International Journal of Multidisciplinary Innovative Research
ISSN: 2583-0228 Volume 2, Number 4 (Oct' 2022) pp. 25-40

https://www.ciir.in

Pandemic Preparedness and Initial Responses: A Study of Kerala Model of Pandemic Management with Reference to Guidelines of the World Health Organization

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ABSTRACT: ***The state of Kerala, a south Indian state, having a population of about 36 million and a meagre GDP per capita of $3200 have been stood as an exemplary in effective COVID-19 management. In the paper, the author discusses the success story of the developing economy. The extensive review of literature reveals that, though many studies have been conducted on the state's model of pandemic management, no study has been assessed the state's Pandemic Preparedness and Initial Response (PPIR) against recommended/suggested actions of any standard PPIR guidelines/models such as WHO's guidance document on "Pandemic Influenza Preparedness and Response". Hence, along studying the state's PPIR model, the author objects to assess it against recommended actions of the WHO's guidance document will not only provide a better understanding on the state's PPIR model, but also discloses its degree/level/depth. The study benefits communities/institutions/nations, around the world, to evolve similar PPIR strategies for future outbreaks or helps to review/amend their existing PPIR plans/policies. For the study, a period of 67 days is considered and the whole period is divided into two phases; Preparatory Phase (January 01 to January 29, 2020) and Initial Response Phase (January 30 to March 08, 2020). For data, the author mainly depended on guidelines/orders/circulars/advisories/documents/press releases/ daily bulletins available on official websites and also, research papers/articles/reports etc are used for the study. The study concludes that the state's PPIR were multi-facet, comprehensive, well-planned, well-organised, well-coordinated, well-executed and the state succeeded in managing the pandemic at its early stage of outbreak itself. Most of the state's PPIR (in phase 1-3) were far ahead and beyond the recommended actions (for the phase 1-3) of the WHO guidance document and it significantly contributed to the success of the model.***

KEYWORDS: ***COVID-19, nCorona Virus, Pandemic Preparedness, Initial Responses, World Health Organization, Pandemic Management.***

INTRODUCTION

The history of human beings, throughout its course, had witnessed epidemics & pandemics. The Antonine Plague, Japanese smallpox, Leprosy, French Disease, Yellow Fever, Cholera, Measles, Typhoid, Carrion's disease, Sleeping Sickness, Poliomyelitis, AIDS (Hays, 2005) Ebola, Swine Flu, MERS, SARS and the recent COVID-19 (LePan, 2020) are a few to name. Though these epidemics/pandemics have taken huge toll on the human civilization, the human race has overcome these hurdles with its advancement in modern medicine and technology.

In the recent COVID-19 outbreak, while many nations/communities (including developed countries) miserably failed to manage, a few effectively managed it. In the paper, the author discusses such a success story (of effective COVID-19 management) of a developing economy.

The state of Kerala (here onwards referred as 'the state'), a south Indian state located on the coast of Arabian Sea (Teasdale, 2005) having a population of about 36 million (as per 2011 Census of India) (Kumar, Kumar, Siva, & Doss, 2020) and a meagre GDP per capita of $3200 (PRS INDIA, 2020) have been stood as an exemplary in effective COVID-19 management. The state has been appreciated for its successful COVID-19 management with exceptional control of the nCorona virus (here onwards referred as 'the virus') spread, extraordinary recovery rate and low fatality rate. For instance, as an honour, the State's Health & Social Welfare minister participated in panel discussion on Public Service Day at the United Nations (WHO, 2020a). Also, the Vogue magazine featured the minister as "women of the year 2020" (Rajan, 2020) for expertly facing the crises; the present COVID-19 and the former NIPAH Virus Disease (Rajan, 2020). Moreover, the state's success story has been widely reported and lauded by several internationally acclaimed daily newspapers, magazines and TV channels.

What were the major initial achievements of the state, in managing COVID-19, to receive appreciation world-wide? The first confirmed COVID-19 case in the state (& in the country) was reported on January 30, 2020 (ET, 2020). By February 03, total confirmed case increased to three (ET, 2020) and the state declared COVID-19 as state specific disaster (DHS, 2020j.). Nevertheless, the state was well prepared and effectively responded to the pandemic outbreak. The outcomes were spectacular; stabilized the health condition of all the three confirmed cases (DHS, 2020u.), primary & secondary contacts were asymptomatic (DHS, 2020u.), test result of 93 per cent of returnees (from Wuhan) were negative (DHS, 2020u.). Finally, on February 07 (8 days of the first confirmed case and 5 days of state specific disaster declaration) the state withdrew the disaster status (DHS, 2020u.) and by February 20 (22 days of first confirmed case) all active cases had been cured & discharged from hospitals (DHS, 2020y.). Moreover, after the third confirmed case reported on February 03 (ET, 2020), the fourth confirmed case was reported only on March 08 (after 33 days) (DHS, 2020ac.). Hence, for 38 days (January 30 till March 08), the state incredibly succeeded in containing the virus spread to a scanty three (with zero fatality) (ET, 2020) (DHS, 2020ac.). However, in the same period, the virus spread to more than 70 new countries and over 80,000 new confirmed cases were reported (GCDL, 2020a.). This reveals the state's success over many progressed (with higher GDP per capita income and lesser/comparable population) countries. To be specific, the comparison (on containing the virus spread and reducing fatality during initial 38 days of first confirmed case in each country) of the state with such 12 progressed countries discloses the height of the state's success (Fig. 1) (GCDL, 2020b.) (GCDL, 2020c.). Certainly, these extraordinary initial achievements (in managing the pandemic at its early stage of outbreak) bagged world-wide appreciation for the state.

