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# Preparedness to Monsoon Diseases in Kuttanad (Kerala)

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# PREPAREDNESS TO MONSOON DISEASES IN KUTTANAD (KERALA)

**Bejo Jacob Raju and S Manasi***

## Abstract

*This paper aims to capture the preparatory measures of the institutional health system in Kerala to address the threats of communicable diseases during the monsoon. Further, with an extensive field survey in Kuttanad, the study explores the preparedness of the households against monsoon epidemics looked in terms of their keenness to treatment, adherence to preventive medicine, vector prevention measures, healthcare insurance coverage and possession of basic knowledge of the etiology of communicable diseases. The study found the pre-monsoon preparatory measures of the local self-governments at the grassroot level inept. The distribution of preventive medicines was poorly administered. The study also found weak permeation of healthcare insurance coverage in the representative sample. The government bodies should frame tailored preparedness programmes targeting the vulnerable groups during the monsoon.*

**Keywords:** Monsoon Diseases, Disease Preparedness, Kuttanad Wetland Ecosystem

## Introduction

The increasing frequency and severity of catastrophic events (natural disasters and epidemic outbreaks) has raised public awareness of the need to be prepared. Globally, epidemic outbreaks kill thousands of people every year, posing threats with increased economic and social consequences. The dreadful effects of the disease outbreaks have put governments all over the globe on high alert for an influenza pandemic (Eastwood *et al*, 2009; Peeling *et al*, 2018).

The Kuttanad wetland ecosystem which lies in the south-west coast of the Indian peninsula is at high risk of infectious diseases during the monsoon. The wetland has a history of infectious disease epidemics due to a dense population and close connection to inland waters. The trepidation about the infectious disease outbreaks in Kuttanad sprouted in the mid-1990s when Japanese encephalitis struck in the form of an epidemic (Ramachandran, 2000). Since the mid-1990s, in addition to Japanese encephalitis, Kuttanad has witnessed outbreaks of malaria, leptospirosis, dengue, chikungunya and what is generically described as 'viral fever' (George, 2011).

The governments and public health organizations play an important role in taking positions to provide overall planning to prepare the public for any epidemic outbreaks. An increase in the awareness of living conditions and good sanitation help decrease the incidence of infectious diseases and facilitate their effective control and prevention. This community-based approach to disease preparedness is fundamental as it promotes the awareness and knowledge of the local people, and their general preparedness for epidemic outbreaks (Paton *et al*, 2001).

In Kerala, the government's preparedness to monsoon epidemics is rooted in the community level through ward-level health and sanitation committees. The committees are formed under the leadership of elected ward members and include related representatives of the department of social welfare, Anganwadi workers, Kudumbasree health volunteers, Mahila Swasthya Sangam (MSS) volunteers, ASHA workers[1], school teachers and other NGOs that are involved in public health work.

No matter how well governmental and related agencies plan and prepare for epidemic outbreaks, the self-reliance of ordinary people may further reduce the damaging effects of epidemics on individuals and their

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loved ones. Every household should have a prompt preparedness plan to minimise the consequences of natural disasters and the epidemic outbreaks that might follow them (Jakeway *et al*, 2008).

Disease awareness and preparedness are thus crucial for reducing the negative effects of any epidemic outbreak. Although many studies have focused on the morbidity patterns of communicable diseases and acknowledged the seasonality trend in Kerala, there are no detailed studies on the state's preparedness to face the outbreaks. This paper therefore aims to capture the preparatory measures of the institutional health system in Kerala to tame the threats of communicable disease spread during the monsoon. The study, with an extensive field survey, also explores the basic knowledge, perception and preparedness practices of the households in Kuttanad wetland during the monsoon.

## Methods

### *Data Collection*

The field work for the study was conducted at two levels:

At the *first level,* to comprehend the preparedness of the institutional health system to respond to the upsurge of communicable diseases during the monsoon, semi-structured personal interviews were conducted with selected public health government officials at the Directorate of Health Services (DHS), Thiruvananthapuram.

Following this, the institutional health system in Kerala was broadly split into three types of institutions: (i) government bodies (ii) research units and (iii) voluntary organizations. Semi-structured personal interviews were conducted with selected public health officials and staff of various government bodies, officers in charge of various research units and also with the office bearers of various voluntary organizations. The preparatory measures of the institutional health system were captured through personal in-depth interviews.

At the *second level,* a hospital-based survey was conducted in Alappuzha and Kuttanad (Kerala) during the south-west monsoon (June-September) of 2018. The survey identified 100 patients each from public hospitals and private hospitals (a total of 200) who availed in-patient treatment for various fever-type illnesses. The patients were followed back at their households after their discharge from the hospitals. The sample was constituted through purposive sampling technique. A semi-structured interview was conducted at their households to solicit information from the households about their basic knowledge and perception of monsoon diseases. The schedule also captured the practices and preparatory measures of the households prior to and during the monsoon. The interview schedule was administered directly to the adult patients and in the case of children (below 15 years), the schedule was administered along with their parents or guardians. The socio-demographic characteristics of the patients are shown in Table 1.

### *Data Analysis*

The qualitative data were analysed after recording and transcribing the in-depth interviews. The interviews were coded and clustered into meaningful themes using ATLAS.ti 8 Mac.

The quantitative data were analysed with IBM SPSS for Mac, Version 23. Pearson's Chi-square test and Fisher's exact test were used to test the association between the variables and to determine the differences between proportions. Binary logistic regression was adopted to identify the extent to which the independent variables were associated with the outcome measures. The statistical significance level was set at $p< 0.05$. The results were presented with odds ratios (ORs) at 95 per cent confidence interval (CI).

## *Ethics*

The ethical approval for the study was received before the commencement of the hospital and household surveys by the ISEC Ethics Committee.

## *Socio-demographic characteristics*

The socio-demographic characteristics of the patients reveal that most of the patients fall in the age-group 41 – 60 (34.5%). The mean age of the patients is 42.83 years (Range 14 – 88). Another interesting observation is the dominance of male patients (56.5%) over female patients (43.5%) in the sample. Among the different social groups, the patients belong mostly to the OBC community (42%). Patients belonging to SC category are the least, constituting 10.5%. About the economic status, 71.0% of the households possess APL ration cards as against 29% of the households that possess BPL ration cards (Table 1).

Patients who had suffered viral fever and availed in-patient treatment at the hospitals constitute 36.0% of the sample. They are followed by leptospirosis patients (34.5%), dengue patients (21.5%) and viral hepatitis patients (6.5%) (Table 2).

**Table 1: Socio-demographic Characteristics of the Respondents**

| **Demographics** | ***n*** | **%** |
|---|---|---|
| **Age** | | |
| Below 20 | 30 | 15.0 |
| 21 – 40 | 63 | 31.5 |
| 41 – 60 | 69 | 34.5 |
| Above 60 | 38 | 19.0 |
| **Gender** | | |
| Male | 113 | 56.5 |
| Female | 87 | 43.5 |
| **Religion** | | |
| Hindu | 125 | 62.5 |
| Muslim | 17 | 8.5 |
| Christian | 58 | 29.0 |
| **Social Group** | | |
| OBC | 84 | 42.0 |
| SC | 21 | 10.5 |
| Others | 95 | 47.5 |
| **Marital Status** | | |
| Never Married | 63 | 31.5 |
| Married | 137 | 68.5 |
| **Education** | | |
| Primary | 77 | 38.5 |
| Secondary | 76 | 38.0 |
| Graduation and Above | 47 | 23.5 |
| **Occupation** | | |
| Self-employed | 23 | 11.5 |
| Regular Salary Earner | 35 | 17.5 |
| Casual Worker | 77 | 38.5 |
| Not in Paid Employment | 65 | 32.5 |
| **Monthly Household Income** | | |
| Below 10000 (INR) | 50 | 25.0 |
| 10000 – 20000 | 72 | 36.0 |
| 20000 – 30000 | 34 | 17.0 |
| Above 30000 | 44 | 22.0 |
| **Type of Ration Card** | | |
| APL | 142 | 71.0 |
| BPL | 58 | 29.0 |

**Table 2: Disease-specific Table of Patients**

| Diagnosed disease | *n* | % |
|---|---|---|
| Viral Fever | 72 | 36.0 |
| Dengue | 43 | 21.5 |
| Malaria | 2 | 1.0 |
| Leptospirosis | 69 | 34.5 |
| Viral Hepatitis | 13 | 6.5 |
| Tomato Fever | 1 | 0.5 |

## Preparedness of Institutional Health System

The institutional health system in the state can be broadly split into three: a) government bodies, b) research units and c) voluntary organizations.

