

**PANDEMIC OUTBREAK MANAGEMENT: A COMPARISON OF PUBLIC HEALTH
PREPAREDNESS AND RESPONSES BY DIFFERENT COUNTRIES****Stanley John Njattumkalayil^{*1}, Marcin Mamiński², Artur Banaszak³, Noel Nelson Thomas⁴ and Nimmy
Njattumkalayil John⁵**¹Research Associate & Strategic Advisor, Unlock Interational, Thiruananthapuram.^{2,3}Professor, WSGE University, Jozefow, Poland.⁴Program Associate, Office of Dr. S. S. Lal, Head of Public Health, Global Institute of Public Health.⁵Associate Professor, DM WIMS College of Pharmacy, Wayanad, Kerala.***Corresponding Author: Stanley John Njattumkalayil**

Research Associate & Strategic Advisor, Unlock Interational, Thiruananthapuram.

Article Received on 22/12/2021

Article Revised on 12/01/2022

Article Accepted on 01/02/2022

ABSTRACT

Developing countries are in the tight grip of emerging and re-emerging infectious diseases which cause devastating health, social and economic consequences. Fortunately, medical science and technology are so advanced that timely detection and effective management by the healthcare team lessened its intensity to an extent. This article is an introspection into the history of pandemics and how the countries claimed triumph of victory over those.

KEYWORDS: pandemic, epidemic, public health, infectious disease.**INTRODUCTION**

Infectious diseases remain the leading cause of death, which adds up to more than thirteen million deaths every year in developing countries. Unfortunately, when the battle to control known infectious diseases continues, new threats arrive in the form of emerging, resurgent and drug-resistant infections. Researchers are challenged by recurrence of devastating epidemic diseases such as cholera, dengue, epidemic meningitis, hemorrhagic fevers as well as the new pandemic diseases. It not only causes considerable mortality and morbidity but also threatens people's health security.^[1] is an ample number of reasons for the extension and transmission of infectious agents in the modern world, especially in the field of the food industry, urbanization, environmental changes like deforestation and changing agricultural practices, emergence and spread of antimicrobial resistance, increasing volume and speed of international travel etc., which increases the potential for the rapid spread of disease.

Developing countries are in the tight grip of emerging and re-emerging infectious diseases which cause devastating health, social and economic consequences. Fortunately, medical science and technology are so advanced that timely detection and effective management by the healthcare team lessened its intensity to an extent.^[3]

According to the World Health Organization (WHO), health is a state of complete physical, mental and social well-being and not merely the absence of disease or

infirmity. And healthcare is the improvement of health through prevention, diagnosis and treatment. This healthcare is delivered by health providers in medical fields.^[4]

The word 'pandemic' originated from the Greek word 'pan' which means all and 'demos' means people. So originally the word 'pandemic' meant all people. However, now the word pandemic means an infectious disease which has spread globally and causes mortality on a significant scale. Similar words are 'endemic' and 'epidemic'. The word endemic means local outbreak and epidemic means a sudden outbreak.^[9]

An outbreak is when the disease happens in unexpectedly high numbers and may last for many days to years. It can be an unknown disease, which is new to the population. However, an epidemic is an infectious disease which spreads to more people than it is expected. Whereas a pandemic disease outbreak is too scary as it spreads across countries or continents and could take more lives than an epidemic.^[10] Epidemics and pandemics are scary conditions that threaten people's health security. It could easily cause considerable mortality and morbidity.