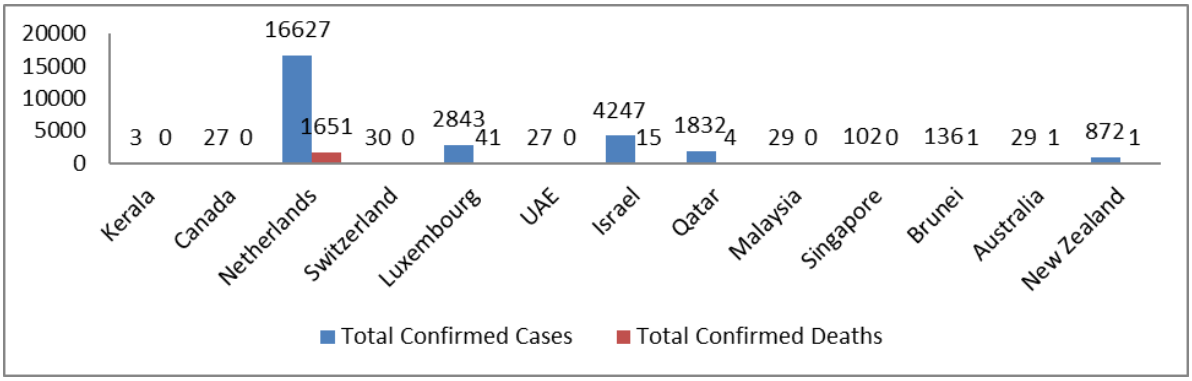

Figure 1: Comparison between the state and selected countries

(Source: Author) Data Source: (GCDL, 2020b.) (GCDL, 2020c.)

Similarly, the state's model has been widely accepted in the country and considered as an exemplary model for other states. To be specific, while the Joint Secretary (Government of India) recognized the state's preparatory works (DHS, 2020z.), the Cabinet Secretary (Government of India) in an online meeting with all states cherished the actions of the state and other states were asked to follow the state's (Kerala) SOPs (DHS, 2020aa.). Moreover, the visit of high-level team (twelve members from the state of Telengana) to familiarize preventive measures in the state (Kerala) (DHS, 2020ab.) also divulges success and wide acceptance of the state's model in the country.

How a developing state, with a low GDP per capita income (PRS INDIA, 2020), could successfully contain the virus spread & reduce fatality in the early stage of pandemic outbreak? Generally, the major two factors that contributes to success of any epidemic/pandemic management models are; 1) pandemic preparedness & initial response (PPIR) and, 2) advancement (of the state/nation) in socio-economic-cultural-political-technological areas. In the paper, the author aims to study the first factor (for a period from January 1 to March 08, 2020) and instead of simply presenting, the author targets to assess the state's PPIR (during early stage of COVID-19 outbreak) against any standard PPIR guidelines/models. Equally, the literature review exposes the research gap in the area. Though many studies have been conducted on Kerala Model of PPIR, no study has been assessed the state's PPIR against recommended/suggested actions of any standard PPIR guidelines/models such as WHO's guidance document on "Pandemic Influenza Preparedness and Response" (WHO, 2009). Hence, along studying the state's PPIR model, the author objects to assess it against recommended actions of the WHO's guidance document.

An effective PPIR significantly lessens the prevalence, impact and ensuing consequences of pandemic/epidemics. Hence, the study not only provides a better understanding on the state's PPIR model, but also discloses its degree/level/depth which aids for further healthcare process (pandemic management) improvement. The study also benefits people, communities, institutions and nations, around the world, to evolve similar PPIR strategies for future outbreaks or helps to review & amend their existing PPIR plans/policies. Eventually, public health will improve & create a healthy world.