At the **government level**, all public health initiatives and programmes are planned at the Directorate of Health Services (DHS), Thiruvananthapuram. The DHS' monsoon preparatory measures are coordinated at all 14 districts through the respective District Medical Officers (DMO).

The **research units** in the state render diagnosis support and carry out outbreak investigations during the monsoon.

The **voluntary organizations and collectives** organize medical camps, generate awareness among the public and also provide orientation to medical doctors and other public health staff.

A brief outline of the institutional health system and their key public health initiatives to contain the monsoon epidemics are given below:

### A. Government Bodies

#### (i) Directorate of Health Services (DHS), Thiruvananthapuram

The DHS under the Government of Kerala performs the chief function of public healthcare delivery in the state. All the public health initiatives in the state are monitored and coordinated by the DHS. During the monsoon, the DHS issues guidelines to District Medical Officers for necessary public health actions to control the communicable disease threats.

#### (ii) National Health Mission (NHM)

- Funds and monitors the **Ward Level Health and Sanitation Committees** constituted at the local self-government level to carry out pre-epidemic preparedness activities at every ward in the state. The committees render technical assistance from NHM and conduct source reduction and vector control activities before monsoon showers (April-May) every year[2].
- Funds and monitors two national programmes viz. **IDSP** (Integrated Disease Surveillance Programme) and **NVBDCP** (National Vector Borne Disease Control Programme) targeted to strengthen disease surveillance and prevention of vector-borne diseases in the country. Through monitoring these two schemes, NHM makes a **possible system of disease surveillance and control** at field level in the state during the monsoon[3].
- Foreseeing fever outbreaks during the monsoon, NHM through the Kerala Medical Services Corporation Limited (KMCL) makes necessary **medicines and fever drugs available in a timely manner** to the

hospitals in the state. The mission also sees that the diagnostic laboratories in the state are well equipped before the monsoon and ensures its services during fever outbreaks[4].

- NHM established **District Fever Monitoring Cells** at all 14 districts in the state. The cell functions every year during the monsoon and provides guidelines and awareness to the public for the prevention of communicable diseases. It also checks for the clustering of fever cases and helps the authorities in taking appropriate preparatory measures to contain the spread[5].
- NHM organizes various **awareness programmes** for the public through ASHA workers and Junior Public Health (JPH) nurses. The mission gives proper training to the JPH nurses and ASHA workers for vector source reduction activities during the monsoon. NHM also generates awareness through the media on communicable diseases. It is mainly done through local television channels. News scrolls regarding the outbreaks make people cautious and prepared[6].
- NHM provides **human resources (HR)** to the hospitals and other healthcare units at the time of epidemic outbreaks. It alleviates the pressure of the health staff in the healthcare units when the fever cases peak up during the monsoon[7].

### (iii) District Medical Officer's (DMO) Office

The DHS make all their public health initiatives and programmes in the districts through the DMO's office. The DMO coordinates and monitors all government public health activities in the district. Some of the public health initiatives of the DMO's office during the monsoon against spreading fevers are highlighted below:

- The office implements their pre-epidemic preparedness plan through **Public Health Centres (PHCs)** in their respective districts. The Medical Officers in the PHCs will be in charge of field activities during the monsoon for **vector source reduction**. They coordinate with the Ward Level Health and Sanitation Committees[8].
- **'Prathirodham' Project** is the sole initiative of Alappuzha DMO's office that aims to contain monsoon fever outbreaks in the district. The project gives utmost importance to community participation in source reduction and sanitation activities[9].
- The DMO's office as a part of the **Integrated Vector Approach** engages in Indoor Space Spraying (ISS) and Indoor Residual Spraying (IRS) to eliminate the vector-breeding sites in the district[10].
- The DMO's office through PHC field staff distributes abate granules and larvivorous fishes (guppy fishes) to the public to check the mosquito menace.
- The office generates **awareness through IEC**[11] against viral influenza during the monsoon.
- The office hosts **orientation programmes** for doctors in the districts before the monsoon. The programmes inform the doctors about the latest treatment protocols given by the DHS. Along with orientation programmes, the office also organizes **sensitization workshops** targeted to equip doctors to handle fever outbreaks during the monsoon. Proper rules and guidelines pertaining to timely treatment referral and also regarding death auditing are given to doctors[12].
- The office conducts **laboratory surveillance** in the districts before monsoon fever outbreaks. The office equips the public sentinel diagnostic laboratories. The laboratories are checked and ensured to be functioning before the monsoon. The laboratories are prepared to conduct highly specific ELISA[13] tests for diagnosing different infectious diseases. This helps in the early diagnosis of diseases[14].
- The DMO's office monitors and **coordinates the Evaluation Meetings** in the district. The Evaluation Meetings are conducted at district, block and panchayat level. The evaluation meetings analyse the preparedness activities and disease status in the district during the monsoon[15].

- DHS has **Rapid Response Teams (RRTs)** to tackle various public health issues in the state. The RRTs are functioning at different levels, specifically at state, district, block and panchayat levels. At the district level, the DMO is the chairperson for the RRTs and the team consists of senior medical doctors (including physician and paediatrician), microbiologists, epidemiologists, lab technicians and public health programme officers. With the help from IDSP, the RRTs trace out disease clustering and outbreak trends in the district. A rapid action plan is designed by the RRTs at the district level against the outbreaks. After a situational analysis, the RRTs estimate the manpower required and funding for action and implement it without delay. RRTs play key roles in controlling the communicable disease spread across the state[16].
- The DMO's office keeps **daily reporting of communicable diseases.** The DMO receives daily and consolidated weekly reports from PHCs and other hospitals. With weekly reports, the DMO organizes weekly IDSP meetings at the district level and at health institution level. A situational analysis and a plan of action is done based on the weekly report. Consolidating the weekly reports, the DMO office prepares a monthly report which is sent to the state DHS and a similar plan of action is done at the state level[17].

### (iv) Vector Surveillance and Vector Control Units

The Vector Control Units under the DHS were established in the state in 2007 to contain the spread of vector-borne diseases. Under this project, District Vector Control Units (DVCUs) got established in all the districts[18].

- The DVCUs engage in the **surveillance of mosquito vectors** in the districts through field staff[19].
- Prior to the monsoon, the DVCUs conduct **vector surveys** in areas with high vector density and execute the appropriate vector control measures[20].

  In Kerala, the DVCUs played great role in the filarial eradication programme[21].

### (v) Integrated Disease Surveillance Programme (IDSP)

In an effort to improve and strengthen the surveillance and response system, the Government of India, with support from the World Bank, initiated IDSP in November 2004. IDSP is a decentralized state based surveillance programme intended to detect early warning signals of impending outbreaks and to initiate an effective response in a timely manner (Thankachi, 2011).