One of the main goals of all of this pandemic management is proper control measures. Some epidemics may take weeks to months together to spread globally, whereas few others will take a few hours to days. A global awareness and optimal control strategies can help us to cope with the pandemic. These pandemics not only

cause social unrest but also lead to a huge economic burden.^[9]

Large outbreaks of pandemics increase mortality and morbidity in a particular geographic area. Research studies show that the likelihood of a pandemic has spiked to peak over the past century due to an increase of global travel, urbanization and exploitation of the natural environment. However, these trends are likely to be continued and will intensify the existing problem.^[9]

Risks and impacts of a pandemic outbreak

Risks

1. Pandemic increases the emergence of viral disease from animals.
2. Pandemic risk is driven by a rise of risk and spread of the risk through human populations.
3. Some geographic regions lag behind to get prepared for the panic attack example Central Africa and West Africa.
4. There are some pathogens which cause the death of a million people, examples of influenza.^[9]

Impacts

1. A pandemic causes morbidity and mortality in the community
2. Causes huge financial damage including short term fiscal shocks and long-term negative shocks to the economy.
3. Some pandemics can cause significant disruption in the social, political and economic life.^[9]

Consequences of pandemics

A pandemic can cause sudden but widespread morbidity and mortality as well as destruction in social, political and economics. A pandemic is considered to be geographic as it has its own severity, frequency and other disease characteristics depending upon the different geographical area. However, each type of event requires preparedness and response strategies. The pathogens which cause this epidemic widely differ in their mechanism and dynamics of disease transmission, and the associated morbidities. Even the pandemic potential also varies widely depending upon the potential health economic, social, political impacts on resources.^[9]

There was a direct impact on health due to pandemics. History shows that several million people lost their lives due to these epidemics. It can affect all segment of the population regardless of age and sex. It causes loss of life and even significant life years in many people. This pandemic has led to the loss of lives of many health care workers too. Another major consequence is economics. Pandemic has caused a significant impact by damaging economic growth. In history, we can see that pandemics have affected all sectors of the economy including agriculture, manufacturing, rapid price increase for staple food, private firms and governments. The other trends which could increase the intensity of the consequences of the pandemics are the higher prevalence of

comorbidities, ageing population, poor health care facilities.^[9]

Tools to handle a pandemic

One of the tools for pandemic preparedness is situational awareness. It is proper surveillance in humans, animals and on the resources available in order to manage threats. This is especially crucial even for the spark risk and the spread risk. It helps to control the propagation as well as the transmission of the pandemic. However, it requires strong back support from healthcare professionals. Moreover, the population of the country should have trust in their public health care system too. This helps to track the transmission of infectious disease and also to detect the most effective method to reduce the propagation of the disease. It also helps to decide how to allocate the resources during the pandemic. It is helpful in monitoring the effectiveness of interventional measures used to control the pandemic. Health care professionals play a very important role in recognizing the illness, identifying the pathogen response to the clinical need and then isolating the infected person and giving appropriate clinical care. So, it is like teamwork which helps to have control over these conditions. This is especially complicated when two or more viral infectious disease are having common symptoms then a differential diagnosis should be immediately available and be communicated to the public healthcare system thereby helpful in detecting the disease at the earliest stage.^[9]

Preventing the pandemic spark before they become a wide threat is one of the crucial things our healthcare system should focus on. It is an age-old saying that 'prevention is better than cure.' So, we need to approach human health, animal health and the environment to control the widespread infectious agent. Moreover protective and preventive action should be taken to find how the pathogen is transmitted, what are the measures for managing the patient care, what are the higher risk practices to be observed and especially the protective behaviour measures which can reduce the spread of the infection.^[9]

Public health should take efforts to minimize the spread of infection once a pandemic has begun. It is mainly by curtailing the interaction between infected and uninfected populations. It is achieved by patient isolation and social distancing practices like a closure of school and office quarantining the infected people. The second way is by reducing the infectious nature of symptomatic patients, by giving proper treatment to the patient through antiviral medications and antibiotic treatment and also by proper infection control measures. The third way is to protect uninfected individuals by providing preventive measures like vaccines.^[9]

Since the 14th century till today, the practice of quarantine in response to a pandemic has been found to be very effective. Prohibition of the mass gatherings during the pandemic period will reduce the spread of the

infection as well as the mortality rate. Quarantine and social distancing are found to be a very effective tool to control the propagation of the illness. It was during Ebola our healthcare system started quarantining the patient and improving measures of infection control in the hospital. Since then, the use of facemask, gloves, gown and hand washing has become a practice. Restriction of the travel meant by the government also helps in curtailing the disease spread. These restrictions are helpful to control the pandemic to an extent.^[9]

