Original Research Article

Measures Adopted by Mauritius to Combat COVID-19 Pandemic in 2020: A Qualitative Study

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Abstract

Background: Governments are facing sequalae of the containment strategies adopted to curb the outbreak of COVID-19 in 2020. Mauritius, a Small Island Developing State was successful in containing the initial surge of COVID-19 cases in 2020 in a short span of time. This paper is a qualitative assessment to explore experience of the healthcare workers in combating COVID-19 pandemic in 2020. **Methods**: A qualitative study was conducted using semi-structured questions. The healthcare workers belonging to pre decided categories were invited for a face to face interview. A total of 19 samples were interviewed at various healthcare facilities at Mauritius till saturation was reached. **Results**: Themes that emerged during the analysis of the interviews were Capacity building, Intersectoral advocacy, Containment measures and Areas of concerns. The healthcare system responded with installation of Flu clinics and COVID-19 testing centres, formation of Rapid Response Team (RRT) for transport of positive patients to hospitals and contacts from their residence to quarantine facilities. Scarcity of public health specialists to lead activities at the grass root level was a challenge for the containment efforts. Adherence to IPC practices has to be improved among the staff working in the isolation wards. **Conclusion**: The containment measures adopted by Mauritius was proactive and well in time. Leadership provided at the grass root level with positive political and administrative commitment effected in large scale coordinated activities in the sectors of humanitarian, social, public health and medical response.

Key-words: COVID-19, Mauritius, Preventive Strategies, Pandemic, SIDS.

Introduction

The COVID-19 pandemic is straining nations across the globe in various ways. Countries have adopted measures to contain the spread of the infection. However, Governments are facing sequalae of the containment strategies adopted to curb the outbreak such as deaths, impoverishment, unemployment, and worsening economy[1]. The International Monetary Fund observed that there has been a sharp contraction in the global trade and the delay in control of COVID-19 pandemic could further deepen the decline[2].

During the turmoil of the prevailing pandemic, successful models adopted by developing Sub Saharan African countries with limited economic resources will be a great resource. Mauritius, a Small Island Developing State, was successful in containing the initial surge of COVID-19 cases in a short span of time. The country started its preventive measures as early as the 3rd week of January 2020, by screening for fever and other flu like symptoms when COVID-19 cases were being identified in other countries such as Thailand, Japan, South Korea, Singapore and Vietnam. Towards the end of January, symptomatic visitors were quarantined and by the end of February, Mauritian health authorities decided to quarantine visitors from affected countries[3].

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On the 18th of March 2020, three individuals with history of international travel were diagnosed with COVID-19 disease in Mauritius. Stringent measures were adopted on detection of more cases. Considering the severity of the situation, the government announced a six-week nationwide complete lock down. Movements were restricted and the borders were seized except for repatriates stranded abroad. Citizens were permitted to go out for essential requirement according to the first alphabet of the surname as promulgated by the Ministry[4].

The number of cases kept escalating steadily, reaching 128 cases on 30 March 2020 and 332 cases on 29 April 2020. The lockdown was extended twice until 1st June 2020 with the economy slowly opening for the public with relaxation from 15th of May 2020[3]. Since 29 April, indigenous cases of COVID-19 were not reported. However, cases were being reported amongst expatriates in quarantine facilities. Small Island Developing States are nations with low resource and are dependent on external aids during such disasters. Hence, the present study was conducted to describe the experience of healthcare workers (HCW) while combating COVID 19 pandemic in Mauritius.

Materials and Methods

Setting

The Republic of Mauritius, located off the southeast coast of Africa has roughly 1.3 million inhabitants located on its three main islands: Mauritius, Rodrigues, and Agalega. As per World Health Organization (WHO) statistics, Mauritius has about 1.262 million population with a median age 35 years. Mauritius is equipped with an average of 3.4 hospital beds per 1000 population and a the density of healthcare workers (HCW) is 2 doctors and 3.3 nursing and

midwifery personnel per thousand population, which is better than other sub-Saharan African countries[4,6].

