, GoI guidelines. Moderate cases were managed with oxygen support, antivirals and anticoagulation as per AIIMS, Patna, guidelines.^[9] But steroids were added in the management of moderate cases in AIIMS, Bhubaneswar, management guidelines.^[8] Severe cases were managed with invasive ventilation, steroids and anticoagulation. As per the Ministry of Health and Family Welfare, GoI guidelines, investigational therapies like convalescent plasma, Ramdesivir, Tocilizumab and hydroxychloroquine were also considered in the management protocol. But no specific guidelines on COVID-19 management are available on the websites of AIIMS, Bhopal, Jodhpur, Raipur and Rishikesh.

Subtheme 2: Special management and supportive therapy

AIIMS, Delhi and JIPMER, Puducherry^[31,63] have published airway management protocols during COVID-19 with guidelines for avoiding bag valve masks, and prolonged ventilation to reduce aerosols. Intubation was not advised before complete neuromuscular blockade.^[64] SOPs of AIIMS, Patna^[9] clearly

described indications for oxygen therapy and mechanical ventilation. Non-invasive ventilation was discouraged due to the chances of aerosol generation. AIIMS, Patna^[9] and Delhi^[65] have given special Cardiopulmonary Resuscitation (CPR) algorithms for the COVID-19 patients.

AIIMS, New Delhi, released guidelines for postoperative care in COVID-19 patients with an emphasis on the performance of rounds, wound management and medications with full PPE, adequate distancing between patient beds, and daily assessment of fever and respiratory symptoms.^[66] AIIMS, Delhi, has also given protocols for screening COVID-19 hospitalised patients for hyperglycaemia at the time of admission and before starting steroids, for initiating oral hypoglycaemics and insulin for newly diagnosed patients and management guidelines for patients already on treatment.^[67,68] AIIMS Bhubaneswar,^[8] AIIMS Patna,^[9] JIPMER Puducherry^[69] have issued management protocols for pregnant women with COVID-19. AIIMS, Bhubaneswar,^[8] and Patna^[9] SOP also specified neonatal care for COVID-19-suspected or COVID-19-confirmed babies. JIPMER, Puducherry has published a special SOP for the management and care of COVID-19-positive and COVID-19-suspected neonates with guidelines for breastfeeding, respiratory support and ICU management.^[70] In addition to this, JIPMER Puducherry provided guidelines for the management of suspected or confirmed COVID-19 patients with renal disease based on the ICMR recommendations.^[71]

Discussion

Healthcare delivery systems around the world faced many challenges during the COVID-19 time to deliver quality routine health services to people due to the additional burden of managing COVID-19 cases. Guidelines from apex INIs of India provide a base for the community as they guide and direct people on how to safeguard themselves against COVID-19 and also offer critical direction for healthcare professionals and policymakers for taking action to slow the spread of COVID-19. The success of different strategies adopted to reduce the spread of COVID-19 depends on strict adherence of the general public to the guidelines released by the GoI, WHO and ICMR on the COVID-19 prevention policies.^[6,72] Both primary and secondary preventive strategies play a key role in the successful management and containment of COVID-19. The primary preventive strategies adopted by the INIs in India include surveillance, monitoring, contact tracing, quarantine and activities to raise public awareness. INIs in India released many public health education materials on various aspects of COVID-19 prevention based on the Ministry of Health, GoI guidelines. The mortality rate of COVID-19 was higher among the elderly as compared to the young adults and paediatric population.^[71] So, to ensure the protection of the elderly, AIIMS, New Delhi and JIPMER, Puducherry have released a special advisory for senior citizens. Furthermore, to prevent the spread of COVID-19, the INIs have implemented strict surveillance, monitoring, contact tracing, quarantine and screening for COVID-19 according to

the World Health Organization^[73] and GoI protocols.^[74] Most of the INIs (78%) followed the Ministry of Health and Family Welfare guidelines for quarantine protocols to prevent the spread of COVID-19. Even though JIPMER Puducherry has issued an SOP to maintain social contact of the quarantined people, specific quarantine guidelines are not available on the website. Additionally, AIIMS, Patna, Raipur, Delhi and Bhubaneswar issued home isolation protocols for mild and asymptomatic cases in accordance with the Ministry of Health, GoI revised guidelines^[75] and WHO guidelines.^[76] SCTIMST, Trivandrum especially developed deployable isolation hospitals to meet the increasing healthcare demands due to COVID-19. Besides this, SCTIMST, Trivandrum developed a COVID-19 dashboard to evaluate the application of data science and epidemiological methods to monitor the transmission dynamics and to track the spread of COVID-19. This dashboard helps to identify epidemic curves, epidemic parameters, vaccination and projections for the COVID-19 pandemic throughout the country.^[77] AIIMS, New Delhi has initiated national teleconsultation services with doctor consultations and medical advices to the public by the residents, students and staff of AIIMS, New Delhi.

At present, the remedial alternatives are exceptionally constrained and there is no endorsed antibody or antiviral medication for viably treating the Novel Corona Virus disease.^[78] Therefore, vaccination against COVID-19 is considered an important primary prevention method to protect a person against the disease and to prevent the spread of the disease. The GoI officially launched the COVID-19 vaccination programme in India on January 16, 2021, to provide a long-lasting solution by enhancing immunity and to contain the disease spread. For the successful implementation of the vaccination programme at various levels, the GoI has developed operational implementation and communication strategies and guidelines.^[79] According to the Ministry of Health and Family Welfare, GoI, a total of 32,90,29,510 doses of COVID-19 vaccine were administered.^[80] India has vaccinated a very low population, and therefore, it is of utmost priority to develop short- and long-term strategies to vaccinate the whole population of India and to end the pandemic. The GoI revised the national COVID-19 vaccination programme with the involvement of the private hospitals with payment for the vaccination.^[81] All INIs are being actively involved in the nationwide implementation of the vaccination programme. But specific guidelines or policies related to the regional level planning and implementation of the COVID-19 vaccination programme is not available on the official websites of INIs.