LITERATURE REVIEW

The Kerala Model of COVID-19 management has been widely studied. The study on the state's early preparedness includes effort (prior to pandemic spread) to get ready healthcare workers (two-hour online training/day) of private hospitals (Valsan, Thomas, Chirayath, P R,

& Kuttichira, 2021), anticipatory preparations under limited resource setting (Rahim, Chacko, & Rajan, 2020) and multidimensional preparedness specifically in Kasaragod district (Vaman, Valamparampil, A V, A T, Varghese, & Joseph, 2020).

Similarly, the study on the virus transmission includes comparison of pandemic spread pattern in Kerala and other selected states (Delhi, Gujarat, Maharashtra, Andhra Pradesh, Jammu and Kashmir, Tamil Nadu, Telangana, Madhya Pradesh, Karnataka, Uttar Pradesh, Rajasthan and West Bengal) in India (Rath, Dixit, Koparkar, Pradip, & Joshi, 2020), comparison on the virus transmission (in early phase of pandemic outbreak) in the state and the country (Tiwari, Gaurav, & Abraham, 2020), elements that directed to transmission at community level (Choolayil & Putran, 2020) and finally, the state's fatality and disease recovery rate has been compared with other selected states (Gujarat, Madhya Pradesh, West Bengal) in the country (Ansari, et al., 2021).

The studies on initial response and strategies/approaches to contain the virus transmission have been conducted and it includes; the state's response under inadequate resource setting (Rahim, Chacko, & Rajan, 2020), initial response strategies in Kasaragod district in Kerala (Vaman, Valamparampil, A V, A T, Varghese, & Joseph, 2020), the spread of initial fifty cases and the state's strategies to manage it (Nagare, Gupta, & Darji, 2020), actions for containing first wave of virus spread (Jalan & Sen, 2020), strategy for thwarting the community spread (Heera & Rajeev, 2020), efforts in containing the virus spread and its outcome (Goult, et al., 2020), main strategies for controlling and managing the pandemic (Menon, Rakesh, John, Thachathodiyl, & Banerjee, 2020), the control strategies (Pandi-Perumal, Gulia, Gupta, & Kumar, 2020), testing and pandemic control approaches (Thayyil, Jayakrishnan, & Bina, 2020), novel practices to contain the virus spread (Bhaskaran & George, 2020), effective containment of the pandemic (Kumar, Kumar, Siva, & Doss, 2020) and on successful containment model (Rahim & Chacko, 2020). Also, tactics of Dharavi and Kerala to retain the virus spread to bare minimum (Pal, Naik, Rathore, Sahu, & Kumar, 2020), preventive measures of Kerala and Rajasthan (Jain, Midha, & Marwah, 2020) and mitigation strategies of the state and Morocco (P & Alaoui, 2020) were a few comparative studies (on initial response and containment strategies/approaches) with the state.

Similarly, the study on the state's success factors includes success elements in recovering (second stage) virus transmission (Choolayil & Putran, 2020), path to success in managing the pandemic (Chathukulam & Tharamangalamb, 2021), the key success factors of strategies (Kaim, Ahirwar, Ahirwar, & Sakarde, 2021) (Kallivayalil & Enara, 2020) and comparative analysis of state's success model with that of Turkey (Akgun & Nayar, 2020).

The extensive review of literature reveals that, though many studies have been conducted on the state's early preparedness, initial response, virus transmission control, testing strategies, containment practices, key success elements, comparison with other models, etc., no study has been assessed the state's PPIR against recommended/suggested actions of any standard PPIR guidelines/models such as WHO's guidance document on "Pandemic Influenza Preparedness and Response"(here onwards referred as 'guidance document) (WHO, 2009).

The guidance document is a revised version of "global influenza preparedness plan" issued by World Health Organization in 2005 which itself is a revision of similar guidance document issued in 1999 (WHO, 2009). The guidance document is not proposed as a substitute for individual nation's plan (WHO, 2009). However, it prepares nations for pandemic outbreaks (WHO, 2009). It suggests a "whole-of-society" support approach which requires support from all segments (the union government, the health sector, non-health sectors, civil

society establishments, families and individuals) of society for effective execution of the recommended actions (WHO, 2009).

Through nine phases, the document described various stages of pandemic spread (Table One) and recommended definite actions for each phase (1-3, 4, 5-6, post peak & post pandemic) (Table Two) (WHO, 2009). The recommended actions for each are classified into five components; "a) planning and coordination, b) situation monitoring and assessment, c) reducing the spread of disease, d) continuity of health care provision and, e) communications" (WHO, 2009).

Table 1: Pandemic Phase Descriptions.

