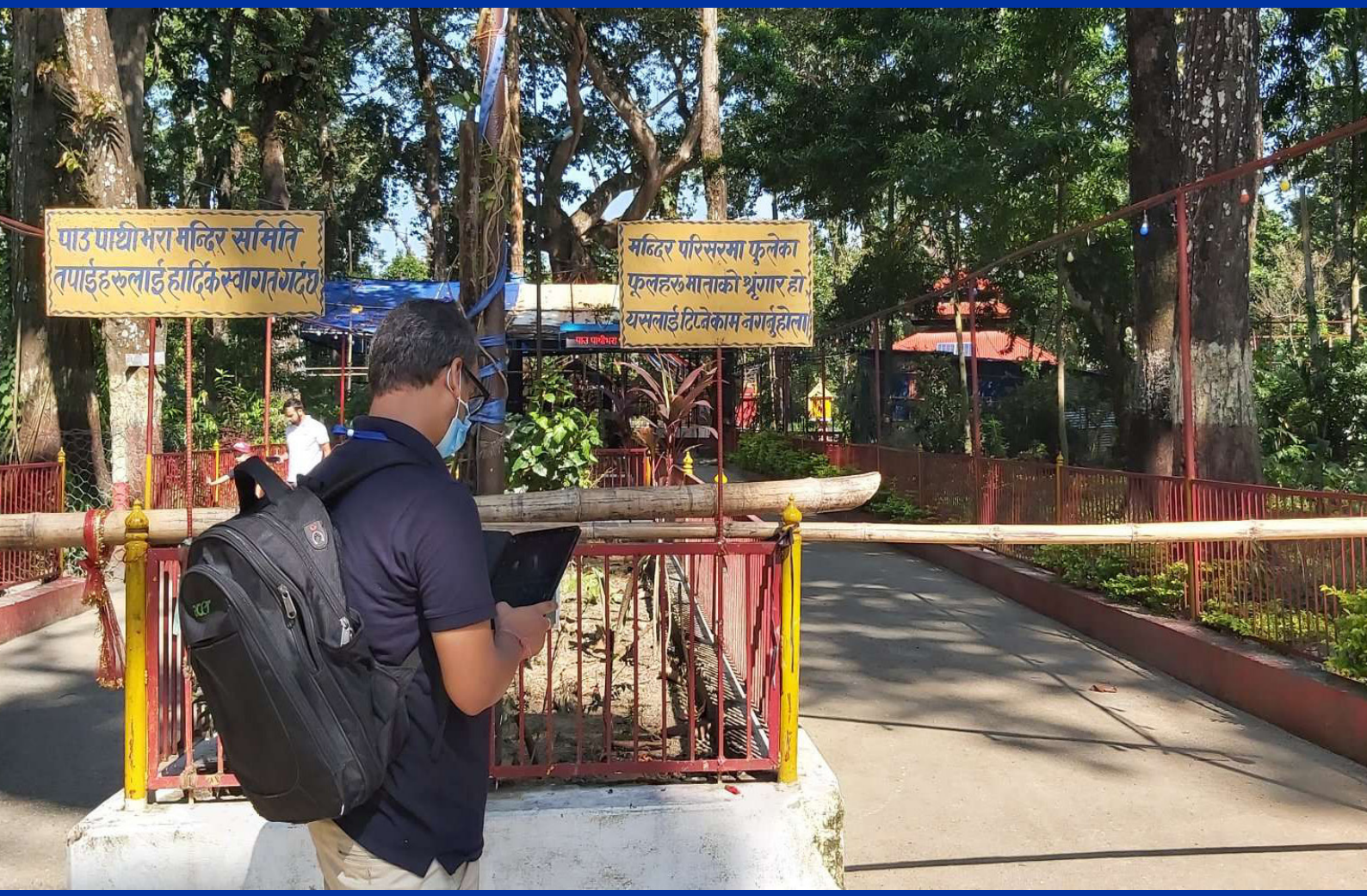

POPULATION MOBILITY AND PUBLIC HEALTH RISK MAPPING

COVID-19 Preparedness and Response Plan in Nepal (2020)

Mechinagar Municipality

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1. INTRODUCTION

The Coronavirus disease 2019, hereinafter referred to as COVID-19, is caused by SARS CoV-2 Virus and is the third recorded animal-to-animal transmission of a Coronavirus, after Severe Acute Respiratory Syndrome (SARS, 2002), and Middle East Respiratory Syndrome (MERS, 2012). The first COVID-19 case was detected in Hubei Province, China, on 17 November 2019. Since then, the disease has spread throughout the globe to the extent to be declared as a pandemic by the World Health Organization (WHO), on 11 March 2020. As of 9 December 2020, the number of cases stands at 67,210,778, including 1,540,777 deaths worldwide.[1]

In Nepal, the first case of COVID-19 was reported on 23 January 2020. As of 9 December 2020, the total number of confirmed cases in Nepal stands at 241,995 and 1,614 deaths.[2] Since the detection of the second positive case on 24 March 2020, the Government of Nepal (GoN) has taken several steps to control transmission and mitigate the impact of COVID-19 on the society, including enforcement of nation-wide lockdown, closure of international border, testing of suspected cases, isolation, treatment, contract tracing, and management of quarantine centres.

1.1 POPULATION MOBILITY MAPPING (PMM)

The Population Mobility Mapping was developed through an adaptation of IOM's Displacement Tracking Matrix (DTM) and has been implemented as part of the response and preparedness plan to several outbreaks, specifically the Ebola Virus Disease (EVD) in West Africa (2014-2016), the Democratic Republic of Congo (2017, 2018-2020), Burundi, South Sudan and Uganda (2019), as well as the plague outbreak in Madagascar (2018). The aim of PMM is to understand the dynamics of human mobility and identify the most vulnerable, priority locations within and outside the border. The findings enable the Government, communities and various actors to prevent the introduction or to limit the spread of infectious diseases and other public health threats, directly affected by human mobility. The Population Mobility Mapping was selected by the Ministry of Health and Population (MoHP) as part of the national COVID-19 Response and Preparedness Plan.

Specific locations to conduct the PMM activities were selected. The selection was based on three main criteria; a) existing knowledge on health risks and general epidemiological information, b) population mobility dynamics based on local available information, and c) accessibility and resources availability. Based on this, nine (9) Municipalities were identified in three (3) Provinces in Nepal:

1. Sudurpashchim Province
    1. Dhangadhi Sub-Metropolitan City (Kailali District)
    2. Bheemdatta Municipality (Kanchanpur District)
    3. Dasharathchanda Municipality (Baitadi District)

[1] *https://covid19.who.int/?gclid=EAIaIQobChMIpu2y9aym6wIVjx0rCh2zNgN6EAAYASAAEgI1zvD_BwE*

[2] *Ibid*

II. Lumbini Province

4. Nepalgunj Sub-Metropolitan City (Banke District)
5. Krishnanagar Municipality (Kapilvastu District)
6. Siddharthanagar Municipality (Rupandehi District)

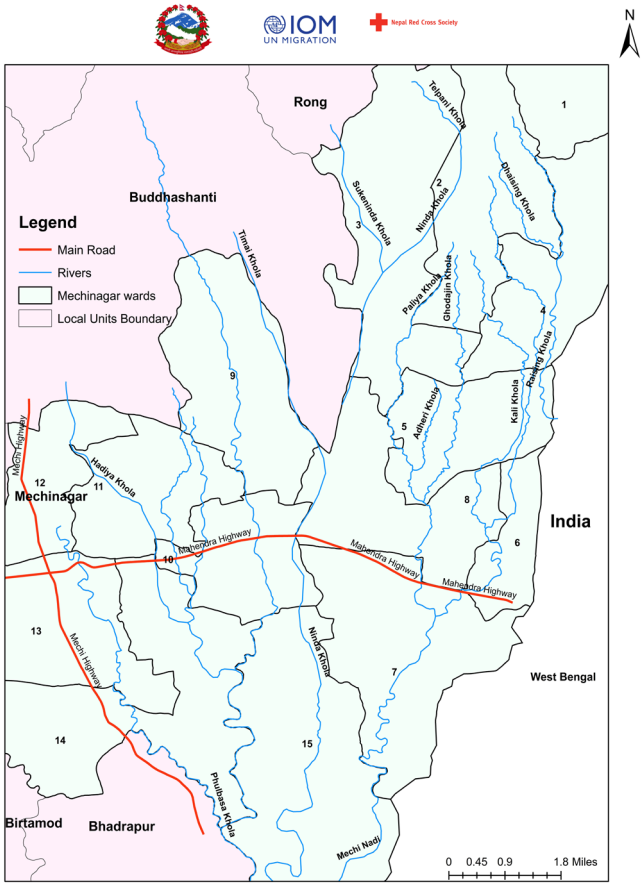
III. Province 1

7. Biratnagar Metropolitan City (Morang District)
8. Mechinagar Municipality (Jhapa District)
9. Suryodaya Municipality (Ilam District)

This report will present the PMM results conducted in Mechinagar Municipality, Province 1, between 9 and 13 October 2020.

1.2 MUNICIPALITY PROFILE

Mechinagar Municipality is located in Jhapa District, in the south-eastern part of Nepal. Situated in a plain (around 140 m above sea level), the municipality is over 450 km away from Kathmandu, the capital city. It covers a total of 192.85 sq. Km (see Map 1), and borders with Rong Rural Municipality in the north, India in the east, Bhadrapur Municipality in the south, Birtamod Municipality in the south-west, Arjundhara Municipality in the west, and Buddhashanti Rural Municipality in the north-west. According to the census in 2011, the population living in the area is 125,668



Map 1: Boundaries of Mechinagar Municipality, rivers and roads/paths. The map was used for the focus group discussions conducted as part of the PMM

(63,372 men and 62,296 women). The main sources of income in the municipality are agriculture and business. In Mechinagar Municipality there are a total of 10 urban health centres, including four (4) district hospitals, one (1) Primary Health Care Center, and 5 health posts, for a total capacity of 19 beds. Registered health workers are 57, with 10 doctors, 5 nurses, 21 auxiliary nursing midwives, and 21 auxiliary health workers.

1.3 OBJECTIVES

The PMM has four main objectives:

1. Identify travellers' profiles and mobility patters which have health related impacts both within and/or outside the country.
2. Identify vulnerable places where travellers or mobile populations gather and interact with each other or with local communities, which are at risk of both contracting and spreading infectious diseases and other health threats.
3. Identify priority sites with limited capacities to prepare and respond to public health emergencies.
4. Identify priority public health actions and resource allocations, in order to develop action plans aimed at strengthening public health emergency preparedness and response capacities.

2. METHODOLOGY

Nine (9) Municipalities were identified in three (3) Provinces in Nepal as mentioned above. At the initial stage, data collection tools were developed and contextualized to the case of Nepal. Special attention was given to the guides to be used during Phase I and the questionnaires for Phase II. Furthermore, maps of the selected municipalities were created using GIS software (see Map 1), based on available geographical and administrative data, to be later used during the focus group discussions (FGDs).

2.1 PREPARATION AND COORDINATION FOR THE PMM

A two-fold coordination was initiated in June 2020 with the MoHP and the Nepal Red Cross Society (NRCS), the implementing partner. This culminated in the signing of the IOM-NRCS agreement on 30 July 2020 and the obtainment of the official approval from the MoHP on 10 August 2020. Several meetings with NRCS were held to discuss and explore the implementation plan on the ground. Simultaneous coordination was undertaken at the provincial and municipality level to engage with relevant stakeholders and finalise the workplan. Similarly, parallel meetings were conducted with the IOM PMM team to analyse the data collection tools and select the categories of key informants (KIs) according to the local context.

On 3 August 2020, a 1-day training was conducted for the IOM PMM team at IOM premises in Kathmandu (Picture 1 and 2). The training had three key objectives:

1. Learn about the concepts at the basis of the PMM, such as human mobility, and its relationship with the Displacement Tracking Matrix (DTM) and the Health, Border, and Mobility Management (HBMM) framework.
2. Understand the structure of the PMM methodology, and its key components.
3. Learn about the implementation of the PMM activities on the ground through a practical simulation of the PMM Exercise and examination of questionnaires in KoBo Collect, to be used during Phase II.

The same training was conducted in Dhangadhi Sub-Metropolitan City on 14 and 15 August 2020, in Nepalgunj Sub-Metropolitan City on 9 and 10 September 2020, and in Biratnagar Metropolitan City on 1 and 2 October 2020 (Picture 3 and 4), for a total of 45 NRCS staffs who have supported the IOM PMM staff in the implementation of field activities. Standard Operating Procedures (SOPs) and Infection Prevention and Control (IPC) measures were observed by all participants and trainers throughout the sessions, which were also attended by Government representatives.

PMM Training: The PMM expert explaining the methodology (left) and the PMM team listening to the training (right)

GPS & KoBo Training: The PMM trainer presenting in Nepali (left) and GPS coordinate training (right)

2.2 DATA COLLECTION

The method implemented in Mechinagar Municipality involves two different phases.

2.2.a PHASE I

Phase I is referred to as 'Participatory Mapping Exercise' and includes facilitated focus group discussions (FGDs) with key informants (KIs), who are knowledgeable of patterns of people's movement in the specific area under consideration. Through this exercise, information is collected on the type and exact locations where people gather and travel to/from, as well as the most used routes, reasons to travel, and size of people's flow.

The PMM Exercise in Mechinagar Municipality was conducted on 9 and 10 October 2020 and was comprised of 5 FGDs. A total of 25 KIs participated in the discussions, according to their respective category; 1) government representatives, 2) agency (specifically NGOs/INGOs) representatives, 3) community workers, 4) drivers, and 5) vendors.

The discussions were facilitated in Nepali by trained moderators, whereas the information was entered in English by the trained note takers. Prior to the start of the FGDs, KIs were informed about IOM's mandate, the scope of the project and the partnership with GoN and NRCS, as well as IOM's experience in the PMM acquired in other countries. All participants were asked to sign a consent form if they agreed to participate in the PMM study. The information was collected using two main tools – the note taker's guide and a map of the municipality (see Map 1). In terms of the process, the note taker would write down the answers provided by the interviewees, while simultaneously the mapper would locate on the map the exact locations of the mentioned sites (Picture 5 and 6).

PMM Exercise: Participatory mapping exercises during FGDs in Mechinagar Municipality

The collected data from the FGDs is later entered in a matrix. The matrix is a set of questions with parameters highlighted by medical officers in IOM to determine places that are more vulnerable. Specific scores are allocated to different sites, such as points of entry (POEs), border crossing points (BCPs), health centres, traditional healers, market centres, migrant worksites, entertainment centres, schools and colleges. The weight scores are selected according to the potential risk of transmission and infection during an emergency or disease outbreaks of international concern (see Annex 1). The matrix analysis allows to identify the sites with the highest population mobility and the specific localities where these are located. The locations at the topmost layer in the matrix are selected and evaluated in Phase II.

2.2.b PHASE II

Phase II involves direct observations and individual interviews with KIs at the specific sites identified in Phase I. In particular, GPS coordinates of the priority sites are collected using a GPS device, together with estimations of travellers' volume, information on accessibility, and existing public health measures and capacities. The data is collected through KoBo Collect, a tool for mobile data collection which allows to create digital surveys and store submissions.

2.3 CHALLENGES

1. Discrepancies in names of locations and information provided by different KIs create confusions and delays, especially during Phase II. This is enhanced by the lack of official names of various sites, including POEs. The issue of locality/site duplicates was mitigated by checking names prior to field observations, though final validation happened exactly when physically visiting the sites.
2. The questionnaires uploaded in the software used for data collection during Phase II, KoBo Collect, were not fully adequate for Nepal's context, despite initial preparatory work and analysis of available contextual data. As a result, questionnaires were updated and revised in order to better reflect the national situation.
3. Some priority locations identified for field observations were not accessible by vehicle due to the rough geographical terrain in the municipality, worsened by heavy rains during monsoon season. Long distances were often covered by foot by the enumerators, despite high weather temperatures (Picture 7 and 8).
4. Due to restricted movement and lockdown, KIs were harder to reach and continuous coordination was necessary to utilize time efficiently and arrange dispatchment of enumerators to priority sites.
5. Despite the enforcement of SOPs and reminders for IPC measures, participants were often inattentive, especially during FGDs. A great deal of attention was put by the field team to make sure social distancing was respected, people were wearing masks adequately and were using hand sanitizer frequently. Gloves, masks and hand sanitizer were provided by IOM to both the NRCS collaborators and KIs.

Challenges: Examples of road infrastructure

3. RESULTS

3.1 PHASE I

Following the data entry and consequent matrix analysis (see Annex 2), a total of 94 sites with high population mobility were selected for further assessments for Phase II. In particular, these are; 20 POEs, 12 Health Centres, 13 Traditional Healers, 10 Schools and Colleges, 10 Entertainment Centres, 5 Market Centres, 8 Migrant Worksites, 5 Transport Stations, 7 Places of Worship, and 4 Other Places (see Table 1.1).

Table 1.1: Full names and localities of vulnerable sites identified within the municipality

POEs		
n	**Name Site**	**Locality**
1	Kakarbhitta Int. POE	Kakarbhitta
2	Charali POE	Charali
3	Dhaijan Chowk POE	Dhaijan
4	Burmeli Tole Int. POE	Barmeli Chowk
5	Bicharni POE	Bicharni
6	Gairi Gaun Int. POE	Gairi Gaun
7	Kalika Tea State Int. POE	Jyamirgadhi
8	Nakal Banda Int. POE	Nakalbanda
9	Mill Chowk POE	Millchowk
10	Mechi Danda Int. POE	Mechidanda
11	Duwagadhi Chowk POE	Duwagadhi
12	Durga Mandir Int. POE	Nakalbanda
13	Satighatta Int. POE	Satighatta
14	Rising Chowk Int. POE	Rising Chowk
15	Madhutole POE	Mata Chowk
16	Jyamirgadhi Int. POE	Sisodangi
17	Banshal Tea State Int. POE	Bicharni
18	Bahundangi Int. POE	Bahundangi
19	Prasad Gauda Int. POE	Bahundangi
20	Gadagalli Int. POE	Gada Galli

Health Centres		
n	**Name Site**	**Locality**
21	Dhulabari Primary Health Care	Dhulabari
22	Mechi Netralaya Hospital	Buspark
23	Mechi Divyajyoti Eye Hospital	Pragati Tole
24	Manisha Polyclinic and Diagnostic Center Pvt. Ltd.	Kakarbhitta
25	Roshan Medical Hall	Dhulabari
26	Mechi Divyajyoti Eye Hospital	Kakarbhitta
27	Mechi Amda Hospital	Dhulabari
28	Kakarbhitta Eye Hospital	Purano Bhansar
29	Adarsha Samaj FPAN Hospital	Kakarbhitta
30	Sarpa Dansa Upachar Kendra (Snake Bite)	Charali
31	Kakarbhitta Health Post	Kakarbhitta
32	Adarsha Samaj FPAN Hospital	Charali

Traditional Healers	
n	**Locality**
33	Dhimal Basti Mata
34	Dhimal Basti Mata (TM)
35	Syanglangtar Walling Baba
36	Syanglangtar Baba
37	Duwaghadhi Mata
38	Aamdangi Baba
39	Khuttedangi Baba
40	Itthabhatta Baba
41	Dhimal Basti Baba (KB)
42	Satighatta Baba
43	Itthabhatta Baba (KR)
44	Guras Path Baba
45	Dhulabari Baidhya

Schools and Colleges		
n	**Name Site**	**Locality**
46	Dhulabari Madhyamik Vidhalaya Secondary School	Dhulabari
47	Adarsha Ma. Vi. Secondary School	Ittabhatta
48	East Horizon Secondary School	Dhulabari
49	Kakarbhitta College	Kakarbhitta
50	Sahid Dasarath Ma. Vi. College	Charali
51	Tridevi College	Charali
52	North Point English College	Kakarbhitta
53	Suryodaya Secondary English Boarding School	Kakarbhitta
54	Shree Mechi Janasadharan Ma. Vi. Secondary	Bahundangi
55	Kakarbhitta Multiple College	Kakarbhitta

Entertainment Centres		
n	**Name Site**	**Locality**
56	Bhaundangi Mahotsav	Bahundangi
57	City Cinema	Ittabhatta
58	Hotel Mechi Crown	Dhulabari
59	SS Lounge Riyaz Hotel (Casino)	Bahundangi
60	Kalika Simsar Park	Dhulabari
61	Ghari Restaurant	Kakarbhitta
62	Dhulabari Cinema	Dhulabari
63	Dhaka Mini Casino	Bahundangi
64	Unique Royal Nirvan Restaurant	Dhulabari
65	Devkota Park	Buspark

Market Centres		
n	**Name Site**	**Locality**
66	Kakarbhitta Market	Kakarbhitta
67	Ittabhatta Market	Ittabhatta
68	Charali Market	Charali
69	Dhulabari Market	Dhulabari
70	Mechinagar Mahotsav (Exhibition)	Bahundangi

Migrant Worksites		
n	**Name Site**	**Locality**
71	Sunrise Cement Factory	Ittabhatta
72	Singapore Beverage Nepal Pvt. Ltd.	Kalambari
73	Mug Noodles Factory	Charali
74	Himalayas Cement Factory	Duwagadhi
75	BBC Brick Factory	Duwagadhi
76	Kakarbhitta Labour Junction	Kakarbhitta
77	Gorakhkali Cement Pvt. Ltd.	Charali
78	January Motorcycle Workshop	Kakarbhitta

Transport Stations		
n	**Name Site**	**Locality**
79	Ittabhatta Bus Station	Ittabhatta
80	Kakarbhitta Buspark	Buspark
81	Charali Bus Station	Charali
82	Pyari Vista Bus Station	Kakarbhitta
83	Dhulabari Bus Station	Dhulabari

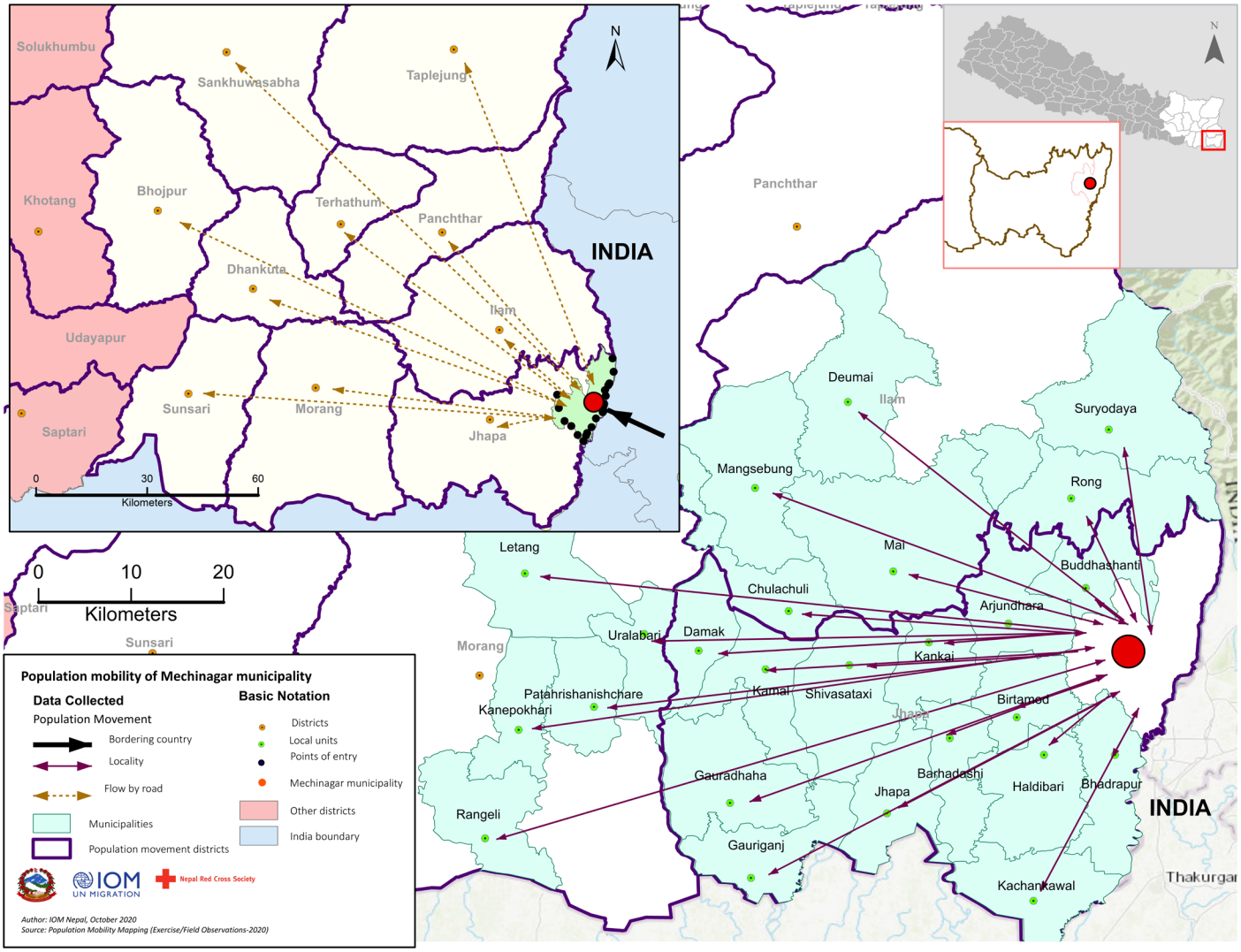
Places of Worship		
n	**Name Site**	**Locality**
84	Pau Pathivara Temple	Charali
85	Jame Mosque	Dhulabari
86	Hanuman Temple	Kakarbhitta
87	Divya Shanti Church	Dhulabari
88	Nepal Christian Revival Church	Bhanu Tole
89	Farsang Namdag Gey Feling Monastery	Kakarbhitta
90	Sherpa Monastery	Bhanu Tole

Other Places		
n	**Name Site**	**Locality**
91	Festival Ground	Dhulabari
92	Charali Mela	Charali
93	Tokla Tea Garden	Kakarbhitta
94	Religious Festival Ground	Patalganga

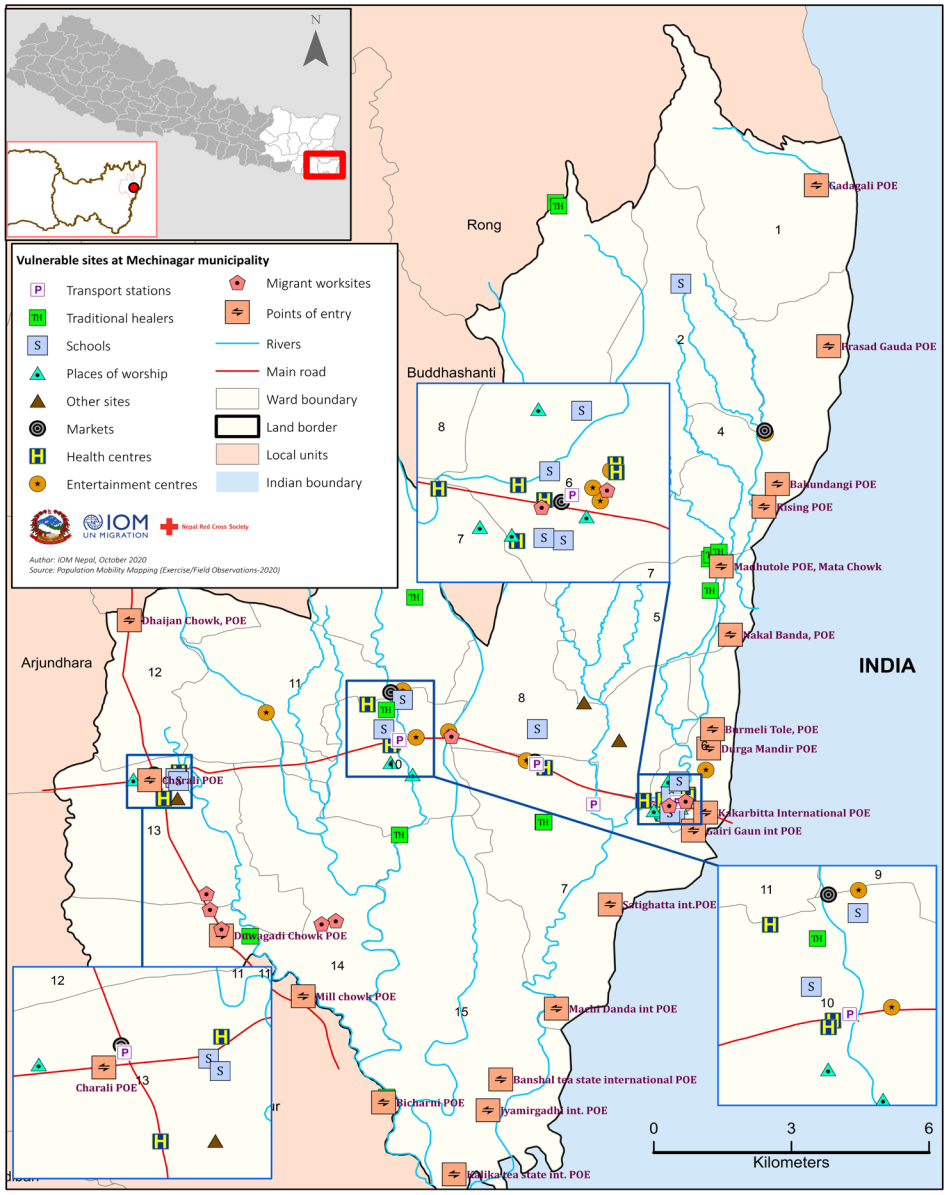
3.2 PHASE II

Based on the data gathered with KoBo Collect on POEs, population movement and vulnerable sites present in Mechinagar Municipality, the below maps were created using GIS software.