- IDSP engages in **disease reporting** which helps to identify disease outbreaks, thereby facilitating the corresponding preventive and response measures.
- This project plays an important role in the **early detection of outbreaks** occurring in any part of the state.
- IDSP **identifies fever clustering** during the monsoon and reports to the DMO for taking prevention and control measures.

### (vi) National Vector Borne Disease Control Programme (NVBDCP)

The NVBDCP is a central nodal agency established in 2003-04 which acts as umbrella programme for the prevention and control of vector borne diseases.

- In Kerala, through the District NVBDCP unit (headed by the District Malaria Officer), **source reduction drives** are organized every year before the start of the monsoon with community participation[22].

- NVBDCP units employ the **Integrated Vector Approach** to eliminate the vector breeding sources prior to the monsoon[23].
- NVBDCP organizes strong **awareness programmes** for the public against the vector-borne diseases before and during the monsoon[24].

### (vii) Prevention of Epidemics and Infectious Diseases Cell (PEID Cell)

The PEID Cell was established by the Government of Kerala in 1982 at the Government Medical College Hospital (Trivandrum) with a view to strengthen the surveillance system in the state. As part of improving the working of the surveillance system, regional PEID cells were established in all Government Medical Colleges in 1989 (Thankachi, 2011).

- Collection/compilation and **daily reporting of surveillance data** on communicable diseases, outbreak investigation and control measures are the main activities under the cell[25].
- PEID cells further conduct **outbreak investigations** and suggest control measures[26].
- PEID cells are involved in **training public health personnel and field staff** to carry out epidemic prevention activities[27].

### (viii) State Disease Control and Monitoring Cell (SDCMC)

- SDCMC monitors and reports the morbidity and mortality from government medical college hospitals in the state.
- The cell conducts **outbreak investigations** and **vector monitoring** in the state.
- The cell coordinates the communicable disease control initiatives of the Government Medical College Hospitals. For instance, when dengue outbreaks occurred during the monsoon in 2017, SDCMC coordinated a 'Dengue Prevention and Control Measures Programme', an initiative from the community medicine departments of all government medical college hospitals in the state.

### (ix) State Government Programmmes and Initiatives

- **Nava Kerala Mission:** The mission was launched in November 2016, aimed at addressing the problems faced in four key social sectors, namely health, education, agriculture and housing. The schemes under the mission are: *Aardram, Haritha Keralam,* Life and Comprehensive Educational Rejuvenation Programme. *Aardram* and *Haritha Keralam* are two schemes that aim to address health and sanitation issues of the state respectively. The two schemes thereby had significant roles to play in the pre-monsoon preparedness plans of the state to prevent and control communicable disease outbreaks[28].
- **Aardram:** It is a project developed to make the government hospitals in the state people friendly by improving their basic infrastructure. The initiative was launched in February 2017 in a mission mode to restructure and revamp the public health system so that government hospitals could be more patient-friendly and efficient, delivering optimum level of care. The mission was in full swing before the monsoon in 2017, equipping government hospitals to handle the spurt of monsoon fever outbreaks.
- **Haritha Keralam:** It is a multi-dimensional development project focusing on sanitation, water conservation, environmental protection and promotion of agriculture. The mission is a people's participatory programme and is run with the active involvement of schools, colleges, Kudumbashree volunteers, local government bodies and the general public. A state level task force constituted by the

government supervises and monitors the programme. The activities of the mission aim to control infectious disease spread during the monsoon. The water quality of the water sources is tested before the monsoon to check for water contamination that can lead to water-borne diseases. Similarly, through proper waste removal and disposal, the mission aims to eliminate vector breeding sites that lead to the spread of vector-borne diseases[29].

- **Clean Kerala Campaign:** In the wake of an increasing number of fever cases during the monsoon in 2017, the state government called for a statewide clean-up drive by the end of June and named the campaign 'Clean Kerala'. The campaign was organised with the help of local self-governments and included NCC, scouts, student cadets and other school/college students. The state ministers, MLAs and other local leaders monitored the cleaning campaign at different areas in the state. The main aim of the campaign was to complement monsoon epidemic preparedness plans of various departments in the state and to address the flaws in the existing efforts of the government bodies (both state and local government bodies) intended to check the fever outbreaks (John, 2017).

### (x) Local Self-Governments (LSGs)

In Kerala, LSGs have been meaningfully empowered through a massive transfer of resources as well as administrative powers. The local self-government institutions have emerged as effective agencies for the implementation of developmental programmes.

The LSGs play a crucial role in the state's pre-monsoon preparedness efforts. Many programmes get organized at panchayat levels (gram, block and district), municipalities and corporations. The monsoon preparatory measures of the state reach the grassroot levels through the LSGs.

- As a part of monsoon epidemic preparatory measures, each local self-government body constitutes a special team comprising Anganawadi workers, ASHA workers, Kudumbhashree members, representatives of political parties and others. The team involves in destroying vector-breeding sources and prevention of puddle formation[30].
- LSGs generate awareness among the public by organizing workshops and awareness programmes[31].
- Throughout the state, **medical camps** are organized by the LSGs during the monsoon when fever cases peak. The camps ensure the supply of necessary medicines and make it available for the patients in a timely manner[32].
- A special initiative was made in Alappuzha district by the District Panchayat constituting a health team named ***Arogyasena***. *Arogyasena* was formed to spread awareness at grassroot level. *Arogyasena* includes ASHA workers and health volunteers with a targeted ratio of one member to 15 households. This initiative of the Alappuzha District Panchayat was widely appreciated and the formation of health units with a similar line of action was carried out in other districts throughout the state[33].
- At municipality level, **cleaning drives** were organized during April-May before the start of the monsoon to eliminate the vector breeding sites. The drainages were cleaned and wastes were properly removed to check vector breeding[34].
- Social awareness programmes were organized under the municipalities to give people instructions and guidelines on various preparatory measures to curb the monsoon epidemics. Some programmes directly addressed specific diseases that hit urban Kerala every year[35].

## B. Research Units

Apart from the above-mentioned institutions and programmes that are directly meant to perform preparedness measures to control the spread of infectious diseases in the state, there exist research units in the state which render help to the government health bodies and complement their efforts to control epidemics in the state. Though the task of containment of the monsoon epidemics is not in their mandate, the services they render out of their routine to the health system of the state is noteworthy. Details of a few such research units that function in the state are provided below:

### (i) National Institute of Virology (NIV)

NIV is one of the major institutes of the Indian Council of Medical Research (ICMR). NIV has a Kerala division functioning as a Virus Research Centre (VRC) at Alappuzha. NIV is not coming directly under the umbrella of bodies meant to perform preparatory measures, nor performs specific routine preparedness activities to control infectious diseases as this is not in the institute mandate. But the institute renders help and support to the government health bodies when needed.

- The institute takes up intensive training and research work on virology and infectious diseases in the state. The institute also carries out **epidemiological investigations** during the monsoon when infectious diseases spike[36].
- NIV renders **diagnosis support** (including ELISA tests and PCR[37] tests) to the state government when approached by the DMO's office[38].
- NIV conducts outbreak investigations when an epidemic outbreak happens in the state and helps in **identifying the infectious diseases' strains and trends**. The results of the NIV investigations on infectious diseases are regularly sent to the district IDSP Office and DMO Office[39].

### (ii) Kerala State Institute of Virology and Infectious Diseases (KSIVID), Alappuzha

KSIVID was established by the state government in 1999 with an aim to start an institute that provides the necessary infrastructure and processes for early detection and rapid prevention of infectious diseases of public health importance in Kerala. The institute was formed in the light of emerging and re-emerging infectious diseases that are occurring in the state very often, specifically leptospirosis and viral encephalitis. Considering the poor diagnosis facilities in the state for identifying the infectious and viral diseases, the KSIVID was established as the first institute in Kerala to identify, control and prevent infectious diseases.

