Experience and Challenges for Establishing Quarantine Facility for Suspected COVID-19 Cases: Field Briefing

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Abstract

Due to unprecedented SARS-CoV2 pandemic, in late January 2020, many countries in the world imposed travel ban. The governments across the world initiated repatriation operations for stranded nationals. It was important to instantly develop quarantine facilities for evacuees. As the disease was fairly new, data on it was sparse to fulfil the requirement. With this article, we are sharing our experience of establishing and managing India's first quarantine facility for repatriate nationals focusing on key parameters including infection prevention & control, environmental cleaning and bio-medical waste management along with basic living requirements. The facility housed a total of 617 evacuees from China and Italy out of who 17 turned out positive on initial testing constituting 27.55% and one tested positive on the 14th day testing. Mindful of the level of exposure 25 contacts were traced and were prescribed additional quarantine period of fourteen days in the facility and discharged accordingly. All evacuees were put on community surveillance under State Surveillance Units by the Integrated Disease Surveillance Programme. Supply of logistics, manpower management and ensuring compliance to protocols were some of the major challenges faced. Appropriate actions were designed and taken to address them. In conclusion, impeccable collaboration and coordination between different stakeholders is most essential ingredient for successful operation of any quarantine facility in the context of current pandemic.

Background

In early January 2020, a novel coronavirus (2019-nCoV) was identified as the infectious agent causing an outbreak of viral pneumonia in Wuhan, China. The first few cases with symptoms though were traced in December 2019 [1]

Like wildfire the infection spread globally and turning into an unprecedented pandemic. During the early stage of the pandemic; considering the SARS-CoV2 crisis and its ability to transmit from human to human, [2] many countries imposed travel restrictions and lockdown. Like other nations the Indian government too planned repatriation of stranded Indian nationals from the infected countries.

On arrival to India, all repatriated nationals were prescribed mandatory institutional quarantine at a designated facility for a period of 14 days followed by self-quarantine for an equal period.

As pioneers in establishing quarantine facility; by this communication we intend to share our experience of managing such facility for the repatriated nationals evacuated from China, Italy, etc. from February to April, 2020.

Main Text

Selection of Facility and Infrastructure

It was early stage of outbreak and there was paucity of scientific evidence and literature specific to natural history of disease and transmission dynamics of the infection. No approved guidelines were available for SARS-CoV2. Therefore, we relied on guidelines for evaluating homes and facilities for isolation and quarantine. We made a checklist for evaluating the quarantine facility. A newly constructed five storey building of the Indo Tibetan Border Police (ITBP) was identified as the potential site for the facility based quarantine. An expert team was constituted for the evaluation, based on criteria like location, accessibility, basic infrastructure and available space. Since ITBP building was on the outskirts of Delhi, in close vicinity of international airport and had sufficient infrastructure and space, it fitted the locational requirement of a quarantine facility.

The original purpose of the building at ITBP Chawla Camp was to use it as a transit stay for 6 soldiers per barrack. The building capacity was for 500 people with 100 on each floor. In order to maintain adequate distance between beds, three beds were arranged in each barrack and almost 32–42 evacuees per floor were housed with common toilets and bathrooms on each floor. Ancillary services like reception, nursing station, room for donning / doffing of personal protective equipment (PPE), closed-circuit television (CCTV) surveillance room, recreational activity hall and holding area for bio-medical waste were identified at ground floor. This building was cordoned off from other areas by fencing and deploying 24*7 security guards. A separate building in the campus housed the administrative office, control room, clerical room, logistics/store room, and lounge for doctors/nurses and supporting staff.

Logistic support and manpower

Logistic support for equipment; materials required for sample collection, packaging and transportation; laboratory support for COVID-19 testing including ambulance services was also provided. Human resource was arranged primarily from ITBP and other agencies like state medical colleges and govt hospitals for patient care and management, security, housekeeping services, meal preparation etc. Services had been provided round the clock by preparing duty rosters and engaging man power accordingly.