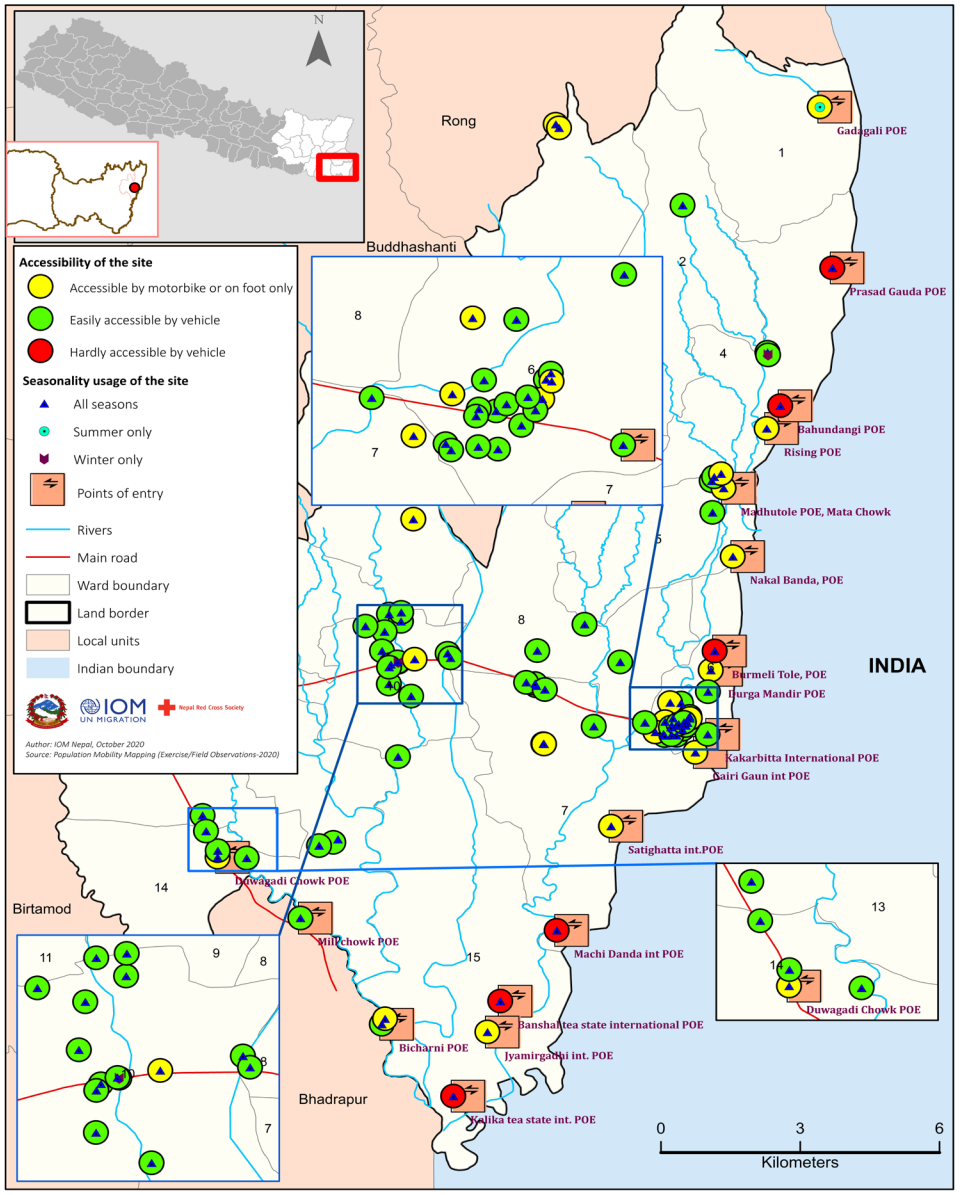
3.2.a MAPS



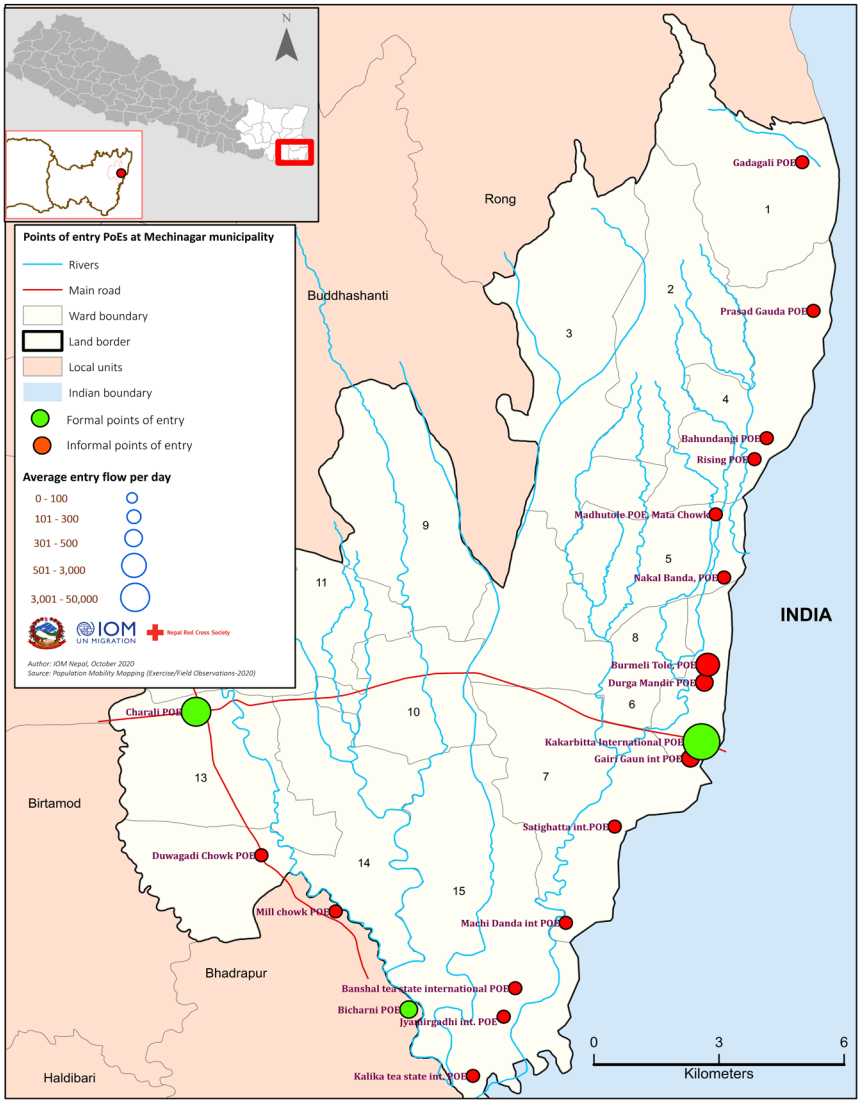
Map 2: Population movement from/to Mechinagar Municipality at the municipality, district and international level



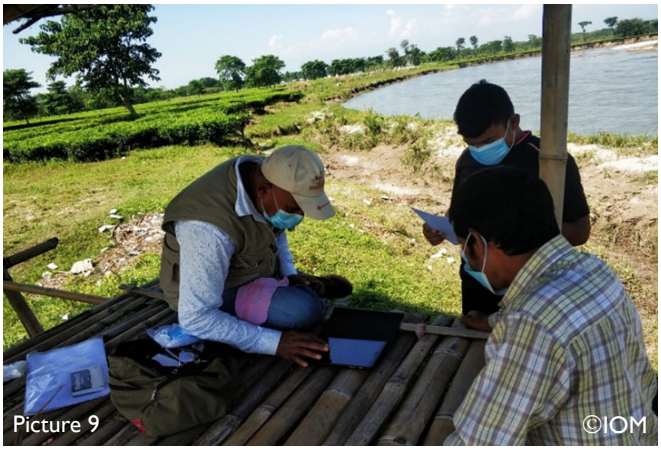
Map 3: Identified vulnerable sites within the municipality boundary



Map 4: Accessibility and seasonality usage of identified vulnerable sites



Map 5: Formal and informal POEs at the India-Nepal border (Mechinagar Municipality)



Field Observations: Site assessments and interviews with KIs

3.2.b POINTS OF ENTRY (POEs)

Population Mobility Pattern (who, where they come from, where they go)

Among the investigated sites where people's congregations occur in Mechinagar Municipality, POEs takes an account for the highest population mobility from Nepal and noticeable numbers of people from India, Bhutan, Bangladesh and Myanmar. The biggest international crossing point in terms of population mobility is identified as *Kakarbhitta POE* (formal). According to the results obtained from the field observations, the population mobility at the respective POEs in Mechinagar Municipality are mostly from *Jhapa, Ilam, Morang, Sunsari, Panchthar* and *Taplejung* districts. At the municipality level, people's movement originates from *Mechinagar Municipality, Birtamode Municipality, Bhadrapur Municipality, Suryodaya Municipality, Ilam Municipality, Jhapa Rural Municipality, Urlabari Municipality, Pathari Sanishchare Municipality,* and *Kankai Municipality.* The study reveals that the identified POEs are open to the public every day and throughout the year, except during government-imposed lockdown or prohibition order to mitigate possible threats from communicable diseases, epidemic or pandemic crisis. The busiest days in terms of higher population mobility are recorded as Tuesday, Saturday, and Sunday. In a similar manner, June, July, October and November are documented as the busiest months.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

In terms of connectivity, *Kakarbhitta POE* (formal) is reported as the largest crossing point in terms of population mobility and lies in *Kakarbhitta* locality. The *East-West Highway* ends in this POE, which is also connected to Mechi River in *Kakarbhitta* locality. This POE is accessible by all kinds of vehicles – small or big – however, people from India and other nationalities eminently use tricycles, motorbikes and cars as modes of transport to reach the site. Field observations show that the terrain and boundary/border at Mechinagar Municipality is separated from India by a river (Mechi River) in most of the investigated POEs. As a result, the investigation reveals that the identified POEs are within close distance from each other – where there is easy accessibility to cross the river, people have made themselves a permanent crossing point (continuous flow). Furthermore, the POEs in *Mechinagar Municipality, Burmeli Tole POE, Mechi Danda POE, Nakal Banda POE, Satighatta POE, Gairi Gaun POE, Gadagalli POE, Prasad Gauda POE, Durga Mandir POE,* and *Rising Chowk POE* are situated at *Burmeli Tole, Mechi Danda, Nakalbanda, Satighatta, Gairi Gaun, Gadagalli, Prasad Gauda,* and *Rising Chowk* localities, respectively. As per observation, these POEs are accessible by *Bahundangi Road*, which is connected to the *East-West Highway* in *Kakarbhitta* locality. All these POEs, except for *Nakal Banda, Burmeli Tole, Durga Mandir* and *Rising Chowk* POEs, are poorly accessible by vehicle. However, during the winter season, people can use motorbikes to access these sites because of the reduced river's flow. Correspondingly, *Bahundangi POE* is located at *Bahundangi* locality, which is also close to Mechi River and accessible by all kinds of vehicles. The nearest localities to this POE are identified as *Gadagalli, Aamdangi, Nakalbanda* and *Burmeli Tole.* Likewise, *Jyamirgadhi POE, Kalika Tea State POE,* and *Banshal Tea State POE* are situated at *Jyamirgadhi* and *Bicharni* localities, respectively, in close proximity to each other. These POEs are associated to the *East-West Highway* via *Jyamirgadhi Road*, the POEs are also accessible by alternative routes, such as *Dhulabari Road* and *Mechi Highway*. The nearest localities to these POEs are reported as *Bhadrapur, Dukhi Tole,* and *Chandragadhi*. In the same way, the results obtained from the participatory mapping exercises and field observations show that, there are some other POEs which function as entry points to Mechinagar Municipality from surrounding municipalities but are not used as international crossing points. As such, *Bicharni POE* and *Mill Chowk POE* are located in *Bicharni* and *Mill Chowk* localities, respectively, which are connected to Bhadrapur Municipality. These POEs are well accessible by all kinds of vehicles and the nearest localities are

observed as *Bhadrapur Airport Area, Jyamirgadhi* and *Chandragadhi*. Similarly, *Duwagadhi Chowk POE* is situated at *Duwagadhi* locality which is connected to *Bhadrapur Municipality* and *Mechi Highway*. This POE is accessible by all kinds of vehicles, and the nearest localities are identified as *Anarmani, Buttabari,* and *Chandragadhi*. Furthermore, *Charali POE* and *Dhaijan Chowk POE* are situated at *Charali* and *Dhaijan Chowk* localities, in close distance from each other, which are linked to the *East-West Highway* via several vehicle routes, such as *Dhulabari Road, Mechi Highway* and *Dhaijan Road*. These POEs are connected with *Pathari Sanishchare Municipality,* and the nearest localities are *Sanishchare, Buttabari, Dhaijan* and *Dhulabari.*

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

A total of twenty (20) POEs were investigated in Mechinagar Municipality, which is the largest number when compared to the other municipalities where the PMM activities were conducted. Among them, only one (1) is formal and nineteen (19) are informal crossing points. Similarly, half the POEs assessed are land border (10/20) and half are water landing (swimming/boat/by foot if shallow water) (10/20). In Fig. 1.1, the POEs are sorted in descending order of flow's magnitude. At the topmost layer, *Kakarbhitta Int. POE* (formal) accounts for the highest across all the POEs and other sites investigated during the PMM activities with a population mobility of 500,000 people per day and 700,000 people on the busiest day. These are followed by *Charali POE, Dhaijan Chowk POE,* and *Burmeli Tole Int. POE,* with a population distribution of 3,000, and 500 each, and 6,000, 700, and 600 people on the busiest day, respectively. The remaining seventeen (17) POEs have a minimum of 50 people and a maximum of 250 people per day, while on the busiest day, the population size increases to a minimum of 50 people and a maximum of 400 people. All the POEs in Mechinagar Municipality attract people from other countries, mainly from India, with *Kakarbhitta Int. POE* and *Durga Mandir Int. POE* receiving people from India, Bhutan, Bangladesh, and Myanmar. Though the average entry flow at *Kailika Tea State Int. POE* is limited (200 people per day and 400 on the busiest day), this POE attracts the largest number of people from India (80%/160 people per day), followed by *Prasad Gauda Int.* and *Jyamirgadhi Int.* POEs (70%/70 people per day each). The third highest influx of people from other countries, in terms of percentage, occurs at *Kakarbhitta Int. POE, Burmeli Tole Int. POE, Nakal Banda Int. POE, Durga Mandir Int. POE, Rising Chowk Int. POE, Gadagalli Int. POE, Banshal Tea State Int. POE,* and *Bahundangi Int. POE* where half of the travellers come from India as well as Bhutan, Bangladesh, and Myanmar in the case of *Kakarbhitta Int. POE* and *Durga Mandir Int. POE*. The remaining POEs share an average of at most 25 per cent and at least 5 per cent (see Fig. 1.1).

Average entry flow per day, busiest day, and percentage coming from other country (October 2020)

Name of POE	Type of POE	Site status	Average entry flow per day	Average entry flow on the busiest day	Average dual flow	Percentage coming from other country
Kakarbhitta Int. POE, Kakarbhitta	Land border	Formal	500,000	700,000	535,000	50
Charali POE, Charali	Land border	Informal	3,000	6,000	3,300	25
Dhaijan Chowk POE, Dhaijan	Land border	Informal	500	700	535	5
Burmeli Tole Int. POE, Burmeli Chowk	Water landing (swimming/boat/by foot)	Informal	500	600	530	50
Bicharni POE, Bicharni	Water landing (swimming/boat/by foot)	Informal	300	400	320	10
Gairi Gaun Int. POE, Gairi Gaun	Land border	Informal	250	500	275	15
Kalika Tea State Int. POE, Jyamirgadhi	Land border	Informal	200	400	220	80
Nakal Banda Int. POE, Chhoti Bhansar	Water landing (swimming/boat/by foot)	Informal	150	300	165	50
Mill Chowk POE, Mill Chowk	Land border	Informal	150	200	160	5
Mechi Danda Int. POE, Mechi Danda	Water landing (swimming/boat/by foot)	Informal	150	300	165	20
Duwagadhi Chowk POE, Duwagadhi	Land border	Informal	150	200	160	5
Durga Mandir Int. POE, Nakalbanda	Water landing (swimming/boat/by foot)	Informal	150	500	175	50
Satighatta Int. POE, Satighatta	Land border	Informal	100	150	108	10
Rising Chowk Int. POE, Rising Chowk	Water landing (swimming/boat/by foot)	Informal	100	150	108	50
Prasad Gauda Int. POE, Bahundangi	Water landing (swimming/boat/by foot)	Informal	100	200	110	70
Madhutole POE, Mata Chowk	Water landing (swimming/boat/by foot)	Informal	100	150	108	50
Jyamirgadhi Int. POE, Sisodangi	Land border	Informal	100	200	110	70
Gadagalli Int. POE, Gadagalli	Water landing (swimming/boat/by foot)	Informal	100	150	108	50
Banshal Tea State Int. POE, Bicharni	Land border	Informal	80	150	88	50
Bahundangi Int. POE, Bahundangi	Water landing (swimming/boat/by foot)	Informal	50	100	55	50

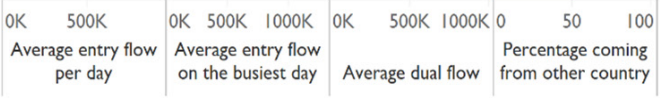


Fig. 1.1: Mobility patterns across the POEs

The nearest and the most used health centre differ across the POEs depending on each locality. The most used health centres in Mechinagar Municipality are *Bahundangi Health Post* (4/20) and *Bicharni Health Post* (4/20), which is closer to *Bahundangi Int., Banshal Tea State Int, Bicharni, Madhatole, Kalika Tea State Int., Prasad Gauda Int.,* and *Rising Chowk Int.* POEs. The majority of the POEs lack electricity (18/20), except for *Bicharni* and *Prasad Gauda Int.* POEs. Most of the POEs are busy throughout the week (11/20), except for *Bahundangi Int. POE, Burmeli Tole Int. POE, Charali POE, Durga Mandir Int. POE, Gadagalli Int. POE, Gairi Tea State Int. POE, Kakarbitta Int. POE, Madhutole POE, Nakal Banda Int. POE, Prasad Gauda Int. POE,* and *Rising Chowk Int. POE* which are busier on Tuesday, Saturday, and Sunday (see Table 1.2). Most of the sites are busy throughout the year (15/20), except for *Burmeli Tole Int. POE, Jyamirgadhi Int. POE, Madhutole POE, Prasad Gauda Int. POE*, and *Rising Chowk Int. POE* whose busiest months are March, April, August, September, November, and December. Most of the POEs do not have toilet facilities nearby (13/20), while the remaining seven (7) have. There is availability of water (for drinking, handwashing and/or other purposes) at eleven (11) POEs, while the remining nine (9) POEs lack water facilities on site.

Table 1.2: Basic health infrastructure at the POEs

Name of POE	Name of the most used health centre	Name of the nearest health centre	Availability of electricity	Busiest day of the week	Busiest month of the year	Availability of toilet nearby	Availability of water on site
Bahundangi Int. POE, Bahundangi	Manisha Clinic	Bahundangi Health post	Do not know	Saturday, Tuesday	Every month	Available	Available
Banshal Tea State Int. POE, Bicharni	Mechi Hospital	Bicharni Health Post	Not available	Every day	Every month	Not available	Not available
Bicharni POE, Bicharni	Mechi Hospital	Bicharni Health Post	Available	Every day	Every month	Not available	Available
Burmeli Tole Int. POE, Burmeli Chowk	Dhulabari Primary Health Center	Kakarbhitta Health Post	Do not know	Sunday, Tuesday	August, September	Available	Available
Charali POE, Charali	Manakamana Hospital	Manakamana Hospital	Do not know	Monday	Every month	Available	Available
Dhaijan Chowk POE, Dhaijan	Manakamana Hospital	Manakamana Hospital	Not available	Every day	Every month	Not available	Not available
Durga Mandir Int. POE, Nakalbanda	Dhulabari Primary Health Center	Kakarbhitta Health Post	Not available	Saturday, Tuesday	Every month	Not available	Available
Duwagadhi Chowk POE, Duwagadhi	Manakamana Hospital	Manakamana Hospital	Not available	Every day	Every month	Not available	Not available
Gadagalli Int. POE, Gadagalli	Dhulabari Primary Health Center	Tiring Health Post	Do not know	Saturday, Tuesday	Every month	Available	Available
Gairi Gaun Int. POE, Gairi Gaun	Birta City Hospital	Manisha Clinic	Not available	Saturday	Every month	Not available	Not available
Jyamirgadhi Int. POE, Sisodangi	Mechi Amda Hospital	Bicharni Health Post	Not available	Every day	March, April	Not available	Not available
Kakarbhitta Int. POE, Kakarbhitta	B&C Medical College T.H & Research Center	Manisha Clinic	Do not know	Saturday	Every month	Available	Available
Kalika Tea State Int. POE, Jyamirgadhi	Mechi Hospital	Bicharni Health Post	Not available	Every day	Every month	Not available	Not available
Madhutole POE, Mata Chowk	Dhulabari Primary Health Center	Bahundangi Health Post	Do not know	Saturday	November, October	Available	Available
Mechi Danda Int. POE, Mechi Danda	Manisha Clinic	Dhulabari Primary Health Center	Not available	Every day	Every month	Not available	Not available
Mill Chowk POE, Mill Chowk	Manakamana Hospital	Duwagadhi Health Post	Not available	Every day	Every month	Not available	Not available
Nakal Banda Int. POE, Chhoti Bhansar	Manisha Clinic	Adheri Health Post	Do not know	Saturday	Every month	Available	Available
Prasad Gauda Int. POE, Bahundangi	Bahundangi Health Post	Bahundangi Health Post	Available	Sunday, Tuesday	September, October	Not available	Available
Rising Chowk Int. POE, Rising Chowk	Bahundangi Health Post	Bahundangi Health post	Not available	Sunday, Tuesday	December, November	Not available	Available
Satighatta Int. POE, Satighatta	Mechi Amda Hospital	Kakarbhitta Health Post	Not available	Every day	Every month	Not available	Not available

Eighteen (18) out of the twenty (20) POEs investigated in Mechinagar Municipality lack special equipment to address health related issues of Public Health Emergency of International Concern (PHEIC), expect for *Madhutole Int. POE* and *Kakarbhitta Int. POE*. Furthermore, an assessment was also done to determine International Health Regulations (IHR) status across the POEs. Among these, none has an IHR focal point within the border and only five (5) POEs (*Durga Mandir Int., Gadagalli Int., Nakal Banda Int., Bahundangi Int.*, and *Kakarbhitta Int.*) in the corresponding country, notably India. Similarly, there is no presence of community health workers or agents or volunteers responsible for health issues related to minor and emergency cases (19/20), except at *Kakarbhitta Int. POE*. The distance to the nearest and most used health centres differs across each POE. The topmost bars (left) show that *Mechi Danga Int. POE, Banshal Tea Int. POE*, and *Madhutole Int. POE* are the farthest away from the health centres, at approximately 9 and 4 Km each, respectively. On the contrary, the remaining POEs are between 1-3 Km away from the nearest health centres, except for *Charali POE* which is 500 meters away. The distance from the nearest health centres to the referral centres differs across the majority of the POEs, except for *Duwagadhi Chowk POE, Dhijan Chowk POE, Prasad Gauda Int. POE,* and *Charali POE* whose distances are the same as from the nearest health centre. Generally, the distances to the referral centres are farther away at *Gadagalli Int. POE, Gairi Gaun Int. POE, Kakarbhitta Int. POE*, and *Madhutole Int. POE* at approximately 20, 18, 17, and 15 Km, respectively. The distance to the nearest water source varies across the eleven (11) POEs with water facilities nearby, however, it is found within a radius of 800 meters (see Fig. 1.2).

Status of health infrastructure and distance to the nearest health centre and water source

Name of POE	Availability of special equipment to address health issues of PHEIC	Presence of IHR focal point at POE	Presence of IHR focal point from corresponding country	Presence of health community worker/agent	Availability of water on site	Distance to the nearest health centre [in Km]	Distanceto from the nearest health centre to the referral centre [in Km]	Distance to the nearest water source [in meters]
Mechi Danda Int. POE, Mechi Danda	Not available	Not available	Not available	Not available	Not available	9.0	5.0	
Banshal Tea State Int. POE, Bicharni	Not available	Not available	Not available	Not available	Not available	4.0	6.0	
Madhutole POE, Mata Chowk	Available	Not available	Not available	Not available	Available	4.0	15.0	10
Durga Mandir Int. POE, Nakalbanda	Not available	Not available	Available	Not available	Available	3.0	8.0	10
Gadagalli Int. POE, Gadagalli	Not available	Not available	Available	Not available	Available	3.0	20.0	200
Kalika Tea State Int. POE, Jyamirgadhi	Not available	Not available	Not available	Not available	Not available	3.0	4.0	
Nakal Banda Int. POE, Chhoti Bhansar	Not available	Not available	Available	Not available	Available	3.0	5.0	20
Satighatta Int. POE, Satighatta	Not available	Not available	Not available	Not available	Not available	3.0	8.0	
Duwagadhi Chowk POE, Duwagadhi	Not available	Not available	Not available	Not available	Not available	2.5	2.5	
Jyamirgadhi Int. POE, Sisodangi	Not available	Not available	Not available	Not available	Not available	2.5	4.0	
Bicharni POE, Bicharni	Not available	Not available	Not available	Not available	Available	2.0	4.0	100
Burmeli Tole Int. POE, Burmeli Chowk	Not available	Not available	Not available	Not available	Available	2.0	7.0	1
Dhaijan Chowk POE, Dhaijan	Not available	Not available	Not available	Not available	Not available	2.0	2.0	
Gairi Gaun Int. POE, Gairi Gaun	Not available	Not available	Not available	Not available	Not available	2.0	18.0	
Mill Chowk POE, Mill Chowk	Not available	Not available	Not available	Not available	Not available	2.0	5.0	
Rising Chowk Int. POE, Rising Chowk	Not available	Not available	Not available	Not available	Available	2.0	4.0	10
Bahundangi Int. POE, Bahundangi	Not available	Not available	Available	Not available	Available	1.5	9.0	800
Kakarbhitta Int. POE, Kakarbhitta	Available	Not available	Available	Available	Available	1.0	17.0	200
Prasad Gauda Int. POE, Bahundangi	Not available	Not available	Not available	Not available	Available	1.0	1.0	21
Charali POE, Charali	Not available	Not available	Not available	Not available	Available	0.5	0.5	1

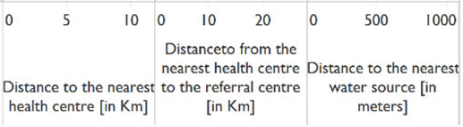


Fig. 1.2: The presence of IHR and PHEIC focal points, and distance to the nearest health/referral centre

The respondents at all the POEs (20/20) are knowledgeable of procedures to follow for suspected COVID-19 cases. The majority of the travellers passing through these BCPs do not wear masks with reference to the following analysis; either less than 10 per cent (15/20) or between 10-30 per cent (5/20) wear masks. Such low percentages are concerning, especially at *Kakarbhitta Int. POE* (formal) whose population mobility is over 500,000 people per day. Most of the sites have an uninterrupted voice communication network (13/20), while the remaining seven (7) POEs have an interrupted network system. There is no record of tracking people or contact tracing mechanism across all the POEs as people cross the border. Similarly, health screening stations for handwashing with soap and hand sanitizer, and IPC personnel are completely absent, except at *Kakarbhitta Int. POE*, which however, has no necessary equipment to implement IPC measures. Similarly, at most of the sites investigated, there is no availability of IPC personnel (15/20), except at *Durga Mandir Int. POE, Gadagalli Int. POE, Kakarbhitta Int. POE, Prasad Gauda Int. POE*, and *Nakal Banda Int. POE*. This is concerning also considering that 95 per cent of the POEs are operational throughout the seasons in Mechinagar Municipality, similarly to other municipalities where the study was conducted, except for *Gadagalli Int. POE,* which is only operational in summer season. According to the respondents, there were seven (7) suspected COVID-19 positive cases reported at *Bahundangi Int. POE, Burmeli Tole Int. POE, Durga Mandir Int. POE, Madhutole POE, Nakal Banda Int. POE, Prasad Gauda Int. POE*, and *Rising Chowk POE* (see Table 1.3).

Table 1.3: Status of IPC and suspected COVID-19 cases at the POEs

Name of POE	Knowledge of procedure to follow for suspected COVID-19 cases	Suspected COVID-19 cases on site	Estimated percentage wearing mask	Availability of health screening station	Presence of IPC personnel	Availability of record book/device for migrants	Seasonality at POE	Communication status
Bahundangi Int. POE, Bahundangi	Yes	Yes	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Banshal Tea State Int. POE, Bicharni	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Bicharni POE, Bicharni	Yes	No	10%-30%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Burmeli Tole Int. POE, Burmeli Chowk	Yes	Yes	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Charali POE, Charali	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Dhaijan Chowk POE, Dhaijan	Yes	No	10%-30%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Durga Mandir Int. POE, Nakalbanda	Yes	Yes	<10%	Not available	Available	Not available	All seasons	Bad (interrupted network)
Duwagadhi Chowk POE, Duwagadhi	Yes	No	10%-30%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Gadagalli Int. POE, Gadagalli	Yes	No	<10%	Not available	Available	Not available	Summer only	Bad (interrupted network)
Gairi Gaun Int. POE, Gairi Gaun	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Jyamirgadhi Int. POE, Sisodangi	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Kakarbhitta Int. POE, Kakarbhitta	Yes	No	10%-30%	Available	Available	Do not know	All seasons	Good (uninterrupted network)
Kalika Tea State Int. POE, Jyamirgadhi	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Madhutole POE, Mata Chowk	Yes	Yes	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Mechi Danda Int. POE, Mechi Danda	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Mill Chowk POE, Mill Chowk	Yes	No	10%-30%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Nakal Banda Int. POE, Chhoti Bhansar	Yes	Yes	<10%	Not available	Available	Not available	All seasons	Bad (interrupted network)
Prasad Gauda Int. POE, Bahundangi	Yes	Yes	<10%	Not available	Available	Not available	All seasons	Good (uninterrupted network)
Rising Chowk Int. POE, Rising Chowk	Yes	Yes	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Satighatta Int. POE, Satighatta	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)

3.2.c HEALTH CENTRES

Population Mobility Pattern (who, where they come from, where they go)

According to the results acquired from the participatory mapping exercises and field observations, people's movement at the health centres in Mechinagar Municipality are observed other than Nepal, from India, Bhutan, Bangladesh and Myanmar. The study shows that the identified health centres are operational every day and throughout the year, however, the busiest days in terms of higher congregation of people are documented as Sunday and Monday. In the same way, January and February are recorded as the busiest months at the respective health centres. The population mobility to the studied health centres in Mechinagar Municipality are recorded mainly from *Jhapa, Ilam, Morang, Sunsari, Panchthar, Dhankuta, Bhojpur* and *Taplejung* districts. At the municipality level, patients and visitors are mostly from Mechinagar Municipality and from *Birtamode Municipality, Bhadrapur Municipality, Kankai Municipality, Arjundhara Municipality, Jhapa Rural Municipality, Damak Municipality* and *Urlabari Municipality.*

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

In terms of connectivity, the majority of the health centres are situated at *Kakarbhitta* locality, namely *Manisha Polyclinic and Diagnostic Center Pvt. Ltd., Kakarbhitta Health Post, Adarsha Samaj FPAN Hospital, Mechi Netralaya* and *Mechi Divyajyoti Eye Hospital.* The respective health centres are situated near *Kakarbhitta POE* (formal), and connected to the *East-West Highway.* The sites at *Kakarbhitta* locality are also accessible by other alternative vehicle routes, such as *Kalikhola Marg, Bahundangi Road, Jyamirgadhi Road*, and *Nakalbanda Road.* According to the results obtained from direct field observations, these health centres are easily accessible by all

kinds of vehicle, however, people from India mainly use cars and motorbikes to access these. The nearest localities to these health centres are recorded as *Pragati Tole, Burmeli Tole, Aayabari, Bahundangi* and *Aamdangi*. Similarly, *Kakarbhitta Eye Hospital* and *Mechi Divyajyoti Eye Hospital* are situated at *Purano Bhansar* and *Pragati Tole* localities, respectively, with equidistance from each other. These health centres are situated close to *Kakarbhitta POE* (formal) and connected to the *East-West Highway* via several vehicle routes, namely *Kalikhola Marg, Bahundangi Road* and *Nakalbanda Road.* The sites are accessible by all kinds of vehicles and the nearest localities are documented as *Kakarbhitta, Burmeli Tole, Bahundangi and Aayabari.* Correspondingly, *Mechi Amda Hospital, Dhulabari Primary Health Care* and *Roshan Medical Hall* are based in *Dhulabari* locality, in close proximity with each other. These sites are linked to the *East-West Highway* via *Amda Road* with several other alternative routes, such as *Dhulabari Road, Magurmadi Road, Dhaijan Road* and *Nakalbanda Road,* all accessible by vehicle. The nearest localities to these health centres are observed as *Dhaijan Mode, Jorsimal, Charali,* and *Ittabhatta*. On the other hand, *Adarsha Samaj FPAN Hospital* and *Sarpa Dansa Upachar Kendra (Snake Bite)* are situated at *Charali* locality, in close distance from each other, and linked to *Mechi Highway,* which is connected to the *East-West Highway*. The alternative routes to access these health centres are *Duwagadhi Road, Dhaijan Road* and *Manipur Road*. The nearest localities to these sites are documented as *Duwagadhi, Dhaijan Mode, Dhulabari, Buttabari* and *Dhaijan*.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

A total of twelve (12) health centres were investigated in Mechinagar Municipality, which is higher than in Biratnagar-Metropolitan City (5) and Suryodaya Municipality (10). Among these twelve (12) health centres, only two (2) (*Kakarbhitta Health Post* and *Dhulabari Primary Health Care*) are government-owned, whereas the remaining ten (10) are private health facilities. The average number of people visiting the health centres varies across the respective facilities. *Dhulabari Primary Health Care, Mechi Netraya Hospital,* and *Mechi Divyajyoti Eye Hospital* account for the highest flow with 300 and 150 people each per day, while on the busiest days the numbers increase to 450, 200, and 250, respectively, which are by far less than in Biratnagar Metropolitan City (3,000 max. per day). The remaining nine (9) health centres have at most 60 people and at least 25 people per day, and on the busiest days the maximum influx is 100 people and the minimum flow is 35. Congruently, despite the minimum influxes of people at *Kakarbhitta Health Post* and *Adarsha Samaj FPAN Hospital* (30 and 25 patients, respectively per day), on the busiest days the numbers (100 and 110, respectively) surpass those at *Roshan Medical Hall, Mechi Divyajyoti Eye Hospital, Mechi Amda Hospital, Kakarbhitta Eye Hospital, Adarsha Samaj FPAN Hospital,* and *Sarpa Dansa Upachar Kendra (Snake Bite)* (between 35 and 70). Most of health centres investigated receive people from other countries, except for *Roshan Medical Hall* whose patients are only Nepalese nationals. Furthermore, the majority of the assessed health centres attract people from India, with *Mechi Netralaya Hospital, Manisha Polyclinic and Diagnostic Centre Pvt. Ltd., Mechi Divyajyoti Eye Hospital,* and *Kakarbitta Eye Hospital* also receiving people (patients and visitors) from India, Bhutan, Bangladesh, and Myanmar. Specifically, 90 per cent of the population at *Mechi Divyajyoti Eye Hospital (Kakarbhitta)* and *Mechi Divyajyoti Eye Hospital (Pragati Tole)* mainly comes from India, Bhutan, and Bangladesh, and the remaining 10 per cent, respectively, are from within the same municipality and nearby municipalities. The second highest influx of people from other countries can be found at *Mechi Netralaya Hospital, Kakarbhitta Eye Hospital,* and *Adarsha Samaj FPAN Hospital (Charali)*, with a percentage distribution of 60 each, and 50, respectively. The remaining six (6) sites receive a limited percentage, less than 10 (see Fig. 2.1).