- The major objectives of the KSIVID are: Prediction of outbreaks, early diagnosis, control and prevention of infectious diseases and conducting research related to disease control[50].
- The institute functions with a Research and Diagnostic (R&D) Wing which performs the diagnosis of infectious diseases and conducts virology investigations[51].
- It also has a Field/(Vector) Surveillance Unit which performs routine vector surveillance and vector mapping. The unit is involved in the isolation and elimination of vector breeding sources[52].
- KSIVID performs vector surveillance and disease control operations. These vector surveillance and disease control measures are done jointly with the cooperation of Alappuzha municipality. The reports of the vector control measures and other field activities done by KSIVID are regularly forwarded to the district IDSP office. The vector control measures of the KSIVID are done with an eye on the monsoon and the epidemics that follow. The institute organizes regular household visits in dengue-prone areas and eliminates the potential mosquito breeding sites. The field surveys conducted by KSIVID assess the

mature and immature density of dengue vectors and it takes source reduction measures. The preparatory measures are done before the monsoon, mostly between April-May every year[53].

**(iii) Vector Control Research Centre (VCRC) Field Unit, Kottayam**

The VCRC in Puducherry is one of the permanent institutes of the ICMR established in 1975. The VCRC is involved in research on vector-borne diseases and their control. The centre has a field unit in Kottayam established in 2008.

- This field unit performs **vector surveillance** in the state and conducts diagnostic tests on blood samples. Routine diagnostic tests like ELISA and PCR are conducted on the samples collected from high risk areas of the state that are prone to various infectious diseases during the monsoons[54].
- The unit also performs vector surveillance at high risk areas on request from the DHS[55].
- The unit plans and implements vector management strategies and conducts training workshops to the staff of the DHS and DVCUs on vector source reduction. The vector surveillance and training programmes are implemented prior to the monsoon[56].
- The unit also conducts training programmes for post-graduate students in government medical colleges on various epidemiological tests. Apart from the vector surveillance and vector control activities, the VCRC field unit also carries out various epidemiological research works on a regular basis[57].

## C. Collectives and Voluntary Organizations

Many voluntary organizations, collectives and NGOs extend a helping hand to the state health department during the monsoon to contain the fever epidemics in the state. The involvement of these organizations and collectives helps the government bodies in their task of controlling monsoon epidemics. Such organizations stand in the forefront to give awareness to the public and to break the hoaxes that get spread on unscientific medical practices. A few such organizations are highlighted below:

**(i) Indian Medical Association (IMA) and other organizations**

IMA was formed in 1928 as the only representative voluntary organization for doctors of the modern scientific system of medicine, which looks after the interests of doctors as well as the well-being of the community at large. In the light of monsoon epidemics that happen in the state every year, the IMA Kerala Chapter has initiated many programmes to control the menace. IMA extends full support to the Health department of the state in their efforts to control disease outbreaks.

- The IMA State Chapter offers **medical manpower** to all government hospitals to contain the fever outbreaks during the monsoon[58].
- The Chapter sets up **fever clinics** at places were the intensity of the fever outbreak is high. Along with fever clinics, IMA takes the initiative to form fever consortiums in all districts with members from government agencies, local self-governments, NGOs, political parties, social groups and other associations. The consortium takes up sensitization and awareness campaigns for the public, aiming at effective control of mosquitoes and proper disposal of waste. The awareness programmes of the IMA are mostly scheduled in schools and other educational institutions[49].
- IMA partnered with KILA[50] to impart **scientific training to the staff and representatives of the local self-government departments** on health, hygiene and environment. This was of great help to the health staff of the local self-governments when they carried out cleanliness drives as a part of eliminating vector sources[51].

- IMA also **organizes training programmes for the doctors** who work in private hospitals in the state to make them prepared to handle patients' rush and to give proper treatments. The doctors are given orientation on the latest treatment protocols and standard guidelines of care[52].
- Along with IMA, the Qualified Private Medical Practitioners Association (QPMA) and Indian Academy of Pediatrics (IAP) also extends support by organizing training programmes for medical doctors, equipping them to face the monsoon fever outbreaks in the state. Such doctors' organizations also organized free medical camps and temporary fever clinics at fever affected areas in the state[53].

**(ii) Info Clinic**

Info Clinic is a collective of socially committed doctors which has evolved as a platform to clear the doubts of the common man about health, diseases and medical treatments. The collective was started through a Facebook page which was launched on October 11, 2016. The collective acts like a guide to the commons to help them to come out from the clutches of medical hoaxes and other malicious misinformation that float in the internet where people fall prey to them and endanger their health.

- The collective, through social media, gives awareness to the public against monsoon epidemics. The team uses live chats and webinars to answer the queries and doubts of the public regarding monsoon diseases[54].
- During the monsoon, through the social media platforms, the collective aims to give health tips and make the community aware of the wrong treatment practices that are unscientific. Quoting medical journals and previous scientific studies, the page exposed the unscientific claims of wrong treatment practices for infectious diseases that were common during the monsoon[55].

## Household Preparedness Against Monsoon Diseases in Kuttanad

The preparedness of the households has been looked at in terms of their keenness to treatment, adherence to preventive medicines, vector prevention measures, healthcare insurance coverage and possession of the basic knowledge of the etiology of common communicable diseases during the monsoon (dengue, malaria, leptospirosis and hepatitis fevers). The household preparedness is analysed across various socio-spatial axis so as to study the recurring patterns.

### *Keenness to Treatment*

The morbidity rates from fever escalate in Kerala during the monsoon (June – September) every year. The people have attributed a high degree of 'naturalness' to monsoon fevers, considering them seasonal and climatic. In the state, people often relied on home remedies and other local therapeutic methods to get cured from monsoon fevers and never bothered to visit any hospitals or clinics. The 'perceived naturalness' of monsoon fevers and casual attitude towards treatment in Kerala changed with the whopping outbreaks of H1N1, leptospirosis and chikungunya post 2000s (Thomas, 2015). Fever is identified as the main symptom of all these life threatening diseases. This realisation made people vigilant about common fevers during the monsoon and led them to consider such fevers serious and fatal. The state government opens fever clinics every year during the monsoon to contain fevers before they reach epidemic proportions (George, 2017).

Keeping this background, the household survey tried to perceive the treatment attitudes of the households against fever type illnesses during the monsoon. In the survey, most of the households (83%) reported that they usually suffer from fever type illnesses during the monsoon and about 93.5% of the

households consider that during monsoon, there is a high chance of falling ill. The households were asked questions to understand their keenness in taking treatments when they fall ill for fever type illnesses during the monsoon. Most of the households (82.5%) showed trepidation over fever type illnesses during the monsoon and responded that they were very keen on taking treatment, particularly during the monsoon.

The results from the descriptive statistics (Table 3A) indicate household income and households' possession of basic knowledge of the etiology of common communicable diseases during the monsoon to have association with households' keenness to treatment.

A 68-year-old man (former paddy worker in a Kuttanad village) expressed his thoughts when it comes to treatment-seeking:

> "I am really weary and tired all day. Same with my wife. We are old and living alone in our small house. The only form of income for us is the meagre money our children send us every month. They live in the town with their families. So we avail treatment only when we fall extremely sick, no matter which part of the year. For us, with this small money, all seasons in the year are the same."

Further, results from a binary logistic regression reveal that the respondents who belong to the middle income group (Rs. 10,000 – 20,000 monthly income) are likely not very keen on availing treatments during the monsoon compared to the highest income groups (OR = 6.215, p value = 0.020). The results also show that the respondents who do not possess basic knowledge of etiology are 2.696 times likely not very keen on seeking treatments during the monsoon (Table 5).