Availability of symptomatic treatment and treatment for boosting immunity plays a very important role in the transmission of the infection. Some infections are caused by a virus where the antiviral drugs play a very important role in curing the illness whereas diseases which are caused by bacteria are treated by antibiotics. Some drugs are given as prophylactic treatment. Virus vaccines can reduce the susceptibility of the infection. Usually, the vaccination strategies target the younger population as they are more commonly affected by the influenza virus. Providing supportive care also enhances the efficacy of the treatment.^[9]

Importance of Surveillance

Surveillance is the only effective tool to control the outbreak of such infections. Surveillance on communicable diseases provides the essential information to monitor, evaluate and control the spread of endemic and zoonotic diseases. Another major goal of surveillance should be to identify populations who are at risk, implement prevention methods, control strategies, detect unusual discharge patterns and contain the re-emergent micro-organisms. A global network of laboratories and disease surveillance systems facilitate rapid information exchange. The key components in order to battle against the zoonotic diseases are epidemic intelligence, coordination of epidemic response and epidemic preparedness.^[1]

Surveillance is critical in assessing the effectiveness of regulatory and advisory measures designed to safeguard public health such as drinking water standards and guidelines for the preparation of infectious diseases.^[2] Here comes the role of a hospital administrator who binds the inter-professional team to coordinate the surveillance of these public pandemic outbreaks. An efficient administrator effectively manages different members of a healthcare team as he configures the importance of teamwork rather than individual activity. In a good clinical setting there is no mention of administrator, instead a collaborative interprofessional practice who works for a common motto.^[13]

How to mitigate the spread of pandemic?

Mitigation of the spread of a pandemic should be done through a series of steps which are scientific as well as proven effective.

1. Planning

In order to minimize the impact of a pandemic, a good preparedness plan needs to be developed. Majority of the countries developed pandemic cop up plans to overcome it. Some of the developing countries have just followed the strategies of industrialized countries. That could lead to failure of following the plans because many of the strategies of developed countries will not be feasible for developing countries. The level of planning in a low-income country will be inadequate to deal with a major health crisis. So, if they want to follow the strategies framed by developed countries it will not be fruitful as they have little or no expertise with pandemic preparedness. WHO has prepared a checklist for pandemic preparedness tools which is a general approach to the pandemic preparedness designed for individual countries with limited resources. Each government and the healthcare system should stand together to fight the pandemic and mitigate its impact on the social, economic and political well-being of the citizens.^[25]

2. Increase the availability of Essential medicines and vaccines

The WHO recommends an increase in vaccine production worldwide to meet the demand during a pandemic. Also, the availability of vaccines and essential drugs should be increased in order to fill the gap between high income countries and low-income countries. And vaccines should be made available to developing countries for a reasonable cost. Preventive medicines and essential medicines should be available at affordable prices for the developing countries.^[25]

3. Reserve essential medical commodities

By reserving essential medical commodities and medical supplies like surgical masks, gloves, emergency medicine hospitals can combat any pandemic. In many developing countries these basic medical amenities are not easily available and the hand hygiene practices are not always followed. Even health care professionals in developing countries should be trained to manage infection control properly.

Basic training on infection control to the healthcare professionals would improve the preparedness for a pandemic. These measures are necessary not only for a pandemic but also for other contagious infections like malaria, HIV, tuberculosis etc.^[25]

4. Develop feasible strategies to control the pandemic

There are many feasible strategies to control the pandemic without the firsthand use of pharmaceutical interventions. Many pandemic outbreaks and its rapid spread can be minimized by non-pharmacological interventions like lifestyle modification, social distancing and personal hygiene. The government should take public health measures like the closure of school and public places, and household quarantine for people who have symptoms. Along with this, proper implementation

of prophylactic treatment with the vaccine or an antimicrobial or an antiviral is very essential to mitigate the spread of the disease. Research studies have shown that hand washing, hand hygiene became core management strategies after influenza attacked developing countries. Hand washing is found to be one of the core strategies for the management of influenza infections.^[25]