Average entry flow per day, busiest day, and percentage coming from other country (October 2020)

Name of health centre	Type of health centre	People coming from other country	Average entry flow per day	Average entry flow on the busiest day	Average dual flow	Percentage coming from other country
Dhulabari Primary Health Care, Dhulabari	Government	India	300	450	338	1
Mechi Netralaya Hospital, Kakarbhitta	Private	India, Bhutan, Bangladesh, Myanmar	150	200	167	60
Mechi Divyajyoti Eye Hospital, Kakarbhitta	Private	Bhutan, India, Bangladesh	150	250	171	90
Manisha Polyclinic and Diagnostic Center Pvt. Ltd., Kakarbhitta	Private	India, Bhutan	60	100	68	2
Roshan Medical Hall, Dhulabari	Private	'	50	60	55	0
Mechi Divyajyoti Eye Hospital, Pragati Tole	Private	India, Bhutan, Bangladesh	50	70	56	90
Mechi Amda Hospital, Dhulabari	Private	India	40	60	45	1
Kakarbhitta Eye Hospital, Purano Bhansar	Private	India, Bhutan, Myanmar, Bangladesh	40	60	45	60
Adarsha Samaj FPAN Hospital, Charali	Private	India	40	50	44	50
Sarpa Dansa Upachar Kendra (Snake Bite), Charali	Private	India	30	35	33	1
Kakarbhitta Health Post, Kakarbhitta	Government	India	30	100	38	5
Adarsha Samaj FPAN Hospital, Kakarbhitta	Private	India	25	110	34	10

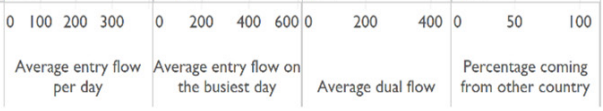


Fig. 2.1: Mobility patterns at the health centres

Half of the health centres are operational 24/7 (6/12) and half (6/12) are not, contrary to Biratnagar Metropolitan City where all the health centres are operational and functioning 24/7. The majority of the health centres (11/12) have separate toilets for staffs and patients, except for *Manisha Polyclinic and Diagnostic Centre Pvt. Ltd.*. In terms of number of toilet facilities at the respective health centres, the maximum of stalls (drop holes) is found at *Mechi Netralaya Hospital* (13), and the minimum of 1 stall at *Roshan Medical Hall* and *Adarsha Samaj FPAN Hospital*. The analysis shows that the patients to stall (drop hole) ratio are distributed fairly and uniformly in terms of population mobility across the health centres, contrary to the analysis obtained in Biratnagar Metropolitan City where some of the health centres (*Nobel Medical College Teaching Hospital, Biratnagar Hospital* and *Koshi Hospital*) have less than one-third (1/3) of the stalls (50 each), despite a population mobility (inpatient ward) 11 and 7 times higher, respectively. Three (3) health centres have people in both inpatient and outpatient wards, one (1) *Sarpa Dansa Upachar Kendra (Snake Bite)* only has inpatients (130), and the remaining eight (8) have population only in the outpatient ward. It can be found that, some of the health centres with lesser inpatients have one of the highest population in the outpatient ward, except for *Dhulabari Primary Health Care* with 5,000 patients (outpatient ward), based on data from the last three months (July-September 2020). *Mechi Netralaya Hospital, Kakarbhitta Eye Hospital,* and *Sarpa Dansa Upachar Kendra (Snake Bite)* have the largest amount of inpatients (300, 150, and 130, respectively) and outpatients (4,500 and 2,500), except for *Sarpa Dansa Upachar Kendra (Snake Bite)* (0 patients). Generally, the numbers of outpatients are significantly higher than inpatients across all the health centres. This is probably due to the inadequate capacity of the treatment facilities based on the last three months (July-September) from the date of observations (October 2020).

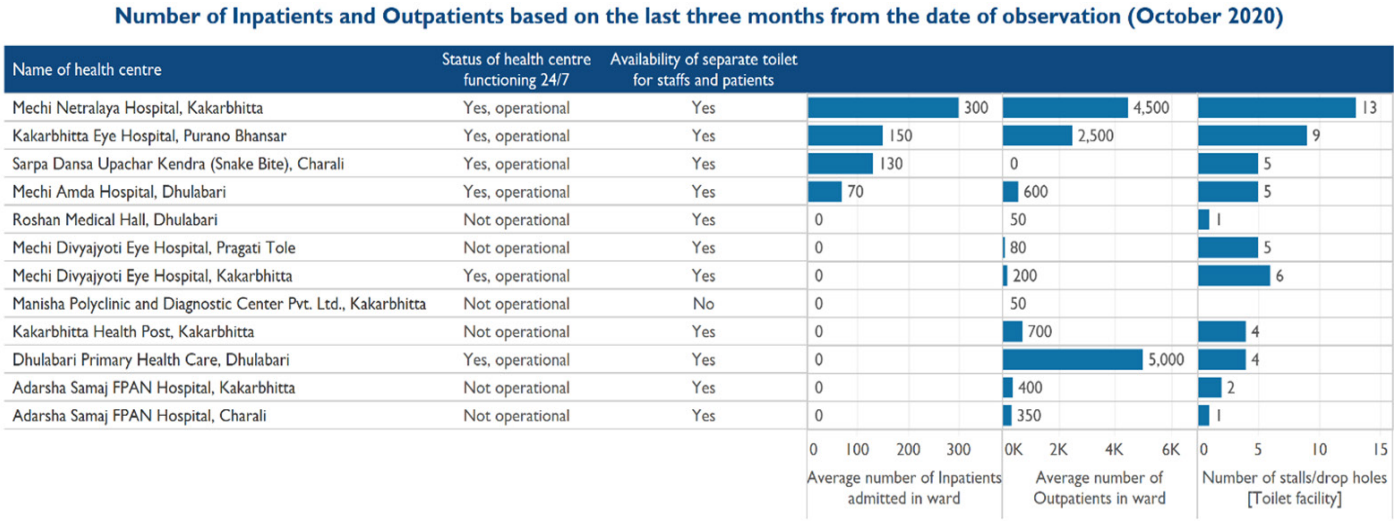


Fig. 2.2: Number of inpatients, outpatients and stalls (toilet facility) at the health centres

Fig. 2.3 shows the distribution of basic hygiene mechanism at the health centres and the distances from the health centre to the nearest water source and another health centre (referral centre). The farthest distance to the referral centres is 17, 10, 8, and 6 Km from *Manisha Polyclinic and Diagnostic Centre Pvt. Ltd., Dhulabari Primary Health Care, Adarsha Samaj FPAN Hospital (Kakarbhitta),* and (*Kakarbhitta Health Post, Sarpa Dansa Upachar Kendra (Snake Bite),* and *Kakarbhitta Eye Hospital*), respectively. The remaining six (6) health centres are at most 3 Km away and at least less than 100 meters away. The distance from the health centres to the nearest water source is within a radius of 150 meters, except for *Sarpa Dansa Upachar Kendra (Snake Bite)* which is about 2 Km distant. This means that the majority of the health centres have a water system nearby. Similarly, the majority of the assessed sites have toilet facilities for both staffs and patients, except for *Manisha Polyclinic and Diagnostic Centre Pvt. Ltd.*. The maximum number of patients per stall (drop hole) is 150 (*Dhulabari Primary Health Care*) and the minimum number of patients per stall is 5 (*Kakarbhitta Eye Hospital*) based on the average number of patients visiting the facilities per day. Similarly, the highest number of staffs per stall can be found at *Mechi Netralaya Hospital* (65) and *Mech Amda Hospital* (57), whereas the minimum number of staffs per stall is 2 (*Roshan Medical Hall* and *Adarsha Samaj FPAN Hospital (Kakarbhitta)*) based on the total population of health personnel at the respective health centres.

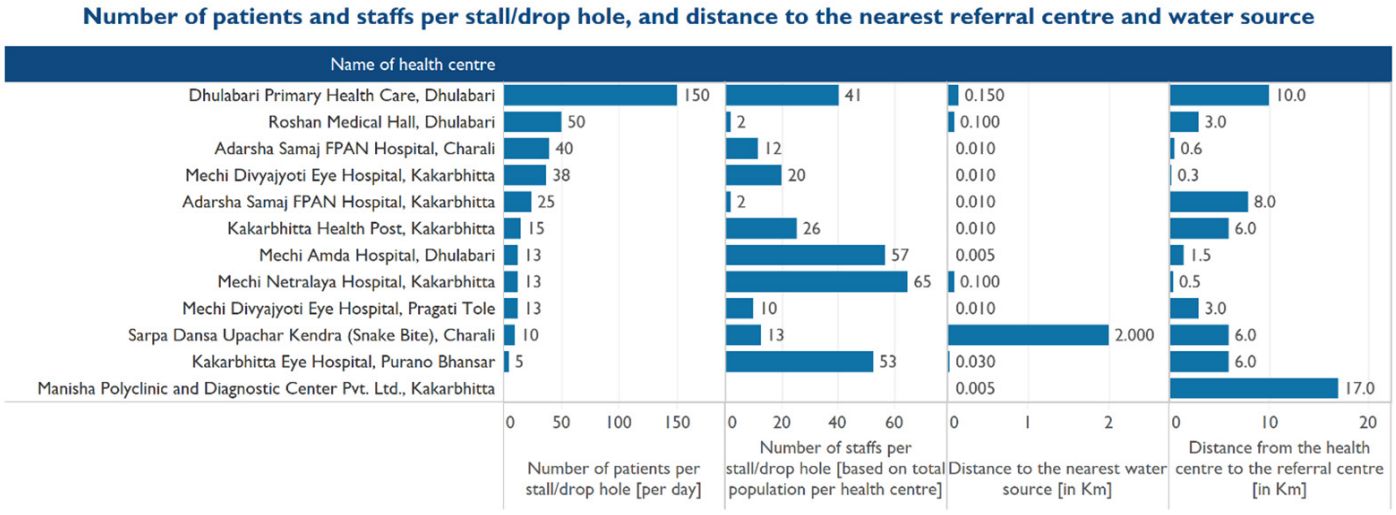


Fig. 2.3: Number of patients and staffs per stall/drop hole, and distances to the nearest health centre and water source

In Mechinagar Municipality, out of twelve (12) respondents at health centres that were investigated, eleven (11) asserted that people who fall ill do seek alternative health treatment before going to the health centres (see Table 2.1). Analysis for these findings is stated as follows, in order of percentage magnitude:

- Less than 10 per cent and between 31-50 per cent seek healthcare at home
- Between 10-30 per cent, less than 10 per cent, and greater than 50 per cent seek healthcare at other private hospitals
- Less than 10 per cent and between 14-34 per cent seek healthcare at other public hospitals
- Between 17-37, less than 10 per cent, and greater than 50 per cent seek healthcare at the pharmacy
- Less than 10 per cent and between 31-50 per cent seek healthcare from the religious leaders
- Less than 10 per cent and between 25-40 per cent seek healthcare from the traditional healers
- Between 10-30 per cent and less than 10 per cent seek healthcare somewhere else

Table 2.1: Most common places people seek care from before going to the health centre

Name of health centre	Care at home	Care at other private hospital	Care at other public hospital	Care at the pharmacy	Care at the traditional healer	Care at the religious leader	Care at somewhere else
Adarsha Samaj FPAN Hospital, Charali	<10%	<10%	10%-30%	10%-30%	10%-30%	<10%	<10%
Adarsha Samaj FPAN Hospital, Kakarbhitta	<10%	<10%	<10%	<10%	<10%	<10%	<10%
Dhulabari Primary Health Care, Dhulabari	31%-50%	<10%	<10%	31%-50%	<10%	<10%	10%-30%
Kakarbhitta Eye Hospital, Purano Bhansar	<10%	10%-30%	10%-30%	<10%	<10%	<10%	<10%
Kakarbhitta Health Post, Kakarbhitta	>50%	>50%	31%-50%	>50%	<10%	<10%	<10%
Manisha Polyclinic and Diagnostic Center Pvt. Ltd., Kakarbhitta	<10%	<10%	<10%	>50%	31%-50%	31%-50%	<10%
Mechi Amda Hospital, Dhulabari	<10%	10%-30%	<10%	<10%	<10%	<10%	10%-30%
Mechi Divyajyoti Eye Hospital, Kakarbhitta	<10%	10%-30%	10%-30%	10%-30%	<10%	<10%	10%-30%
Mechi Divyajyoti Eye Hospital, Pragati Tole	<10%	10%-30%	<10%	10%-30%	<10%	<10%	10%-30%
Mechi Netralaya Hospital, Kakarbhitta	<10%	10%-30%	10%-30%	10%-30%	<10%	<10%	10%-30%
Roshan Medical Hall, Dhulabari	<10%	<10%	<10%	31%-50%	<10%	<10%	10%-30%

In Table 2.2, the population distribution of the medical personnel across the health centres where the study was conducted shows that; *Mechi Netralaya Hospital* and *Mechi Amda Hospital* account for the largest total of medical personnel (65 and 58, respectively), and the highest number of medical officers (5 and 22, respectively). This is followed by *Kakarbhitta Eye Hospital* and *Dhulabari Primary Health Care* with an equal total medical population of 53 each, respectively. The majority of the health centres investigated have at least one (1) and at most 22 medical officers, except for *Adarsha Samaj FPAN Hospital (Kakarbhitta), Kakarbhitta Health Post,* and *Roshan Medical Hall* (see Table 2.2). Additionally, based on inpatients and outpatients population distribution, at *Mechi Netralaya Hospital, Mechi Amda Hospital,* and *Kakarbhitta Eye Hospital* the population of medical personnel is proportionate to the influxes of people, contrary to *Dhulabari Primary Health Care* (with 5,000 outpatients). The remaining eight (8) health centres account for far less than the latter in terms of medical personnel, probably due to the lower mobility of patients at these sites, which is still higher when compared to Biratnagar Metropolitan City. Consequently, at most of the health centres the presence of health personnel varies for most of the sixteen (16) staff categories, contrary to the analysis obtained in Biratnagar Metropolitan City (where all the 16 categories have at least 1 medical personnel, staff nurse, pharmacist, and lab technician).

Table 2.2: Population of medical personnel at the health centres

	Name of health centre / Type of health centre											
	Adarsha Samaj FPAN Hospital, Charali	Adarsha Samaj FPAN Hospital, Kakarbhitta	Dhulabari Primary Health Care, Dhulabari	Kakarbhitta Eye Hospital, Purano Bhansar	Kakarbhitta Health Post, Kakarbhitta	Manisha Polyclinic and Diagnostic Center Pvt. Ltd., Kakarbhitta	Mechi Amda Hospital, Dhulabari	Mechi Divyajyoti Eye Hospital, Kakarbhitta	Mechi Divyajyoti Eye Hospital, Pragati Tole	Mechi Netralaya Hospital, Kakarbhitta	Roshan Medical Hall, Dhulabari	Sarpa Dansa Upachar Kendra (Snake Bite), Charali
	Private	Private	Government	Private	Government	Private	Private	Private	Private	Private	Private	Private
Auxiliary Health Worker	0	0	1	1	3	0	2	0	0	5	0	0
Auxiliary Nursing Midwifery	0	0	4	9	4	0	3	0	0	5	0	0
Female Community Health Volunteer	1	0	25	4	33	0	2	0	1	0	0	0
Health Assistant	0	1	1	0	1	1	1	4	1	5	0	5
House Keeper	1	0	3	1	0	2	3	4	3	4	0	1
Lab Assistant	0	0	1	1	0	0	3	0	1	2	0	0
Lab Technician	1	0	2	1	0	2	3	1	0	3	0	0
Medical Officer	1	0	2	1	0	4	22	4	1	5	0	2
Medical Recorder	1	0	2	1	0	1	1	0	0	1	0	0
Nursing Officer	2	0	4	10	0	0	3	1	1	10	0	0
Office Helper	1	1	4	4	1	2	3	2	1	3	0	5
Pharmacist	0	0	1	1	0	2	3	1	0	0	1	0
Pharmacy Assistant	0	0	1	0	0	0	1	0	0	2	0	0
Public Health Nurse	2	0	0	10	0	0	3	0	1	10	1	0
Radiographer	0	0	2	0	0	1	2	0	0	0	0	0
Staff Nurse	2	0	0	9	0	2	3	3	0	10	0	0
Total Health Officers	12	2	53	53	42	17	58	20	10	65	2	13

Among the twelve (12) health centres investigated in Mechinagar Municipality, eight (8) are private and their primary purpose is to deliver special healthcare services. Only three (3) (*Kakarbhitta Health Post, Mechi Amda Hospital,* and *Sarpa Dansa Upachar Kendra (Snake Bite)*) are community health centres and attracts less patients compared to *Mechi Netralaya Hospital* and *Dhulabari Primary Health Care* in terms of number of inpatients admitted in ward, however, they attract more people than other health centres, in terms of influxes of people per day (see Fig. 2.1 and 2.2). Five (5) health centres have recorded suspected COVID-19 cases. The majority of the health centres have conducted training on IPC (10/12) and perform health screening for travellers or patients entering the facilities (7/12), whereas four (5) do not (*Adarsha Samaj FPAN Hospital (Charali), Adarsha Samaj FPAN Hospital (Kakarbhitta), Mechi Divyajyoti Eye Hospital (Kakarbhitta), Mechi Divyajyoti Eye Hospital (Pragati Tole),* and *Roshan Medical Hall*). Most of the health centres (8/12) do not have health screening stations operational 24/7, except for *Kakarbhitta Eye Hospital, Mechi Amda Hospital, Mechi Netralaya Hospital*, and *Sarpa Dansa Upachar Kendra (Snake Bite)*. Only half of the health centres have an emergency preparedness plan (6/12). Among these, five (5) have tested the plan between less than 3 months and between 6 to 9 months prior to observations. At nearly all the health centres (10/12), people wear masks at a percentage greater than 50 (>50%), and only at two (2) sites the distribution is between 20-40 per cent (see Table 2.3).

Table 2.3: Status of emergency preparedness plan, IPC, and health screening at the health centres

Name of health centre	Level of health system/service delivery	Suspected COVID-19 cases on site	Status of IPC training	Availability of health screening station	Availability of health screening station 24/7	Availability of emergency preparedness plan	Emergency preparedness plan last tested	Estimated percentage wearing mask
Adarsha Samaj FPAN Hospital, Charali	Private Clinic, Private Specialized Clinic, Private faith based Hospital	Yes	Yes, conducted	Not available	Not available	Available	Between 6 to 9 months	31%-50%
Adarsha Samaj FPAN Hospital, Kakarbhitta	Private Specialized Clinic	No	Yes, conducted	Not available	Not available	Available	Less than 3 months	>50%
Dhulabari Primary Health Care, Dhulabari	Primary Healthcare Center	Yes	Yes, conducted	Available	Not available	Available	Less than 3 months	>50%
Kakarbhitta Eye Hospital, Purano Bhansar	Private Specialized Clinic	No	Yes, conducted	Available	Available	Available	Between 6 to 9 months	>50%
Kakarbhitta Health Post, Kakarbhitta	Health Post	Yes	Yes, conducted	Available	Not available	Not available	'	>50%
Manisha Polyclinic and Diagnostic Center Pvt. Ltd., Kakarbhitta	Private Clinic	Yes	Yes, conducted	Available	Not available	Not available	'	>50%
Mechi Amda Hospital, Dhulabari	Community Health Center	Yes	Not conducted	Available	Available	Available	'	>50%
Mechi Divyajyoti Eye Hospital, Kakarbhitta	Private Specialized Clinic, Private Hospital	No	Yes, conducted	Not available	Not available	Not available	'	>50%
Mechi Divyajyoti Eye Hospital, Pragati Tole	Private Health Center, Private Specialized Clinic, Community Health Center	No	Yes, conducted	Not available	Not available	Not available	'	>50%
Mechi Netralaya Hospital, Kakarbhitta	Private Specialized Clinic, Private Hospital	No	Yes, conducted	Available	Available	Available	Less than 3 months	>50%
Roshan Medical Hall, Dhulabari	Private Health Center	No	Not conducted	Not available	Not available	Not available	'	10%-30%
Sarpa Dansa Upachar Kendra (Snake Bite), Charali	Community Health Center, Health Post	No	Yes, conducted	Available	Available	Not available	'	>50%

Most of the health centres have availability of functional thermometers to check body temperature (8/12) for both patients and visitors, except for *Dhulabari Primary Health Care* and *Mechi Divyajyoti Eye Hospital (Pragati Tole),* while at the other two (2) the respondents were uncertain (*Mechi Divyajyoti Eye Hospital (Kakarbhitta)* and *Roshan Medical Hall*). Water is present on site across all the health centres. Half of the facilities (6/12) are busy throughout the week and the year, and half are busy on Monday, Thursday, Friday, Saturday and Sunday. Similarly, the busiest months of the year vary across most of the sites, except for *Dhulabari Primary Health Care, Kakarbhitta Health Post, Mechi Divyajyoti Eye Hospital (Pragati Tole), Mechi Divyajyoti Eye Hospital (Kakarbhitta),* and *Mechi Netralaya Hospital* which are busy throughout the year (see Table 2.4). None of the health centres have tracking matrix (record book/device) for patients and visitors entering the sites, especially for contact tracing mechanism.

Table 2.4: Water facility, the busiest days/months, and name of the most used health centre

Name of health centre	Status of body temperature checking	Availability of water on site	Busiest day of the week	Busiest month of the year	Availability of record book/device for patients/visitors
Adarsha Samaj FPAN Hospital, Charali	Available	Available	Sunday	September, October	Not available
Adarsha Samaj FPAN Hospital, Kakarbhitta	Available	Available	Every day	February, May, August, November	Not available
Dhulabari Primary Health Care, Dhulabari	Not available	Available	Sunday, Monday, Friday	Every month	Not available
Kakarbhitta Eye Hospital, Purano Bhansar	Available	Available	Sunday, Monday	August, September	Not available
Kakarbhitta Health Post, Kakarbhitta	Available	Available	Every day	Every month	Not available
Manisha Polyclinic and Diagnostic Center Pvt. Ltd., Kakarbhitta	Available	Available	Saturday	November, December, January	Not available
Mechi Amda Hospital, Dhulabari	Available	Available	Sunday, Thursday	April, May, June, July	Not available
Mechi Divyajyoti Eye Hospital, Kakarbhitta	Do not know	Available	Every day	Every month	Do not know
Mechi Divyajyoti Eye Hospital, Pragati Tole	Not available	Available	Sunday	Every month	Not available
Mechi Netralaya Hospital, Kakarbhitta	Available	Available	Every day	Every month	Not available
Roshan Medical Hall, Dhulabari	Do not know	Available	Every day	March, April, May, January, June	Do not know
Sarpa Dansa Upachar Kendra (Snake Bite), Charali	Available	Available	Every day	February, April, March, May	Not available

Two (2) main assessments were done to determine the modes of transport for emergency cases to the nearest POEs, and the most common means of transport to access the health centres. The findings revealed that private transport (motorbike or 3-wheel) and public transport (rickshaw) are mostly used to access the POEs, especially during emergency cases, with a percentage distribution of 22.2 each, respectively, which is slightly different from the analysis obtained in Biratnagar Metropolitan City (private transport (motorbike or 3-wheel and ambulance).

These are followed by public transport (car, bus, flight) and by ambulance, with a percentage distribution of 20.4 and 18.5, respectively (see Fig. 2.4). On the other hand, the health centres are mostly accessed by foot and motorbike (22.5% and 22.0%, respectively), followed by car and minivan, with a percentage distribution of 19.1 and 17.7, respectively, similarly to most of the sites investigated in the PMM project.

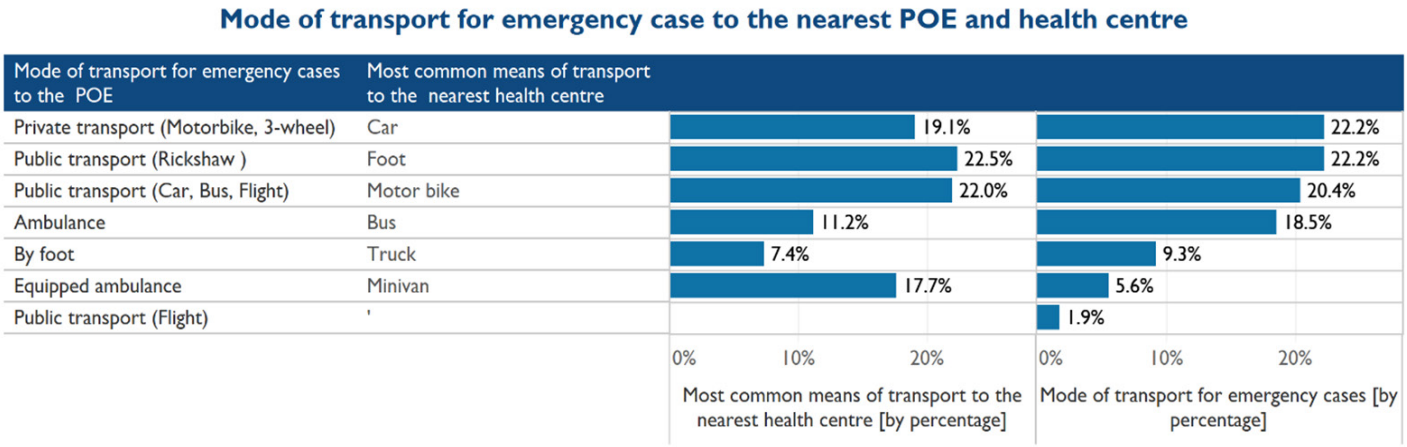


Fig. 2.4: Most common modes of transport to access the POEs during emergency cases from the health centres

In Fig. 2.5, the bars (right side) show the main purposes patients visit the health centres and the main purposes of visitors coming from India (left). The analysis shows that diarrhea and typhoid (23.5% and 17.6%, respectively) are the major factors for people to seek healthcare, contrary to Biratnagar Metropolitan City (surgery and maternal delivery). Secondly, delivery, malaria, immunization, cholera, and antenatal and post-natal care (8.8% each), are the major reasons for patients to go to the health centres. On the other hand, people coming from India mostly visit the health centres in Mechinagar Municipality to treat and visit patients, with a percentage distribution of 55.6 and 38.9, respectively. This means that people from India who go to the assessed health centres are medical practitioners whose primary objective is to treat or support the health service delivery in Nepal (see Fig. 2.5).