Participants

The researchers in this study included four public health specialists (one female) and two Clinicians. The present project was supervised by a Public Health specialist with an MD degree in Community Medicine from a medical college in India. This Public Health specialist was involved in training human resource and was responsible for developing a policy for combating COVID 19 pandemic in Mauritius. We used purposive sampling to recruit HCWs from healthcare facilities to ensure broad and diverse information. The study sample included, Regional Health Director (RHD), Regional Public Health Superintendents (RPHS), Regional Nursing Superintendents (RNS), Head of the departments (HoD), Ward Managers and Nurses. A total of nineteen participants were recruited and interviewed between May to June 2020 is shown in **Table 1**.

Table 1: Demographic characteristics of the study participants

Variables	Frequency (n=19)
Profession	
Public health	03
Curative medicine	03
Rapid Response Team Doctor	01
Nurses	04
Ward Managers	02
COVID hospital Doctor	01
COVID hospital paramedical staff	05
Age	29-61 years
Gender	
Male	11
Female	08
Professional years of experience	08-36 years
Healthcare Facility	
Regional Hospital	05
COVID hospital	01
Quarantine facility	01
Primary care	01

Data Collection

After forming the research group, review of literature on various aspects such as trend of COVID 19 disease in the study setting, healthcare preparedness and social support available for population requiring support were carried out. A pilot study was then undertaken in May 2020 to test the interview quide. The interview questions adjusted according to pilot study is shown in **Table 2**.

Table 2: Interview questions for study participants

	Interview guide
1.	Could you please talk about preparedness in the healthcare facilities to COVID-19?
2.	How did various stakeholders get involved and what were their contribution?
3.	Could you describe about the screening and testing strategy?
4.	What do you think are the difficulties encountered by the staffs while understanding and practicing infection prevention control modalities?
5.	What were strategies adopted at different levels to limit spread of transmission?
6.	According to you how did the country prepare for the pandemic?
7.	What kind of services were provided for the elderly and other category of population requiring special precaution?
8.	How does these measures inspire other nations and healthcare settings to respond to pandemics in the future?

Each regional hospital in the island was visited by the research team and HCWs belonging to pre-decided categories were invited for a face-to-face interview. The samples were taken till data saturation was attained i.e, at the point where no new themes from participants experiences emerged. Using semi-structured questions, a total of 19 samples were interviewed. The interviews were held in private rooms where only interviewers and interviewees were present. The interviews were conducted by the supervisor of the project. Each of these interviews lasted for about 49 minutes (range 25-65). Field notes of the interview were recorded during the interview and the notes were reviewed to avoid conducting repeat interviews. All HCWs, who were approached by the research team were known by at least one of the researchers and expressed willingness to participate in the study. The participants were informed about the study and were encouraged to ask questions. Written informed consent was then obtained and a demographic form was completed by all participants. Themes and sub themes emerged during the analysis of the interviews are described in **Table 3**. The Ethical clearance was obtained from the National Ethics Committee, Ministry of Health and Wellness, Republic of Mauritius.

Table 3: Themes and sub themes emerged on content analysis

Themes	Sub-theme
Capacity building	Preparedness and training
	Response of the healthcare system
Intersectoral advocacy	Political commitment
	Transparency, social mobilization & Community participation
	Social welfare and social security
Containment measures	Amplifying healthcare resources
	Syndromic surveillance, isolation and testing
Areas of concern	Public health workforce scarcity
	Knowledge gap among HCWs

Data Analysis

A reflexive thematic analysis described by Braun and Clarke were used for analysis. The interviews were conducted in English. The data collected were simultaneously transcribed and manually coded to identify emerging themes and subthemes that were further categorized. The analysis included reading the transcript several times to gain an understanding of meaning conveyed, identifying significant phrases and restating them in general terms, formulating meaning and validating meaning through research team discussions to reach consensus, identifying and organizing themes into clusters and categories, and developing a full description of themes. Two members of the research team independently coded and cross-checked the data for data triangulation. The discrepancies that evolved were resolved through discussion till consensus was reached between the researchers. We have included verbatim descriptions of participants' accounts to support our findings. The study participants were not involved in the designing, planning and analysis phases of the study. However, the participants were allowed to know the study results, if requested.