PANDEMIC PHASES	***DESCRIPTIONS***
Phase 1	*No animal influenza virus circulating among animals has been reported to cause infection in humans*
Phase 2	*An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat.*
Phase 3	*An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.*
Phase 4	*Human-to-human transmission (H2H) of an animal or human-animal influenza reassortant virus able to sustain community-level outbreaks has been verified*
Phase 5	*The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region*
Phase 6	*In addition to the criteria defined in Phase 5, the same virus has caused sustained community level outbreaks in at least one other country in another WHO region.*
POST-PEAK PERIOD	*Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels.*
POSSIBLE NEW WAVE	*Level of pandemic influenza activity in most countries with adequate surveillance rising again.*
POST-PANDEMIC PERIOD	*Levels of influenza activity have returned to the levels seen for seasonal influenza in most countries with adequate surveillance.*

Source: World Health Organization (WHO, 2009)

Table 2: Summary Table of Recommended Actions.

PREPAREDNESS COMPONENTS	***PHASES***				
	1-3	***4***	***5-6***	***POST PEAK***	***POST PANDEMIC***
PLANNING AND COORDINATION	***Develop**, **exercise**, and periodically **revise** national influenza pandemic preparedness and response **plans.***	*Direct and coordinate rapid pandemic **containment** activities in collaboration with WHO to limit or delay the spread of infection.*	*Provide **leadership** and **coordination** to **multisectoral resources** to mitigate the societal and economic impacts.*	*Plan and coordinate for **additional resources** and **capacities** during possible future waves.*	***Review** lessons learned and share experiences with the international community. **Replenish** resources.*
SITUATION MONITORING AND ASSESSMENT	***Develop** robust national **surveillance** systems in collaboration*	***Increase** surveillance. Monitor containment operations.*	***Actively monitor and assess** the evolving pandemic and*	***Continue** surveillance to detect subsequent waves.*	***Evaluate** the pandemic characteristics and situation monitoring and*

	with national animal health authorities, and other relevant sectors.	*Share findings with WHO and the international community.*	*its impacts and mitigation measures.*		*assessment tools for the next pandemic and other public health emergencies.*
REDUCING THE SPREAD OF DISEASE	***Promote beneficial behaviours** in individuals for self protection. Plan for use of pharmaceuticals and vaccines.*	*Implement rapid pandemic **containment** operations and other activities; collaborate with WHO and the international community as necessary.*	***Implement** individual, societal, and pharmaceutical measures.*	***Evaluate** the effectiveness of the measures used to update guidelines, protocols, and algorithms.*	*Conduct a **thorough evaluation** of all interventions implemented.*
CONTINUITY OF HEALTH CARE PROVISION	***Prepare** the health system to **scale up.***	*Activate **contingency** plans.*	***Implement** contingency plans for health systems at all levels.*	***Rest, restock** resources, **revise** plans, **and rebuild** essential services.*	***Evaluate** the response of the health system to the pandemic and **share** the lessons learned.*
COMMUNICATIONS	***Complete** communications planning and initiate **communications** activities to communicate real and potential risks.*	*Promote and communicate recommended **interventions** to prevent and reduce population and individual risk.*	*Continue **providing updates** to general public and all stakeholders on the state of the pandemic and measures to mitigate risk.*	***Regularly update** the public and other stakeholders on any changes to the status of the pandemic.*	*Publicly **acknowledge** contributions of all communities and sectors and communicate the lessons learned; **incorporate** lessons learned into communications activities and planning for the next major public health crisis.*

Source: World Health Organization (WHO, 2009)

MATERIALS AND METHODS

A period of 67 days (January 01 till March 08, 2020) is considered for the study and the whole period is divided into two phases; Preparatory Phase (January 01 to January 29, 2020) and Initial Response Phase (January 30 to March 08, 2020). The selection and partition of the period is based on the following facts:

1. The state had started its preparations (to fight against COVID-19) in early January itself, specifically on January 01, 2020 (DSS, 2020) till COVID-19 outbreak on January 30, 2020 (ET, 2020). Hence, a period from January 01 to January 29 is selected for studying the state's pandemic preparedness.
2. Alike, after the first outbreak on January 30, 2020 (ET, 2020), the state effectively contained the virus spread to a meagre three (with zero fatality) till fourth confirmed COVID-19 case reported on March 08, 2020 (DHS, 2020ac.) (ET, 2020). Hence, for studying the state's initial response, the author selected a period from January 30 till March 08, 2020.

The characteristics of Preparatory Phase is unerringly ties with that of phase 1 ("no viruses circulating among animals have been reported to cause infections in humans") (WHO, 2009) of the guidance document. Thus, the state's pandemic preparedness (during the period) will be assessed against the recommended actions of phase 1 of the guidance document.

Likewise, the characteristics of Initial Response Phase exactly matches with that of phase 2 ("an animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans, and is therefore considered a potential pandemic threat")(WHO, 2009) and phase 3 ("limited human-to-human transmission may occur….does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic") (WHO, 2009) of the guidance document. Subsequently, the state's initial response (during the period) will be assessed against the recommended actions of phase 2 & 3 of the guidance document.