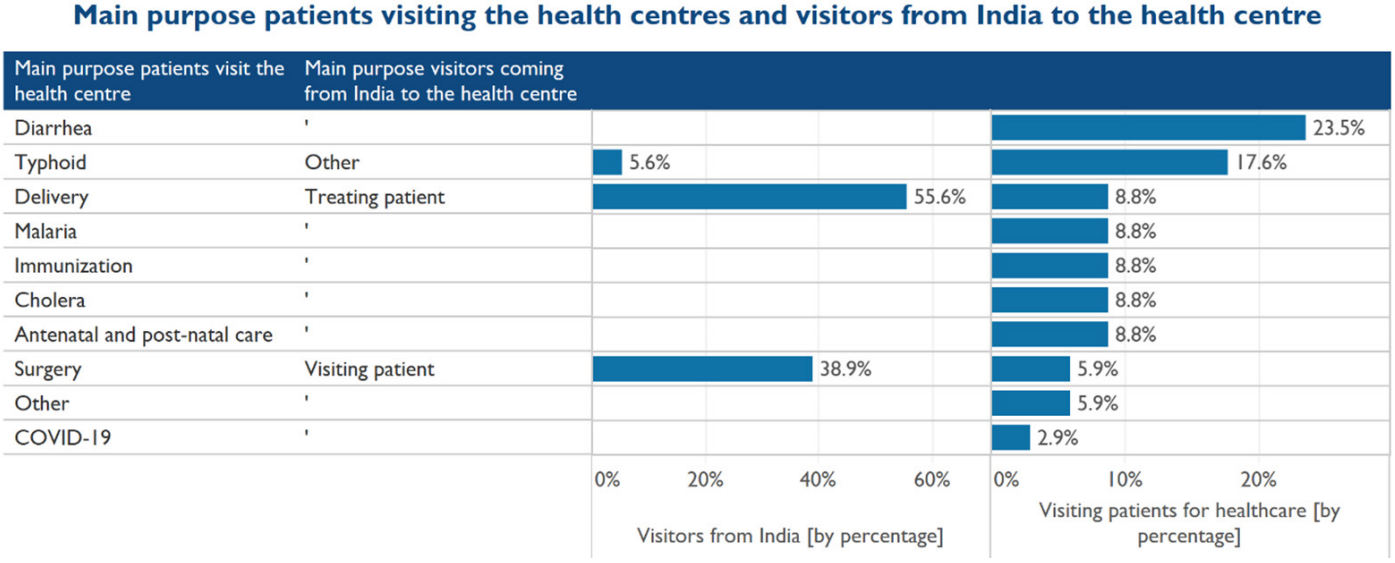


Fig. 2.5: Main reasons for patients and visitors' entry to the health centres

The analysis shows that at the health centres there are twelve (12) wards present, including one (1) unnamed ward, with percentage distributions of; laundry, laboratory, and kitchen (14.8% each), surgical, medical, emergency room (11.1%), padiatric, outpatient, mortuary, maternal/delivery, intensive care, and other (3.7% each). Therefore, the largest wards at the health centres in Mechinagar Municipality are laundry, laboratory, kitchen, surgical, medical, and emergency room (see Fig. 2.6).

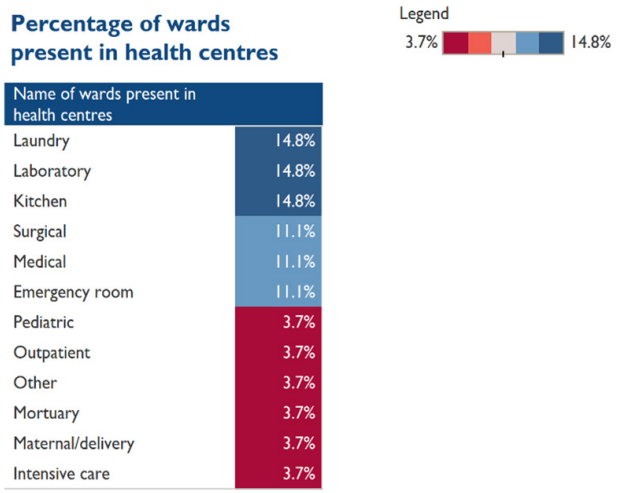


Fig. 2.6: Percentage distribution of wards present at the health centres

Fig. 2.7 shows the methods of waste disposal and the types of toilet facilities at the various health centres in Mechinagar Municipality. According to the chart, waste bins are available and regularly emptied, and account for the most common technique for disposal of waste (31.6% and 26.3%, respectively). This is followed by burning pit (23.7%), incinerator and placenta pit, which carry small percentage distributions of 10.5, and 5.3, respectively, while ash pit is less significant (2.6%). In terms of toilet facilities; pour-flush latrine and pit latrine are the most available types of toilet facilities at the health centres (53.8% and 38.5%, respectively). Therefore, the most adopted techniques for waste disposal at the health centres are waste bins (regularly emptied) and burning pit, and the most common types of toilet facilities are pour-flush latrines and pit latrines.

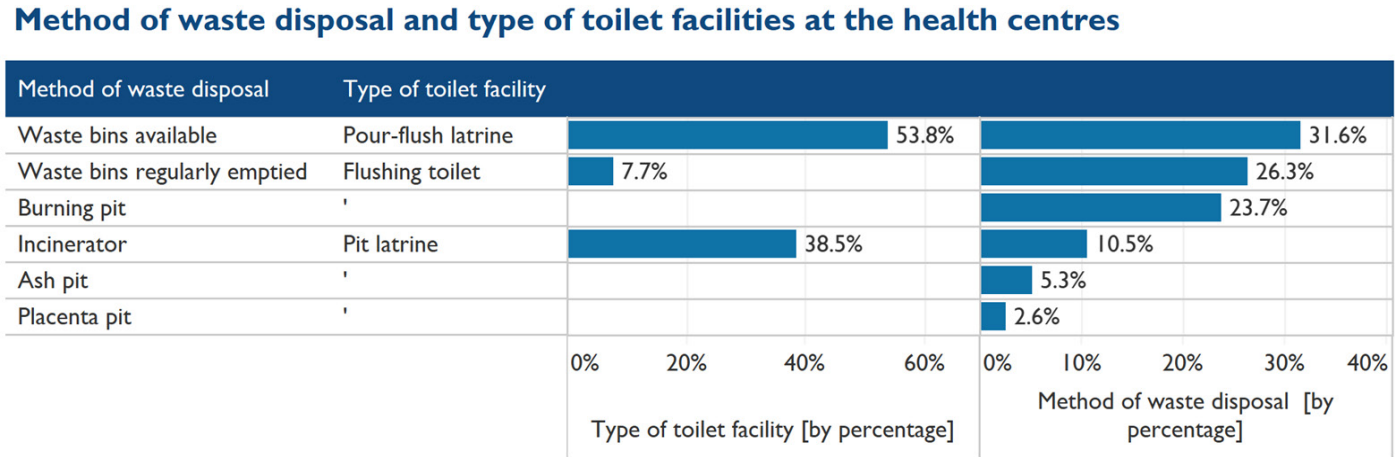


Fig. 2.7: Method of waste disposal and type of toilet facilities at the health centres

3.2.d TRADITIONAL HEALERS

Population Mobility Pattern (who, where they come from, where they go)

According to the results obtained from direct field observations, the investigated traditional healers in Mechinagar Municipality attract a noticeable number of people, with *Dhimal Basti Mata* accounting for the highest population mobility. The study suggests that the traditional healers' compounds are open to visitors every day and throughout the year. However, Tuesday and Saturday are denoted as the busiest days in terms of higher people's inflow to the respective sites. Correspondingly, March and May are recorded as the busiest months in terms of higher people's movement. People accessing the investigated traditional healers' compounds eminently come from *Jhapa, Ilam, Morang, Sunsari, Panchthar* and *Tehrathum* districts. At the municipality level, the most common origins are *Mechinagar Municipality, Jhapa Rural Municipality, Damak Municipality, Ilam Municipality, Birtamode Municipality, Bhadrapur Municipality,* and *Katahari Rural Municipality.*

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

Regarding the connectivity of the investigated traditional healers in Mechinagar Municipality, *Dhimal Basti Mata, Dhimal Basti Baba (KB),* and *Dhimal Basti Mata (TM)* are situated at *Dhimal Basti* locality. As per results from the field observations, these traditional healers' sites are linked to the *East-West Highway* in *Ittabhatta Chowk* junction via *Nakalbanda Road.* These sites are accessible by all kinds of vehicles, however, visitors from other districts and municipalities mainly travel by bus and minivan. The nearest localities and junctions to these sites are observed as *Ittabhatta Chowk, Jorsimal, Aayabari* and *Dhulabari Chowk*. Likewise, *Ittabhatta Baba* and *Ittabhatta Baba (KR)* are based in *Ittabhatta* locality, which is connected to the *East-West Highway* and considered as one of the biggest junctions in Mechinagar Municipality. The study reveals that these sites are accessible by other alternative vehicle routes, such as *Dhulabari Road, Nakalbada Road* and *Jyamirgadhi Road,* with the nearest localities documented as *Jyamirgadhi, Jorsimal, Dhulabari Chowk a*nd *Aayabari*. Conversely, *Syanglangtar Walling Baba* and *Syanglangtar Baba* are located at the border of Ilam district, which is linked to *Bahundangi Road*. As per the study, these sites are accessible by motorbike and minivan due to the difficult terrain and poor road structure. The nearest localities to these sites are observed as *Bahundangi, Gadagalli* and *Kiratbasti*. Likewise, *Aamdangi Baba* and *Satighatta Baba* are located in *Aamdangi* and *Satighatta* localities, respectively, within close distance from each other. These sites are linked to *Bahundangi Road* which is connected to the *East-West Highway* through *Kakarbhitta* Junction. The findings show that these sites are accessible by all kinds of vehicles, with the nearest localities being *Nakalbanda, Bahundangi, Burmeli Tole* and *Muktinath Tole*. Furthermore, *Khuttedangi Baba* and *Dhulabari Baidhya* are situated at *Khuttedangi* and *Dhulabari* localities, respectively. The study shows that *Khuttedangi* locality falls under the larger locality *Dhulabari*, which is linked to the *East-West Highway* via several vehicle routes, such as *Dhulabari Road, Nakalbanda Road, Magurmadi Road* and *Manipur Road.* These sites are accessible by all kinds of vehicles and the nearest localities are observed as *Jorsimal, Ittabhatta Chowk, Dhaijan Mode* and *Kakarbhitta*. Similarly, *Duwagadhi Mata* lies in *Duwagadhi* locality which is associated with the *East-West Highway* via *Mechi Highway* at *Charali Junction*. The nearest localities and junction to this site are documented as *Charali, Dhulabari Chowk, Dhaijan Mode* and *Buttabari*. On the other hand, *Guras Path Baba* is situated at *Guras Path* which lies in *Kakarbhitta* locality, linked to the *East-West Highway* and *Kakarbhitta POE* (formal). The nearest localities to this site are observed as *Burmeli Tole, Pragati Tole, Aayabari* and *Ittabhatti Chowk.*

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

Thirteen (13) traditional healers at the respective localities were investigated in Mechinagar Municipality,

which is higher than those assessed in Biratnagar Metropolitan City (8) and Suryodaya Municipality (6). The largest population mobility of both patients and visitors to the traditional healers' compounds can be found at *Dhimal Basti Mata* and *Dhimal Basti Mata (TM)* with an average entry flow per day of 100 and 70 people, respectively, while on the busiest day the number increases to 150 people each, similarly to the flow in Biratnagar Metropolitan City, except for one locality with 800 patients/visitors on the busiest day (*Kushal Tole Pathibharadev Mata*). This is followed by *Syanglangtar Walling Baba, Syanglangtar Baba, Duwagadhi Mata,* and *Aamdangi Baba,* with an equal daily distribution of 50 people each, and 100 people each, on the busiest day. The remaining seven (7) localities receive a minimum of 20 people and a maximum of 30 people per day, while on the busiest days, the minimum entrance is 40 people and the maximum 65 people. The majority of the traditional healers (8/13) treat people from other countries, notably India (*Dhimal Basti Matat, Dhimal Basti Mata (TM), Syanglangtar Walling Baba, Duwagadhi Mata, Khuttedangi Baba, Satighatta Baba, Ittabhatta Baba (KR),* and *Guras Path Baba*) with a minimal entry flow (1-10%), except at *Ittabhatta Baba (KR)*, whose influx from India is 20 per cent. The remaining localities (5/13) are visited by people from the surrounding municipalities (see Fig. 3.1).

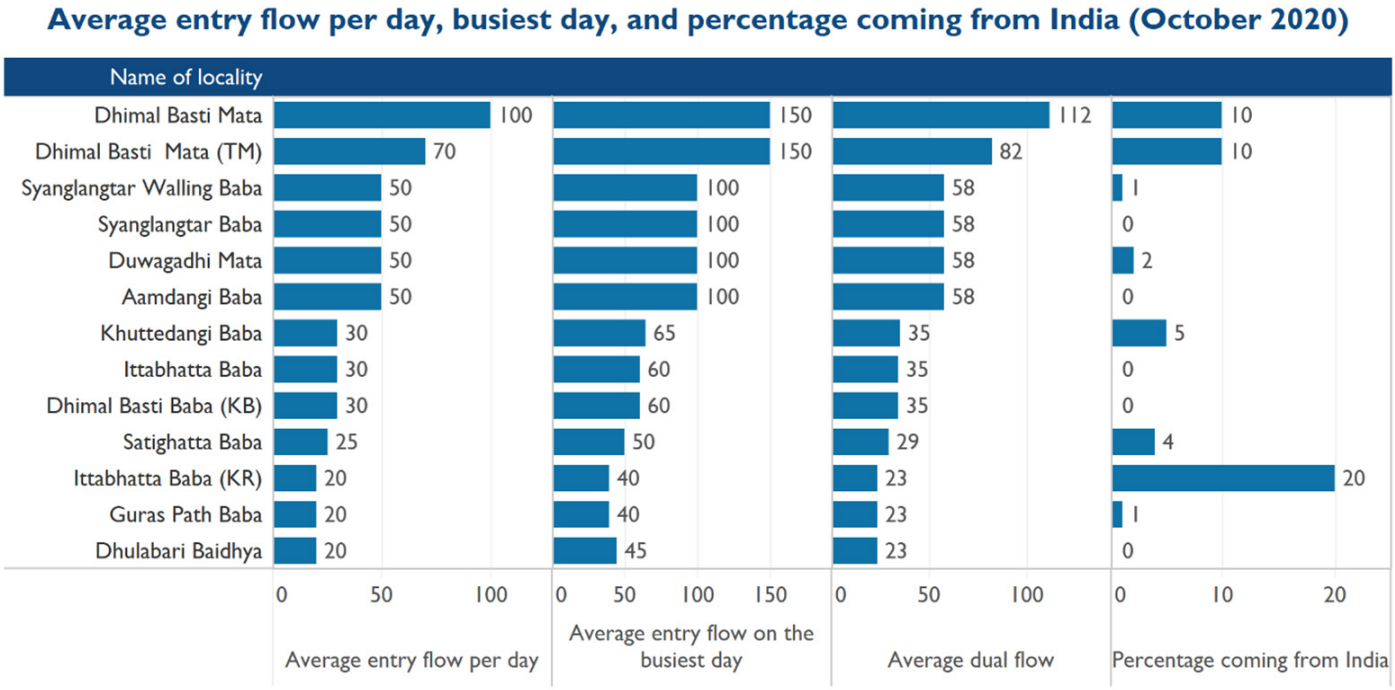


Fig. 3.1: Mobility patterns at the traditional healers' compounds

According to most of the respondents (10/13), patients do not seek alternative health care before visiting the traditional healers, except at *Dhimal Basti Mata* and *Syanglangtar Walling Baba,* where the respondents were uncertain and at *Satighatta Baba,* where the interviewee answered positively. This means that most of the patients/visitors' primarily go to the traditional healers' compounds before seeking alternative healthcare. The traditional healers' compounds are operational throughout the seasons and open to every denomination, except for *Aamdangi Baba*. Most of the sites investigated are open day and night (7/13), or during the day (*Syanglangtar Baba, Khuttedangi Baba, Aamdangi Baba, Dhulabari Baidhya*, and *Ittabhatta Baba*), except for *Satighatta Baba* (night only). The distance to the nearest health centres varies across each locality (see Fig. 3.2). *Dhimal Basti Mata, Syanglangtar Walling Baba,* and *Dhimal Basti Baba (KB)* are the farthest, about 13, 9, and 5 Km away, respectively, while the remaining ten (10) localities are within a minimum radius of 70 meters and a maximum of 3 Km.

Similarly, the distances between the health centres and the nearest referral centre varies across the localities, with the farthest away being *Dhimal Basti Mata, Syanglangtar Walling Baba, Syanglangtar Baba, Dhimal Basti Mata (TM)* and *Aamdangi Baba* (between 25-10 Km). The closest distance is found at *Satighatta Baba* (70 meters).

Sites operational period, seasonality, and distance to the nearest health centre

Name of locality	Patients seek alternative healthcare before visiting the traditional healer	Compound open to everyone	Compound open day and night	Seasonality	Distance to the nearest health centre [in Km]	Distance from the health centre to the referral centre [in Km]
Dhimal Basti Mata	Do not know	Yes	Day and Night	All seasons	13.00	25.00
Syanglangtar Walling Baba	Do not know	Yes	Day and Night	All seasons	9.00	17.00
Dhimal Basti Baba (KB)	No	Yes	Day and Night	All seasons	5.00	7.00
Syanglangtar Baba	No	Yes	Day	All seasons	3.00	12.00
Khuttedangi Baba	No	Yes	Day	All seasons	3.00	4.00
Dhimal Basti Mata (TM)	No	Yes	Day and Night	All seasons	3.00	10.00
Aamdangi Baba	No	No	Day	All seasons	3.00	10.00
Dhulabari Baidhya	No	Yes	Day	All seasons	2.50	2.60
Ittabhatta Baba (KR)	No	Yes	Day and Night	All seasons	2.00	5.00
Ittabhatta Baba	No	Yes	Day	All seasons	2.00	3.00
Duwagadhi Mata	No	Yes	Day and Night	All seasons	2.00	5.00
Guras Path Baba	No	Yes	Day and Night	All seasons	1.50	3.00
Satighatta Baba	Yes	Yes	Night	All seasons	0.07	0.07

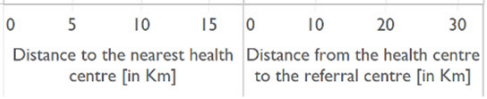


Fig. 3.2: Operational period, distance to the nearest health centre and referral centre

Waste management systems are an essential factor to determine the spaces of vulnerability of a specific site or general localities in relation to public health risks and capacity (see Table 3.1). Most of the respondents from the compounds asserted that they do not have a waste management system in place (7/13), while the remaining sites (6/13) do, which result in the following vulnerability spaces:

- There is inadequate waste disposal as some of the sites have trash visible in the open and in large quantity (8/13), while the remaining sites are tidy (5/13).
- Some of the sites show visibility of stagnant water on the floor in large quantity (6/13), which serves as a breeding place for mosquitoes.
- All the sites investigated (13/13) have unwanted animals/insects visible in large quantity.

The majority of the respondents asserted that less than 10 per cent (7/13) and between 16-37 per cent (6/13) wear masks at the traditional healers' compounds. Overall, less than 16 per cent of the people accessing the sites investigated wear masks, which means that greater than 80 per cent of the population do not follow mask-wearing practices. According to the KIs, the most used health centre in Mechinagar Municipality varies across the different localities, based on their proximity to the nearest and most used health centre as explained;

- From *Duwagadhi Mata* and *Guras Path Baba* the most used health centre is *Mechi Hospital*.
- From *Dhimal Basti Baba* and *Syanglangtar Walling Baba* the most used health centre is *B&C Medical College Teaching Hospital and Research Centre Pvt. Ltd.*.
- From *Dhimal Basti Baba (KB), Ittabhatta Baba*, and *Ittabhatta Baba (KR)* the most used health centre is *Dhulabari Primary Health Centre*.
- From *Aamdangi Baba* and *Dhimal Basti Mata (TM)* the most used health centre is *Manisha Clinic*.
- From *Dhulabari Baidhya, Khuttedangi Baba,* and *Syandlangtar Baba* the most used health centre is *Roshan Medical.*

Table 3.1: Waste management, environmental condition, and estimated percentage wearing masks at the traditional healers' compounds

Name of locality	Name of the most used health centre	Estimated percentage wearing mask	Availability of waste management system	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects
Aamdangi Baba	Manisha Clinic	<10%	Not available	Yes, in large quantity	Yes, in large quantity	Yes, in large quantity
Dhimal Basti Baba (KB)	Dhulabari Primary Health Center	<10%	Not available	Yes, in large quantity	No	Yes, in large quantity
Dhimal Basti Mata	B&C Medical College Teaching Hospital and Research Center Pvt. Ltd.	<10%	Not available	Yes, in large quantity	Yes, in large quantity	Yes, in large quantity
Dhimal Basti Mata (TM)	Manisha Clinic	<10%	Available	No	No	Yes, in large quantity
Dhulabari Baidhya	Roshan Medical	<10%	Available	Yes, in large quantity	Yes, in large quantity	Yes, in large quantity
Duwagadhi Mata	Mechi Hospital	31%-50%	Not available	No	No	Yes, in large quantity
Guras Path Baba	Mechi Hospital	10%-30%	Not available	Yes, in large quantity	No	Yes, in large quantity
Ittabhatta Baba	Dhulabari Primary Health Center	10%-30%	Available	Yes, in large quantity	No	Yes, in large quantity
Ittabhatta Baba (KR)	Dhulabari Primary Health Center	10%-30%	Available	No	No	Yes, in large quantity
Khuttedangi Baba	Roshan Medical	31%-50%	Available	No	No	Yes, in large quantity
Satighatta Baba	Mechi Amda Hospital	10%-30%	Available	Yes, in large quantity	Yes, in large quantity	Yes, in large quantity
Syanglangtar Baba	Roshan Medical	<10%	Not available	Yes, in large quantity	Yes, in large quantity	Yes, in large quantity
Syanglangtar Walling Baba	B&C Medical College Teaching Hospital and Research Center Pvt. Ltd.	<10%	Not available	No	Yes, in large quantity	Yes, in large quantity

The busiest days and months of the year varies across each locality. However, most of the localities are busy throughout the week (9/13), except for *Duwagadhi Mata, Dhimal Basti Baba (KB), Aamdangi Baba,* and *Khuttedangi Baba,* whose busiest days are Tuesday, Thursday, Saturday, and Sunday. The majority of the sites are busy throughout the year (10/13), except for *Dhimal Basit Baba (KB), Ittabhatta Baba,* and *Satighatta Baba,* whose busiest months are March, April, May, August, October, and November. There is the availability of water and toilet facilities at all the sites investigated, with half of the sites having at most 1 stall/drop hole and the remaining with at most 2 or 3 stalls/drop holes, except for *Guras Path Baba* which has no toilet facility. The most common type of toilet facilities is the pour-flush latrine (7/13), followed by pit-latrine (5/13), except at *Dhimal Basti Mata (TM)* locality where there are both pour-flush latrines and flushing toilets. Most of the localities have water facilities nearby for handwashing with soap, at most 200 meters away, except for *Ittabhatta Baba,* whose distance is 2 Km. In terms of the number of visitors per stall/drop hole ratio, it is higher in the following localities; *Dhimal Basti Mata, Syanglangtar Baba,* and *Duwagadhi Mata* (100:1, and 50:1 each, respectively). The remining ten (10) localities have a minimum of 13:1 and a maximum of 30:1 ratio (see Fig. 3.3).

Water and toilet facilities, busiest days/months, patients/visitors per stall (drop hole) ratio, and distance to the nearest water source

Name of locality	Busiest day of the week	Busiest month of the year	Availability of water on site	Availability of toilet nearby	Type of toilet available
Dhimal Basti Mata	Every day	Every month	Available	Available	Pit Latrine
Syanglangtar Baba	Every day	Every month	Available	Available	Pit Latrine
Duwagadhi Mata	Thursday, Saturday	Every month	Available	Available	Pour-flush latrine
Ittabhatta Baba	Every day	Every month	Available	Available	Pour-flush latrine
Dhimal Basti Baba (KB)	Tuesday, Sunday	August, October, November	Available	Available	Pit Latrine
Syanglangtar Walling Baba	Every day	Every month	Available	Available	Pit Latrine
Aamdangi Baba	Saturday, Tuesday	Every month	Available	Available	Pour-flush latrine
Dhimal Basti Mata (TM)	Every day	Every month	Available	Available	Flushing toilet, Pour-flush latrine
Ittabhatta Baba (KR)	Every day	March	Available	Available	Pour-flush latrine
Dhulabari Baidhya	Every day	Every month	Available	Available	Pour-flush latrine
Khuttedangi Baba	Saturday, Tuesday	Every month	Available	Available	Pit Latrine
Satighatta Baba	Every day	March, April, May	Available	Available	Pour-flush latrine
Guras Path Baba	Every day	Every month	Available	Not available	'

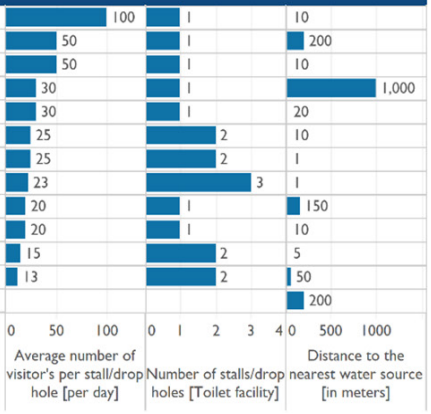


Fig. 3.3: Water and toilet facilities, the busiest days/months, and patients to stall/drop hole ratio

The majority of the traditional healers do not use protective gears during their practices (8/13), whereas the remaining five (5) localities do, contrary to the analysis obtained in Biratnagar Metropolitan City (all the traditional healers use protective gears). Consequently, such practices might contribute to the spread of contagious diseases within and outside the nearby communities, and eventually spread to other nations, as in the case of Ebola, COVID-19, and Influenza viruses[3]. Most of the traditional healers' compounds are not organized in sectors (10/13), except at *Aamdangi Baba, Khuttedangi Baba,* and *Satighatta Baba*, which contribute to the adequate treatment of people seeking alternative care, be it related to health or other. According to the respondents, most of the compounds do not have an isolated room to conduct their health practices (9/13), while at the remaining sites it is available (4/13). Furthermore, among the thirteen (13) traditional healers, only four (4) do not advice patients to seek alternative healthcare (*Dhimal Basti Mata, Duwagadhi Mata, Guras Path Baba*, and *Syanglantar Walling Baba*), rather they advise patients to seek help from other traditional healers, be it health related or other issues. At nine (9) out of thirteen (13) sites, traditional healers do advice their patients to seek alternative health treatment in at least two (2) conditions, namely; when the situation is too critical or the disease cannot be cured. At the majority of the traditional healers' localities there is a good or uninterrupted network for voice communication (10/13), except at *Dhimal Basti Mata* (no network), *Syanglangtar Baba* and *Syanglantar Walling Baba* (bad network). Only one (1) suspected COVID-19 positive case was found on site at *Dhimal Basti Mata* (see Table 3.2).

Table 3.2: Use of protective gears, suspected COVID-19 cases, isolated room, sites organisation, and status of voice communication system at the traditional healers' compounds

Name of locality	Suspected COVID-19 case on site	Use of protective materials during practices	Organisation of traditional healer's compound in sectors	Availability of isolated room during practices	Status of voice communication system	Traditional healer advices patients to seek alternative healthcare	Situation the traditional healer advices patients to seek alternative healthcare
Aamdangi Baba	No	No	Organised	Available	Good (uninterrupted network)	Yes	Disease cannot be cured
Dhimal Basti Baba (KB)	No	Yes	Not organised	Not available	Good (uninterrupted network)	Yes	When the situation is too critical
Dhimal Basti Mata	Yes	Yes	Not organised	Not available	No network	No	'
Dhimal Basti Mata (TM)	No	No	Not organised	Available	Good (uninterrupted network)	Yes	Disease cannot be cured
Dhulabari Baidhya	No	No	Not organised	Not available	Good (uninterrupted network)	Yes	Disease cannot be cured
Duwagadhi Mata	No	Yes	Not organised	Available	Good (uninterrupted network)	No	'
Guras Path Baba	No	No	Not organised	Not available	Good (uninterrupted network)	No	'
Ittabhatta Baba	Do not know	No	Not organised	Not available	Good (uninterrupted network)	Yes	When the situation is too critical
Ittabhatta Baba (KR)	No	No	Not organised	Not available	Good (uninterrupted network)	Yes	When the situation is too critical
Khuttedangi Baba	No	Yes	Organised	Not available	Good (uninterrupted network)	Yes	Disease cannot be cured
Satighatta Baba	Do not know	Yes	Organised	Available	Good (uninterrupted network)	Yes	Disease cannot be cured
Syanglangtar Baba	No	No	Not organised	Not available	Bad (interrupted network)	Yes	When the situation is too critical
Syanglangtar Walling Baba	No	No	Not organised	Not available	Bad (interrupted network)	No	'

Fig. 3.4 shows the common diseases and practices performed by the traditional healers, as well as the main reasons people visit their compounds. According to the analysis, headache, mental illness, and fever (16.1% and 12.5% each, respectively) are the most common diseases treated by the traditional healers. These are followed by yellow fever (10.7%), STI and other related diseases (8.9% each), abdominal pain (7.1%), skin diseases, lower abdominal pain, fracture, diarrhea (5.4% each), and measles (1.8%). The types of practices performed by the traditional healers, which account for the main reasons of patients' visits, in order of importance, include; disease cure (30.3%), bone setting, mental illness, and other related diseases (15.2% each), protection (12.1%), divination (9.1%), and love password (Mohani) (3.0%). Therefore, the most common diseases cured by the traditional healers in Mechinagar Municipality are headache, mental illness, and fever, and the most adopted health practices are disease cure, bone setting, mental illness and other related diseases.