Results

Theme 1: Capacity Building

Preparedness & Training

The Curative division prepared the hospitals and staff to manage all confirmed/probable/suspected cases of COVID-19 at a war footing. Two hospitals (Souillac and ENT hospital) were designated as "COVID hospitals" and were repurposed solely for the management and isolation of COVID-19 cases. The team at both hospitals housed dedicated teams of nursing and medical staff on a rotation basis, along with an earmarked team of anesthetists and chest physicians for consultation and intubation if necessary. The country's experience in preventing Ebola outbreak at Souillac hospital ensured seamless preparedness and high level of confidence among the staff. "Suspected Ebola cases were managed in this hospital. Many staffs in the isolation wards and the ICU have managed these cases. You know it's a deadly disease. Our staffs had training and experience in managing such disease. I think we will be able to manage COVID-19," (RHD, COVID Hospital). "Videos of donning and doffing of PPE, collection of samples was distributed by experts from WHO AFRO. The doctors, nurses and other staffs, they see it for training," (Nurse Superintendent, Regional Hospital). "The training session taken by the team from India was useful. We have such training rarely. May be because all our experts are busy on the field. But the good news is, we have no indigenous cases of COVID in the country," (RNS, Regional Hospital).

Response of the Healthcare System

Flu clinics; with an examination room, detention room, and COVID testing centers were designed and installed for easy patient access. The clinics were located at designated points. The clinics were managed by two doctors for consultation, one doctor or trained nursing officer for sample collection, one nursing officer for the overall administration and record maintenance, and one pharmacist for dispensing medicines. "The ministry arranged cabins, which can be assembled and installed in front of all regional hospitals or where ever required. These COVID testing centres check patients with flu symptoms and if the doctor prescribes, test for COVID was also done," (HoD, General Medicine, Regional hospital). Initially, testing for COVID-19 was conducted as advised by the treating physician. In due course, Director of Public Health extended the testing policy to all patients attending the flu clinic. A Rapid Response Team (RRT) was formed under each regional preventive healthcare team for ensuring use of personal protective equipment by the HCWs, during the transport of positive patients to hospitals, contacts from their residence to quarantine facilities and to monitor the practice of disinfection policies in healthcare facilities and ambulances. "We have a well-established Emergency Medical Service. We call it SAMU (Service d' Aide Medicale Urgente). The SAMU team is given the duties of RRT. The SAMU transfers patients to isolation wards and the primary contacts to quarantine centres." (HoD, SAMU, Regional Hospital).

The health authorities earmarked several hotels around the island for use as quarantine facilities for asymptomatic contacts of positive cases, expatriates returning to the country, people with international travel history and medical staff on completion of their rotation in the COVID wards. People in quarantine facilities were detained for 14 days and were discharged only on testing negative for COVID-19. The quarantine facilities are manned by teams comprising of doctors (general practitioners), 2 male and 2 female nurses, along with sanitation staff and specialist doctors who visit on a consultation basis. The service was offered to the public for free thereby addressing public health concerns on out of the pocket expenditure for health. "Many resorts where converted into quarantine centres to keep the primary contacts under quarantine for 14 days. We test them on 14 days and if it is positive, then we inform the Rapid Response Team" (RPHS, Regional Hospital). The isolation wards were established in each Regional Hospitals to admit patients whose COVID-19 test reports are awaited. Other blood tests are carried out if necessary while admitted in the hospital. Separate wards were ear marked for male and female patients which was manned by dedicated staff. "Patients who give sample are admitted in the isolation ward until the result comes. If the test comes positive, they are shifted in our ambulance to the COVID hospital. Patients whose test is negative is discharged after discussing with the physician in charge." (RNS, Regional Hospital)