### *Adherence to Preventive Medicines*

Questions were asked whether the respondents had taken preventive medicines as a precaution against any communicable diseases during the monsoon. The results from the survey reveal poor intake of preventive medicines. Only 26 respondents (13%) had taken any sorts of preventive medicines prior to monsoon showers. The results from the descriptive statistics indicate households' adherence to preventive medicines to be strongly influenced by factors such as age, social group, religion, marital status, the type of ration card they possessed, household income, education, occupation and households' possession of basic knowledge of the etiology of common communicable diseases (Table 3A).

As a part of the local self-government's pre-monsoon epidemic preparatory measures, ward-level health and sanitation committees were constituted at each ward under the leadership of the elected ward member. The committee comprised representatives of the department of social welfare, Anganwadi workers, Kudumbasree health volunteers, Mahila Swasthya Sangam (MSS) volunteers, ASHA workers, school teachers and other NGOs that are involved in public health work in the area. As part of pre-epidemic preparedness, the committees inspected the areas in their wards and conducted source reduction and vector control activities before the monsoon showers (between April-May) every year. The committees are supposed to visit every household prior to the monsoon and distribute doxycycline capsules (preventive medicine against leptospirosis) to MGNREGA workers, casual workers who engage in agriculture (and allied activities) and also to the households that live in flood risk areas.

The households were asked about the coverage of ward-level health and sanitation committees. The results reveal inadequate intervention of the ward-level health and sanitation committees. The committees that are constituted to generate awareness against fever outbreaks and to distribute preventive medicines at the local self-government level failed to cover 100 per cent households in the sample. The committees' coverage was

limited to 143 households (71.5%). This reflects a blemish in the pre-monsoon epidemic preparedness plans of the local self-governments.

When asked about the intervention of ward-level health and sanitation committees, a 59-year-old woman (homemaker) from Upper Kuttanad responded:

> "The ward-level committees [sanitation and health] will only visit households in extremely flood prone areas. Our areas are not flooded throughout the year, but during heavy showers, our houses also get affected. Our roads too will be under water. But never have any representatives of such committees turned up to monitor our monsoon preparatory measures. Never they have given us any preventive medicines."

The results from the descriptive analysis reveal the coverage of ward-level health and sanitation committees to have an association with household's social group, religion, type of ration card possessed, monthly household income, education and occupation of the head of the family (Table 3C). Further, a binary logistic regression was undertaken with social group, religion, type of ration card possessed by the household, monthly household income, occupation and education (head of the family) as covariates. The results from the regression indicate the type of ration card possessed by the household, monthly household income and occupation of the head of the family to have an influence on the coverage of the ward level health and sanitation committees (Table 5). The results show that households that possess APL ration cards have higher odds (OR = 3.429) to get excluded from the coverage of ward level health and sanitation committees compared to households that possess BPL ration cards. The households that belong to the highest monthly income group have higher odds to get excluded from the coverage of ward level health and sanitation committees compared to the middle income group households. This shows that the attention of the ward-level health and sanitation committees were largely with households in the lower economic stratum.

Households with the head of the family not in paid employment have higher odds of getting excluded from the coverage of ward level health and sanitation committees compared to households whose earnings come from the self-employed head of the family.

The household survey further found a few cases where the households were not properly directed on the usage of doxycycline capsules. A few patients had taken doxycycline pills after getting infected with leptospirosis. A 47-year-old man with leptospirosis responded:

> "I collapsed with fever after a week of cleaning our house that got ruined from the monsoon flooding. When I was sure this was no normal fever, I took the doxycycline pill that got distributed a few months back. It did not work. I was taken to the hospital and was diagnosed with rat fever [leptospirosis]. I should have taken the doxycycline pill before removing the mud [from the house]. Nobody told us how to take the pill."

Similarly, many of the respondents from the sample got infected with leptospirosis after the deluge when they were cleaning their affected houses. There was direct contact with contaminated water when they were clearing the mud. The ward-level sanitation and health committees failed to give them proper instruction on the consumption of doxycycline capsules. The households' poor knowledge of the usage and dosage of preventive medicines like doxycycline capsules caused them give less importance to such pills. Thus many households took the distribution of doxycycline and other preventive medicines very lightly.

A 60-year-old-woman, an MGNREGA worker, explains her notions about doxycycline capsules:

> "We get such kinds of medicines [doxycycline] every year from ASHA workers and other people sent from the panchayats. I don't take it. It is totally unnecessary. Why should we take medicines when we are fine? I don't believe in such English medicines. I generally avoid it. I will take medicines only when I fall sick."

Remiss distribution of preventive medicines by the ward-level health and sanitation committees and the heedless attitude of some of the households about preventive medicines are a few factors that led to the severe outbreak of leptospirosis after the floods in Kuttanad region in 2018.

### *Vector Prevention Measures*

The results from the field survey reveal fair practice of vector prevention measures. A total of 178 households (89.0%) use at least one protection measure against mosquito proliferation and bites. The most used method of protection by the households are repellant mat/vaporiser (39.0%) and repellant coils (34.0%). Only 22 households (11.0%) did not practice any of the protection measures against mosquito bites. The reasons were "inconvenience/allergy" (9 households), "no confidence" (9 households), and "economic constraints" (4 households).

The descriptive analysis shows that factors like social group, type of ration card possessed, education, occupation and households' possession of basic knowledge of etiology have an association with the households' self-protection measures against mosquito bites (Table 3B).

The total monthly mean expenditure on self-protection measures against mosquito bites of the sample households is Rs. 362.64 (INR). The expenditure on self-protection measures against mosquito bites was significantly higher among households with a monthly income over Rs 30,000 and households with APL ration cards. The descriptive analysis reveals monthly household income, type of ration card possessed by the households, possession of basic knowledge of etiology of common communicable diseases, education and occupation of the head of the family to have an association with the households' spending on mosquito protection measures (Table 4).

### *Healthcare Insurance Coverage*

High healthcare expenditure incurred on episodes of hospitalization for family members is a major worry for lower and middle income households. Being able to afford good healthcare facilities without healthcare insurance will become difficult for families that belong to lower income groups in the light of the high cost of medical care facilities and uncontrolled increase in the spread of diseases.

In Kerala, the response to healthcare insurance is very poor despite the state making a headway in other public health measures (Varghese, 2013;Vijay & Krishnaveni, 2017).This low permeation of healthcare insurance in the state leaves people in the low income brackets with no choice but to pay out their medical costs from their own pockets.

In the survey, over half of the patients (109) did not possess any healthcare insurance. Out of the 91 patients who had active healthcare insurance coverage, 79 were under the Comprehensive Health Insurance Scheme (CHIS)[56] of the state government. The CHIS is a government sponsored scheme that aims to provide health insurance coverage to family members of lower income groups. The scheme provides cashless insurance

for hospitalization in public and selected private hospitals, relieving poor households from the financial shocks that involve in-patient treatment services.

The results from the survey align with the previous studies reflecting the state's poor response to healthcare insurance schemes. The descriptive analysis shows healthcare insurance coverage of the patients varies with social group, type of ration card possessed, monthly household income, education, occupation and possession of basic knowledge of etiology (Table 3B).

Out of the 91 patients in the survey who had active healthcare insurance, only 80 patients claimed and availed the benefits of healthcare insurance. Patients' lack of knowledge about the terms and conditions of the CHIS (or RSBY) and the details of the hospitals empanelled under the scheme are a few reasons that were found in the survey for not claiming the healthcare insurance benefits (for patients under CHIS).

A 37-year-old-man (casual worker) who got admitted in a private hospital for leptospirosis with an active CHIS health card responded when asked about not claiming his healthcare insurance:

> "The clinic doctor suspected rat fever and asked me to get admitted in a good hospital. I went to this [nearby] private hospital. After treatment, we inquired about the RSBY card but the hospital people said their hospital is not empanelled under RSBY. So I had to pay the hospital bills from my pocket. We weren't aware about the details of the hospitals where we could seek treatment using the card."