For data, the author mainly depended on guidelines, orders, circulars, advisories, documents, press releases and daily bulletins (on management of COVID-19) available on official websites such as Government of Kerala, Chief Minister of Kerala, Directorate of Health Services (DHS), Department of Health & Family Welfare (DHFW), Directorate of Samoohika Sannadhasena (DSS), Kerala Battles COVID, COVID-19 Jagratha, Government of Kerala Dashboard, etc. Also, research papers/articles (published in journals, daily newspapers & magazines), reports (published by various organisations/institutions such as World Health Organization, NITI Aayog, etc.), and data/information (available on various websites such as Kerala State IT Mission, Kerala State Planning Board, Our World In Data etc.) are used for the study.

STUDY

As a popular tourist hotspot (IBEF, 2020) and with 2.12 million (approx. as on 2020) diaspora world-wide (Kannan & Hari, 2020), the state has been exceedingly exposed to epidemics/pandemics. Expecting the outbreak, the state started its preparations in early January itself and effectively responded to the outbreak.

Planning and Coordination

As the virus spread in China, many people (including students) from the state were stranded in Chinese provinces (NIE, 2020a.). Consequently, the Chief Minister of Kerala demanded the Government of India to direct the Indian Embassy (in China) to offer essential support to the stranded and also demanded necessary steps for their repatriation (NIE, 2020a.). For the repatriation process, the state expressed its readiness to offer service of health professionals (NIE, 2020a.). Furthermore, the state launched tele-helpline facility to guide/support its people (within and outside the state) on health issues, mental stress, repatriation and quarantine (Cris, 2020).

Learning from previous natural disasters, the state Government issued an order (on January 01, 2020) to constitute a community volunteer force ("Samoohika Sannadhasena") of strength 0.34 million (through people participation) (DSS, 2020). Healthy persons under the age group of 16-65, in a ratio of one volunteer for every 100 persons in the state, are the members of the force (DSS, 2020). Various departments (disaster management, police, fire and forest) of the state train the force to assist in any natural disasters and local emergencies (DSS, 2020). Though the learning from previous natural disasters initiated its formation (DSS, 2020), conceivably, the anticipated outbreak sped up formation in early January itself.

Similarly, anticipating the outbreak, the state issued guidelines on preventive measures, use of self-protective equipment, infection deterrence & control, monitoring, spotting & reporting of symptomatic passengers/tourists, secondary contacts sketching, home isolation, types of samples, collection of samples, safety measures (for collecting, storing and transiting samples), diagnosis at laboratory, preparations at hospitals, handling patients, treatment, reporting health status etc (DHS, 2020c.). Likewise, to provide training and guidance to healthcare staff/institutions, around 10 videos were developed & disseminated via official YouTube Channel of DHFW, "Kerala Health Online Training" (DoHFW, 2020b.).

The state responded, to the COVID-19 outbreak, by opening control rooms at state and district level (DHS, 2020d.). At state level control room, 18 teams were constituted to coordinate and manage activities across the state (DHS, 2020l.) and also; exclusive teams have been constituted for various purposes (DHS, 2020k.) (DHS, 2020l.). For instance, a financial management team (for anticipating requirement of funds & accumulation of resources) (DHS, 2020l.), an interdepartmental coordination team (for effective coordination between states' line departments) (DHS, 2020l.) and a rapid response team under the chairpersonship of State's Health Minister (for technical support and timely interventions) (DHS, 2020k.) have been constituted. As the number of confirmed COVID-19 cases increased to three (ET, 2020) the State Disaster Management Authority (SDMA) declared COVID-19 as state specific calamity on February 03, 2020 (DHS, 2020j.).

To mitigate the socio-economic impacts, the state entrusted the LSGIs to provide daily life assistance to economically backward families of persons under isolation/treatment (DHS, 2020s.), to arrange caregiver facility for the needy (DHS, 2020s.) and made necessary arrangements for the supply of food kits to persons under quarantine (DHS, 2020l.).

Situation Monitoring and Assessment

A team for surveillance has been constituted to support and manage all surveillance activities at district level (DHS, 2020l.). The state, through LSGIs, ensured adherence of infection control protocols at hospitals, health centres, consulting centres, clinics and laboratories (DHS, 2020s.). The LSGIs were also entrusted to source necessary safety materials to family members of persons under treatment (DHS, 2020s.). Similarly, to identify suspected case, the local people who visit private hospitals have been consistently monitored (DHS, 2020l.). Also, to coordinate department level surveillance activities, departments (tourism, education) were instructed to constitute a special cell under them (DHS, 2020o.) (DHS, 2020q.).