Capacity building and key activities

Furthermore, training was carried out for health care workers including doctors, nurses, paramedics, sanitary workers and auxiliary staff focussing on standard precautions, hand washing, hand hygiene, cough etiquettes and respiratory hygiene, disinfection procedures, proper donning, doffing and disposal of bio-medical waste (BMW) segregation. Specific trainings of different teams were conducted in infection prevention and control practices with special reference to COVID-19 virus according to their roles, responsibilities and nature of duties. Whenever new staff joined the team, he/she was trained at the earliest before commencing his/her duties. Key activities in **table 1** were taken into consideration for the establishment of quarantine facility, where utmost care and treatment could be provided to repatriated evacuees without compromising safety of themselves, health workers and their inmates.

Table 1
Summary of key activities considered for setting up a facility based quarantine in the context of COVID-19

S.no	Operational consideration	Challenges	Actions taken
1.	Cohort and lodging of evacuees <ul style="list-style-type: none"> 3 beds/barrack, 32- 42 evacuees/floor common toilets and bathrooms on each wing Separate buckets, mugs, bathing and cloth rinsing soap, liquid soaps for hand washing, sanitizers, water bottles, electric kettles, sleepers, water jar etc for each evacuee d. Cohort mapping done based on criteria such as family, Sex (male/female), history of travel to epicentre (Wuhan/Non – Wuhan) 	<ul style="list-style-type: none"> Separate Room with attached toilet could not be provided to each individual. However, beds kept at 1 m distance and the facility was naturally well ventilated. compliance to social distancing norms minimising sharing of articles 	<ul style="list-style-type: none"> Advisory released for evacuees Strict CCTV monitoring PAS used for immediate intervention Signage like restricted access, arrows to display functional flow used
2.	Security <ul style="list-style-type: none"> Fencing and armed guards 24x7 Record of in- out personnel at entry and exit gate CCTV surveillance 	<ul style="list-style-type: none"> Manpower rotation for 24*7 monitoring Maintenance of record 	<ul style="list-style-type: none"> Supervisors appointed for regular check
3.	Clinical examination, and referral <ul style="list-style-type: none"> Done twice in a day Two teams, each comprised of a physician, resident, nurse and a paramedic staff for morning shift, likewise one team for evening and night shift respectively on call. screened for fever, cough/sneezing, difficulty of breathing and oxygen desaturation Any Suspect manifested symptoms at any point of time were immediately referred to dedicated COVID-19 isolation facility 	<ul style="list-style-type: none"> PPE availability supplies of medicine, medical equipment Setting up Intercom telephone lines on each floor Setting up Public Address system (PAS) on each floors vehicles for patient transportation 	<ul style="list-style-type: none"> Inventory maintained and demand placed in well advance Rational use of PPE followed up (8) Improved communication between stakeholders
4.	Sample collection, packaging and transportation <ul style="list-style-type: none"> Samples collected on day1 of arrival to facility and at the end of quarantine period(14th day) Transported in cold chain and triple layer packaging Any Suspect turned out to be positive in testing were immediately referred to dedicated COVID-19 isolation facility 	<ul style="list-style-type: none"> supply of logistics viz PPE, materials required for sample collection, packaging and transportation Skilled medical personnel vehicles for transportation 	<ul style="list-style-type: none"> Inventory maintained and demand placed in well advance b. Necessary trainings in cooperated c. Improved communication between stakeholders
5.	Food supply <ul style="list-style-type: none"> Separate entry for kitchen staff Dining hall at each floor Disposable crockery and cutlery Decontamination of Non disposable articles Tables placed at 1 m distance and reserved for a single person use. Cleaning of furniture, floor, water taps, shared utensils between two batches 	<ul style="list-style-type: none"> Supplies of groceries Decontamination of Non disposable articles Cleaning between two batches 	<ul style="list-style-type: none"> Protocol developed for decontamination procedure Supervision enhanced
6.	Mental health and recreational activity <ul style="list-style-type: none"> Wi-fi internet services Periodically counselling by clinical psychologist for evacuees, 	<ul style="list-style-type: none"> Compliance to safe distancing practices 	<ul style="list-style-type: none"> Scope of television was dismissed due to violation of safe distancing practices by passengers