[3] *https://www.who.int/tdr/publications/tdr-research-publications/ritam/en/*

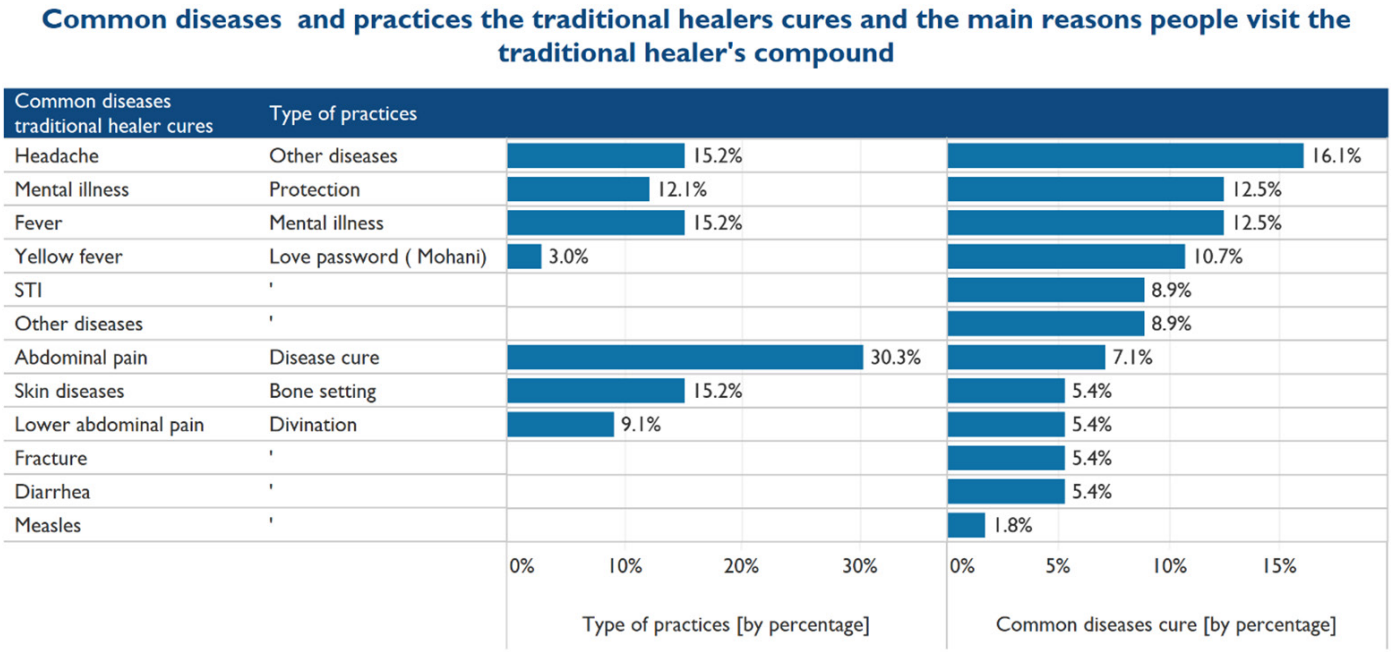


Fig. 3.4: Common diseases and health practices at the traditional healers' compounds

3.2.e SCHOOLS AND COLLEGES

Population Mobility Pattern (who, where they come from, where they go)

The study reveals that schools and colleges in Mechinagar Municipality eminently attract students from within the same municipality and localities, however, some of the investigated sites attract students from other districts, municipalities, as well as India. In terms of population mobility to the investigated schools and colleges, these attract people every day and throughout the year, except for Saturdays and Sundays, and other public holidays.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

According to the results obtained from the field observations, *Kakarbhitta Secondary School, Suryodaya Secondary English Boarding School, North Point English School,* and *Kakarbhitta Multiple College* are situated at *Kakarbhitta* locality – walking distance from *Kakarbhitta POE* (formal) – in close proximity to each other. These schools and colleges are connected to the *East-West Highway* via several vehicle routes, namely *Khanikhola Marg, Bahundangi Road* and *Nakalbanda Road.* The sites are accessible by all kinds of vehicles, however, students/pupils mainly access these by foot. The nearest localities to these schools and colleges are recorded as *Burmeli Tole, Pragati Tole, Bahundangi, Aayabari* and *Nakalbanda*. Similarly, *Shree Mechi Janasadharan Ma.Vi.* is located at *Bahundangi* locality, which is connected to the *East-West Highway* via *Bahundangi Road.* The alternative routes to access this school are observed as *Nakalbanda Road* and *Khanikhola Marg*. The study shows that this school is accessible by all kinds of vehicles and the nearest localities are *Aamdangi, Gadagalli, Kirat Basti* and *Muktinath Tole*. Likewise, *Adarsha Ma.Vi.* is situated at Ittabhatta locality, which is linked to the East-West Highway. This school is also accessible by vehicle via alternative vehicle routes, such as *Jyamirgadhi Road, Nakalbanda Road*

and *Dhulabari Road*. The nearest localities to this school are observed as *Jorsimal, Aayabari, Dhulabari Chowk* and *Kakarbhitta*. On the other hand, *Dhulabari Madhyamik Vidhyalaya* and *East Horizon School* are based in *Dhulabari* locality, which is considered as one of the biggest localities in the municipality in terms of population mobility. These schools are linked to the *East-West Highway* via *Dhulabari Road*. The nearest localities to these schools are documented as *Charali, Ittabhatta, Jorsimal* and *Dhaijan Mode*. Furthermore, *Sahid Dasarath Ma. Vi.* and *Tridevi College* are situated at *Charali* locality, which is linked to the *East-West Highway* and *Mechi Highway*. These schools are also accessible by all kinds of vehicles, with the nearest localities recorded as *Ittabhatta, Duwagadhi, Dhaijan Mode, Dhaijan* and *Buttabari*.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

A total of ten (10) schools/colleges were investigated in Mechinagar Municipality, a higher number compared to Biratnagar Metropolitan City (7) and Suryodaya Municipality (7). Among the schools and colleges, half of them (5/10) are secondary schools and the other half (5/10) are tertiary educational institutions. The average attendance differs across the schools/colleges. Three (3) secondary schools – *Dhulabari Madhyamik Vidhalaya Secondary School, Adsarsha Ma. Vi. Secondary School,* and *East Horizon School* – account for the highest mobility with 2,262, 2,000, and 1,450 attendance per day, while on the busiest days the attendance of pupils/students increases to 3,000, 2,500, and 1,600, respectively. These are followed by two (2) large tertiary institutions; *Kakarbhitta College* and *Sahid Dasarath Ma. Vi. College,* with a population distribution of 1,325 and 1,000 people per day, respectively, while on the busiest days the attendance increases to 1,500 and 1,300 students, respectively. At the remaining five (5) schools and colleges, the daily average attendance ranges from 160 up to 800, whereas on the busiest days, it is between 300 and 1,200 pupils/students. Five (5) out of ten (10) schools/colleges are attended by citizens from India, carrying a distribution of 2 per cent (*Adarsha Ma. Vi. Secondary School* and *Suryodaya Secondary English Boarding School*), 5 per cent (*Kakarbhitta College*), 7 per cent (*East Horizon Secondary School*) and 10 per cent (*Kakarbhitta Multiple College*). *Dhulabari Madhyamik Vidhalaya Secondary School, Sahid Dasarath Ma.Vi. College, Tridevi College, North Point English College,* and *Shree Mech Janasadharan Ma.Vi. Secondary School* are the only institutions whose students/pupils are from within Mechinagar Municipality (see Fig. 4.1).

Average attendance per day, busiest day, and percentage coming from India (October 2020)

Name of school/college	Level/grade of school/college	Average attendance per day	Average attendance on the busiest day	Percentage coming from India
Dhulabari Madhyamik Vidhalaya Secondary School, Dhulabari	Secondary School	2,262	3,000	0
Adarsha Ma. Vi. Secondary School, Ittabhatta	Secondary School	2,000	2,500	2
East Horizon Secondary School, Dhulabari	Secondary School	1,450	1,600	7
Kakarbhitta College, Kabarbhitta	Tertiary	1,325	1,500	5
Sahid Dasarath Ma. Vi. College, Charali	Tertiary	1,000	1,300	0
Tridevi College, Charali	Tertiary	800	1,200	0
North Point English College, Kakarbhitta	Tertiary	800	1,000	0
Suryodaya Secondary English Boarding School, Kakarbhitta	Secondary School	650	800	2
Shree Mechi Janasadharan Ma. Vi. Secondary, Bahundangi	Secondary School	550	700	0
Kakarbhitta Multiple College, Kakarbhitta	Tertiary	160	300	10

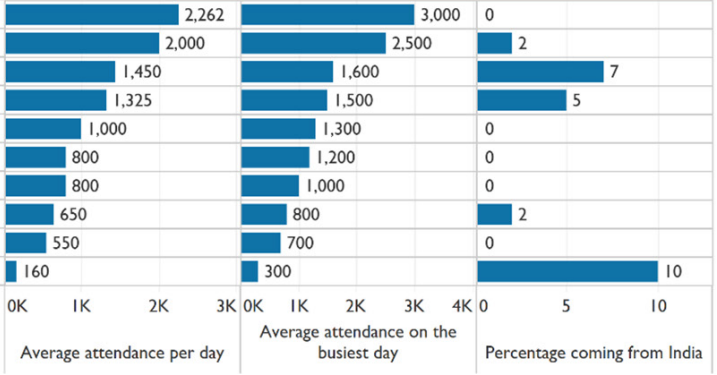


Fig. 4.1: Population mobility at the schools/colleges

Most of the schools investigated (6/10) have health agents or volunteers to address health related issues, except for *Shree Mechi Janasadharan Ma. Vi. Secondary, Adarsha Ma. Vi. Secondary School, Karkarbhitta Multiple College,* and *Kakarbhitta College*. The nearest health centre differs across the respective schools and colleges, except for *Dhulabari Madhyamik Vidhalaya Secondary School* and *East Horizon Secondary School,* whose nearest health centre is *Mechi Amda Hospital.* There is the availability of water at all the schools and colleges investigated. The distance to the nearest water source ranges from a minimum of 1 meter (*Tridevi College*) to a maximum of 100 meters (*Adarsha Ma. Vi. Secondary School* and *Suryodaya Secondary English Boarding School*). The farthest distance to the nearest health centre is from *North Point English College* and *Shree Mechi Janasadharan Ma. Vi. Secondary,* which are 17 and 16 Km away, followed by two (2) schools; *Adarsha Ma. Vi. Secondary School* and *Dhulabari Madhyamik Vidhalaya Secondary School,* with a distance distribution of 4 and 1 Km, respectively. The closest are *Kakarbhitta Multiple College, Tridevi College, Suryodaya Secondary English Boarding School,* and *Kakarbhitta College,* at an equal radius from the nearest health centre of 300 meters each (see Fig. 4.2).

Availability of health agent, water, and distance to the nearest health centre and water source

Name of school/college	Name of the nearest health centre	Availability of community health worker/agent	Availability of water on site	Distance to the nearest health centre [in Km]	Distance to the nearest water source [in meters]
North Point English College, Kakarbhitta	Pradhan Pharmacy	Available	Available	17.0	30
Shree Mechi Janasadharan Ma. Vi. Secondary, Bahundangi	Bahundangi Health Post	Not available	Available	16.0	10
Adarsha Ma. Vi. Secondary School, Ittabhatta	Rasmika Pharmacy	Not available	Available	4.0	100
Dhulabari Madhyamik Vidhalaya Secondary School, Dhulabari	Mechi Amda Hospital	Available	Available	1.0	50
Sahid Dasarath Ma. Vi. College, Charali	Karki Medical Clinic	Available	Available	0.5	50
East Horizon Secondary School, Dhulabari	Mechi Amda Hospital	Available	Available	0.5	50
Kakarbhitta Multiple College, Kakarbhitta	Tejaswee Clinic	Not available	Available	0.3	2
Tridevi College, Charali	Manakamana Hospital	Available	Available	0.3	1
Suryodaya Secondary English Boarding School, Kakarbhitta	Rista Medical	Available	Available	0.3	100
Kakarbhitta College, Kabarbhitta	Kakarbhitta Health Post	Not available	Available	0.3	5

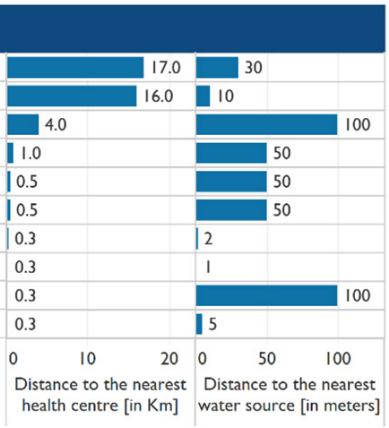


Fig. 4.2: Availability of health agents, and distances to the nearest health centre and water source

The number of classrooms varies across the schools and colleges. *East Horizon Secondary School, Dhulabari Madhyamik Vidhalaya Secondary School,* and *North Point English College* account for the largest number of classrooms due to their high influx of pupils, with 60, 53, and 26 classrooms, respectively (see Fig. 4.3). On the other hand, *East Horizon Secondary School, Dhulabari Madhyamik Vidhalaya Secondary School,* and *Adarsha Ma. Vi. Secondary School* have the largest number of desks, with a distribution of 600, 588, and 400 desks, respectively. The minimum number of pupils/students per desk is 2 (*East Horizon Secondary School* and *Suryodaya Secondary English Boarding School*) and thus indicates that there are more desks than the total school population, whereas the maximum is 5 at *Kakarbhitta Multiple College* (government). Instead, *Tridevi College* (private), *North Point English College* (private), *Sahid Dasarath Ma. Vi. College* (government), and *Shree Mechi Janasadharan Ma. Vi. Secondary* (government) have 3 pupils/students per desk each, and *Dhulabari Madhyamik Vidhalaya Secondary School, Adarsha Ma. Vi. Secondary School*, and *Kakarbhitta College* (both government-owned institutions) have 4 each. *Adarsha Ma. Vi. Secondary School* and *Kakarbhitta College* have the largest number of students/pupils per classroom (66), followed by *Sahid Dasarath Ma. Vi. College* and *Dhulabari Madhyamik Vidhalaya Secondary School* with a distribution of 53 and 47 pupils/students per classroom, respectively. The remaining schools/colleges have at most 35 pupils/students, and at least 24 students/pupils per classroom. The number of desks per classroom accounts for the highest at *Adarsha Ma. Vi. Secondary School* (18), while the remaining schools/colleges have at most 16, and at least 8 desks per classroom (see Fig. 4.3).

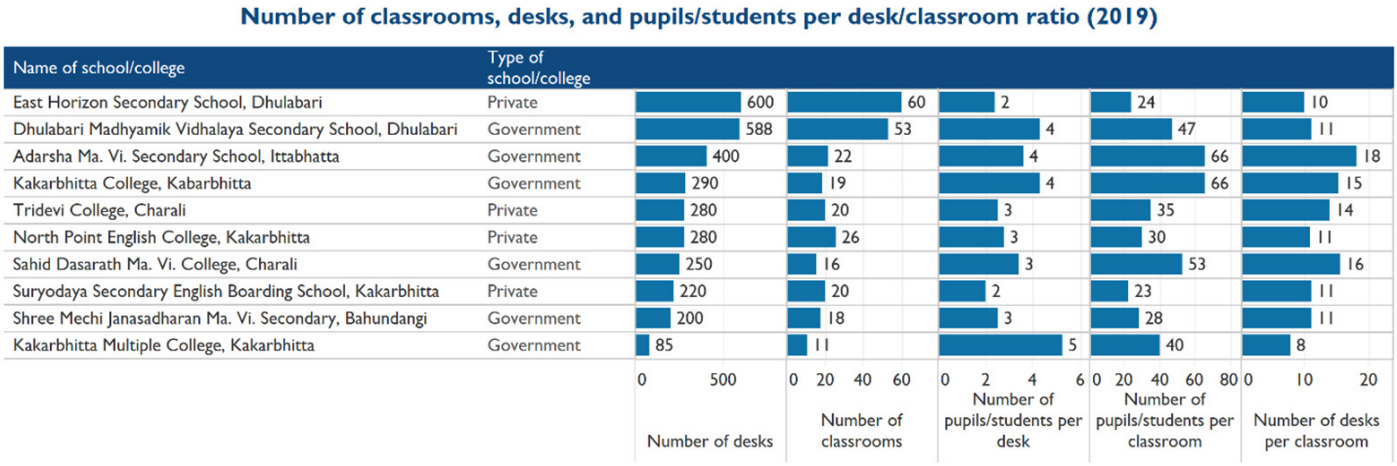


Fig. 4.3: Number of students/pupils, classrooms, and desk ratio

All the schools have separate toilet facilities for students/pupils, while only half of the schools and colleges have separate toilets for teachers (5/10). East Horizon Secondary School has the largest toilet facilities for both male and female students, with 12 toilets each, respectively. This is followed by *Dhulabari Madhyamik Vidhalaya Secondary School* and *Adarsha Ma.Vi. Secondary School,* with 10 for male each, and 8 and 5 for female, respectively. The remaining educational institutions have at least 2 toilets for males and 2 for females (except for *Sahid Dasarath Ma.Vi. College,* 1), and at most 9 toilets for male and female students each. As for the teachers, *East Horizon Secondary School* have an equal number of toilet facilities for both male and female (3 each), while the remaining schools have 1 for male and 1 for female teachers (see Fig. 4.4).

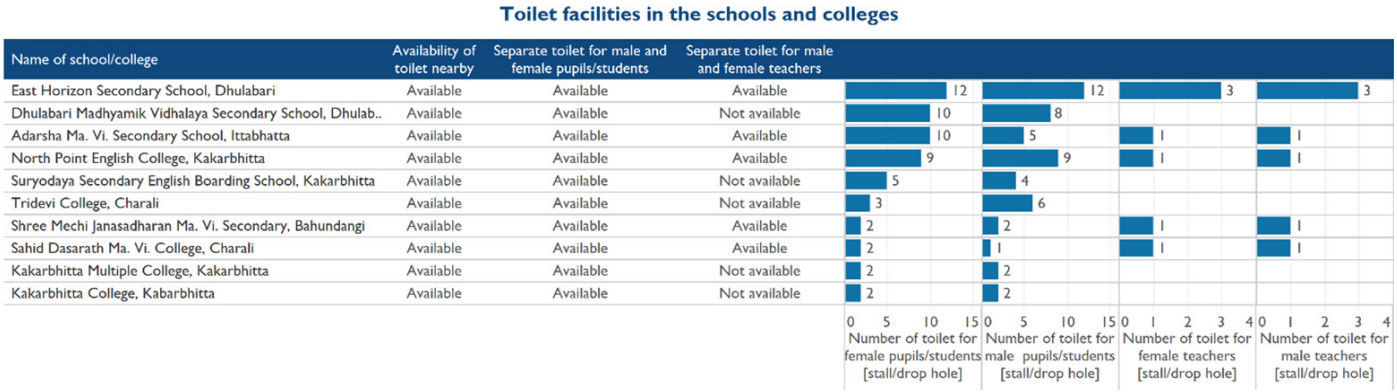


Fig. 4.4: Categories of toilet facilities at the schools/colleges

Fig. 4.5 shows the average number of students/pupils and teachers per stall/drop hole as of October 2020. *Kakarbhitta College* and *Sahid Dasarath Ma.Vi. College* (both government) account for the highest number of male pupils/students per stall with 275 and 350, respectively, and female pupils/students per stall with 350 and 250, respectively. At the remaining eight (8) schools, the maximum number of males and females per stall is 126 and 150, respectively, and the minimum is 42 each. Overall, there are slightly more male students/pupils per stall than female students/pupils at each school. This is as a result of the higher population distribution of male than female pupils/students (see Fig. 4.3). Overall, the maximum number of students/pupils per stall is 313 (*Kakarbhitta College*), and the minimum is 43 (*North Point English College*). As for the teachers, the maximum number of teachers per stall is 21 (*Adarsha Ma.Vi. Secondary School*),

and the minimum is 10 (*East Horizon Secondary School*). The analysis shows that the government schools have limited toilet facilities when compared to the population distributions across the other schools/colleges investigated.

Average number of pupils/students and teachers per stall (drop hole) ratio (Toilet facility-October 2020)

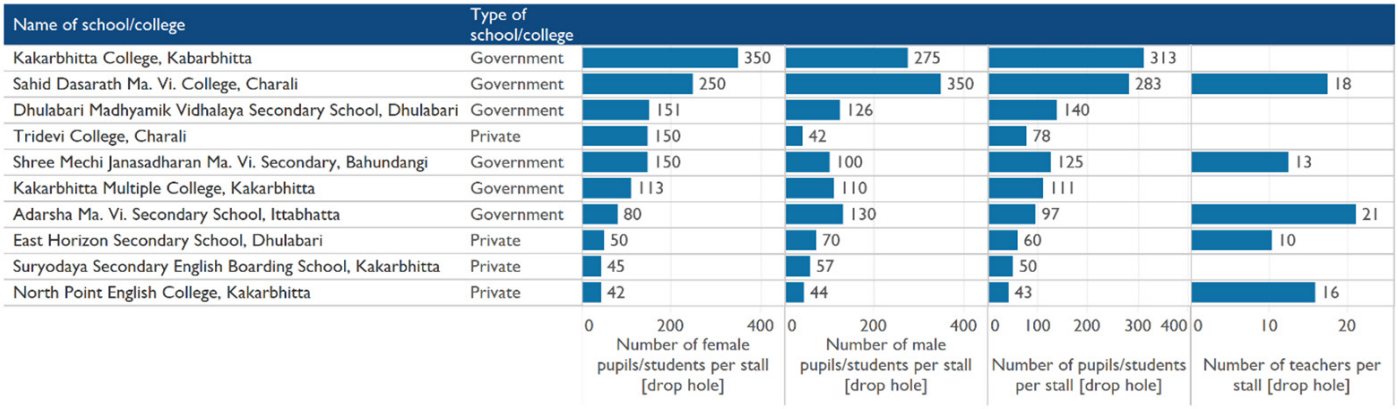


Fig. 4.5: Population of pupils/students and teachers per stall (drop hole) ratio

Fig. 4.6 shows the population distribution at the respective schools/colleges for the 2019/2020 academic year. *Dhulabari Madhyamik Vidhalaya Secondary School, East Horizon Secondary School,* and *Adarsha Ma.Vi. Secondary School* are the most populated schools in Mechinagar Municipality, with a population of 2,513, 1,440, and 1,450 pupils/students enrolled in 2019, respectively, which is slightly less than in Biratnagar Metropolitan City (between 2,244 to 3,150 pupils enrolled in 2019). These are followed by *Kakarbhitta College, North Point English College,* and *Sahid Dasarath Ma. Vi. College* with a student population distribution of 1,250, 782, and 850, respectively. According to the study, overall, the secondary institutions have a higher population compared to the tertiary institutions. In regard to male to female ratio, there are more female candidates than male across seven (7) densely populated schools, differently from *East Horizon Secondary School, North Point English College,* and *Suryodaya Secondary English Boarding School* where males are in slightly higher number than their female counterpart. The gender ratio reaches up to 503 more female than male pupils (*Dhulabari Madhyamik Vidhalaya Secondary School*) and a maximum of 240 more males than females (*East Horizon Secondary School*). In descending order, there are 35 pupils per teacher at *Adarsha Ma. Vi. Secondary School*, 33 pupils per teacher at *Dhulabari Madhyamik Vidhalaya Secondary School,* 29 students per teacher at *Kakarbhitta College,* 27 students per teacher at *Tridevi College,* 24 students per teacher at *North Point English College* and *Sahid Dasarath Ma.Vi. College* each, 23 pupils per teacher at *East Horizon Secondary School*, 22 students per teacher at *Kakarbhitta Multiple College,* closely followed by *Shree Mechi Janasadharan Ma.Vi. Secondary School* with 20, and *Suryodaya Secondary English Boarding School* with 13.

School population before COVID-19 pandemic (2019)

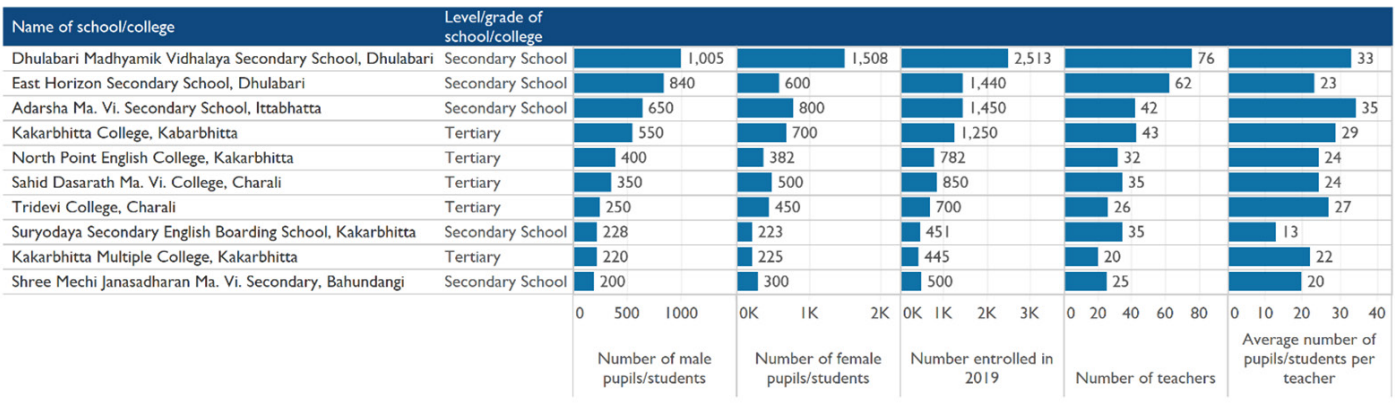


Fig. 4.6: Population distribution at the schools/colleges

In regard to mask-wearing, overall, between 20-44 per cent of the pupils/students wear masks at the respective schools, except at *East Horizon Secondary School, Shree Mechi Janasadharan Ma.Vi. Secondary School,* and *Suryodaya Secondary English Boarding School* where the percentage is greater than 50 (>50%) and *Tridevi College,* which is less than 10 per cent. All the schools have isolated places dedicated for pupils/students when they get sick (10/10). Most of the schools (9/10) are busy throughout the week, except for *East Horizon Secondary School,* and half of them are busy in March, April, June, July, August, September, October, and November, and all the sites are operational throughout the four seasons. Three (3) suspected COVID-19 positive cases were reported at *Adarsha Ma.Vi. Secondary School, Dhulabari Madhyamik Vidhalaya Secondary School,* and *Shree Mechi Janasadharan Ma.Vi. Secondary School.* The majority of the schools and colleges do not have a tracking matrix for contact tracing mechanism for visitors, except for *Adarsha Ma. Vi. Secondary School* and *Shree Mechi Janasadharan Ma. Vi. Secondary School.* Most of the sites (9/10) have inadequate health screening stations (handwashing with soap, hand sanitizer, and body temperature checking), except for *North Point English College* (see Table 4.1).

Table 4.1: Health checks, tracking matrix, and schools/colleges seasonality

Name of school/college	Estimated percentage wearing mask	Suspected COVID-19 case on site	Availability of health screening station	Isolated place dedicated for sick pupils/students	Busiest day of the week	Busiest month of the year	Seasonality	Availability of record book/device for visitors
Adarsha Ma. Vi. Secondary School, Ittabhatta	31%-50%	Yes	Not available	Available	Every day	Every month	All seasons	Available
Dhulabari Madhyamik Vidhalaya Secondary School, Dhulabari	31%-50%	Yes	Not available	Available	Every day	March, April	All seasons	Not available
East Horizon Secondary School, Dhulabari	>50%	No	Not available	Available	Sunday	June, July	All seasons	Not available
Kakarbhitta College, Kabarbhitta	31%-50%	No	Not available	Available	Every day	November, August, October	All seasons	Do not know
Kakarbhitta Multiple College, Kakarbhitta	31%-50%	Do not know	Not available	Available	Every day	Every month	All seasons	Do not know
North Point English College, Kakarbhitta	10%-30%	No	Available	Available	Every day	June, July	All seasons	Not available
Sahid Dasarath Ma. Vi. College, Charali	10%-30%	No	Not available	Available	Every day	Every month	All seasons	Not available
Shree Mechi Janasadharan Ma. Vi. Secondary, Bahundangi	>50%	Yes	Not available	Available	Every day	Every month	All seasons	Available
Suryodaya Secondary English Boarding School, Kakarbhitta	>50%	No	Not available	Available	Every day	Every month	All seasons	Not available
Tridevi College, Charali	<10%	No	Not available	Available	Every day	August, September, October	All seasons	Not available

Based on the PMM findings, vulnerability can be determined by poor health systems and/or in terms of health infrastructure, and in particular hygiene management. Waste management systems are available at all the schools and colleges in Mechinagar Municipality but they are not adequate according to eye findings and the following parameters;

- Visibility of trash in the open (4/10) in limited quantity, except at *Adarsha Ma.Vi. Secondary School, East Horizon Secondary School, Kakarbhitta College, Kakarbhitta Multiple College, North Point English College*, and *Suryodaya Secondary English Boarding School.*
- Visibility of stagnant water on the floor in limited quantity (5/10), except at *Dhulabari Madhyamik Vidhalaya Secondary School, East Horizon Secondary School, Sahid Dasarath Ma.Vi. College, Suryodaya Secondary English Boarding School,* and *Tridevi College*, especially during the rainy season.
- Visibility of unwanted animals/insects (10/10) in limited quantity at all the sites investigated.

The most used health centre from the respective schools and colleges varies across the schools and colleges likely due to their locations. Most of the schools and colleges have cafeterias or food services for their pupils/students and teachers (9/10), except at *Suryodaya Secondary English Boarding School* (Table 4.2).

Table 4.2: Waste management, food service, and the most used health centre

Name of school/college	Visibility of stagnant water on the floor	Availability of waste management system	Visibility of trash in the open	Visibility of unwanted animals/insects	Availability of cafeteria/food service	Name of the most used health centre
Adarsha Ma. Vi. Secondary School, Ittabhatta	Yes, limited	Available	No	Yes, limited	Available	Dhulabari Primary Health Center
Dhulabari Madhyamik Vidhalaya Secondary School, Dhulabari	No	Available	Yes, limited	Yes, limited	Available	Mechi Amda Hospital
East Horizon Secondary School, Dhulabari	No	Available	No	Yes, limited	Available	Dhulabari Primary Health Center
Kakarbhitta College, Kabarbhitta	Yes, limited	Available	No	Yes, limited	Available	Kakarbhitta Health Post
Kakarbhitta Multiple College, Kakarbhitta	Yes, limited	Available	No	Yes, limited	Available	Kakarbhitta Health Post
North Point English College, Kakarbhitta	Yes, limited	Available	No	Yes, limited	Available	Birta City Hospital
Sahid Dasarath Ma. Vi. College, Charali	No	Available	Yes, limited	Yes, limited	Available	Manakamana Hospital
Shree Mechi Janasadharan Ma. Vi. Secondary, Bahundangi	Yes, limited	Available	Yes, limited	Yes, limited	Available	Dhulabari Hospital
Suryodaya Secondary English Boarding School, Kakarbhitta	No	Available	No	Yes, limited	Not available	Manisha Clinic
Tridevi College, Charali	No	Available	Yes, limited	Yes, limited	Available	Manakamana Hospital

3.2.f ENTERTAINMENT CENTRES

Population Mobility Pattern (who, where they come from, where they go)

The analysis revealed that the entertainment centres in Mechinagar Municipality attract people from India, Bangladesh, Bhutan and China. The identified entertainment centres are open to the public every day and throughout the year. However, the busiest day in terms of higher population mobility is reported as Saturday. Similarly, the busiest months are January and September. The study shows that the population mobility at the investigated entertainment centres mainly originates from *Jhapa, Ilam, Sunsari, Morang, Panchthar* and *Taplejung* districts. At the municipality level, people's movement at the respective entertainment centres is mostly from *Mechinagar Municipality,* and *Damak Municipality, Kamal Rural Municipality, Bhadrapur Municipality, Birtamode Municipality, Urlabari Municipality, Shivasatakshi Municipality* and *Buddhashanti Rural Municipality.*

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

In terms of connectivity, the entertainment centres in Mechinagar Municipality, *Devkota Park* and *Ghari Restaurant* are located at *Buspark* and *Kakarbhitta* localities, respectively, which are near *Kakarbhitta POE* (formal) and connected to the *East-West Highway,* and *Ghari Restaurant* linked to *Bahundangi Road.* These entertainment centres are accessible by all kinds of vehicles, with the nearest localities being *Burmeli Tole, Pragati Tole, Nakalbanda* and *Ittabhatta*. Correspondingly, *Dhaka Mini Casino, Bhaundangi Mahotsav* and *SS Lounge Riyaz Hotel (Casino)* are situated at *Bahundangi* locality and linked to *Bahundangi Road* and *Nakalbanda Road,* in turn connected to the *East-West Highway* in *Kakarbhitta*. These sites are accessible by vehicle and the nearest localities are observed as *Kakarbhitta, Pragati Tole, Burmeli Tole, Nakalbanda,* and *Aamdangi*. Furthermore, *Dhulabari Cinema, Hotel Mechi Crown, Kalika Simsar Park,* and *Unique Royal Nirvan Restaurant* are located at *Dhulabari* locality. These entertainment centres are associated with the *East-West Highway* via several alternative routes, such as *Dhulabari Road, Dhaijan Road* and *Nakalbanda Road*. The nearest localities to these entertainment centres are *Jorsimal, Ittabhatta Chowk, Dhaijan Mode,* and *Aayabari*. On the other hand, *City Cinema* is located at one of the biggest junctions in the municipality in terms of population mobility named *Ittabhatta*. This entertainment centre is linked to the *East-West Highway* with several other alternative routes, such as *Nakalbanda Road, Dhulabari Road* and *Jyamirgadhi Road*. The nearest localities to this entertainment centre

are *Aayabari, Jorsimal, Kakarbhitta,* and *Dhulabari*.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

According to the matrix analysis, ten (10) main entertainment centres in Mechinagar Municipality fall under the localities with the largest influx of people, which is less than the entertainment centres assessed in Biratnagar Metropolitan City (13) and greater than in Suryodaya Municipality (4). *Bhaundangi Mahotsav* has the largest influx of people with 1,000 per day, and on the busiest day, the number increases to 1,200, which is 8 times lesser than the highest flow in Biratnagar Metropolitan City (8,000 people per day). This is followed by *City Cinema* and *Hotel Mechi Crown* with 500 and 175 people per day, and 750 and 180 people on the busiest day, respectively (see Fig. 5.1). The remaining seven (7) sites receive a daily maximum of 150 people (*SS Lounge Riyaz Hotel, Kalika Simsar Park, Ghari Restaurant,* and *Dhulabari Cinema*) and a minimum of 25 (*Devkota Park*), while on the busiest days, the number increases to a maximum of 250 people and a minimum of 35. Except for *Hotel Mechi Crown* and *Dhulabari Cinema*, the remaining sites (8/10) receive people from outside Nepal. Similarly, apart from *SS Lounge Riyaz Hotel (Casino)* and *Dhaka Mini Casino,* which receive people from India, Bangladesh, China, and Bhutan; most of the entertainment centres (6/8) only receive people from India. *SS Lounge Riyaz Hotel (Casino)* and *Dhaka Mini Casino* are visited by the highest percentage of people from other countries (about 90%). The remaining six (6) entertainment centres receive a maximum of 15 per cent and a minimum of 10 per cent of people from India. This shows that, among all the sites investigated for the PMM activities, Mechinagar Municipality together with Biratnagar Metropolitan City receives one of the largest influxes of people from India, with a minority coming from Bangladesh, Bhutan and China.