The travellers were classified into; a) those arriving from province of Wuhan, b) from China (other than Wuhan), c) from the virus affected country (other than China) and specific advisories were issued (mainly) on isolation, reporting to authorities, test for COVID-19, supply of food, use of amenities at place of stay and disinfection process (DHS, 2020o.). For specific follow up actions, the close contacts were categorised (based on their degree of contacts with confirmed COVID-19 cases) into low risk and high risk (DHS, 2020e.). The protocols for home isolation were prepared & provided to all repatriates (and their close contacts) (DHS, 2020s.). Strict home isolation (28 days), regardless symptomatic or asymptomatic, has been enforced (DHS, 2020d.) and at public health centre (PHC) level, the discharged patients/asymptomatic travellers/close contacts (under home isolation) were strictly monitored (DHS, 2020l.). Based on isolation review, right instructions were given to those who poorly followed isolation protocols (DHS, 2020n.) and doctor's consultations were made mandatory for those who completes home isolation term (DHS, 2020w.).

Similarly, the education department carried out surveillance activities across the education institutions (DHS, 2020q.). The students/teacher/staff with symptoms were strictly disallowed to appear for classes/duty at schools till symptoms lessened (DHS, 2020q.). Also, strict home isolation (28 days) was enforced for those who have family member/s, at home, who recently returned from Wuhan (China) and those who expected the return of family member/s from Wuhan were advised to move to home of relatives to avoid missing the class/failure to join duty (DHS, 2020q.).

In each district, the veterinary administrations (with the support of LSGIs) were entrusted to find out animals/pets (in households/farms of those who were under isolation) to quarantine at site and care them (DHS, 2020p.). Accordingly, such 26 households were identified and made necessary arrangements to feed & rear the animals/pets (DHS, 2020v.). Similarly, at Panchayath level, the health status of animals/birds (in households/farms/wet markets/slaughterhouses/migratory bird hubs) was steadily monitored for uncommon symptoms or death (DHS, 2020p.).

In the same way, tight surveillance measures were enforced for public gathering. For instance, during 'Pongala' festivals millions of women devotees gather at the Attukal Bhagavathi Temple (Thiruvananthapuram, capital of the state) premises to perform rituals to form world's largest women gathering for a festival (NIE, 2020c.). It holds the Guinness Book of World Records (NIE, 2020c.). With the slogan, "the self-isolation is the real prayer for good community, their families and themselves" (DHS, 2020ac.), the state enlightened persons (with symptoms/travelled to affected countries/close contacts with travellers) to perform 'Pongala' rituals at their places of stay (DHS, 2020ac.). Nevertheless, knowing the vulnerability of the situation, for surveillance, rapid action team, ambulances and around two dozens of medical teams were deployed (NIE, 2020b.).

Reducing the Spread of Disease

For self-protection of people, the state focused to endorse positive & favourable behaviours through awareness (on virus spread and personal hygiene) building programmes. At LSGIs level, awareness programmes were conducted at markets, resident colonies (DHS, 2020s.) and families of Wuhan returnees (DHS, 2020w.). Also, detailed Information Education Communication (IECs) on the virus, its spread in humans, safety measures, symptoms, affecting organs, diagnosis and treatment were published (DHS, 2020f.).

Similarly, sector specific health advisories (for the departments of tourism, animal husbandry and education) were issued (DHS, 2020o.) (DHS, 2020p.) (DHS, 2020q.). As a potential source of the virus spread, the travel/tourism/hotel industries were given advisories for themselves and for circulating among tourists/guests (DHS, 2020c.). Among tourists, the tourism department raised awareness on Dos & Don'ts, personal hygiene, social distancing, use of triple layer masks and sanitizers (DHS, 2020o.), whereas the animal husbandry department raised awareness on pet/animal care among farmers & households (DHS, 2020p.). At schools, the education department conducted awareness sessions (DHS, 2020q.) and total school awareness crossed 0.19 million (DHS, 2020t.).

Simultaneously, the state issued guidelines on sample collection (DHS, 2020g.) and entrusted district nodal officers & district surveillance officers for sample collection (DHS, 2020l.). Sample tracing team and lab surveillance team monitored/facilitated sample collection, scrutinized sample requisition forms, transported to designated laboratories, collected test report and communicated test report to concerned authorities/officials (DHS, 2020l.). To evade the slenderest chance of spread, the healthcare institutions were instructed for testing second

sample of symptomatic patients even if their initial test result was negative (DHS, 2020a.). Also, severe home-based isolation was emphasized for those who discharged from hospital isolation (DHS, 2020a.). Besides, proper course of actions was issued for safest disposal (segregation, package, transport, storage and treatment) of bio-medical wastes from COVID-19 ward and/or OPD (DHS, 2020r.).

Continuity of Health Care Provision

The state, through LSGIs, ensured right treatment (as per guidelines of the health department) for every patient (confirmed COVID-19 case) admitted in hospitals (DHS, 2020s.). By February 20, within 22 days of first confirmed case, all the three active COVID-19 cases have been cured & discharged (DHS, 2020y.).