	medical and non-medical teams			
	· television and indoor games			
7.	Infection prevention and control(4)	<ul style="list-style-type: none"> · Training on proper donning, doffing and disposal of PPE, standard precautions, hand washing, hand hygiene, cough etiquettes and respiratory hygiene · Designated route for movement · Disinfection of Medical devices in between evacuees. (4,9) · Disinfection of ambulances after every use · Foot mats, carpets, curtains, horticulture décor stuff etc. were removed · Foot operated covered dustbin 	<ul style="list-style-type: none"> · Giving periodic training especially whenever new member joined · Supervision for implementation of protocols · Disagreement with guideline or specific recommendation, lack of commitment, motivation and awareness 	<ul style="list-style-type: none"> · Capacity building of trainers · Supervisory team comprising of nursing officer and sanitization officer established for regular supervision and communication · Counselling
8.	Environmental cleaning(4)	<ul style="list-style-type: none"> · Sweeping with broom was avoided · Mopping from far corner of room to the exit door · Frequently touched surfaces wiped with damp cloth daily · Toilet floor, commodes, wash basins, sink etc cleaned with 1% hypochlorite twice daily. · Terminal cleaning between two quarantined batches 	<ul style="list-style-type: none"> · Supplies of PPE (heavy duty rubber gloves and Gum boots) · Disinfection of tools used for cleaning · Supervision for cleaning, hygiene and sanitation methods · RLU measurement in ATP swab system or microbial methods like aerobic colony count, MRSA count could not be exercised for determination of efficacy of cleaning 	<ul style="list-style-type: none"> · Rational use of PPE encouraged · Checklist for cleaning and disinfection made and accountability was exercised
9.	Biomedical waste management (BMW)(10,11)	<ul style="list-style-type: none"> · Unidirectional route for collection · Collected thrice daily · Storage area identified at ground floor · Surfaces of bins were disinfected with 1% sodium hypochlorite solution daily · Common storage site was cleaned once daily · Ultimately outsourced for final treatment and disposal within 24 hours 	<ul style="list-style-type: none"> · Adequate PPE and training · Foot operated covered dustbin of suitable size with colour coded Polybags · disinfection of bins and cleaning of storage area 	<ul style="list-style-type: none"> · Regular supplies ensured · Capacity building of trainers · Checklist for BMW was made

Screenings & repatriation

Exit screening was conducted for all evacuees before boarding the repatriation flight. Entry screening for SARS-CoV2 symptoms was conducted at Indira Gandhi International (IGI) airport by Airport Health Officials (APHO) in collaboration with other stakeholders (Fig. 1). Every evacuee was being subjected to thermal screening. Suspected evacuees were isolated from others at the airport itself and examined by Airport medical officer and shifted to isolation facility in dedicated ambulances if required. Rest of the evacuees were sent to the ITBP quarantine facility by buses. All vehicles used for transportation were disinfected with 1% Sodium hypochlorite after each use. (4)

A total of 617 Indian and other nationals were repatriated between February to April, 2020. Out of these, 112 (18.15%) evacuees were from Wuhan and non-Wuhan provinces of China, 24 (3.89%) were from India, 21 were Italian tourists and 3 Indians (Guide, driver and conductor)], 218 (35.33%) were from Milan, Italy and 263 (42.63%) were Rome, Italy. **(Table-2)**

Table 2
Demographic characteristics and period of quarantine of the suspected cases of COVID-19 kept in quarantine facility

S. No.	Country of repatriation (total evacuees)	Quarantine Period		Age (years)	Male n(%)	Female n(%)	confirmed cases#		
		Date of commencement of quarantine	Date of Discharge (no of evacuees discharged)				Asymptomatic n (%)	Symptomatic	Total
1.	China^ (n= 112)	27-02-2020	13-03-2020 (112)	0-10	4(3.6)	1(0.9)	0	0	0
				11-20	3(2.7)	4(3.6)			
				21-30	46(41.4)	18(16.2)			
				31-40	21(18.9)	6(5.4)			
				41-50	7(6.3)	2(1.8)			
2.	India\$ (n= 24)	03-03-2020	04-03-2020 (24)	35-40	1(4.2)	0	15(62.5)	0	15(62.5)
				41-50	0	2(8.4)			
				51-60	2(8.4)	0			
				61-70	5(21)	5(21)			
				71-80	3(12.6)	6(25.2)			
3.	Italy (Milan) (n=218)	15-03-2020	29-03-2020 (211)	11-20	3(1.3)	3(1.3)	1+1* (0.9)	0	2(0.9)
				21-30	142 (65.1)	58(26.6)			
				31-40	8(3.7)	2(.9)			
		16-03-2020 (for contacts)	30-03-2020 (7)	41-50	0	0			
				51-60	0	1(0.5)			
				>60	1(0.5)	0			
4.	Italy (Rome) (n= 263)	22-03-2020	04-04-2020 (244)	0-10	1(0.4)	0	1(0.4)	0	1(0.4)
				11-20	15(5.7)	5(1.9)			
				21-30	178(67.7)	44(16.7)			
		05-04-2020 (for contacts)	18-04-2020 (18)	31-40	10(3.8)	4(1.5)			
				41-50	3(1.1)	2(0.8)			
				51-60	1(0.4)	0			