Average entry flow per day, busiest day, and percentage coming from other country (October 2020)

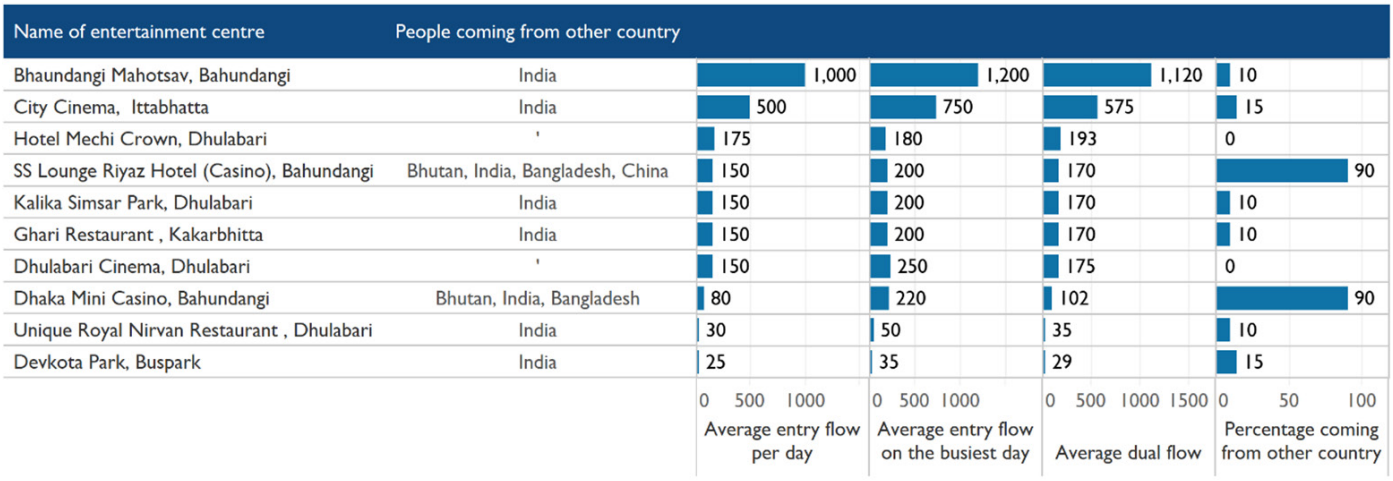


Fig. 5.1: Population mobility at the entertainment centres

Despite all the entertainment centres being operational throughout the seasons, except for *Bhaundangi Mahotsav* (winter only), the majority of these sites do not check body temperature before visitors' entry (9/10), except for *Hotel Mechi Crown,* and health screening stations for handwashing with soap and hand sanitizer on arrival are absent, except for *City Cinema* and *Hotel Mechi Crown* (see Fig. 5.2). There is the availability of both water and toilet facilities nearby for all the sites investigated, with at least 2 stalls/drop holes (*Devkota Park*) and at most 115 stalls/drop holes for visitors and staffs (*Hotel Mechi Crown*). The distance to the nearest water sources is limited, with the farthest being 250 meters (*Devkota Park*) and the closest 1 meter (*Dhaka Mini Casino*). Similarly, the distance to the nearest

health centre differs across the ten (10) entertainment centres, the most distant being *Ghari Restaurant* and *Bhaundangi Mahotsav* (17 and 8 Km away, respectively) and the closest *SS Lounge Riyaz Hotel (Casino)* (200 meters away).

Availability of health screening station, water and toilet facilities, and distance to the nearest health centre and water source

Name of entertainment centre	Availability of health screening station	Body temperature checking status	Availability of toilet nearby	Availability of water on site	Seasonality	Distance to the nearest health centre [in Km]	Distance to the nearest water source [in meters]	Number of stalls/drop holes [Toilet facility]
Ghari Restaurant , Kakarbhitta	Not available	Not available	Available	Available	All seasons	17.0	10.0	3
Bhaundangi Mahotsav, Bahundangi	Not available	Not available	Available	Available	Winter only	8.0	2.0	5
Unique Royal Nirvan Restaurant , Dhulabari	Not available	Not available	Available	Available	All seasons	4.0	150.0	4
City Cinema, Ittabhatta	Available	Not available	Available	Available	All seasons	3.0	100.0	20
Kalika Simsar Park, Dhulabari	Not available	Not available	Available	Available	All seasons	2.5	50.0	6
Hotel Mechi Crown, Dhulabari	Available	Available	Available	Available	All seasons	1.0	1.0	115
Dhulabari Cinema, Dhulabari	Not available	Not available	Available	Available	All seasons	1.0	50.0	4
Dhaka Mini Casino, Bahundangi	Not available	Not available	Available	Available	All seasons	0.5	1.0	17
Devkota Park, Buspark	Not available	Not available	Available	Available	All seasons	0.5	250.0	2
SS Lounge Riyaz Hotel (Casino), Bahundangi	Not available	Do not know	Available	Available	All seasons	0.2	10.0	24

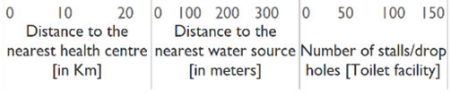


Fig. 5.2: Availability of health screening station, water and toilet facilities, and distances to the nearest health centre and water source

Table 5.1 shows the availability of community health workers or agents, presence of isolated rooms dedicated for sick people, the busiest days/months, and people coming from other country. There is no presence of community health workers/volunteers at most of the entertainment centres (9/10), except for *Hotel Mechi Crown*. At the entertainment centres the busiest days and months vary across the sites, except for *City Cinema, Ghari Restaurant,* and *SS Lounge Riyaz Hotel (Casino),* which are busy throughout the year. The nearest and most used health centres differ across each site, except for *Devkota Park* and *SS Lounge Riyaz Hotel (Casino)* whose nearest health centre is *Manisha Clinic,* and *Hotel Mechi Crown* and *Kalika Simsar Park* whose nearest health centre is *Roshan Medical.* Most of the entertainment centres do not have an isolated place dedicated for sick people (7/10), except for *Dhaka Mini Casino, Ghari Restaurant,* and *Hotel Mechi Crown.*

Table 5.1: Availability of health worker, isolated room, the busiest days/months and the nearest and most used health centre

Name of entertainment centre	Presence of community health worker/agent for emergency cases	Busiest day of the week	Busiest month of the year	Isolated place dedicated for sick people	Name of the nearest health centre	Name of the most used health centre
Bhaundangi Mahotsav, Bahundangi	Not available	Saturday, Sunday	February, January, December, November, October	Not available	Aarambha Clinic	Manisha Clinic
City Cinema, Ittabhatta	Not available	Saturday, Friday, Monday	Every month	Not available	Rasmika Pharmacy	Roshan Medical
Devkota Park, Buspark	Not available	Saturday	January, June, July, September	Not available	Manisha Clinic	Kakarbhitta Health Post
Dhaka Mini Casino, Bahundangi	Not available	Sunday, Saturday	September, October, November, July	Available	Bhattarai Pharmacy	Manisha Clinic
Dhulabari Cinema, Dhulabari	Not available	Friday, Monday	September, October, November, April	Not available	Mechi Amda Hospital	Mechi Amda Hospital
Ghari Restaurant , Kakarbhitta	Not available	Saturday	Every month	Available	Kakarbhitta Health Post	B&C Medical College Teaching Hospital and Research Center Pvt. Ltd.
Hotel Mechi Crown, Dhulabari	Available	Friday, Saturday, Sunday	January, December	Available	Roshan Medical	Dhulabari Primary Health Center
Kalika Simsar Park, Dhulabari	Not available	Saturday, Friday	December, January, February	Not available	Roshan Medical	Roshan Medical
SS Lounge Riyaz Hotel (Casino), Bahundangi	Not available	Sunday	Every month	Not available	Manisha Clinic	Mechi Netralaya
Unique Royal Nirvan Restaurant , Dhulabari	Not available	Saturday	January, June, July, September	Not available	Dhulabari Primary Health Center	Mechi Amda Hospital

Greater than 50 per cent (5/10) and between 18-38 percent of the people visiting the entertainment centres wear masks (5/10), similarly to the analysis obtained in Biratnagar Metropolitan City. Nine (9) of the entertainment centres have waste management systems in place, except for *Bhaundangi Mahotsav.* Despite this, the following indicators are inadequate; visibility of unwanted animals/insects (9/10), visibility of trash in the open (3/10), and visibility of stagnant water on the floor (2/10). There is inadequate tracking of migrants and visitors across the entertainment centres (9/10), except for *Dhaka Mini Casino,* especially for contact tracing and for COVID-19 suspected cases (see Table 5.2).

Table 5.2: Hygiene and travellers' status at the entertainment centres

Name of entertainment centre	Suspected COVID-19 on site	Estimated percentage wearing mask	Availability of record book/device for visitors	Availability of waste management system	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects
Bhaundangi Mahotsav, Bahundangi	Yes	10%-30%	Not available	Not available	Yes, in large quantity	Yes, in large quantity	Yes, in large quantity
City Cinema, Ittabhatta	No	31%-50%	Not available	Available	No	No	Yes, in large quantity
Devkota Park, Buspark	No	>50%	Not available	Available	No	No	Yes, in large quantity
Dhaka Mini Casino, Bahundangi	No	10%-30%	Available	Available	No	No	Yes, in large quantity
Dhulabari Cinema, Dhulabari	Do not know	31%-50%	Not available	Available	No	No	Yes, in large quantity
Ghari Restaurant , Kakarbhitta	Yes	>50%	Not available	Available	Yes, in large quantity	No	Yes, in large quantity
Hotel Mechi Crown, Dhulabari	No	>50%	Do not know	Available	No	No	No
Kalika Simsar Park, Dhulabari	No	>50%	Not available	Available	No	Yes, in large quantity	Yes, in large quantity
SS Lounge Riyaz Hotel (Casino), Bahundangi	No	10%-30%	Do not know	Available	Yes, in large quantity	No	Yes, in large quantity
Unique Royal Nirvan Restaurant , Dhulabari	No	>50%	Not available	Available	No	No	Yes, in large quantity

3.2.g MARKET CENTRES

Population Mobility Pattern (who, where they come from, where they go)

The study shows that the market centres in Mechinagar Municipality attract people from Nepal, as well as a significant number of people from India. The studied markets are open to the public every day and throughout the year. However, the busiest days in terms of higher people's movement are recorded as Monday and Friday. Similarly, September and October are recorded as the busiest months at the respective markets in Mechinagar Municipality. The findings reveal that the population mobility to the identified centres is predominately from *Jhapa, Ilam, Morang, Sunsari, Panchthar,* and *Taplejung* districts. At the municipality level, people's movement to the respective markets mainly originates in Mechinagar Municipality and from *Birtamode Municipality, Arjundhara Municipality, Ilam Municipality, Kankai Municipality, Pathari Sanishchare Municipality, Damak Municipality, Bhadrapur Municipality* and *Pathari Sanishchare Municipality.*

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

In Mechinagar Municipality, *Kakarbhitta Market* attracts the highest influx of people from Nepal and India. In terms of connectivity, *Kakarbhitta Market* lies in *Kakarbhitta* locality, which is one of the biggest localities in the municipality that lies close to *Kakarbhitta POE* (formal). This market is associated with the *East-West Highway* and other vehicle routes which connect other localities, such as *Kalikhola Marg, Barmeli Marg,* and *Bahundangi Road.* According to the results obtained from the field observations, the nearest localities to this market are identified as *Pragati Tole, Burmeli Tole, Aayabari, Nakalbanda* and *Aamdangi.* Similarly,

Ittabhatta Market is situated at *Ittabhatta Chowk* locality and linked to *East-West Highway.* As per the eye findings, this market is also accessible through several roads, namely *Nakalbanda Road, Jyamirgadhi Road,* and *Dhulabari Road.* The nearest localities to this market are identified as *Kakarbhitta, Jyamirgadhi, Dhulabari, Jorsimal* and *Aayabari*. Likewise, *Dhulabari Market* is located at *Dhulabari* locality, which is one of the largest junctions in Mechinagar Municipality in terms of population mobility. This market is linked to the *East-West Highway* which can be accessible by other several roads, such as *Dhulabari Road, Magurmadi Road, Manipur Road* and *Nakalbanda Road*. The nearest localities to this market are observed as *Jorsimal*, *Ittabhatta Chowk, Dhaijan Mode,* and *Jyamirgadhi*. Correspondingly, *Charali Market* is situated at *Charali* locality, which is also another big junction in the municipality. It is associated with the *East-West Highway,* which can be accessible by other vehicle routes, such as *Mechi Highway, Dhaijan Road, Manipur Road*, and *Charali-Sanischare Road,* with the nearest localities being *Dhaijan Mode, Dhulabari Chowk, Duwagadhi, Dhaijan* and *Sanischare*. On the other hand, *Mechinagar Mahotsav (Exhibition)* is located at *Bahundangi* locality, which is connected to the *East-West Road* via *Bahundangi Road*. The nearest localities to this market are recorded as *Kiratbasti, Aamdangi, Nakalbanda* and *Kakarbhitta*. According to the results obtained from the field observations, all the investigated markets are accessible by all kinds of vehicles, however, people coming from India eminently use cars and motorbikes as modes of transport to access these markets.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

A total of five (5) market centres were investigated in Mechinagar Municipality, which is equal to the markets assessed in Biratnagar Metropolitan City (5) but less than in Suryodaya Municipality (8). Among these, *Kakarhitta Market* has by far the largest congregation of people with 20,000 people entering per day, while on the busiest day the number increases to 30,000, which is double the size of the highest flow in Biratnagar Metropolitan City (10,000 and 15,000 per day and on the busiest day, respectively). These are followed by *Ittabhatta Market* and *Charali Market,* with an average entry flow of 5,000 people each, and 6,000 and 7,500 people on the busiest day, respectively (see Fig. 6.1). The remaining two (2) market centres receive a minimum of 100 people (*Mechinagar Mahotsav (Exihibition)* and a maximum of 2,000 people (*Dhulabari Market*) per day, and on the busiest day a minimum of 400 people and a maximum of 4,000 people. Overall, comparing the people's flow at the markets in Mechinagar Municipality and Biratnagar Metropolitan City, it is larger in the latter, however, in Mechinagar Municipality, *Kakarbhitta Market* stands out (20,000 people per day) in terms of population mobility. Furthermore, all the marketplaces are visited by people from India, except for *Kakarbhitta Market* and *Charali Market,* which also receive from Bhutan, Bangsladesh, Afghanistan, and Pakistan. The highest percentage from India, Bangladesh, and Bhutan is found at *Kakarbhitta Market* and *Mechinagar Mahotsav (Exihibition)* (50% each, respectively), followed by *Dhulabari Market,* which receives 10 per cent of people from India. *Ittabhatta Market* and *Charali Market* receive an equal percentage of people from India, Bhutan, Bangladesh, Pakistan, Afghanistan (5%) and from Nepal (95%).

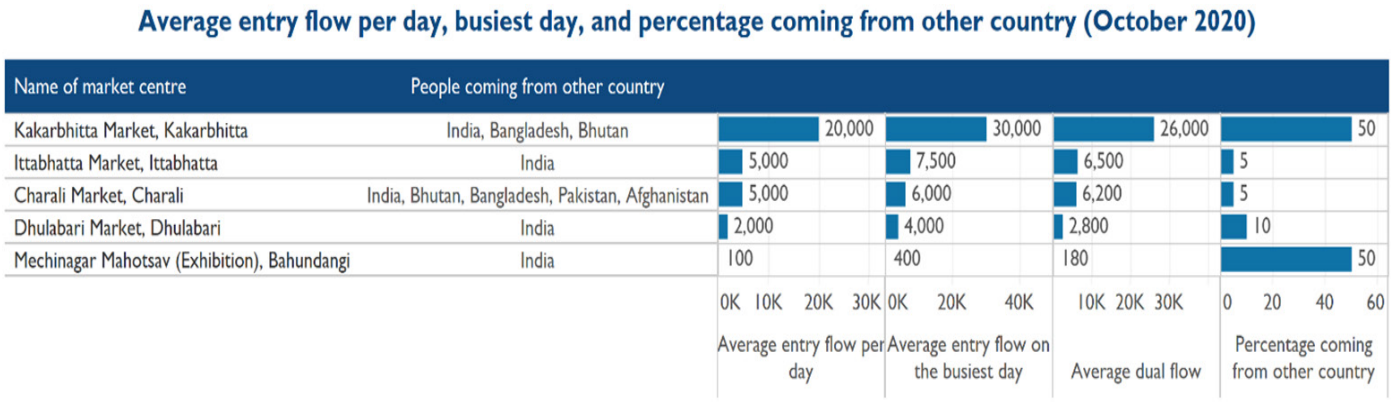


Fig. 6.1: Population mobility at the market centres

The waste management system was investigated as a determinant of vulnerability and capacity to respond to health threats across the various market centres. Most of the respondents (4/5) asserted that a waste management is in place, except for *Mechinagar Mahotsav (Exhibition)*. However, the following indicators show that this is not appropriate; visibility of unwanted animals/insects (5/5), trash in the open (5/5), and stagnant water on the floor (2/5). This shows that, even when in place, the waste management system is not adequately managed, and thus facilitates the spread of contagious diseases among the community. Furthermore, most of the market centres do not have an isolated place dedicated to sick people (4/5), except for *Mechinagar Mahotsav (Exhibition)*, nor a health authority for emergency cases (5/5), which is especially worrying during a pandemic (see Table 6.1). Similarly to other municipalities where the PMM was conducted, the majority of the people at the market centres in Mechinagar Municipality do not wear masks (less than 10%).

Table 6.1: Waste management, health authority, and estimated percentage wearing masks

Name of market centre	Availability of waste management system	Availability of isolated place dedicted for sick people	Presence of community health worker/agent for emergency cases	Estimated percentage wearing mask	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects
Charali Market, Charali	Available	Not available	Available	<10%	Yes, limited	No	Yes, limited
Dhulabari Market, Dhulabari	Available	Not available	Not available	<10%	Yes, limited	Yes, limited	Yes, limited
Ittabhatta Market, Ittabhatta	Available	Not available	Not available	<10%	Yes, limited	No	Yes, limited
Kakarbhitta Market, Kakarbhitta	Available	Available	Not available	<10%	Yes, limited	No	Yes, limited
Mechinagar Mahotsav (Exhibition), Bahundangi	Not available	Not available	Not available	<10%	Yes, limited	Yes, limited	Yes, limited

The study shows that most of the market centres have water and toilet facilities (4/5), with a minimum of 1 stall/drop hole and a maximum of 6 stalls/drop holes, except for Ittabhatta Market, with no toilet facility on site. There were suspected COVID-19 positive cases at *Ittabhatta Market* and *Dhulabari Market.* Most of the market centres investigated do not have health screening stations (handwashing with soap and hand sanitizer), nor body temperature checking (4/5), except for *Charali Market,* which has a screening station but without a thermometer for body temperature checking. The farthest distance to the nearest health centre is from *Mechinagar Mahotsav (Exhibition)* at 8 Km, followed by *Ittabhatta Market* which is 3 Km away. The remaining three (3) sites are at a maximum of 200 meters and a minimum of 20 meters. The distance to the nearest water source from the market centres is not significant, within a minimum radius of 5 meters and a maximum of 100 (see Fig. 6.2).

Availability of health screening station, basic hygiene, and distance to the nearest health centre and water source

Name of market centre	Suspected COVID-19 case on site	Body temperature checking status	Availability of health screening station	Availability of toilet nearby	Availability of water on site	Distance to the nearest health centre [in Km]	Distance to the nearest water source [in meters]	Number of stall/drop holes [Toilet facility]
Mechinagar Mahotsav (Exhibiti..	No	Not available	Not available	Available	Available	8.00	10	1
Ittabhatta Market, Ittabhatta	Yes	Not available	Not available	Not available	Available	3.00	100	
Dhulabari Market, Dhulabari	Yes	Not available	Not available	Available	Available	0.20	5	1
Kakarbhitta Market, Kakarbhit..	No	Not available	Not available	Available	Available	0.03	20	1
Charali Market, Charali	No	Available	Not available	Available	Available	0.02	10	6

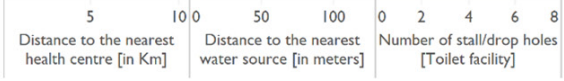


Fig. 6.2: Availability of health screening station, water and toilet facilities, and distances to the nearest health centre and water source

All the market centres are busy throughout the week but the busiest months vary across the sites. *Charali Market* and *Ittabhatta Market* are busy throughout the year, while at *Dhulabari Market, Kakarbhitta Market*, and *Mechinagar Mahotsav (Exhibition)* the busiest months are June, July, September, October, November, and December. There is no availability of record book/device or technique for tracking visitors or buyers at the respective market centres, and thus it increases the chances for affected people with COVID-19 to spread the disease or other contagious diseases. All the sites are busy throughout the four seasons (winter, summer, spring, and rainy season). The nearest health centre differs across the market centres based on their respective locations. However, *Manisha Clinic* accounts for the most used health centre (*Kakarbhitta* and *Mechingar Mahotsav (Exhibition)* markets), probably because of its close proximity to the markets and since the health centre is government-owned, the cost of medication is cheaper compared to other health centres (see Table 6.2).

Table 6.2: Tracking matrix, the busiest days/months, and name of the most used and nearest health centre

Name of market centre	Availability of record book/device for buyers/visitors	Busiest day of the week	Busiest month of the year	Market seasonality	Name of the nearest health centre	Name of the most used health centre
Charali Market, Charali	Do not know	Every day	Every month	All seasons	Manakamana Hospital	Manakamana Hospital
Dhulabari Market, Dhulabari	Not available	Every day	September, October, November, December	All seasons	Mechi Amda Hospital	Aagaman Medical
Ittabhatta Market, Ittabhatta	Not available	Every day	Every month	All seasons	Pavitra Clinic	Dhulabari Primary Health Center
Kakarbhitta Market, Kakarbhitta	Not available	Every day	June, July, September, October	All seasons	Manisha Clinic	Manisha Clinic
Mechinagar Mahotsav (Exhibition), Bahundangi	Not available	Every day	September, October	All seasons	Aarambha Clinic	Manisha Clinic

According to the analysis obtained, there are four (4) main layers of bars indicating food or goods sold at the various market centres. The first layer shows that prepared foods, meat/poultry, fruits/vegetables, and canned food/drinks account for the highest percentage (15.2% each). The second layer includes goods/merchandise and fish (12.1% each). In the third layer, there are other related food items and livestock (6.1% each), followed by industrial chemicals (3.0%). These findings revealed that prepared foods, meat/poultry, fruits/vegetables, and canned food/drinks are the most sold items at the market centres in Mechinagar Municipality (see Fig. 6.3).

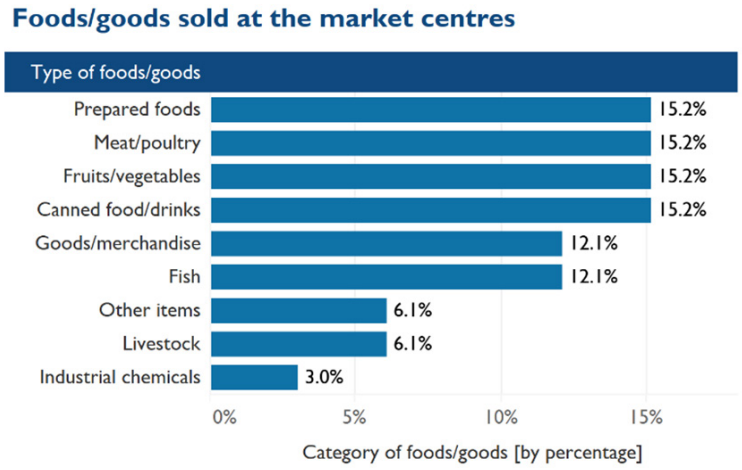


Fig. 6.3: Common foods/goods sold at the market centres

3.2.h MIGRANT WORKSITES

Population Mobility Pattern (who, where they come from, where they go)

The results show that migrant worksites in Mechinagar Municipality attract a noticeable number of people from both Nepal and India. The migrant worksites are open or operational every day and throughout the year. However, people's movement is higher on Thursday and Friday. Likewise, January, November, and December account for the busiest months in terms of population mobility to the respective worksites in Mechinagar Municipality. According to the findings, the population mobility at the investigated migrant worksites is eminently from *Jhapa, Ilam, Morang, Sunsari* and *Panchthar* districts. In the same way, at the municipality level, people's congregations at the respective worksites mainly originate in Mechinagar Municipality and from *Bhadrapur Municipality, Birtamode Municipality, Ilam Municipality, Damak Municipality, Jhapa Rural Municipality* and *Buddhashanti Rural Municipality.*

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

Regarding the connectivity of the assessed migrant worksites in Mechinagar Municipality, *Kakarbhitta Labour Junction* and *January Motorcycle Workshop* are situated in close proximity to each other at *Kakarbhitta* locality, considered as one of the biggest junctions in the municipality. These worksites are walking distance from *Kakarbhitta POE* (formal) and are connected to the *East-West Highway* via several vehicle routes, such as *Kalikhola Marg, Burmeli Tole Marg,* and *Bahundangi Road.* The nearest localities to the respective worksites are identified as *Pragati Tole, Burmeli Tole, Aayabari* and *Ittabhatta Chowk*. Correspondingly, *Gorakhkali Cement Pvt. Ltd.* and *Mug Mug Noddles Factory* are located at *Charali* locality within close distance from each other. These sites are linked to *Mechi Highway* via a few other alternative routes, such as *Duwagadhi Mode Road, East-West Highway, Dhaijan Road* and *Manipur Road.* The nearest localities to these migrant worksites are recorded as *Duwagadhi, Jyamirgadhi, Buttabari,* and *Dhaijan Mode*. Similarly, *Himalayas Cement Factory* and *BBC Brick Factory* are based in *Duwagadhi* locality, in close proximity to each other.

According to the results, these migrant worksites are connected to *Mechi Highway* via the *East-West Highway* with other alternative routes, namely *Dhaijan Road, Manipur Road,* and *Dhulabari Road,* with the nearest localities accounted as *Charali, Jyamirgadhi, Buttabari,* and *Dhaijan Mode*. Furthermore, *Sunrise Cement Factory* is situated at *Ittabhatta* locality and linked to the *East-West Highway* via *Jyamirgadhi Road* and *Dhulabari Road.* The nearest localities to this worksite are observed as *Kakarbhitta, Jorsimal, Dhulabari Chowk,* and *Aayabari*. On the other hand, *Singapore Beverage Nepal Pvt. Ltd. is* located at *Kalambari* locality, which is near *Charali* and *Dhulabari Chowk* localities, and again connected to the *East-West Highway* via several alternative routes, namely *Mechi Highway, Dhaijan Road,* and *Manipur Road.* The nearest localities to this migrant worksite are *Charali, Dhulabari, Dhaijan Mode* and *Buttabari*. However, people from localities nearby and India mainly use tricycles and motorbikes as modes of transport to access the respective worksites.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

In Mechinagar Municipality, a total of eight (8) migrant worksites were investigated, which is less than in Biratnagar Metropolitan City (12) and more than in Suryodaya Municipality (6). The largest influx of people can be found at *Sunrise Cement Factory* and *Singapore Beverage Nepal Pvt. Ltd.,* with an average entry flow of 180 people each per day, while on the busiest day, the number increases to 200 people each (staffs and visitors). These are followed *Mug Noodles Factory* and *Himalayas Cement Factory*, with a population mobility of 150 people each per day, and 150 and 200 people, respectively, on the busiest day (see Fig. 7.1). The remaining four (4) sites have a minimum daily population mobility of 80 people (*January Motorcycle Workshop*) and a maximum of 120 (*BBC Brick Factory*). On the busiest day, the minimum influx is 100 people (*January Motorcycle Workshop*) and the maximum is 200 (*Gorakhkali Cement Pvt. Ltd.*). Most of the migrant worksites investigated receive people from India, with the highest found at *BBC Brick Factory* (75%), while the remaining six (6) receive a percentage distribution ranging between 25 and 2 per cent, and only one (1) site is accessed by Nepalese nationals only (*Kakarbhitta Labour Junction*).