5. Denial of securing equitable access to healthcare resources

One of the main reasons where the epidemics have affected the developing countries is many of the countries do not have access to the vaccines and the drugs during these epidemics lead to a hike in the fatality rate. The author emphasized that the largest epidemic which caused the death of many million people in Africa is Meningitis. Every dry season, meningitis causes epidemic outbreaks with high morbidity and mortality rate. The lack of availability of the resources does not allow these low economic countries to buy and reserve vaccines for distribution during the critical times.^[26]

How UAE fought the pandemic H1N1 2009?

H1N1 influenza virus was first reported in Mexico in March 2009 and had a very quick worldwide spread. The WHO declared the pandemic as a public health priority and initiated various measures in order to control its spread. So, the state government made the reporting of the case mandatory as well as data were recorded by the health authority department. The Cardinal symptoms of the H1N1 virus were influenza like illness, e.g. fever, cold and cough, sore throat, lethargy etc. Laboratory testing was recommended for patients with shortness of breath, the radiographic appearance of the lungs, patients with either hypotension or hypertension who are having risk factors like pregnancy, children below 5 years and co-morbid conditions. The first case was reported in 2009 and the country has taken numerous measures to block the spread.^[28, 29]

One of the major steps which had been taken by the UAE government was the formation of an infection control committee to combat the threat of swine flu. It comprises healthcare professionals including physician, pharmacist, nurses, healthcare administrators, microbiologist and management professionals for planning, developing and implementing protocol for controlling the pandemic.

The second measure was the installation of thermal detectors in order to detect the presence of the virus. These thermal detectors were installed at country entry points, new passengers and the travellers who are coming back were able to be scanned and detected the illness at the point of entry itself.

The third and the major step they have taken forward was public awareness about the flu pandemic. The clinical symptoms and the manifestations and the precautionary measures to avoid the spread of the

pandemic were distributed as leaflets to the public through various modes. These leaflets are distributed to the plane passengers, passengers in the public transport, market square in malls and shops in business firms, hotels etc. The distribution of the pamphlets has helped a lot in taking precautionary measures for the public.

Television and radio programs lined up with medical experts to educate the general public about the virus spread and the preventive measures to be taken. Moreover, the hospital authorities and the public health teams organized health education seminars and health education programs in public areas like malls, shopping complex etc.

Additionally, the public health department was in collaboration with the WHO and other international health organizations to develop health plans, equations and preventive procedures to combat the new pandemic.

Another major step taken by the health department of the government was stocking up the flu vaccine and antiviral drugs – Tamiflu. These are some of the precautionary measures taken by UAE in order to control the spread of the pandemic swine flu.^[28, 29]

How India fought the pandemic swine flu H1N1?

The country has been preparing to fight against the virus since the beginning of 2009 when the first patient was reported in August 2009. One of the major steps taken by the hospitals was the formation of an infection control committee with hospital administrator, senior resident hospital administrator, nursing superintendent, infection control nurse and material management officials. And these members of the committee guided each department and equipped with sufficient supplies and precautionary measures.^[30]

An isolation ward was prepared for the infected people and those who are suspected with flu symptoms. There were glass partitions in the ward between the cubicles to separate the patients. On the emergency side of the hospital, a triangle area was identified which is available for the patients with influenza-like illness. This was connected to the isolation ward with a separate access for the flu patients. There were visitor restrictions for the triage as well as to the isolated area and it was maintained with the help of security of the hospital.

Another major measure taken was the availability of logistic support which is necessary for the patients. N95 respirators, personal protective equipment (PPE) kits, hand sanitizers, ventilators, face masks and antiviral drugs were made available to the patient at the isolation ward.

Hospital surveillance: In order to detect people with influenza-like illnesses separate surveillance was arranged in the emergency unit. The hospital staffs treating the patients in the isolation ward and also other

departments of the hospital were having a facility to send their sample for detection of the presence of virus.