Theme 2: Inter-sectoral Advocacy

Political Commitment

Instant measures were taken by the Government to curb the transmission of Covid 19 disease. Requests for medical aid from sister countries like India and other International agencies were made, while preparing to combat the disease. A team of multidisciplinary experts in the Ministry of Health and Quality of Life quickly analysed the requirement for various resources such as quarantine facilities, Personal Protective measures (PPE), screening equipment, hygiene chemicals and manpower. The team ensured adequacy of all required resources. "We prevented Ebola outbreak earlier. I think we were among the first countries to start screening international passengers for temperature. I can also say that Mauritius was one among the first country to quarantine suspected cases. This was even before the testing facility was available." (RHD, COVID hospital)

Transparency, Social mobilization and Community participation

Enhanced media campaign was undertaken to raise awareness on preventing transmission of the disease. A "National Communication Committee" was established by the Prime Minister to address the nation urging for individual responsibility in breaking the chain of transmission. The Ministry of Health, Mauritian Police force and other Key stakeholders held daily press conferences to communicate risks and pattern of disease progression in the country. In addition, The Ministry of Information and Communication Technology developed a free mobile app called 'beSafeMoris', for easy access to all local information and statistics about COVID-19. Efforts taken by the Govt in sensitizing the population were reciprocated by the citizens equivalently. People were highly compliant with the advised social distancing norms, confinement norms and wearing masks to cover nose and mouth. "The Directorate General of Public Health, communicated to the public through television and radio and whichever ways possible. He was able to emotionally connect to the public. People were also waiting for his updates and briefs. I think this communication was important for achieving participation of the public in wearing a mask or be it using hand sanitisers." (RNS, Regional Hospital)

Social welfare and social security

Distinctive measures were instigated for the welfare of population requiring special care and precautions (elderly and homeless people) by the Ministry of Social Security. Dedicated Social Welfare Teams,

formed by the Ministry of Social Security were attached to each Regional Hospital. Activities covered by the teams included provision of shelter and food to the homeless, domiciliary visits for the elderly and transport for the conveyance of needy patients to hospitals. "Sometime we get people who are homeless or are mentally sick without anybody to look after. The social security people coordinate for safe shelter and food. This is also important in reducing disease transmission. The ministry was alert and tried very hard to bring down transmission in the community." (RPHS, Regional Hospital). Welfare aids to the disabled and disadvantaged sections of the society were provided during sanitary curfew. Through the Self-Employed Assistance Scheme & Government Wage Assistance Scheme, income support measures were introduced for self-employed individuals, trade persons in the formal and informal sectors and employees earning up to $1,300 per month.

Theme 3: Containment Measures

Amplifying Healthcare Resources

Stocks of Hydroxychloroquine, PPE and disinfectant chemicals (Hypochlorite Solution) were made available at all healthcare facilities. Hand sanitisation stations in major areas of patient management were installed. Ventilators and provision for piped oxygen supply was installed in COVID hospitals in a rapid phase. One of the objectives of the containment strategy was to curtail dissemination from infected patients to other patients in the wards thereby preventing overwhelming of cases of COVID-19 in the wards, particularly in the Intensive Care Units. Flu Clinics and COVID testing centres were established at each regional hospital outside their main building. These Flu Clinics served to screen patients presenting to the hospital with ILI, as well as a site for collecting samples of suspected COVID-19 cases. "We had shortage of supplies in the beginning. But with a couple of weeks the Ministry supplied us almost all basic requirements. Now we have adequate PPEs, medicines, hand sanitisers and disinfectants." (RHD, Regional Hospital)