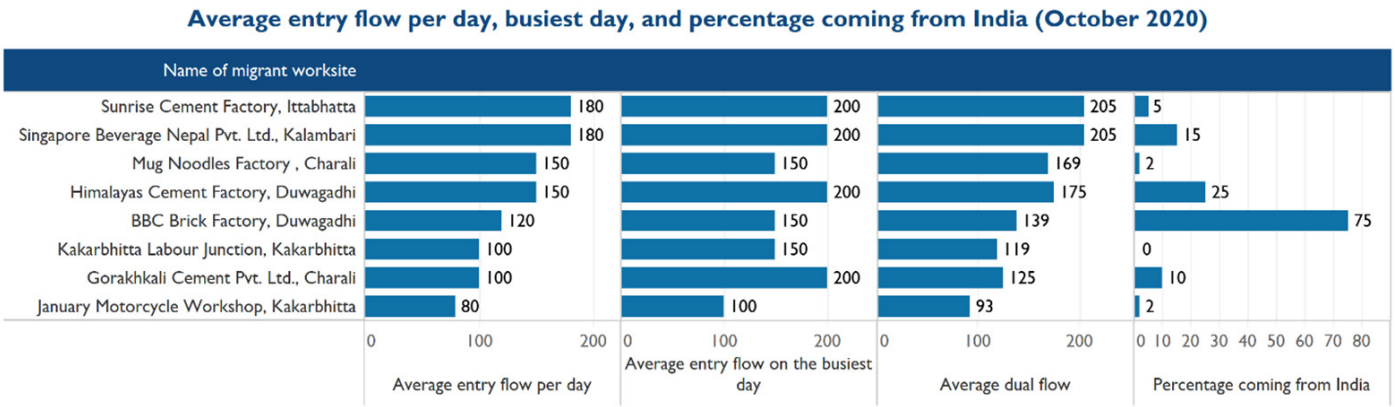


Fig. 7.1: Population mobility at the migrant worksites

According to the findings, out of the eight (8) migrant worksites, half of the sites (4/8) have a health screening station and body temperature check, whereas the remaining half (4/8) do not. Five (5) out of eight (8) migrant worksites have a living accommodation for staff, except for *January Motorcycle Workshop, Kakarbhitta Labour Junction*, and *Mug Noodles Factory*. The most used health centre from the respective migrant worksites differs across the localities, although *Roshan Medical* was identified by more than one respondent (3/8). Most of these sites are busy throughout the week (7/8), except for *BBC Brick Factory*, whose busiest days are Thursday and Sunday. Similarly, six (6) sites are busy throughout the year (6/8), while at the remaining two (2) the period varies across the different localities,

although most sites are busier in January, February, June, July, November, and December.

Table 7.1: Hygiene status and the busiest days/months at the migrant worksites

Name of migrant worksite	Availability of health screening station	Body temperature checking status	Availability of accommodation for staffs	Name of the most used health centre	Busiest day of the week	Busiest month of the year
BBC Brick Factory, Duwagadhi	Not available	Not available	Available	Duwagadhi Health Post	Sunday, Thursday	Every month
Gorakhkali Cement Pvt. Ltd., Charali	Available	Available	Available	B&C Medical College Teaching Hospital and Research Center Pvt. Ltd.	Every day	January, February, November, December
Himalayas Cement Factory, Duwagadhi	Available	Available	Available	Roshan Medical	Every day	Every month
January Motorcycle Workshop, Kakarbhitta	Not available	Not available	Not available	Manisha Clinic	Saturday	January, June, July
Kakarbhitta Labour Junction, Kakarbhitta	Not available	Not available	Not available	Dhulabari Primary Health Center	Every day	Every month
Mug Noodles Factory , Charali	Available	Available	Not available	Manakamana Hospital	Every day	Every month
Singapore Beverage Nepal Pvt. Ltd., Kalambari	Not available	Not available	Available	Roshan Medical	Every day	Every month
Sunrise Cement Factory, Ittabhatta	Available	Available	Available	Roshan Medical	Every day	Every month

According to the analysis, most of the migrant worksites investigated have water and toilet facilities nearby (7/8), except for *Kakarbhitta Labour Junction*, with a minimum of 1 stall/drop hole (*January Motorcycle Workshop*) and a maximum of 23 stalls/drop holes (*Sunrise Cement Factory*).The nearest health centre differs across the sites investigated, with *Kakarbhitta Health Post* and *Duwagadhi Health Post* generally being in close proximity to the sites (see Fig. 7.2). The farthest distance to the nearest health centre can be found at *Singapore Beverage Nepal Pvt. Ltd.* (6 Km), followed by *Rathi Group Annapurna Cable Factory* and *Raghupati Jute Mill* (9 Km each). These are followed by *Sunrise Cement Factory, Himalayas Cement Factory,* and *Gorakhkali Cement Pvt. Ltd.* with an equal distance distribution of 7 Km each, respectively. The remaining sites have a maximum of 5 Km (*Kakarbhitta Labour Junction*) way and a minimum of 10 meters away (*Mug Noodles Factory* and *BBC Brick Factory*). Most of the sites investigated have water nearby, except for *Singapore Beverage Nepal Pvt. Ltd.* and *Gorakhkali Cement Pvt. Ltd.*, whose distance is 1 Km each. The staffs/visitors to stall/drop hole ratio differs across the migrant worksites, with a minimum of 7:1 (*Gorakhkali Cement Pvt. Ltd.* and *BBC Brick Factory*) and a maximum of 80:1 (*January Motorcycle Workshop*).

Availability of water and toilet facilities, staffs/visitors per stall/drop hole ratio, and distance to the nearest health centre and water source (October 2020)

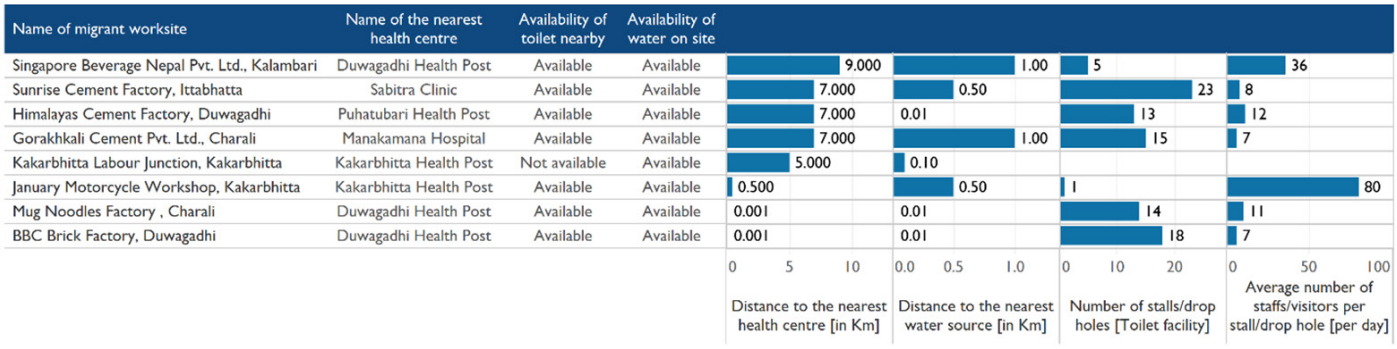


Fig. 7.2: Availability of water and toilet facilities, staffs/visitors to stall/drop hole ratio, and distances to the nearest health centre and water source

Most of the migrant worksites have a waste management system in place (7/8), except for *Kakarbhitta Labour Junction.* Therefore, the waste management system is partially available, however, according to the respondents and eye findings, the following are inadequate;

- Visibility of trash in the open (2/8) in limited quantity, although the majority of the sites are tidy.
- Only one (1) site presents visibility of stagnant water on the floor (*Kakarbhitta Labour Junction*).
- Visibility of unwanted animals/insects (8/8) in limited quantity at all the sites investigated.

People at these sites rely on alternative treatment when they get sick, such as; clinic or hospital, home treatment, traditional healer, and pharmacy, in order of importance (see Table 7.2).

Table 7.2: Waste management and places people go to when they get sick

Name of migrant worksite	Availability of waste management system	Places people go to when they get sick	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects
BBC Brick Factory, Duwagadhi	Available	Clinic or Hospital, Traditional Healer	Yes, limited	No	Yes, limited
Gorakhkali Cement Pvt. Ltd., Charali	Available	Clinic or Hospital	No	No	Yes, limited
Himalayas Cement Factory, Duwagadhi	Available	Clinic or Hospital, Pharmacy	No	No	Yes, limited
January Motorcycle Workshop, Kakarbhitta	Available	Clinic or Hospital	No	No	Yes, limited
Kakarbhitta Labour Junction, Kakarbhitta	Not available	Home Treatment, Clinic or Hospital	Yes, limited	Yes, limited	Yes, limited
Mug Noodles Factory , Charali	Available	Clinic or Hospital	No	No	Yes, limited
Singapore Beverage Nepal Pvt. Ltd., Kalambari	Available	Clinic or Hospital	No	No	Yes, limited
Sunrise Cement Factory, Ittabhatta	Available	Clinic or Hospital	No	No	Yes, limited

Half of the migrant worksites do not have a record tracking matrix, such as a record book or device for visitors (4/8), while the remaining sites have (*Gorakhkali Cement Pvt. Ltd., Himalayas Cement Factory, Singapore Beverage Nepal Pvt. Ltd.,* and *Sunrise Cement Factory*). Most of the respondents (5/8) agreed that greater than 50 per cent of people wear masks on site, whereas two (2) respondents reported a percentage between 31-50 per cent, and one (1) site reported less than 10 per cent (see Table 7.3). Most of these sites are operational throughout the seasons (7/8), except for *BBC Brick Factory*, which is operational in winter and summer only. Most the of the migrant worksites do not have a community health worker/agent for emergency cases on site (6/8), except for *BBC Brick Factory* and *Sunrise Cement Factory.*

Table 7.3: Tracking visitors/travellers and estimated percentage wearing masks at the migrant worksites

Name of migrant worksite	Estimated percentage wearing mask	Availability of record book/device for visitors	Seasonality	Availability of community health worker/agent for emergency cases
BBC Brick Factory, Duwagadhi	<10%	Do not know	Winter and summer only	Available
Gorakhkali Cement Pvt. Ltd., Charali	>50%	Available	All seasons	Not available
Himalayas Cement Factory, Duwagadhi	>50%	Available	All seasons	Not available
January Motorcycle Workshop, Kakarbhitta	31%-50%	Not available	All seasons	Not available
Kakarbhitta Labour Junction, Kakarbhitta	>50%	Not available	All seasons	Not available
Mug Noodles Factory , Charali	31%-50%	Do not know	All seasons	Not available
Singapore Beverage Nepal Pvt. Ltd., Kalambari	>50%	Available	All seasons	Not available
Sunrise Cement Factory, Ittabhatta	>50%	Available	All seasons	Available

The main activities conducted at the migrant worksites in Mechinagar Municipality are factory, timber logging, and sand mining. Among these, factory accounts for the largest percentage with 55.6, similar to the majority of the municipalities where the study was conducted, followed by timber logging and sand mining, with an equal percentage distribution of 22.2 each, and thus contrary to the majority of the municipalities where the study was conducted. There are five (5) types of accommodation for staffs at the migrant worksites, of which contrete account for

the highest percentage (50%). The remaining four (4) types share the remaining 50 per cent equally (zinc, thatch, tarpaulin, and wooden house), contrary to the results obtained in most of the municipalities where the survey was conducted (wooden house) and similar to the analysis obtained in Biratnagar Metropolitan City, with the exception of tarpaulin (see Fig. 7.3).

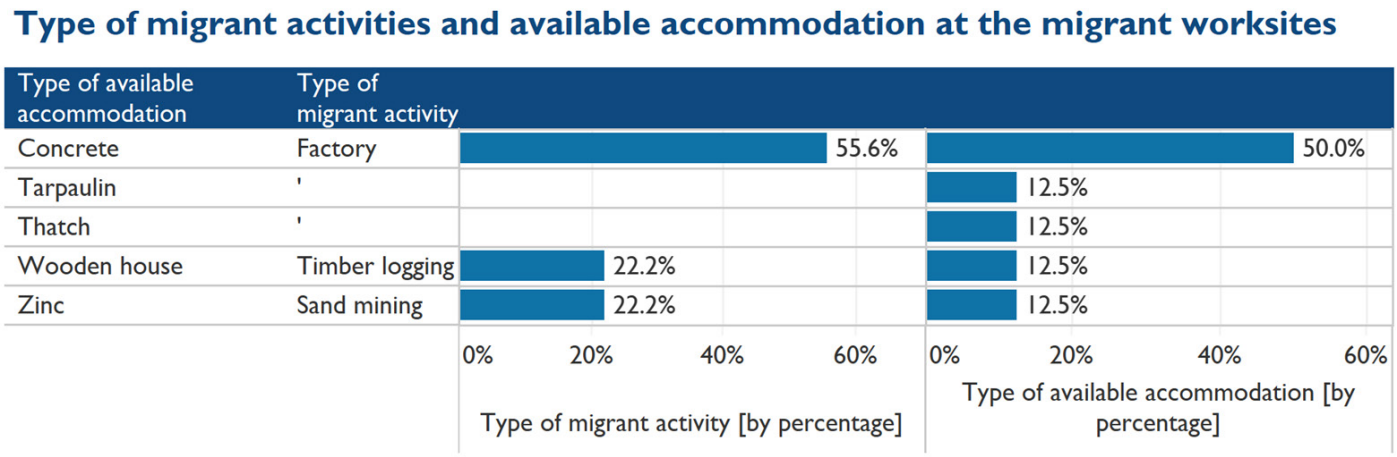


Fig. 7.3: Type of activity and accommodation at the migrant worksites

3.2.i TRANSPORT STATIONS

Population Mobility Pattern (who, where they come from, where they go)

In terms of mobility pattern, the transport stations in Mechinagar Municipality attract people from India, Bhutan, Bangladesh and Myanmar. As per the results obtained from the participatory mapping exercises and the field observations, most of the sites are operational every day and throughout the year, however, the busiest days are reported as Monday and Friday. In the same way, the busiest months in terms of higher people's congregation at the studied transport stations are observed as June and July. Furthermore, the analysis reveals that the population mobility at the investigated transport stations are eminently from *Jhapa, Ilam, Taplejung, Panchthar, Morang* and *Sunsari* districts. At the municipality level, people's movement mainly originates in Mechinagar Municipality and from *Arjundhara Municipality, Bhadrapur Municipality, Kankai Municipality, Birtamode Municipality,* and *Damak Municipality.*

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

According to the field observations, *Kakarbhitta Bus Park* is situated at *Kakarbhitta* locality, which is linked to the *East-West Highway* and *Kakarbhitta POE* (formal). This transport station is also accessible by other alternative routes, such as *Kalikhola Marg, Burmeli Tole Marg,* and *Bahundangi Road.* In the same way, *Pyari Vista Bus Station* is also based in *Kakarbhitta* locality, though a quiet smaller station than *Kakarbhitta Bus Park*, and is connected to the *East-West Highway* via *Burmeli Tole Marg.* Correspondingly, *Ittabhatta Bus Station* is located at *Ittabhatta* locality, which is also linked to

the *East-West Highway* via *Nakalbanda Road* and *Jyamirgadhi Road* and considered the biggest transport station in terms of population mobility's size. The nearest localities to this transport station are reported as *Jorsimal, Dhulabari Chowk, Kakarbhitta* and *Aayabari*. On the other hand, *Dhulabari Bus Station* lies in *Dhulabari Chowk* locality, which is connected to the *East-West Highway* via *Dhulabari Road.* The alternative routes to access this site are *Nakalbanda Road* and *Dhaijan Road*. The nearest localities are documented as *Dhaijan Mode, Ittabhatta Chowk, Aayabari, Charali,* and *Jorsimal*. Furthermore, *Charali Bus Station* is located at *Charali* locality, one of the biggest junctions in the municipality. This site is connected to *Mechi Highway* as well as *Dhaijan Road*, with the nearest localities observed as *Dhaijan Mode, Duwagadhi, Dhulabari Chowk* and *Buttabari*.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

Five (5) transport stations were investigated in Mechinagar Municipality, which is equal to the number assessed in Biratnagar Metropolitan City (5) and less than in Suryodaya Municipality (12). *Ittabhatta Bus Station* and *Kakarbhitta Buspark* have the largest mobility with 1,200 and 500 people per day, while on the busiest day, the numbers add up to 1,500 and 3,000 people, respectively. At the remaining three (3) transport stations, people's movement is at most 250 and at least 100 people per day, and on the busiest days, the movement of people is at most 300 and at least 150. Most of these sites receive people from India (4/5), except for *Pyari Vista Bus Station,* which is only accessed by Nepalese nationals. The highest influx from India is found at *Kakarbhitta Buspark*, where 30 per cent of the people are from India and 70 per cent are Nepalese nationals. The remaining three (3) sites receive at most 15 per cent and at least 5 per cent from India (see Fig. 8.1).

Average entry flow per day, busiest day, and percentage coming from other country (October 2020)

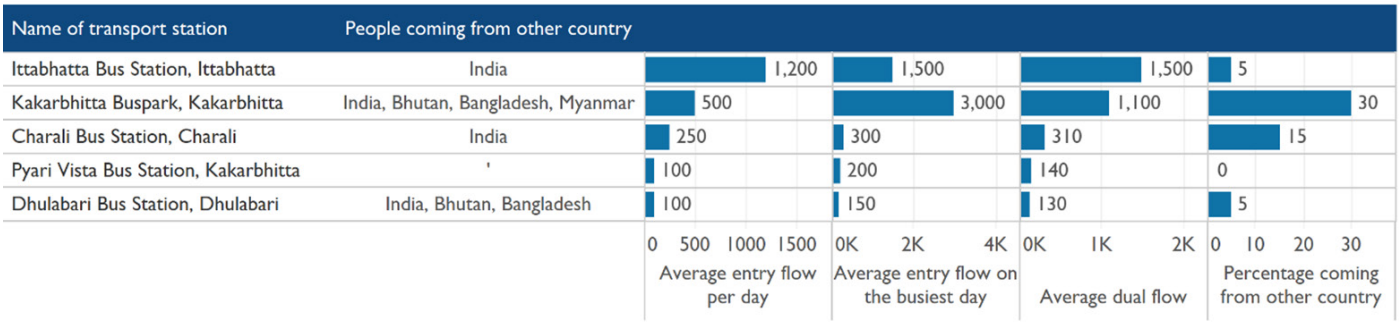


Fig. 8.1: Population mobility at the transport stations

Basic facilities, such as the availability of toilets and water, as well as the busiest days/months, and the tracking matrix to trace people that might be affected by the COVID-19 pandemic, were investigated. The analysis shows that the majority of the sites have water and toilet facilities available (4/5), except for *Charali Bus Station* (lack of toilet facility) and *Kakarbhitta Buspark* (lack of water facility). The available toilet facilities (*Pyari Vista Bus Station, Kakarbhitta Buspark, Ittabhatta Bus Station,* and *Dhulabari Bus Station*) have a distribution of stall/drop holes of 3, 15, 1, and 4, respectively. Despite the huge population mobility at *Ittabhatta Bus Station* (over 1,200 people per day), there is only one (1) stall/drop hole. The farthest distance to the nearest health centre is from *Pyari Vista Bus Station* and *Kakarbhitta Buspark* (8 and 6 Km, respectively) and the shortest distance is from *Charali Bus Station* (approximately 100 meters). The distance to the nearest water source is limited, within a radius of 500 meters. A suspected COVID-19 positive case was found at *Kakarbhitta Buspark* (see Fig. 8.2).

Availability of water and toilet facilities, busiest days/months, and distance to the nearest health centre and water source

Name of transport station	Busiest day of the week	Busiest month of the year	Availability of toilet nearby	Availability of water on site	Suspected COVID-19 case on site
Pyari Vista Bus Station, Kakarbhitta	Every day	June, July	Available	Available	Do not know
Kakarbhitta Buspark, Kakarbhitta	Every day	June, July	Available	Not available	Yes
Ittabhatta Bus Station, Ittabhatta	Every day	Every month	Available	Available	Do not know
Dhulabari Bus Station, Dhulabari	Friday, Monday	June, July, January	Available	Available	No
Charali Bus Station, Charali	Wednesday	December, January, September	Not available	Available	No

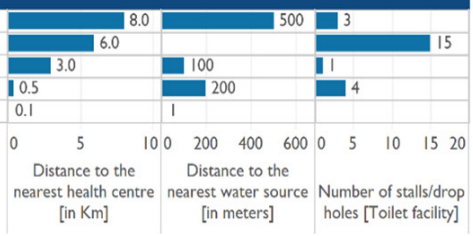


Fig. 8.2: Availability of water and toilet facilities, the busiest days/months, and distances to the nearest health centre and water source

The nearest health centre from the respective sites varies across the transport stations. There is no availability of isolated places for sick people nor community health workers/agents, especially for emergency cases (5/5). The following indicators are inadequate or not available at the transport stations; availability of health screening stations, such as handwashing stations and hand sanitizer (5/5), and body temperature checking (5/5). The majority of the sites are operational throughout the four seasons, namely; summer, spring, winter, and rainy season. Similarly, the investigated transport stations do not have a record book/device for travellers or visitors (4/5), except for *Pyari Vista Bus Station*, and hence hinders contact tracing mechanism if someone is affected by COVID-19 (see Table 8.1).

Table 8.1: Health screening and tracking travellers' status at the transport stations

Name of transport station	Name of the nearest health centre	Isolated place dedicated for sick people	Availability of health screening station	Body temperature checking status	Availability of community health worker/agent for emergency cases	Seasonality	Availability of record book/device for travellers
Charali Bus Station, Charali	Manakamana Hospital	Not available	Not available	Not available	Not available	All seasons	Not available
Dhulabari Bus Station, Dhulabari	Dhulabari Primary Health Center	Not available	Not available	Not available	Not available	All seasons	Not available
Ittabhatta Bus Station, Ittabhatta	Sabitra Clinic	Not available	Not available	Not available	Available	All seasons	Do not know
Kakarbhitta Buspark, Kakarbhitta	Mechi Health Post	Not available	Not available	Not available	Not available	All seasons	Not available
Pyari Vista Bus Station, Kakarbhitta	Kakarbhitta Health Post	Not available	Not available	Not available	Not available	All seasons	Available

All of the transport stations have waste management systems in place (5/5). However, there are still challenges in controlling waste, such as the visibility of trash in the open (3/5), stagnant water on the floor (3/5), and unwanted animals/insects (5/5) in large quantity, which contribute to the transmission of diseases from animals to humans. Greater than 50 per cent (2/5) and between 31-50 per cent (2/5) of people wear masks at these sites, with only one (1) site having less than 10 per cent. Overall, between 20-40 per cent wear masks at the investigated transport stations. The most used health centre from the respective sites differs, however, *Mechi Amda Hospital* was mentioned by two (2) respondents (see Table 8.2).

Table 8.2: Waste management and estimated percentage wearing mask at the transport stations

Name of transport station	Estimated percentage wearing mask	Availability of waste management system	Name of the most used health centre	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects
Charali Bus Station, Charali	<10%	Available	Manakamana Hospital	Yes, in large quantity	Yes, in large quantity	Yes, in large quantity
Dhulabari Bus Station, Dhulabari	>50%	Available	Mechi Amda Hospital	Yes, in large quantity	Yes, in large quantity	Yes, in large quantity
Ittabhatta Bus Station, Ittabhatta	31%-50%	Available	Roshan Medical	Yes, in large quantity	Yes, in large quantity	Yes, in large quantity
Kakarbhitta Buspark, Kakarbhitta	>50%	Available	Dhulabari Primary Health Center	No	No	Yes, in large quantity
Pyari Vista Bus Station, Kakarbhitta	31%-50%	Available	Mechi Amda Hospital	No	No	Yes, in large quantity

3.2.j PLACES OF WORSHIP

Population Mobility Pattern (who, where they come from, where they go)

According to the results obtained from the participatory mapping exercises and filed observations, the places of worship in Mechinagar Municipality attract pilgrims from Nepal as well as India. The study shows that the identified places of worship are open to the public every day and throughout the year. However, the busiest days in terms of higher people's movement are reported as Tuesday and Saturday. Likewise, the busiest months at the respective places of worship are October, November and December. The population mobility at the investigated places of worship mostly comes from *Jhapa, Ilam, Sunsari, Morang, Panchthar* and *Dhankuta*. At the municipality level, people originate from Mechinagar Municipality and *Kankai Municipality, Pathari Sanishchare Municipality, Damak Municipality, Bhadrapur Municipality, Jhapa Rural Municipality* and *Birtamode Municipality.*

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

In terms of the connectivity of the places of worship in Mechinagar Municipality, *Hanuman Temple* and *Farsang Namdag Gey Feling Monastery* are situated at *Kakarbhitta* locality in close proximity to each other. These sites are located near *Kakarbhitta POE* (formal) and linked to the *East-West Highway,* and are accessible by all kinds of vehicles. However, most people use tricycles and motorbikes to access these via alternative vehicle routes, such as *Kalikhola Marg, Burmeli Tole Marg* and *Bahundangi Road*. The nearest localities to these sites are *Pragati Tole, Burmeli Tole, Aayabari* and *Nakalbanda*. Similarly, *Sherpa Monastery* and *Nepal Christian Revival Church* are situated at *Bhanu Tole* locality which is linked to the *East-West Highway* via *Kalikhola Marg, Bahundangi Road* and *Nakalbanda Road.* These places of worship are close to *Kakarbhitta POE* (formal), with the nearest localities recorded as *Kakarbhitta, Burmeli Tole, Pragati Tole, Nakalbanda* and *Aamdangi.* Congruently, *Divya Shanti Church* and *Jame Mosque* are located at *Dhulabari* locality, one of the biggest junctions in the municipality. These places of worship are linked to the *East-West Highway* via *Dhulabari Road* and *Nakalband Road* and are accessible by vehicle. The nearest localities to the identified places of worship are reported as *Jorsimal, Ittabhatta Chowk, Dhaijan Mode* and *Dhaijan*. Furthermore, *Pau Pathivara Temple* is situated at *Charali* locality and linked to the *East-West Highway* and *Mechi Highway.* The alternative routes to access this temple are *Manipur Road, Dhaijan Road* and *Buttabari-Sanischare Road*. The nearest localities to this place of worship are reported as *Duwagadhi, Dhaijan Mode, Dhaijan,* and *Buttabari*.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

Seven (7) places of worship were investigated in Mechinagar Municipality, which is less than those assessed in Biratnagar Metropolitan City (9) and Suryodaya Municipality (9). Among the assessed sites, the largest population is found at *Pau Pathivara Temple* and *Jame Mosque*, with a population distribution of 500 and 200 people per day, and 1,500 and 500 people on the busiest day, respectively. At the remaining five (5) sites, the highest influx of people per day is 150 (*Hanuman Temple* and *Divya Shanti Church*), and the lowest is 50 (*Sherpa Monastery*). On the busiest day, the minimum entry flow is 100 people and the maximum is 500 people. All the places of worship are visited by people from India. The largest influx of people from India can be found at *Pau Pathivara Temple* (60%), while at the remaining sites the percentage is between 10-15 (see Fig. 8.1).

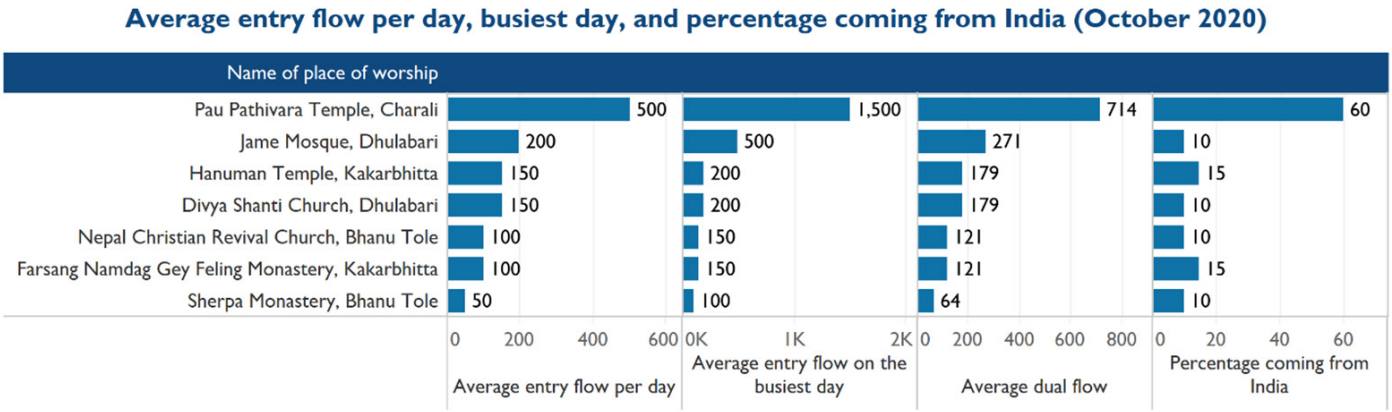


Fig. 9.1: Population mobility at the places of worship

According to the analysis, the nearest health centre from the places of worship differs across their locations, although *Kakarbhitta Health Post* is often the nearest (4/7). At all the places of worship investigated, there is neither a tracking matrix for visitors (record book/device), nor health screening, nor hand washing stations, nor the availability of body temperature checking, except at *Nepal Christian Revival Church*, where body temperature is checked before entrance (see Table 9.1). Overall, the estimated percentage of people wearing masks at these sites is greater than 50 and between 20-40 per cent. This shows that more than half of the people do not wear masks when visiting the respective places of worship. The busiest days of the week are Tuesday, Wednesday, Friday, and Saturday, except for *Farsang Namdag Gey Feling Monastery* and *Sherpa Monastery,* which are busy throughout the week. The busiest months of the year differ across all the places of worship investigated. In terms of seasonality, all the sites are operational throughout the seasons (winter, summer, spring, and rainy season).

Table 9.1: Health screening, tracking matrix, and the busiest days/months at the places of worship

Name of place of worship	Name of the nearest health centre	Availability of record book/device for visitors	Availability of health screening station	Body temperature checking status	Estimated percentage wearing mask	Seasonality	Busiest month of the year	Busiest day of the week
Divya Shanti Church, Dhulabari	Kakarbhitta Health Post	Not available	Not available	Not available	>50%	All seasons	September	Saturday
Farsang Namdag Gey Feling Monastery, Kakarbhitta	Kakarbhitta Health Post	Not available	Not available	Not available	10%-30%	All seasons	October	Every day
Hanuman Temple, Kakarbhitta	Kakarbhitta Health Post	Not available	Not available	Not available	>50%	All seasons	April, February, July, November	Saturday, Tuesday
Jame Mosque, Dhulabari	Dhulabari Primary Health Center	Not available	Not available	Not available	10%-30%	All seasons	June, May	Friday
Nepal Christian Revival Church, Bhanu Tole	Roshan Medical	Not available	Not available	Available	31%-50%	All seasons	November, December, January, February	Saturday, Wednesday
Pau Pathivara Temple, Charali	Manakamana Hospital	Not available	Not available	Not available	<10%	All seasons	June, January, December	Saturday, Tuesday
Sherpa Monastery, Bhanu Tole	Kakarbhitta Health Post	Not available	Not available	Not available	>50%	All seasons	October, November	Every day

At the places of worship, there are waste management systems in place, except at *Lakshmi Narayan Temple*, however, these are not fully adequate due to the following;

- Visibility of trash in the open in large quantity (1/7), while the remaining sites are tidy (6/7).
- Visibility of stagnant water on the floor (2/7), which encourages mosquitoes breeding, especially during the rainy season.
- Visibility of unwanted animals/insects in large quantity at all the sites investigated (7/7).

Furthermore, water and toilet facilities are available at all the sites, except at *Hanuman Temple* where

there is no toilet facility. Among the sites with toilet facilities, the maximum is 7 stalls/drop holes (*Sherpa Monastery*) and the minimum is 2 stalls/drop holes (*Divya Shanti Church* and *Pau Pathivara Temple*). People at these sites seek alternative healthcare when they get sick, such as clinic or hospital, traditional healer, and home treatment, in ascending order. The longest distance to the nearest health centre from the places of worship can be found from *Farsang Namdag Gey Feling Monastery* and *Sherpa Monastery,* about 30 and 4 Km away, respectively. The remaining places of worship are at most 1 Km and at least 500 meters away. The distance to the nearest water source from all the sites investigated is limited, within a radius of 200 meters (see Fig. 9.2).