In the survey, there were patients who were eligible to get enrolled under the CHIS but failed to get enrolled due to lack of awareness about the scheme.

A 48-year-old-woman (home maker) who got admitted in the hospital for suspected dengue responds about CHIS:

> "I got to know about the health card [CHIS] after getting admitted in the hospital. I noticed other patients in the hospital talking about some government health card and getting benefits. I had no idea about it at that time. After getting discharged from the hospital, we checked about the health card and found that even we are eligible for the card. We should have known about this much earlier."

Out of the 109 patients in the survey (54.5%) who did not have any healthcare insurance to avail, an inquiry was made to find out the reasons for not having healthcare insurance. The reasons found were lackadaisical approach (61%), lack of awareness (25%) skeptical about returns (24%) and economic constraints (15%). Most of the patients who did not have any healthcare insurance belonged to households with a higher monthly income who were ineligible to get enrolled under CHIS. Their casual attitude towards healthcare insurance made them not to enroll in any scheme.

A 29-year-old self-employed man who got admitted in a hospital for dengue replied thus when asked about not having healthcare insurance:

> "I was very casual in getting one [healthcare insurance]. Never bothered. Thought it was a wasteful expenditure. But after this 7-day hospital episode, I wish I had one. Could have saved over ten thousand [rupees]."

A binary logistic regression was undertaken with gender, age, social group, religion, marital status, ration card, household income, education, occupation and knowledge of etiology as covariates. The results indicate age, social group, type of ration card possessed, monthly household income, education and occupation

to have an influence on the coverage of healthcare insurance. Patients who belong to backward communities (SC and OBC), BPL families and lower income households have less odds of not having healthcare insurance compared to other groups (Table 5).

### *Basic Knowledge*

The field survey had questions to comprehend the households' basic knowledge of the causation of communicable diseases that have high incidence during the monsoon. The diseases include dengue, malaria, ADD, cholera, typhoid, AES/JE, chikungunya, hepatitis fevers, H1N1 and leptospirosis. The households possess fairly good basic knowledge of the causation of communicable diseases like dengue (97%), ADD (81%) and malaria (71%). The knowledge of etiology about H1N1 influenza (16%) and typhoid (21.5%) was found very poor. 19 households (9.5%) possess basic knowledge of etiology on all ten communicable diseases and only 5 households (2.5%) did not possess basic knowledge of etiology of any of these communicable diseases. 98 households (49%) have basic knowledge of etiology on the four most prevalent communicable diseases during monsoon, namely dengue, hepatitis fevers, leptospirosis and malaria.

The descriptive statistics reveal the households' social group, religion, type of ration card possessed, household income, education and occupation to have an association with the respondents' possession of the basic knowledge of etiology of communicable diseases (Table 3C). For a further understanding, a binary logistic regression was carried out considering social group, religion, type of ration card possessed, household income, education and occupation as the covariates. The findings of the logistic regression (Table 5) indicate the respondent's social group and level of education to have an influence on the possession of basic knowledge of etiology of common communicable diseases during the monsoon. The respondents who belong to the non-backward communities (coded "others") are more likely to possess basic knowledge of etiology of common communicable diseases compared to the backward communities (OBC, OR = 0.298 and SC, OR = 0.029). The respondents who belong to a higher education background (graduation and above) have higher odds to possess basic knowledge of the etiology of common communicable diseases compared to respondents who have acquired primary (OR = 0.059) and secondary (OR = 0.237) levels of education.

The households that constitute the sample also possess good knowledge on the mosquito menace. Almost all the households (99%) are aware that mosquitoes transmit diseases. About 62.5% of the households suffer from extreme mosquito menace against 33.5% and 4.0% households who suffer from moderate and low mosquito menace.

The households were asked to list the common communicable diseases that are seen in their localities during the monsoon. Most of the households (94.0%) identified common viral fever as the major communicable disease that they see in their localities. Viral fever was followed by leptospirosis (57.5%), dengue (53.5%), acute diarrheal diseases (25.5%) and hepatitis fever (17.0%).

The household survey also attempted to understand the reach of government awareness programmes and media warnings against epidemic outbreaks. The survey found 39.0% and 34.5% of the households respectively followed government awareness programmes and media warnings against epidemic outbreaks during the monsoon.

**Table 3A: Household Preparedness for Monsoon across Sample**

| Variables | Keenness to Treatment | | | Adherence to Preventive Medicines | | |
|---|---|---|---|---|---|---|
| | Yes (%) | $X^2$ | *p* value | Yes (%) | $X^2$ | *p* value |
| **Gender** | | | | | | |
| Male | 78.8 | 2.515 | 0.113 | 11.5 | 0.514 | 0.474 |
| Female | 87.4 | | | 14.9 | | |
| **Age** | | | | | | |
| Below 20 | 90.0 | 2.908 | 0.406 | 10.0 | 14.088 | 0.003 |
| 21 – 40 | 84.1 | | | 1.6 | | |
| 41 – 60 | 76.8 | | | 23.2 | | |
| Above 60 | 84.2 | | | 15.8 | | |
| **Social Group** | | | | | | |
| Others | 88.4 | 4.988 | 0.083 | 5.3 | 9.914 | 0.007 |
| OBC | 78.6 | | | 19.0 | | |
| SC | 71.4 | | | 23.8 | | |
| **Religion** | | | | | | |
| Hindu | 78.4 | 3.899 | 0.142 | 18.4 | 8.663 | 0.013 |
| Muslim | 88.2 | | | 5.9 | | |
| Christian | 89.7 | | | 3.4 | | |
| **Marital Status** | | | | | | |
| Never Married | 85.7 | 0.658 | 0.417 | 4.8 | 5.519 | 0.019 |
| Married | 81.0 | | | 16.8 | | |
| **Ration Card** | | | | | | |
| APL | 83.1 | 0.122 | 0.727 | 8.5 | 8.960 | 0.030 |
| BPL | 81.0 | | | 24.1 | | |
| **Household Income** | | | | | | |
| Below 10k | 82.0 | 13.684 | 0.003 | 30.0 | 20.311 | 0.000 |
| 10k – 20k | 70.8 | | | 12.5 | | |
| 20k – 30k | 91.2 | | | 2.9 | | |
| Above 30k | 95.5 | | | 2.3 | | |
| **Education** | | | | | | |
| Primary | 77.9 | 2.659 | 0.265 | 28.6 | 26.927 | 0.000 |
| Secondary | 82.9 | | | 3.9 | | |
| Graduation and Above | 89.4 | | | 2.1 | | |
| **Occupation** | | | | | | |
| Self-employment | 87.0 | 6.436 | 0.092 | 13.0 | 17.204 | 0.001 |
| Regular Salary Earner | 85.7 | | | 0.0 | | |
| Casual Worker | 74.0 | | | 24.7 | | |
| Not Employed | 89.2 | | | 6.2 | | |
| **Possession of Basic Knowledge of Etiology** | 90.8 | 9.205 | 0.002 | 7.1 | 5.829 | 0.016 |