For patient management, medical boards have been constituted institution (medical college hospitals, district hospitals and general hospitals) and at state level (DHS, 2020i.). At institutional level, the superintendent of the institution acts as convenor and head of departments (general medicine, respiratory medicine, anaesthesiology, infectious diseases, microbiology and community medicine) as members (DHS, 2020i.). The medical board of medical college hospitals provided technical support to other hospitals including private hospitals in district/districts concerned (DHS, 2020i.). Material management team monitored stocks at hospitals to confirm uninterrupted supply of healthcare items (DHS, 2020l.). The public health lab supplied 1100 viral transport media to all districts (DHS, 2020m.) (DHS, 2020n.) and for testing, a total of 729 samples were collected (DHS, 2020ac.). Initially, the state depending on the National Institute of Virology (NIV) at Pune (outside the state) for sample testing, however within 02 days of the outbreak, NIV at Alappuzha (within the state) was made functional (DHS, 2020h.).

Likewise, the state also ensured the availability of sufficient facilitates for isolation (DHS, 2020l.) (DHS, 2020m.). The infrastructure management team has been entrusted to find isolation facilities (in every district) with a minimum capacity of 50 patients (DHS, 2020l.). Accordingly, minimum two hospitals (with sufficient facilities, human resources and necessary materials) were identified (DHS, 2020l.) (DHS, 2020m.). Equally, the state (through ambulance management team) ensured round-the-clock availability of ambulances and drivers (in each district) for patients' conveyance (between home isolation & hospital) (DHS, 2020l.). After every trip, the team ensured sanitization of ambulance (DHS, 2020l.).

Simultaneously, the human resources were trained extensively for healthcare and supporting activities. The segment specific training modules, manuals, FAQs were developed (DHS, 2020l.) and numerous demonstration/training sessions were conducted (through online/offline/telephone) for ambulance drivers, workers of ASHA, members of Kudumbashree, Anganwadi workers/teachers and staffs of healthcare, line departments, local self-government departments (LSGD) & call centres (DHS, 2020l.)(Fig.Two). Also, around 50 training (post-pandemic outbreak) videos (DHS, 2020ac.) were developed & disseminated through the official YouTube Channel of DHFW, "Kerala Health Online Training" (DoHFW, 2020b.). Similarly, a human resource management team were constituted to ensure the availability of sufficient trained workforce across the state (DHS, 2020l.). The team compiles data on district-wise distribution of workforce in the state and also redeploys the workforce (as per requirement) (DHS, 2020l.).

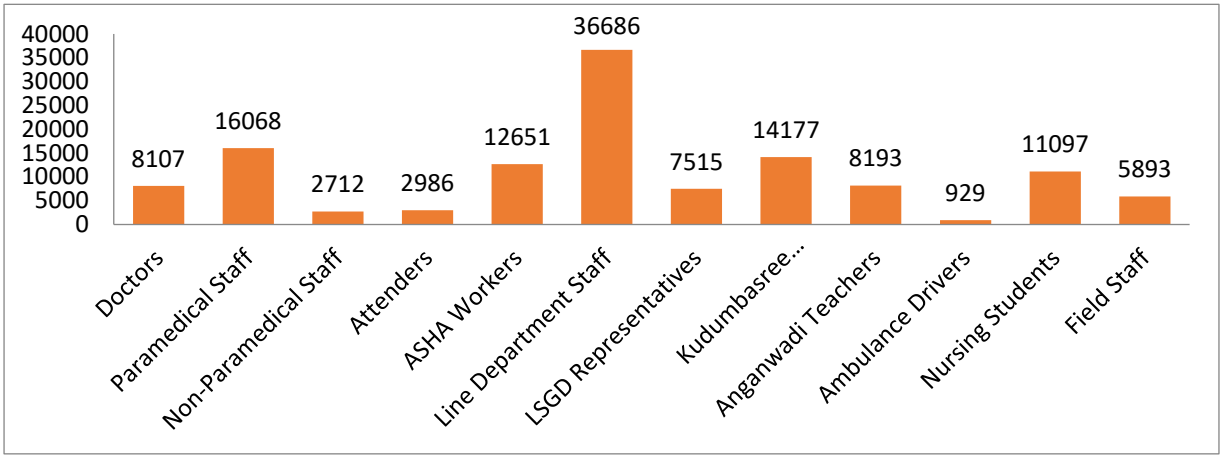

Figure 2: Human Resource Training Given to Workforce

[Source: Author, Data Source: (DHS, 2020t.)]

Concurrently, the state health department focused on mental well-being of its population. With the slogan "Kerala health department is with you. Be alert; do not fear" (DHS, 2020m.), the state boosted morale of large apprehensive population. Psychological support team has been constituted to arrange staffs (at field level) to deal with anxiety/stress of persons under isolation (DHS, 2020l.). With 143 staff, around 4000 counselling services were provided (through telephone/mobile) to families of persons under isolation (DHS, 2020ac.) and motivational messages (SMS) were sent to persons under isolation (DHS, 2020w.).