Transparency in communication was considered to be a vital part which played a very important role in mitigating the epidemic attack. There was an information exchange between the hospital with the higher authorities in the form of written and verbal communication. The information exchanged between the country and the health department were found to be accurate, which was a timely key to the effective management of pandemic. Written communication was in the form of email and fax whereas verbal communication was done through telephone between the hospital and the Ministry of Health regarding the guidelines, planning feedback, a number of cases reported each day and the availability of the vaccines and drugs.

Public media like television and daily newspapers were used to create awareness among the public. Some of the senior faculty of the hospital and experts in infection control delivered interactive sessions over the mass media. Even the public health department played a very important role in answering the queries related to the pandemic.

Moreover, there was good coordination between the internal departments of the hospitals for patient care. Patients who are given symptomatic treatment in pulmonary medicine, critical care, emergency treatment, etc.

On top of all, there was a group of qualified healthcare professionals who were trained for treating influenza patients with utmost care. Four sets of health care teams were present in the hospital, trained to work in an isolated ward for treating influenza patients. The shifting service was allotted for this medical team. Special training was given by the hospital infection control office regarding the personal protective equipment, hand washing technique and waste handling and management technique.

The role of the hospital infection control committee for making awareness for the patients and their contents regarding the control of the treatment and the spread and the profile after treatment was indispensable. They did a good job of convincing the hospital staff to avail the vaccination offered by the government of India free of cost. Moreover, the safety of the healthcare employees was made sure through the provision of essential logistics required for the infection control like hand sanitizer, N95 mask, PPE (personal protective equipment) kits, throat swabs, suction kits etc.

The healthcare professionals who fell ill were given special permission by the hospital to stay at home till they recovered. The vaccine as well as antiviral medication was provided to the health care professionals free of cost.

How Kerala (a South Indian state) fought the outbreak of NIPAH in 2018?

It was during May 2018 a highly pathogenic virus outbreak happened in Calicut district in the South Indian state, Kerala. It was an emerging zoonotic disease which was previously reported from Southeast Asian countries.

The natural reservoir of this particular virus were the bats which belonged to the genus 'pteropus' and virus samples were isolated from the urine of the bat. The patients who are infected with this pathogen initially show fever and brain inflammation leading to disorientation or a coma stage. Some rare cases of the patients were reported with acute respiratory distress. The common laboratory confirmed tests are ELISA and reverse transcription PCR test. More than the drug and its treatment- intensive care treatment and non-pharmacological treatment played a very important role in sustaining the life of the patient.^[31, 32]

The health care team was actively involved in the outbreak response, surveillance and data management. The cases were confirmed as per the definition of the Nipah virus. Suspected, probable and confirmed cases were segregated for the confirmation of the infection through an RNA test performed by reverse transcription PCR method using the samples of blood, urine and throat swab. Meanwhile, the patient's symptoms were treated with intensive supportive therapy. Patients who were confirmed with influenza attack were admitted in isolation wards with intensive care support.

Another major measure taken by the government was case-based surveillance, where case tracking was done to determine the source of the infection. Meanwhile those patients were home quarantined for 21 days. These surveillance activities were performed about 42 days which is twice its incubation period.

The infection control practices were strengthened by ensuring the prepositioning of medical supplies and adequate stocks of personal protection equipment. The hospital staffs were familiarized with standard operating procedures and protocol for incident management. Maintaining universal precautions and hospital infection control practices regardless of the type of the patient handled was one of the most vital things.

These countries show an example of how they fought the pandemic which attacked them. All sectors in the health department have a unique role in pandemic preparedness and in resisting the spread of infection.