It is of utmost importance to follow strict IPC practices to contain the spread of COVID-19. Strict IPC measures and proper use of PPE are considered the gold standard in the prevention of COVID-19. During the COVID-19 pandemic, hand hygiene, respiratory hygiene and compliance with PPE are the key concerns for the healthcare workers' safety. The guidelines released by the GoI on the rational use of the PPE kits for COVID-19 focuses on using gloves, coveralls or gowns, goggles, N95 masks, shoe covers, triple-layer medical

masks and headcovers based on risk assessment.^[82,83] Safe and proper disposal of the used PPE is recommended in the GoI's biomedical waste (BMW) management rules, 2016, and the Central Pollution Control Board (CPCB) guidelines.^[84] The WHO also released IPC strategies including standard precautions, hand hygiene and respiratory hygiene and type of PPE based on the procedure to be performed, setting and personnel and healthcare workers' risk assessment and testing for COVID-19 based on exposure.^[85,86] The COVID-19 IPC practices adopted by most of the INIs of India were based on the GoI and WHO guidelines. SCTIMST, Trivandrum protocols on PPE use by healthcare workers were based on the American and Australian Society of Anaesthetists Guidelines.^[33,34] Specific IPC protocols related to COVID-19 are not available on the websites of the AIIMS, Bhopal, Jodhpur, Raipur and Rishikesh.

Screening, testing, quarantine and monitoring of the suspected cases are considered as effective secondary preventive strategies to prevent the spread of COVID-19. Early detection and diagnostic testing were vital in tracking the COVID-19 virus. The Ministry of Health, GoI guidelines for screening and laboratory testing for COVID-19 suspected and confirmed cases were central in protecting the public from the virus. The INIs in India followed the GoI and ICMR^[87,88] guidelines for screening and testing the COVID-19 cases. While reviewing the screening and testing guidelines, 45% of the INIs followed the revised ICMR and GoI guidelines. Specific guidelines on screening and testing are not available on the websites of AIIMS, Bhopal, Raipur, Rishikesh, Jodhpur and SCTIMST, Trivandrum. However, many factors like the lack of adequate material and workforce resources have affected the screening and testing due to the rapidly increasing number of cases especially in the rural areas of India in the later period of the outbreak of COVID-19.^[89]

While analysing COVID-19, SOPs and guidelines released by the INIs of India, tertiary prevention and rehabilitation of COVID-19 were not addressed by majority of the institutions. AIIMS, Raipur has issued guidelines for pulmonary rehabilitation of the patient after the COVID-19 infection.^[90] But other aspects of rehabilitation were not given importance in the rehabilitation guidelines published by AIIMS, Raipur. AIIMS, Patna has developed a video on the rehabilitation of the patient after COVID-19 with a focus on the various rehabilitative aspects. AIIMS, Bhopal has published a post-COVID rehabilitation booklet in the regional language.^[91] Even though tertiary preventive strategies play a significant role in rehabilitating patients with clinical diseases and reducing complications, it was not given priority and importance in formulating various guidelines and policies for managing COVID-19.

The current study has limitations as a research team could evaluate COVID-19 management guidelines and policies that are available only on the official websites of the INIs. Many of the institutions might have prepared and circulated guidelines

internally, which were not evaluated by the research team in the present study. However, the evaluation of policies and identification of similarities and differences among them would contribute to the improvement in the policies and guidelines as well as help the decision-makers for future planning and revision of the guidelines and policies. The findings of the current analytic study are only related to the guidelines for the healthcare workers of the institutions and the general public as updated until June 30, 2021, though some guidelines may have been continuously updated beyond this date.

Moreover, guidelines and SOPs issued by the INIs were based on the recommended standards advised by the international and national bodies like the WHO and ICMR. But slight variations were noticed in the implementation and execution of some guidelines as per the institutional policy. A Uniform pattern of the execution of the policies and procedures and communication strategies would be helpful in effective nationwide management of the pandemic. The most important factor affecting successful pandemic management is the well-coordinated implementation of the various cost-effective strategies of pandemic preparedness, control and mitigation measures for controlling the pandemic globally and nationally. Surely, the INIs of India have made a significant contribution by setting high standards of care in the management of the COVID-19 pandemic by providing quality pandemic management and essential care to the affected people and by developing and enforcing various public health and health workers' guidelines and policies by creating a separate corner or link for COVID-19-related information.

Conclusion

The INIs in India played a vital role in the prevention and control of COVID-19 in India by developing COVID-19 management guidelines and protocols and providing quality care to the people. A Better understanding of the COVID-19 policies developed by the INIs in India would be helpful for the country to strengthen the COVID-19 control network. It was observed that most of the INIs have strictly followed the national and international guidelines and were vigilant towards the COVID-19 pandemic, took prompt action and updated the important and necessary guidelines, policies and protocols online on their websites for the healthcare workers as well as for the public. This has definitely shown the proactive involvement of these institutes for the better management of the COVID -19 pandemic and to halt the progression of the COVID-19 spread.

Ethical approval and consent to participate

Not applicable.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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