**Table 3B: Household Preparedness for Monsoon across Sample**

| Variables | Self-Protection Measures Against Mosquito Bites | | | Healthcare Insurance Coverage | | |
|---|---|---|---|---|---|---|
| | Yes (%) | $X^2$ | *p* value | Yes (%) | $X^2$ | *p* value |
| **Gender** | | | | | | |
| Male | 88.5 | 0.068 | 0.795 | 43.4 | 0.478 | 0.489 |
| Female | 89.7 | | | 48.3 | | |
| **Age** | | | | | | |
| Below 20 | 100.0 | 5.871 | 0.118 | 36.7 | 1.433 | 0.698 |
| 21 – 40 | 88.9 | | | 44.4 | | |
| 41 – 60 | 88.4 | | | 47.8 | | |
| Above 60 | 81.6 | | | 50.0 | | |
| **Social Group** | | | | | | |
| Others | 93.7 | 6.026 | 0.049 | 28.4 | 30.512 | 0.000 |
| OBC | 86.9 | | | 53.6 | | |
| SC | 76.2 | | | 90.5 | | |
| **Religion** | | | | | | |
| Hindu | 89.6 | 0.839 | 0.657 | 51.2 | 5.452 | 0.065 |
| Muslim | 82.4 | | | 47.1 | | |
| Christian | 89.7 | | | 32.8 | | |
| **Marital Status** | | | | | | |
| Never Married | 95.2 | 3.656 | 0.056 | 36.5 | 2.999 | 0.083 |
| Married | 86.1 | | | 49.6 | | |
| **Ration Card** | | | | | | |
| APL | 93.7 | 10.870 | 0.001 | 27.5 | 64.228 | 0.000 |
| BPL | 77.6 | | | 89.7 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Household Income** | | | | | | |
| Below 10k | 80.0 | 6.920 | 0.074 | 86.0 | 56.137 | 0.000 |
| 10k – 20k | 88.9 | | | 45.8 | | |
| 20k – 30k | 94.1 | | | 11.8 | | |
| Above 30k | 95.5 | | | 25.0 | | |
| **Education** | | | | | | |
| Primary | 79.2 | 12.406 | 0.002 | 61.0 | 12.196 | 0.002 |
| Secondary | 96.1 | | | 35.5 | | |
| Graduation and Above | 93.6 | | | 36.2 | | |
| **Occupation** | | | | | | |
| Self-employment | 87.0 | 15.864 | 0.001 | 34.8 | 14.252 | 0.003 |
| Regular Salary Earner | 91.4 | | | 45.7 | | |
| Casual Worker | 79.2 | | | 61.0 | | |
| Not Employed | 100.0 | | | 30.8 | | |
| **Possession of Basic Knowledge of Etiology** | 94.9 | 6.828 | 0.009 | 30.6 | 17.175 | 0.000 |

**Table 3C: Household Preparedness for Monsoon across Sample**

| **Variables** | **Possession of Basic Knowledge of Etiology** | | | **Coverage of Ward Level Health and Sanitation Committees** | | |
|---|---|---|---|---|---|---|
| | Yes (%) | $X^2$ | *p* value | Yes (%) | $X^2$ | *p* value |
| **Gender** | | | | | | |
| Male | 48.7 | 0.011 | 0.916 | 72.5 | 0.596 | 0.440 |
| Female | 49.4 | | | 65.5 | | |
| **Social Group** | | | | | | |
| Others | 70.5 | 39.994 | 0.000 | 64.2 | 8.504 | 0.014 |
| OBC | 35.7 | | | 73.8 | | |
| SC | 4.8 | | | 95.2 | | |
| **Religion** | | | | | | |
| Hindu | 44.8 | 6.12 | 0.047 | 77.6 | 7.011 | 0.030 |
| Muslim | 35.3 | | | 70.6 | | |
| Christian | 62.1 | | | 58.6 | | |
| **Ration Card** | | | | | | |
| APL | 59.9 | 23.106 | 0.000 | 65.5 | 8.671 | 0.003 |
| BPL | 22.4 | | | 86.2 | | |
| **Household Income** | | | | | | |
| Below 10k | 22.0 | 34.249 | 0.000 | 80.0 | 15.780 | 0.001 |
| 10k – 20k | 43.1 | | | 77.8 | | |
| 20k – 30k | 61.8 | | | 76.5 | | |
| Above 30k | 79.5 | | | 47.7 | | |
| **Education** | | | | | | |
| Primary | 18.2 | 58.505 | 0.000 | 78.8 | 9.003 | 0.011 |
| Secondary | 56.6 | | | 67.9 | | |
| Graduation and Above | 87.2 | | | 52.9 | | |
| **Occupation** | | | | | | |
| Self-employment | 56.5 | 38.151 | 0.000 | 81.6 | 13.202 | 0.004 |
| Regular Salary Earner | 74.3 | | | 54.8 | | |
| Casual Worker | 22.1 | | | 78.9 | | |
| Not Employed | 64.6 | | | 56.0 | | |

**Table 4: Average Monthly Expenditure on Self-Protection Measures Against Mosquito Bites across Sample**

| Variables | Average Monthly Expenditure (INR) | *p* value |
|---|---|---|
| **Religion** | | |
| Hindu | 382.64 | 0.071 |
| Muslim | 287.06 | |
| Christian | 339.8 | |
| **Social Group** | | |
| Others | 392.95 | 0.297 |
| OBC | 358.80 | |
| SC | 235.71 | |
| **Household Income** | | |
| Below 10000 | 263.20 | 0.032 |
| 10000 – 20000 | 348.89 | |
| 20000 – 30000 | 435.59 | |
| Above 30000 | 439.32 | |
| **Ration Card** | | |
| APL | 409.51 | 0.003 |
| BPL | 246.03 | |
| **Education (HOF)** | | |
| Primary | 315.13 | 0.022 |
| Secondary | 445.47 | |
| Graduation and Above | 388.24 | |
| **Occupation (HOF)** | | |
| Self Employed | 447.89 | 0.003 |
| Regular Salary Earner | 350.71 | |
| Casual Worker | 293.05 | |
| Not in Paid Employment | 513.20 | |
| **Possession of Knowledge of Etiology** | | |
| Yes | 406.84 | 0.003 |
| No | 319.12 | |

**Table 5: Logistic Regression Analysis on Household Preparedness**

| Variables | Walds | *p* value | OR | 95% CI |
|---|---|---|---|---|
| a.) Keenness to Treatment | | | | |
| **Household Income** | | | | |
| Below 10000 | 1.367 | 0.242 | 2.691 | 0.512 – 14.140 |
| 10000 – 20000 | 5.409 | 0.020 | 6.215 | 1.333 – 28.977 |
| 20000 – 30000 | 0.295 | 0.587 | 1.678 | 0.259 – 10.892 |
| Above 30000 (Reference) | - | - | - | - |
| **Possession of Knowledge of Etiology** | | | | |
| No | 4.908 | 0.027 | 2.696 | 1.121 – 6.485 |
| Yes (Reference) | - | - | - | - |
| b.) Healthcare Insurance Coverage | | | | |
| **Age Group** | | | | |
| Below 20 | 4.772 | 0.029 | 0.062 | 0.005 – 0.752 |
| 21 – 40 | 1.345 | 0.246 | 0.431 | 0.104 – 1.786 |
| 41 – 60 | 0.059 | 0.808 | 1.156 | 0.360 – 3.708 |
| Above 60 (Reference) | - | - | - | - |
| **Social Group** | | | | |
| Others (Reference) | - | - | - | - |
| OBC | 4.660 | 0.031 | 0.316 | 0.111 – 0.899 |
| SC | 4.030 | 0.045 | 0.057 | 0.003 – 0.934 |
| **Ration Card** | | | | |
| APL | 13.402 | 0.000 | 9.730 | 2.878 – 32.892 |
| BPL (Reference) | - | - | - | - |
| **Household Income** | | | | |
| Below 10000 | 9.288 | 0.002 | 0.062 | 0.010 – 0.371 |
| 10000 – 20000 | 6.018 | 0.014 | 0.161 | 0.037 – 0.693 |
| 20000 – 30000 | 0.082 | 0.775 | 1.277 | 0.238 – 6.854 |
| Above 30000 (Reference) | - | - | - | - |