confirmed cases discharged to their respective states/ country from isolation facility

^ 55 had history of travel to Wuhan.

\$ 21 Italian tourists + 3 Indians (Guide, driver and conductor)

*1 confirmed case gave history of fever 3-4 days ago, though asymptomatic at the time of testing.

Clinical examination, testing and referral

On arrival to the quarantine facility, base line medical examination of each evacuee was done by medical team. On the first day of arrival to the facility, regardless of clinical symptoms, all evacuees were tested for SARS-CoV2 by Real Time Polymerase Chain Reaction (RT-PCR). For the next 14 days, evacuees were examined twice daily by medical teams for development of symptoms suggestive of SARSCoV2. **(Table 1)** Evacuee who turned out positive during initial testing or manifested clinical features of COVID-19 at any point of time during quarantine period, were immediately transferred to dedicated COVID-19 isolation facility for further management and discharged from there only. Total 17 (27.55%)

evacuees found positive on initial testing including 14 Italians tourists, their Indian guide and 2 repatriate Indian nationals from Milan. COVID-19 positive Indian Guide and 2 Indian nationals (driver and conductor) were immediately transferred to a designated tertiary care hospital for the isolation. Fourteen Italian tourists who tested positive for SARS-CoV2 and also 7 Italians were transferred to reputed private tertiary care hospital at Gurugram in separate vehicles.

After completion of specified quarantine period, the evacuees were again tested through RT-PCR on 14th day and discharged on negative results. Since evacuees from Rome had already been tested just before the evacuation activity, hence were retested only at the end of quarantine period. Among them, only one (0.16%) evacuee from Rome was turned out positive.

Contact tracing and reset of quarantine

Whenever confirmed SARS-CoV-2 positive cases were recognised, contact tracing was initiated. Close seating in aircraft, sharing the same barrack, hand shaking, sharing of personal articles, dining at same table or any activity where the person was within 1 m distance with confirmed case was taken as high risk exposure. [5] To facilitate contact tracing, photograph of positive cases was used and interviews of passengers and telephonic interview of positive cases were taken to determine the level of exposure of an individual. Among the evacuees from Milan, 5 were identified as close contacts where 4 shared same barrack and 1 shared dining table with confirmed case. Likewise, 18 evacuees from Rome were identified as close contact where 5 were in same barrack, 1 shared personal article (laptop) and 12 had exposure during recreational activities. A 14 day quarantine period was reset for them from the day of last contact with confirmed SARS-CoV2 case. (Table-1) Exposure risk assessment among health care workers (HCWs) was done according to World Health Organization (WHO) protocol. [6] They were found to have low risk for SARS-CoV2 infection hence advised for self-monitoring of temperature and respiratory symptoms daily for 14 days from the last day of exposure and practising contact, droplet and airborne precautions wherever required.

Discharge and community surveillance

After completion of 14 days quarantine period, the evacuees who tested negative for SARS-CoV-2 infection through RT-PCR, were discharged to their respective states/districts (**Figure-1**). Details of their stay for the next 14th days including contact number were obtained from the passengers before discharging from ITBP quarantine facility. Advisory about home quarantine and the recommendations of self-monitoring of their health, practicing hand-washing, hand hygiene and wearing masks were shared with them. State Surveillance Officer's/District Surveillance Officer's (SSO/DSO) number were provided to them to report in case of any health issue. Integrated Disease Surveillance Programme (IDSP), State units were directed to put them on community surveillance for next 14 days.

Fortunately, none of the evacuees developed symptoms after discharge. Monitoring and supervision was done by expert team and senior officials from Ministry of Health and Family Welfare (MoH&FW) by regular visits.