Syndromic surveillance, Isolation & Testing

The Public healthcare system and the Hospitals were prepared to screen for COVID-19 among international passengers as early as 20th January 2020. All passengers from high-risk countries were screened for Influenza Like Illness (ILI). Subsequently symptomatic passengers were isolated and asymptomatic passengers were quarantined. The contact tracing team was trained to conduct thorough investigation and trace contacts of every case reported. Every region had a contact tracing team which functioned in association with the Regional hospital and RRT of the respective region. RT PCR test for SARS CoV2 was operationalised on 03rd February 2020. A testing strategy, which included testing of all suspects, irrespective of risk or clinical features, was effective in early identification of cases, mostly during the asymptomatic phase. "Patients were triaged at the reception and were sent to COVID testing centres. The doctor examines and prescribes testing for suspected patients. We have tested a lot of patients. The test result comes after 2 days sometime after 3 days. The contact tracing team is informed by the regional hospital if the report is positive. The team takes on from that point to find out all primary contacts." (Nurse Superintendent, Regional Hospital). Rapid Antigen Test (STANDARD™ Q COVID-19 Ag Test) was used to screen those with risk of exposure to the virus such as the frontline health workers, police personnel, shopkeepers and health volunteers. "We are using Rapid Antigen Kits, which is validated in countries like South Korea and India. We tested HCWs, shopkeepers and police force to find out if there is community transmission. All tests were negative till now. It was easy to do and screening was done twice. It helped in taking relevant policy decisions." (RPHS, Regional Hospital)

Theme 4: Areas of Concern

Public health workforce scarcity

Mauritius has a robust team of Administrators with expertise in various specialties including curative medicine, public health experts, and public health engineers. However, there is a scarcity of trained and qualified epidemiologists, Public health Specialists and Public Health Nurses to implement the policies promulgated by the experts in the Ministry. The scarcity may affect the nation's efforts in the prevention of disease transmission in the community in case of surge of cases in the country. "There are very less people working in public health specialty. It was difficult to make a contact tracing team at first without a public health person in the team. We trained health care staffs and doctors to work in public health programs and activities."(RPHS, Regional Hospital).

Knowledge gap among HCWs

Appropriate use of PPE and COVID Care facilities were found to be good. However, the use of PPE was insufficient in the Triage Centres, Isolation Wards handling suspected cases, Laboratories handling blood & urine samples and Flu Clinics. Awareness amongst the Ward staff on required concentration of the disinfectants or the method of dilution and its appropriate use was inadequate and dilution was being done on rough estimation. "We did not have any training session on how to disinfect. We have been doing it as usual. The disinfectant is issued from the store in the hospital. The store staff said one cap of disinfectant for half a bucket. We use it for mopping the floors about three times a day." (Ward Manager, Regional Hospital).

Discussion

The Republic of Mauritius was successful in containing the first wave of an outbreak of COVID-19 disease in the country due to intersectoral co-operation in the Ministry and community participation at the public. Mauritius followed the 'Act fast. Act now. Keep the lights on' approach by following strict contact-tracing and testing methods using a broader inclusion criterion (with about 10% of the population being tested)[7]. Gilbert M et al in his study reported that the African countries had lower risk of importation of COVID-19 cases compared to European countries, however, their response and reaction capacity to COVID-19 was poor leading to high rate of disease transmission and mortality[8]. About 74% of the African countries have an outdated Influenza pandemic preparedness plan which is inadequate to deal with the prevailing pandemic[9]. Another study by Mei Y et al reported that the Western Pacific Countries have reported a rapid increase in cases due to delayed response and preparedness resulting in a Case Fatality Rate of 3.63%[10]. Islands like Fiji, largely dependent on tourism, controlled cases by shutting down all ports resulting in an economic recession and rise in unemployment in Fiji and other Pacific Small Island Developing States[11]. Similarly, the Caribbean islands have been facing multidimensional issues resulting from lack of political commitment, resources and poor communication. Lack of adequate communication and transparency has resulted in varied beliefs among the islanders. For example, some of them believed that the virus is God's punishment on humans for their sinful ways while some believes that this is manufactured to kill the minorities[12].

The present study has explored experiences of key stakeholders in containing COVID-19 outbreak. It has added essential insights to the necessity of implementing significant preventive measures with political and administrative drive and support. Establishment of the National Communication Committee and a Communication cell in the Prime Minsters Office and sanction of important bills for social security of the at-risk category of population were major steps at the Ministerial level. These steps were important to prevent hunger, poverty and other social issues during the curfew. Similarly, Education and social mobilization efforts taken in a southern state in India was found to be effective in reducing the transmission of infection especially while a large number of expatriates returned to the state[13]. Moreover, the sensitivity of contact tracing is enhanced

through social mobilization, community participation achieved by efficient media advocacy.