Highlights of actions taken by Government, Hospital and the Public Health in fighting the pandemic:

Government	Hospital	Public Health
Made the reporting of cases mandatory and data were recorded by the health authority.	Infection control committee was formed with representatives from all departments.	Organized health education seminars health education programs in public areas like malls, shopping complex etc.
Thermal detectors were installed at the country entry points.	An isolation ward was prepared for the infected people and those who are suspected with flu symptoms.	Developed health plans, equations and preventive procedures to combat the pandemic in collaboration with the WHO.
Stocked up the flu vaccine and antiviral drugs.	Laboratory testing was recommended for high-risk patients.	Answered queries related to the pandemic with the help of senior experts over the mass media.
Transparency in communication with hospitals and higher authorities.	Ensured the availability of logistic support like face masks, gloves, PPEs, drugs etc., which are necessary for the patients.	Awareness was given on preventive measures like the use of face masks, hand washing techniques, etc.
Case-based surveillance, where case tracking was done to determine the source of the infection.	Good coordination of the internal departments.	Organized programs for creating awareness about the pandemic like flash mobs etc.

REFERENCES

- Berkelman, Ruth L., Ralph T. Bryan, Michael T. Osterholm, James W. LeDuc, and James M. Hughes. "Infectious disease surveillance: a crumbling foundation." *Science*, 1994; 264(5157): 368-370.
- Martinez, Lindsay. "Global infectious disease surveillance." *International Journal of Infectious Diseases*, 2000; 4(4): 222-228.
- <http://www.northeastern.edu>
- Health Topics: Health system, World Health Organisation.
- <http://www.encyclopedia.com/>
- <http://www.pallipedia.org/> - the free online palliative care dictionary.
- Ferlie, Ewan B., and Stephen M. Shortell. "Improving the quality of health care in the United Kingdom and the United States: a framework for change." *The Milbank Quarterly*, 2001; 79(2): 281-315.
- Diagram – <http://www.nap.edu/> The national academies press. Chapter 2 – A framework for a systems approach to healthcare delivery.
- Madhav, Nita, Ben Oppenheim, Mark Gallivan, Prime Mulembakani, Edward Rubin, and Nathan Wolfe. "Pandemics: risks, impacts, and mitigation." 2017.
- <http://www.webmed.com/>
- <http://www.lifescience.com/>
- <https://www.symptomsense.com/history-of-pandemics>
- Nagel, Jerod L., James G. Stevenson, Edward H. Eiland III, and Keith S. Kaye. "Demonstrating the value of antimicrobial stewardship programs to hospital administrators." *Clinical Infectious Diseases*, 2014; 59 suppl_3: S146-S153.
- Woolhouse, Mark EJ, Andrew Rambaut, and Paul Kellam. "Lessons from Ebola: Improving infectious disease surveillance to inform outbreak management." *Science translational medicine*, 2015; 7(307): 307rv5-307rv5.
- <https://online.maryville.edu/online-masters-degrees/health-administration/>
- David Heymann. Institute of Medicine (US) Forum on Microbial Threats. Ethical and Legal Considerations in Mitigating Pandemic Disease: Workshop Summary. Washington (DC): National Academies Press (US); 2007. 1, Learning from Pandemics Past. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK54171/>
- <https://www.history.com/news/spanish-flu-second-wave-resurgence>
- <https://www.history.com/topics/world-war-i/1918-flu-pandemic>
- https://en.wikipedia.org/wiki/Spanish_flu
- Oshitani, Hitoshi, Taro Kamigaki, and Akira Suzuki. "Major issues and challenges of influenza pandemic preparedness in developing countries." *Emerging infectious diseases*, 2008; 14(6): 875.
- <https://www.nytimes.com/2020/04/04/us/coronavirus-spanish-flu-philadelphia-pennsylvania.html>
- Howard Markel, *Contemplating Pandemics: The Role of Historical Inquiry in Developing Pandemic Influenza Mitigation Strategies for the 21st Century*, 2006.
- Georg Kell. Four Lessons We Should Learn From The Pandemic <https://www.forbes.com/sites/georgkell/2020/04/11/four-lessons-we-should-learn-from-the-pandemic/#63bc2f106370>
- Forman, Rebecca & Atun, Rifat & McKee, Martin & Mossialos, Elias, 2020. "12 Lessons learned from the management of the coronavirus pandemic," *Health Policy*, Elsevier, 124(6): 577-580.