Challenges and action taken

In present study, we have tried to share our experience of establishing and running the very first quarantine facility of India for repatriated nationals. Reasons for successful or unsuccessful operation of any facility are often multiple and interconnected. And so, challenges are a universal part of human experience.

Arrangement and supply of logistics viz PPE, materials required for sample collection, packaging and transportation, medicines, medical equipment, grocery for meal preparation, vehicles for transportation etc was leading limitation factor for the successful running of the facility. Since the facility was situated in outskirts of city, transportation and commute cost was significantly high due to distance thereby more consumption of fuel.

Manpower management was another challenge. Intent was to retain same members in a team for complete quarantine period which could not be achieved due to fear among workers or their family members about their health and well-being. Training and quality communication with them was essential requirement which was handled in solution oriented effective way. Psychosocial counselling was also conducted whenever required. Ensuring compliance to protocols and recommendations among HCW and evacuees the key parameter for successful quarantine facility were put in place. Disagreement with guideline or specific recommendation, lack of commitment, motivation and awareness led to suboptimal compliance to recommendations by individuals. When used alone, printed information and educational material generally lead to limited improvement in practices. However, implementation of and compliance with recommendation improved with communication. Round the clock surveillance with CCTV camera and public address system at each floor was established to improve communication with evacuees and provide necessary instructions. Signage like restricted access, arrows to display functional flow was pasted to minimize the interaction between HCW and quarantined inhabitants. Since CCTV camera could not be installed in bathroom and toilet areas hence demarcated use of them could not be ensured. (**Table 1**)

Routine evaluation of cleaning, hygiene and sanitation methods were ensured by supervisory team. Determination of efficacy of cleaning method was tough and subjective by mere visual inspection of cleaned area. [7] Other chemical method like RLU measurement in ATP swab system or microbial methods like aerobic colony count, MRSA count could not be exercised due to limitation of resources in field settings.

Conclusion

Passive presence of written guidelines/ SOPs is not sufficient to establish a quarantine facility. Committed leadership, improvement in collaborations and coordination between different stakeholders, transparency between key partners, regular supplies of logistic, dedicated and skilled manpower, general and task oriented training and development at multi-disciplinary approach, motivation and awareness are the most essential ingredients for successful operation of quarantine facility for suspected cases of COVID-19 in current pandemic.

List Of Abbreviations

Indo Tibetan Border Police (ITBP), bio-medical waste (BMW), personal protective equipment (PPE), closed-circuit television (CCTV), Real Time Polymerase Chain Reaction (RT-PCR), health care workers (HCWs), Indira Gandhi International (IGI), Airport Health Officials (APHO), World Health Organization (WHO), State Surveillance Officer (SSO), District Surveillance Officer DSO, Integrated Disease Surveillance Programme (IDSP), Ministry of Health and Family Welfare (MoH&FW).

Declarations

Ethical approval and consent to participate

This was a public health response from Ministry of Health & Family Welfare, Government of India, undertaken with the purpose to prevent the spread of SARS CoV2 in India. The nasal and throat sample from evacuees were taken to screen them for the infection of SARS CoV2. Ethical approval is not applicable as part of public health response. All Government of India ethical principles and guidelines were adopted during the outbreak response: the investigation was aimed at achieving public good (beneficence) and collective welfare (solidarity); no harm was done to any individual (non-maleficence); fair, honest and transparent (accountability and transparency); and participants' data was de-identified prior to analysis (confidentiality). This study involve secondary data analysis and hence no consent was taken.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declares that they have no competing interests

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There was no funding required for this study

Authors' contributions

SG conceptualized the manuscript, did data curation and analysis, wrote the original draft, edited the draft, AK conceptualized the manuscript, did data curation and analysis, edited the draft, TN did data curation and analysis, edited the draft, NV did data curation and analysis, edited the draft, MD conceptualized the manuscript, supervised the process, reviewed & edited draft, SKJ conceptualized and supervised the process SKS conceptualized and supervised the process. All authors have approved the submitted version and have agreed to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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Figures

Figure 1

Evacuation flow of repatriate nationals from different countries to India and further discharge *Source: Adapted from Integrated Disease Surveillance Programme India. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.