| | | | | |
|---|---|---|---|---|
| **Education** | 2.569 | 0.109 | 5.209 | 0.692 – 39.202 |
| Primary | 6.807 | 0.009 | 9.337 | 1.743 – 50.005 |
| Secondary | - | - | - | - |
| Graduation and Above (Reference) | | | | |
| **Occupation** | 4.758 | 0.029 | 0.146 | 0.026 – 0.823 |
| Self Employed | 6.445 | 0.011 | 0.119 | 0.023 – 0.616 |
| Regular Salary Earner | 3.321 | 0.068 | 0.234 | 0.049 – 1.116 |
| Casual Worker | - | - | - | - |
| Not Employed (Reference) | | | | |
| **c.) Possession of Basic Knowledge of Etiology** | | | | |
| **Social Group** | | | | |
| Others (Reference) | - | - | - | - |
| OBC | 6.990 | 0.008 | 0.298 | 0.121 – 0.731 |
| SC | 8.903 | 0.003 | 0.029 | 0.003 – 0.297 |
| **Education** | | | | |
| Primary | 14.668 | 0.000 | 0.059 | 0.014 – 0.251 |
| Secondary | 4.902 | 0.027 | 0.237 | 0.066 – 0.848 |
| Graduation and Above (Reference) | - | - | - | - |
| **d.) Coverage of Ward Level Health and Sanitation Committees** | | | | |
| **Ration Card** | | | | |
| APL | 3.836 | 0.049 | 3.429 | 0.999 – 11.767 |
| BPL (Reference) | - | - | - | - |
| **Household Income** | | | | |
| Below 10000 | 0.046 | 0.830 | 1.166 | 0.286 – 4.760 |
| 10000 – 20000 | 2.405 | 0.121 | 0.452 | 0.166 – 1.233 |
| 20000 – 30000 | 4.187 | 0.041 | 0.332 | 0.115 – 0.954 |
| Above 30000 (Reference) | - | - | - | - |
| **Occupation (HOF)** | | | | |
| Self Employed | 5.398 | 0.020 | 0.224 | 0.063 – 0.791 |
| Regular Salary Earner | 0.367 | 0.545 | 0.672 | 0.186 – 2.430 |
| Casual Worker | 0.730 | 0.393 | 0.621 | 0.208 – 1.854 |
| Not Employed (Reference) | - | - | - | - |

## Conclusion

Although the study found the monsoon preparedness plans of the institutional health system in Kerala resolute, its effectiveness and reach is still questionable. In the representative sample, the study found the intervention of local self-governments through ward-level sanitation committees inept. More than a quarter of the households were not covered by the ward-level health and sanitation committees that are constituted to generate awareness and help the households in their pre-monsoon preparatory measures. The distribution of preventive medicines prior to the monsoon was also poorly carried out.

The study found weak permeation of the healthcare insurance coverage. Over half (54.5%) of the patients in the representative sample were left out from any type of healthcare insurance. The government should carry out campaigns to enroll eligible households with the CHIS insurance scheme. Healthcare insurance is very important in a state like Kerala where morbidity rates go high during the rainy season. Healthcare insurance will enable the poor to access quality medical facilities without having a catastrophic effect on their family income.

The government bodies should frame a tailored preparedness programme targeting the vulnerable groups. The needs of the vulnerable groups within the communities who may be severely affected should be considered. The people who engage in labour with direct contact to contaminated water (casual workers in agriculture, inland fishermen, MGNREGA workers etc.) should be identified prior to the monsoon and proper preventive medicines (like doxycycline) should be distributed.

Accurate information must be provided to the public before and during the monsoon on various preparatory measures against infectious diseases. The provision of information in a clear, accessible, and engaging way is required to optimise community acceptance of public health actions to prevent or respond to outbreaks (Torda, 2006). Strategies to restrict the spread of disease will be ineffective if communication is not improved. In this regard, the health campaign efforts through the media should be improved.

## End Notes

[1] Accredited Social Health Activists (ASHAs) are community health workers introduced by the Ministry of Health & Family Welfare (Govt of India) in 2005 as a part of the National Health Mission (NHM).

[2] From an interview conducted by the author with Dr Arun P V, District Programme Officer, National Health Mission, Alappuzha.

[3] ibid

[4] ibid

[5] ibid

[6] ibid

[7] ibid

[8] From an interview conducted by the author with Dr Jamuna Varghese, District Surveillance Officer and Deputy District Medical Officer, Alappuzha District.

[9] ibid

[10] ibid

[11] Information, Education & Communication (IEC) is an approach which attempts to change or reinforce a set of behaviours in a target audience regarding a specific problem in a predefined time period.

[12] From an interview conducted by the author with Dr Jamuna Varghese, District Surveillance Officer and Deputy District Medical Officer, Alappuzha District.

[13] The Enzyme-linked Immunosorbent Assay (ELISA) is a test that detects and measures the level of antibodies in one's blood. The test can be used to determine antibodies related to some infectious conditions.

[14] From an interview conducted by the author with Dr Jamuna Varghese, District Surveillance Officer and Deputy District Medical Officer, Alappuzha District.

[15] ibid

[16] ibid

[17] ibid

[18] Kerala State Action Plan on Climate Change, August 2014

[19] ibid

[20] ibid

[21] ibid

[22] See, https://www.nhp.gov.in/national-vector-borne-disease-control-programme_pg

[23] ibid

[24] ibid

[25] From an interview conducted by the author with Dr Sairu Philip (Community Medicine), Vice-Principal, T D Medical College (Alappuzha).

[26] ibid

[27] ibid

[28] See, http://www.keralacm.gov.in/tag/nava-kerala-mission/

[29] See, https://kerala.gov.in/harithakeralam

[30] Admn mulls dengue squads for homes (2017, June 24). The New Indian Express.

[31] From an interview conducted by the author with Adv. Manoj, Standing Committee Member, Health and Sanitation, Alappuzha Municipality.

[32] ibid

[33] From an interview conducted by the author with A P Kannan, Standing Committee Member, Health and Sanitation, Alappuzha District Panchayat.

[34] ibid

[35] ibid

[36] From an interview conducted by the author with Dr Ratheesh Babu, The Director, Vector Research Center (ICMR), Alappuzha.

[37] Polymerase chain reaction (PCR) tests are sensitive and rapid methods to detect microbial pathogens in clinical specimens. The results of these diagnostic and monitoring tests provide clinicians and other healthcare providers with information to guide treatment.

[38] From an interview conducted by the author with Dr Ratheesh Babu, The Director, Vector Research Center (ICMR), Alappuzha.

[39] ibid

[40] From an interview conducted by the author with Mr Kamraj, Acting Director, KSIVID, Alappuzha.

[41] ibid

[42] ibid

[43] ibid

[44] From an interview conducted by the author with Dr Pradeep Kumar, Unit Director, VCRC, Kottayam.

[45] ibid

[46] ibid

[47] ibid

[48] IMA state chapter to offers manpower support to government hospitals. (2017, June 23). *The New Indian Express*.

[49] ibid

[50] Kerala Institute of Local Adminstration (KILA) is an autonomous institute functioning for local governments in Kerala

[51] From an interview conducted by the author with Dr Jamuna Varghese, District Surveillance Officer cum Deputy District Medical Officer, Alappuzha.

[52] ibid

[53] ibid

[54] From an interview conducted by the author with Dr Jinesh P S, (Adminstrator, Info Clinic Facebook Page), Lecturer, Department of Forensic Medicine, Government Medical College, Kottayam

[55] ibid

[56] The Govt. of Kerala extended the Rashtriya Swasthya Bima Yojna (RSBY) to include APL households and introduced the Comprehensive Health Insurance Scheme (CHIS).

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