Communication

Round-the-clock call center has been established in control rooms to address queries on administrative, logistics and medical matters (DHS, 2020l.). Through real time automatic data transfer, the state ensured quick & direct communication between district control rooms and state control room (DHS, 2020m.). The data/information from all teams was compiled to confirm availability & accessibility of the right information for all officials/staff/institutions/general public (DHS, 2020l.). On the other side, the decisions taken at government/minister/secretary level were documented and right information were disseminated through press conferences, press briefing (State's Health Minister) (Ramachandran, 2020), public relations department, All India Radio, television channels, official websites and social medias (DHS, 2020l.).

However, the state has been very cautious for false messages/information (on COVID-19) spread on print/visual/social media (DHS, 2020l.). Hence, a special team has been deployed to screen the messages/information (DHS, 2020l.). A joint training by DHFW & Facebook-India was conducted to deliberate approaches to curb false propagandas on social media (DHS, 2020x.).

RESULT& DISCUSSIONS

Most of the state's PPIR (in phase 1-3) were far ahead than the recommended actions for the phase 1-3. For instance, in Planning and Coordination, the state is expected only to develop, excise & revise the PPIR plans. However, the state's preparatory efforts [issue of guidelines on preventive measures, home isolation, preparations at hospitals, etc (DHS, 2020c.), opening control rooms (DHS, 2020d.), constitution of teams (DHS, 2020k.) (DHS, 2020l.), state specific calamity declaration (DHS, 2020j.)] in phase 1-3 were expected to be executed in phase 4 only. Likewise, life assistance to economically backward families, caregiver facility (DHS, 2020s.), supply of food kits (DHS, 2020l.) were expected to be

performed in phases 5-6 only. Similarly, in Situation Monitoring and Assessment, the state was expected to develop surveillance systems. Yet, the state's PPIR [monitoring travellers (DHS, 2020o.), protocols for home isolation (DHS, 2020s.), development of infrastructure for isolation (DHS, 2020l.) (DHS, 2020m.), monitoring health status of animals/birds (DHS, 2020p.), surveillance at departmental level (DHS, 2020o.) (DHS, 2020q.) and for festivals (NIE, 2020b.)] in phase 1-3 were expected to complete in phase 4 and 5- 6 only. Too, in Communication, what was expected to execute in phase 1 to 6, was executed in phase 1-3 itself. To be specific, the state's efforts to disseminate information on the status of pandemic to public/stakeholders have been performed exceptionally well in phase 1-3 itself. The press briefing of the state's Health Minister (Ramachandran, 2020) were one of its key highlights.

Conversely, a few efforts of the state were absolutely beyond the recommended actions of the guidance document. To be specific, in Planning and Coordination, training and guidance to healthcare staff/institutions (DoHFW, 2020b.), necessary steps for repatriation of stranded (NIE, 2020a.), tele-helpline facility for people outside the state (Cris, 2020), constitution of "Samoohika Sannadhasena" (DSS, 2020) along with the focus of state to ensure mental well-being of large apprehensive population in Continuity of Health Care Provision and in Communication, the measures to curb false messages/information (DHS, 2020l.) were a few to name.

Above all, outcomes of a few PPIR were highly constructive and multi-facet. To be specific, in Planning and Coordination, the constitution of community volunteer force has been highly beneficial for the activities of community kitchens, supply of essential items (medicines, vegetable seeds, banana sapling and books), blood donations and for assisting officials/staff (health, police and fire department) (DSS, 2020) whereas in Communication, the transparency of communication, especially the press briefing of the state's health minister, not only disseminated correct information but also improved the trust & faith of people in state Government (Ramachandran, 2020). Similarly, the school awareness (DHS, 2020q.), in Reducing Spread of Disease, not only improved awareness (on self-protection) among the students but also enlighten their families. Similarly, though vaccines were not developed to protect its people, the state 'vaccinated' them by developing beneficial behaviours for self-protection (WHO, 2020b.). For the study, the author considered only a small period (January 01 till March 08, 2020) which is equivalent to the phase 1-3 (of the WHO's guidance document). Hence, in future, detailed studies comprising the entire nine phases will exceedingly help to clearly understand the depth & breadth of the state's pandemic management model.

CONCLUSION

The state succeeded in managing the pandemic at its early stage of outbreak itself. The state's PPIR were multi-facet, comprehensive, well-planned, well-organised, well-coordinated and well-executed. Most of the state's PPIR (in phase 1-3) were far ahead and beyond the recommended actions (for the phase 1-3) of the WHO guidance document and it significantly contributed to the success of the state's pandemic (early) management model.

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