Rise in cases over and above the available resources impoverishes the developing nations. Access to free medical care and vaccines such as routine pediatric vaccines and influenza vaccine for adults kept out of pocket expenditure on health to the minimum and was also effective as a long term measure to curtail flu cases in Mauritius during the COVID pandemic[14]. The financial barriers and patients access to optimum treatment for both confirmed and suspected cases of COVID-19 was a major threat among developing countries[15]. Manifold rise in price of preventative goods such as masks and sanitizer resulted in approximately more than 20 % of a family's monthly income invested in these products[16]. King J S and Thorpe J et al opinied that universal access to affordable healthcare during the pandemic has to be aimed through health care reforms and social protection schemes to expand disease-control efforts by reaching out to the most marginalized and vulnerable people to contain the spread of SARS CoV2[17,18].

The experience gained by the Government of Mauritius from preventing Ebola cases in the nation was useful in carrying out a swift analysis of healthcare resources (PPE, ventilators, testing kits, disinfectants, medicines and Oxygen reserve). The estimated demand was largely materialized through aid from International co-operations, International agencies and local resources. Similarly, drawing lessons from SARS CoV outbreak in 2002, response of Singapore and Taiwan to COVID-19 was proactive, quick and aggressive[19]. Singapore established Public Health Preparedness Clinics, outbreak wings with negative pressure rooms, ventilators, PPEs and medicines through release of emergency fund, echoing their public health preparedness[20]. In contrast to this, arrival of SARS CoV2 in African countries was delayed due to an early shut down of international borders and ports. However, the opportunity gained by delaying the pandemic was utilized by very few countries in Africa[21].

Our study found that Mauritius has a well-established Emergency Medical Service (EMS) with a speed dial tele-service (dial 144) and a well-equipped ambulance service. This service was effectively utilized as RRT with a task for quick response on detection of a confirmed case in the community in addition to catering for domiciliary medical care and patient transfers. EMS narrows the gap to reduce death tolls while transferring COVID-19 patients in critical condition to higher medical facility who may need medical intervention en route[22]. This was a key strategy in achieving low mortality rate and reduction in transmission of diseases in the community.

A testing strategy aimed at wiping out SARS CoV2 was followed and was in line with WHO recommendation. The testing strategy and effective isolation of cases in South Korea was largely influenced by its experience in containing Middle East Respiratory Syndrome in 2015.[19] The "Chase the virus" model adopted in Dharavi, an urban slum in India, controlled spread of virus through aggressive tracing, tracking, testing and treating[23]. Similarly, a mathematical model observed that extensive testing, contact tracing along with continuous social distancing can result in complete containment of the pandemic[24].

Our study found that Mauritius curbed the pandemic by adhering to scientific measures implemented within the time frame of opportunity. In addition, an earlier experience of the public and healthcare echelons in preventing Ebola disease in the country effected in developing adequate capacity. The limitations of this study were that the sample composition could not include stakeholders from other domains such as police force, social security, economy etc which resulted in a small sample size and the data was recorded as filed notes which has an inherent risk of incomplete information. Thus, our study findings cannot be generalized to other community settings.

Conclusion

The containment measures adopted by Mauritius was proactive and well in time. Leadership provided at the grass root level with positive political administrative commitment effected in large scale coordinated activities in the sectors of humanitarian, social, public health and medical response. Transparent and consistent communication of the government earned the faith of the community to practice social distancing, hand hygiene and wearing of face mask. Further, until an effective vaccine is developed, the "stop the outbreak, treat the infected, ensure essential services, preserve stability and prevent further outbreaks" (STEPP) framework, developed by the United Nations to deal with the Ebola outbreak, may be adopted to control COVID-19 pandemic[25].

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Conflict of interest

None

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