Waste management system, water and toilet facilities, and distance to the nearest health centre and water source

Name of place of worship	Availability of waste management system	Places people go to when they get sick	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects	Availability of water on site	Availability of toilet nearby	Distance to the nearest health centre [in Km]	Distance to the nearest water source [in meters]	Number of stalls/drop holes [Toilet facility]
Farsang Namdag Gey Feling Monastery, Kakarbhitta	Available	Traditional Healer Clinic or Hospital Home Treatment	No	No	Yes, in large quantity	Available	Available	30.0	20	5
Sherpa Monastery, Bhanu Tole	Available	Clinic or Hospital Traditional Healer	No	No	Yes, in large quantity	Available	Available	4.0	10	7
Nepal Christian Revival Church, Bhanu Tole	Available	Clinic or Hospital	No	Yes, in large quantity	Yes, in large quantity	Available	Available	1.0	2	6
Hanuman Temple, Kakarbhitta	Available	Clinic or Hospital	No	No	Yes, in large quantity	Available	Not available	1.0	200	
Divya Shanti Church, Dhulabari	Available	Clinic or Hospital	No	No	Yes, in large quantity	Available	Available	1.0	100	2
Pau Pathivara Temple, Charali	Available	Clinic or Hospital	No	Yes, in large quantity	Yes, in large quantity	Available	Available	0.5	2	2
Jame Mosque, Dhulabari	Available	Clinic or Hospital	Yes, in large quantity	No	Yes, in large quantity	Available	Available	0.5	50	3

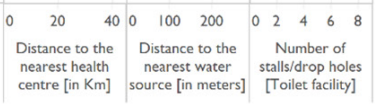


Fig. 9.2: Waste management, toilet and water facilities, and distances to the nearest health centre and water source

3.2.k OTHER PLACES

Population Mobility Pattern (who, where they come from, where they go)

According to the results obtained from the participatory mapping exercises and field observations, some other sites were identified in Mechinagar Municipality where high congregations of people take place. The sites are open or operational throughout week and the year. However, Monday and Saturday are recorded as the busiest days in terms of higher population mobility. Similarly, June and July are reported as the busiest months of the year. The study shows that the population mobility pattern at these sites in Mechinagar Municipality is eminently from *Jhapa, Ilam, Sunsari, Morang,* and *Panchthar* districts. At the municipality level, people's movement originates mainly in Mechinagar Municipality and from *Damak Municipality, Kamal Rural Municipality, Bhadrapur Municipality, Birtamode Municipality, Urlabari Municipality,* and *Buddhashanti Rural Municipality.*

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

In terms of connectivity, the sites assessed in Mechinagar Municipality include; *Tokla Tea Garden*, which is situated at *Kakarbhitta* locality and is linked to the *East-West Highway,* with accessibility of all kinds of vehicles. The nearest localities to this site are reported as *Pragati Tole, Burmeli Tole, Ittabhatta Chowk,* and *Aayabari*. Similarly,

Religious Festival Ground is located at *Patalganga* locality, which is associated with *Nakalbanda Road* and linked to the *East-West Highway* at *Jorsimal* locality. The nearest localities to this site are identified as *Jorsimal, Nakalbanda* and *Kakarbhitta*. Similarly, *Festival Ground* lies in *Dhulabari* locality also connected to the *East-West Highway*. This site is accessible by all vehicle and alternative routes, *Dhulabari Road, Nakalbanda Road* and *Dhaijan Road*. The nearest localities to this site are observed as *Dhaijan Mode, Ittabhatta, Jorsimal,* and *Aayabari*. On the other hand, *Charali Mela* is located in *Charali* locality and connected to *Mechi Highway* and the *East-West Highway*. The nearest localities to this site are documented as *Duwagadhi, Dhaijan Mode, Buttabari* and *Dhaijan*.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

Four (4) other places were identified by the KIs and assessed during the field observations conducted in September 2020, which is a higher number than those assessed in Biratnagar Metropolitan City (2) and less than in Suryodaya Municipality (7). Among the four (4) places, *Festival Ground* and *Charali Mela* account for the largest population with 20,000 and 1,000 people per day, and 40,000 and 2,000 people on the busiest day, respectively (see Fig. 10.1). However, despite the low influx of people at *Religious Festival Ground* (35 people per day), on the busiest day it accounts for the highest across all 'other places' investigated for the PMM activities in Nepal (100,000 people). This is followed by *Tokla Tea Garden* with a population of 250 people per day, while on the busiest day, the population is 300 people. Three (3) out of four (4) sites receive people from India (between 5-75%), except for *Religious Festival Ground,* which is only visited by Nepalese nationals.

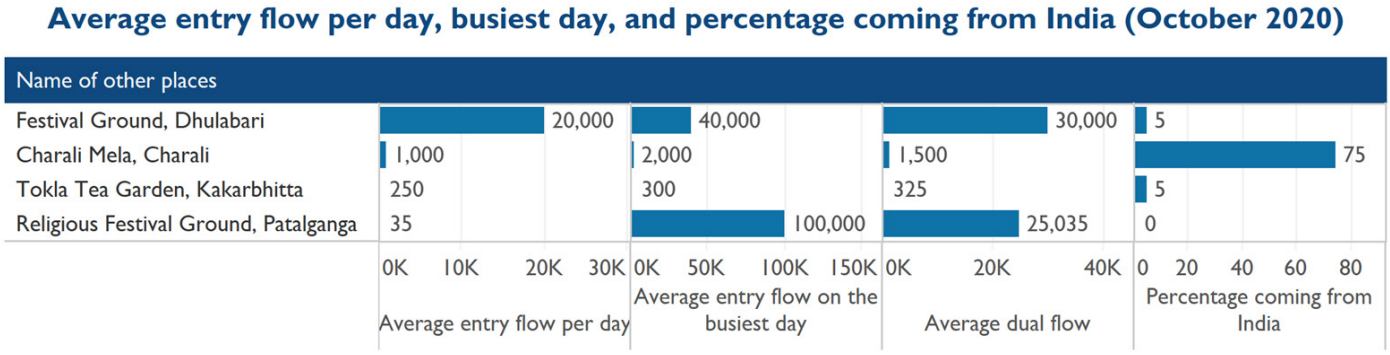


Fig. 10.1: Population mobility at other places

Fig. 10.2 shows the condition of basic hygiene at these localities. There is the availability of water (handwashing and for use after toilets) and toilet facilities nearby at all the four (4) sites investigated in Mechinagar Municipality, with a maximum of 15 stalls/drop holes (*Festival Ground*) and a minimum of 2 (*Religious Festival Ground* and *Charali Mela*), and hence present a proportionate distribution in terms population mobility, except for *Religious Festival Ground* (100,000 people in nomadic days). The nearest health centre from the respective sites varies according to their locations, with the farthest distance being 7 and 6 Km (*Tokla Tea Garden* and *Religious Festival Ground*), while the shortest distance is 20 meters (*Festival Ground* and *Charali Mela*). Similarly, the distance to the nearest water source across all the sites is limited, within a maximum radius of 200 meters and a minimum of 16 (Fig. 10.2).

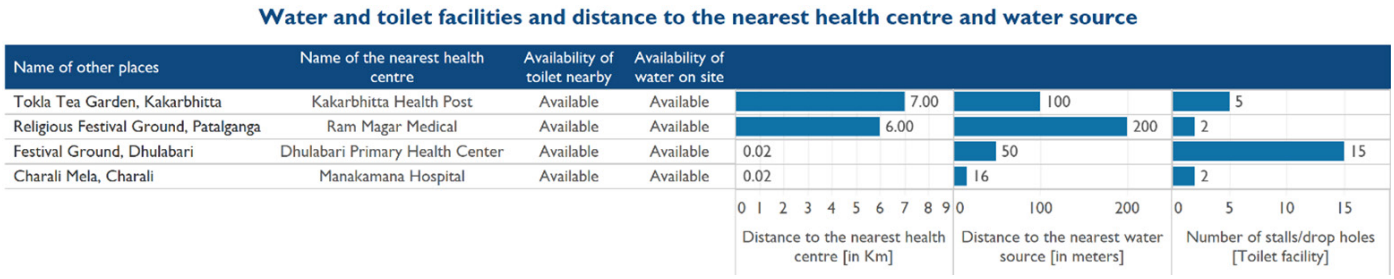


Fig. 10.2: Availability of water and toilet facilities, the busiest days/months, and distances to the nearest health centre and water source

Table 10.1 shows the basic health screening stations (handwashing and hand sanitizer) and tracking of people's movement. Among the four (4) sites, on average less than 10 per cent (2/4), between 10-30 per cent and greater than 50 per cent of people wear masks. This means that, overall, only between 10-20 per cent wear masks at these sites. The busiest months and day of the week differ across all the sites investigated with most of the sites being busier in February, March, October, and November, except for *Tokla Tea Garden,* which is busy throughout the week and year. There is inadequate availability of record book/device for visitors regarding contact tracing, except at *Tokla Tea Garden*. Similarly, there are no community health workers or agents, especially for emergency cases, and there is inadequate availability of thermometers for body temperature checking across the sites, except at *Festival Ground.* Half of the sites are operational throughout the seasons, namely; winter, summer, spring, and rainy season, and half are operational in winter only. A suspected COVID-19 positive case was found at *Festival Ground*. Considering the high population mobility and the proximity of *Festival Ground* to the bordering country (India), it is even more important to institute a contact tracing mechanism which would help mitigate the COVID-19 transmission or other communicable diseases.

Table 10.1: Health screening, tracking matrix status, and the busiest days/months at other places

Name of other places	Estimated percentage wearing mask	Busiest day of the week	Busiest month of the year	Seasonality	Suspected COVID-19 case on site	Availability of community health worker/agent for emergency cases	Body temperature checking status	Availability of record book/device for visitors	Availability of health screening station
Charali Mela, Charali	<10%	Sunday, Monday	October	Winter only	Do not know	Not available	Not available	Not available	Not available
Festival Ground, Dhulabari	>50%	Saturday, Friday	December	Winter only	Yes	Available	Do not know	Do not know	Available
Religious Festival Ground, Patalganga	10%-30%	Monday	February, March	All seasons	No	Not available	Not available	Not available	Not available
Tokla Tea Garden, Kakarbhitta	<10%	Every day	Every month	All seasons	No	Not available	Not available	Available	Not available

3.3 GENERAL ANALYSIS

This section of the report indicates the general analysis of all common variables or indicators where core parameters are evaluated, holistically. Some indicators were analysed separately since different findings were obtained from various sites. The rationale of combining these variables lies in the fact that the results would be the same across all the sites where the study was conducted. Key highlights are listed as follows:

1. Communication system
2. Sources of water
3. Names of unwanted animals/insects and other domestic animals
4. Modes of transport
5. List of procedures to follow when someone is affected by COVID-19
6. Major reasons for the busiest days/months
7. Common infectious diseases affecting people
8. Major purposes people travel across the sites

Fig. 11.1 shows the percentage distribution of various indicators for all the sites in Mechinagar Municipality, related to the concept of vulnerability capacity analysis. The pie charts show the communication system (top left), the presence of unwanted animals/insects (bottom left), various sources of water (top right), and the most used modes of transport (bottom right).

The most common means of voice communication system (GSM) involves phones or text messages (62.4%), followed by the use of internet to access emails and social media technologies (34.2%). The remaining two (UHF/VHF radio and no communication) are not significant. However, it is important to note that, according to the findings, some of the sites where there is better communication are the majority of the health centres, entertainment centres, transport stations, and some places of worship. The main source of water is public water system, which accounts for the highest percentage (38.6%), closely followed by the pump (37.1%), which is the direct opposite of the analysis obtained in Biratnagar Metropolitan City. The remaining 24.3 per cent is shared by other sources of water, such as delivery by truck or vehicle, river water, well, and rain catchment.

The visibility of animals across all the sites was validated, although based on the community setting in Nepal, people live with domestic animals, such as cows, goats, and buffalos. As a result, these animals fall into the category of 'wanted animals' as people commonly live with them, and also in terms of proportion, it varies across each municipality. Mosquitoes, ants/beetles, flies/months, and cockroaches carry the largest share in the chart, with a percentage of 27.8, 26.7, 25.7, and 18.2, respectively. According to the analysis, the sites are mainly reached by foot and motorbike, with a percentage distribution of 21.6 and 20.2, respectively, and thus similar to the result obtained in the other municipalities in Sudurpashchim Province and Lumbini Province. Other modes of transport include minivans, cars, buses, and trucks. At some sites, especially the POEs, places of worship, and traditional healers' compounds, accessibility by foot or vehicle is difficult and, in most cases, people walk long distances to reach their respective destinations.

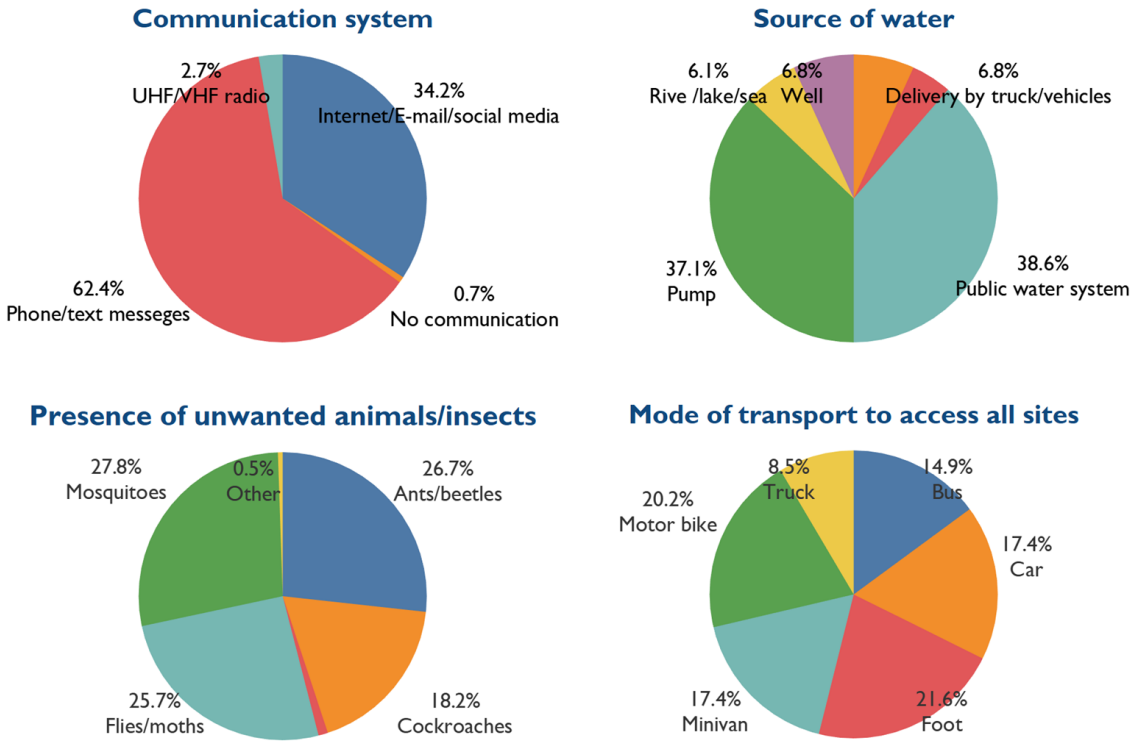


Fig. 11.1: Communication system, source of water, mode of transport, and unwanted animals/insects for all sites

Fig. 11.2 shows the places from which people seek alternative healthcare when they fall ill. Most people seek help from clinics or hospitals, home treatment, traditional healers, and pharmacy, in order of importance, with a percentage distribution of 61.0, 19.5, and 12.2 each, respectively, which is similar to the results obtained in Biratnagar Metropolitan City. It is worth noting that, although most people do seek support from health professionals, in areas where the accessibility to health centres is difficult as well as the availability of health infrastructure along closest corridors, people tend to rely on immediate alternative treatment (traditional healer and home treatment), as well as other alternative means. Equally, the main reasons behind the population influxes were investigated at the respective sites. The findings revealed that congregations of people are due to the following; market day (sporadic or nomadic) (16.4%), religious festivals (15.8%), worship services of either Temple, Church, or Mosque (12.8%), markets set up in the locality (permanent or temporal basis), cultural festivals (11.4% each), and crusade (9.4%). This shows that the population mobility pattern in Mechinagar Municipality is highly affected by economic and cultural/religious activities, places of worship, including cultural and religious festivals, and thus consistent with the analysis obtained in Biratnagar Metropolitan City.

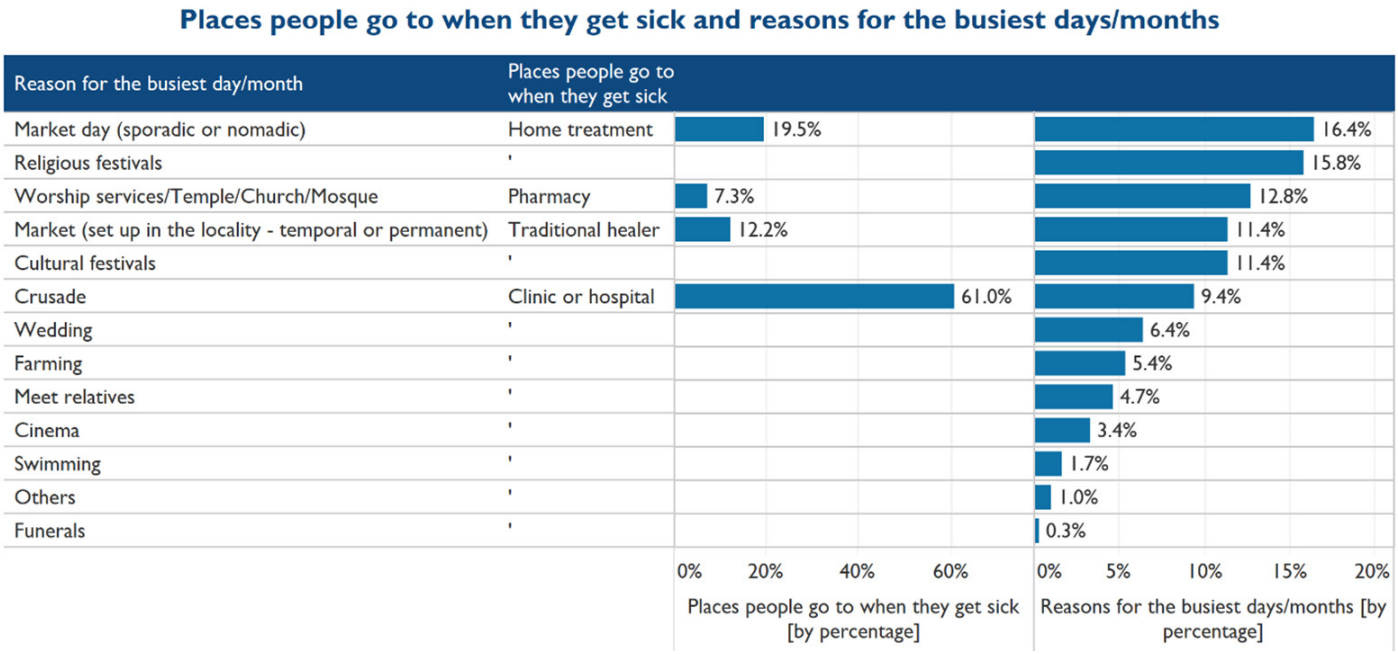


Fig. 11.2: Major reasons for the busiest days/months and places people go to when they get sick

Fig. 11.3 shows the common infectious diseases affecting people in Mechinagar Municipality, and some of the procedures to follow for COVID-19 suspected cases. During a pandemic or an outbreak, there are always concerns on how people should respond to emergency cases of affected people. The list of procedures was evaluated in percentage based on respondents' feedback as follows; isolate the patient (28.9%), counsel and calm the patient (26.4%), call or notify on-site authorities (24.0%), and call the emergency hotline (23.9%), in order of importance (see Fig. 11.3). Overall, this means that people are generally aware of the techniques or procedures to follow if someone is affected by COVID-19. Although we have analysed some of the common diseases affecting people at specific sites, such as the health centres, the aim was to find out what is the proportion for the entire municipality. The study revealed that malaria, dengue, typhoid, and COVID-19 are the major diseases affecting people in Mechinagar Municipality, with a percentage distribution of 19.2, 17.3, 15.4, and 13.5, respectively. Therefore, typhoid, malaria, and dengue are the most prevalent diseases prior to and during the pandemic, as of October 2020.

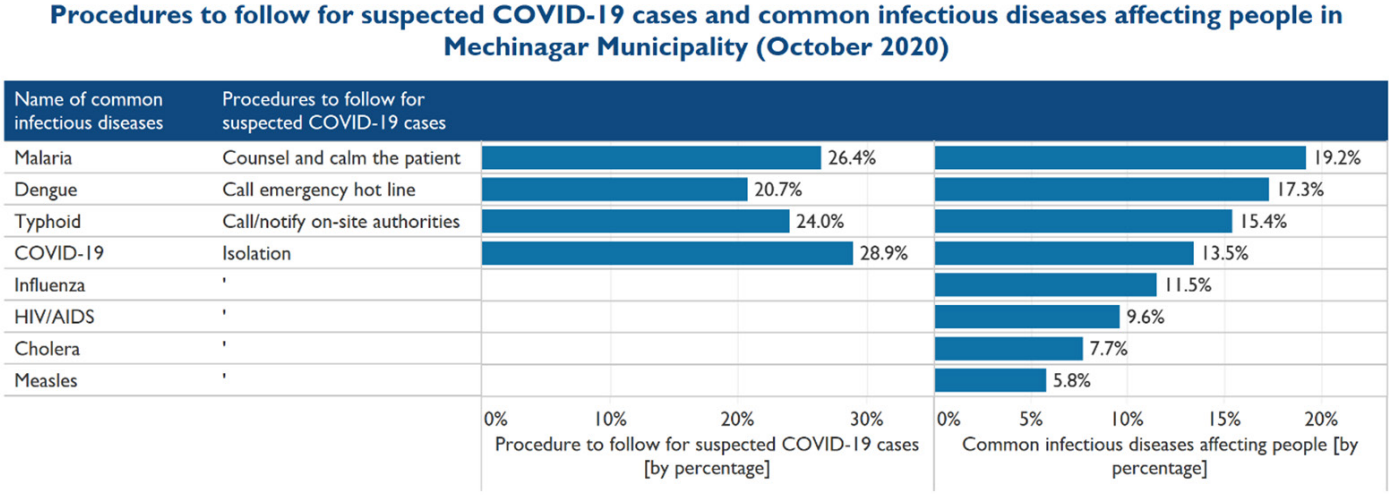


Fig. 11.3: Procedures for COVID-19 and common infectious diseases affecting people in the municipality

The major reasons for people's movement across the BCPs/POEs and other sites with high mobility were also explored and identified as follows; trade/market/commerce, employment, industry/mining/plantation/timber, transportation, and visit of relatives and/or friends account for the highest, with a percentage distribution of 20.4, 19.4, 13.3 each, and 12.2, respectively, similar to the findings obtained in other municipalities, except for employment, visit of relatives or friends, and industrial activities. This show that the main reasons migrant travel across the POEs and other sites are for economic activities, employment, and industrial activities, such as mining, plantation or timer logging (see Fig. 11.4). Furthermore, although we have analysis by site in terms of seasonality, the researchers calculated the overall distribution of sites by seasonality as thus; all seasons (90.8%), winter and summer only (4.1%), winter only (3.1%), and summer only (2.0%).

Sites seasonlity and the main reasons migrant travel across all the sites

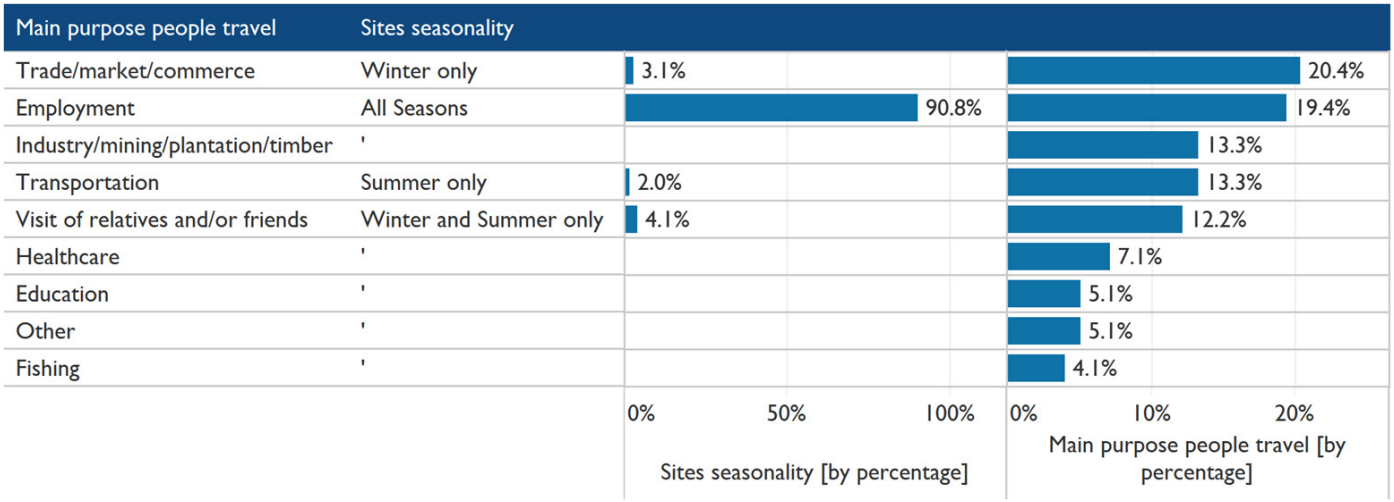


Fig. 11.4: Main purposes for people's mobility across all the sites

4. CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNT

4.1 CONCLUSIONS

It is important to note that, in some of the sites where the research was conducted, the questions asked to key informants refer to practices prior to the enforcement of lockdown and restricted movement regulations. In this sense, the aim was to identify and understand the population mobility patterns both across bordering municipalities, and between Nepal and India.

Points of entry (POEs)

Twenty (20) POEs were investigated in Mechinagar Municipality, half land border (10/20) and half water landing sites (10/20). Among them, only one (1) is a formal crossing point (*Kakarbhitta Int. POE*), while the remaining nineteen (19) are informal. *Kakarbhitta Int. POE* (formal) has by far the largest population mobility, also compared to the other municipalities where the study was conducted, with 500,000 people crossing daily and up to 700,000 on the busiest day. All the POEs are crossed by people coming from India, with the lowest percentage being 5 per cent (*Dhaijan Chowk POE, Mill Chowk POE,* and *Duwagadhi Chowk POE*) and the highest found at *Kalika Tea State Int. POE* (80%), although in terms of size the largest is observed *Kakarbhitta Int. POE* (50%/ 250,000 per day). According to the respondents, the most used health centres are *Manakamana Hospital, Mechi Hospital* and *Manisha Clinic* despite not always being the closest health facilities to the respective POEs. Most of the POEs are busy throughout the week and the year but people's movement is often higher in the weekend (Saturday and Sunday) and between August and November. It is concerning that, despite the high population mobility, almost half of the POEs do not have water (9/20) nor toilet facilities present on site (13/20) for drinking, handwashing, and use after toilet. Similarly, only two (2) sites have electricity available. Across the POEs, there is no IHR focal point based at the POEs or municipality level nor in the correspond country, India (except for *Durga Mandir Int. POE, Gadagalli Int. POE, Nakal Banda Int. POE, Bahundangi Int. POE,* and *Kakarbhitta Int. POE*), nor community health workers or volunteers (except at *Kakarbhitta Int. POE*). The distance to the nearest health centre ranges from a maximum of 9 Km (*Mechi Danda Int. POE*) to a minimum of 500 meters (*Charali POE*). All the POEs lack health screening stations (except for *Kakarbhitta Int. POE*) and a tracking matrix (record book/device and or other technique of tracking people's movement) for visitors and travellers. Despite being generally operational throughout the seasons and having reported suspected COVID-19 positive cases at seven (7) POEs, the estimated percentage of people wearing masks is extremely inadequate at less than 10% at the majority of the sites.

Health centres

Among the twelve (12) health centres assessed in Mechinagar Municipality, only two (2) are government owned (*Dhulabari Primary Health Care* and *Kakarbhitta Health Post*), whereas the remaining are private health facilities. The largest, in terms of entry flow, is the public *Dhulabari Primary Health Care* with 300 people per day and 450 on the busiest day. However, it is only visited by 1 per cent of people from India, together with *Mechi Amda Hospital* and *Sarpa Dansa Upachar Kendra (Snake Bite)*. The highest percentage of people coming from outside Nepal (India, Bangladesh, Bhutan) is found at *Mechi Polyclinic and Diagnostic Center Pvt. Ltd.* and *Mechi Divyajyoti Eye Hospital* (90% each). Half of the facilities (6/12) are operational 24/7. Based on the last three months (July-September 2020), outpatients are generally in higher numbers compared to inpatients, with the highest figures found at *Dhulabari Primary Health Care* (5,000), *Mechi Netralaya Hospital* (4,500) and *Kakarbhitta Eye Hospital* (2,500). The status of

toilet facilities depends on whether the number of stalls/drop holes are assessed for patients or staffs. The most poorly equipped toilet facilities for staffs are found at *Mechi Netralaya Hospital, Mechi Amda Hospital,* and *Kakarbhitta Eye Hospital* (65:1, 57:1, and 53:1, respectively). Instead, in terms of patients to stall/drop hole ratio, the least equipped are *Dhulabari Primary Health Care* and *Roshan Medical Hall* (150:1 and 50:1, respectively).

The sources of water are generally situated close-by, within a radius of 150 meters, except for *Sarpa Dansa Upachar Kendra (Snake Bite)* (2 Km). Instead, the distance from the respective health centre to the nearest referral centre reaches up to 17 and 10 Km for *Manisha Polyclinic and Diagnostic Center Pvt. Ltd.* and *Dhulabari Primary Health Care,* respectively. The health centre with the highest population of medical personnel is *Mechi Netralaya Hospital* (65), closely followed by *Mechi Amda Hospital* (58). The majority of the health centres have conducted IPC training (10/12) but half have an emergency preparedness plan in place (6/12). Five (5) health centres reported suspected COVID-19 positive cases. Based on the analysis, the health infrastructure and screening stations are not fully adequate since only four (4) facilities have health screening station 24/7 and none of them keeps a tracking matrix for visitors and patients. According to the findings, people from India accessing the health centres in Mechinagar Municipality are mostly medical practitioners visiting or treating patients in Nepal, similarly to the results obtained in other municipalities where the study was conducted. In terms of wards, the largest at the facilities assessed are laundry, laboratory, surgical and medical.

Traditional Healers

A total of thirteen (13) traditional healers' compounds were investigated, with a population mobility ranging from 20-100 per day, and 40-150 on the busiest days. The majority of the compounds are visited by people from India, with the most significant percentage found at Itthabhatta *Baba (KR)* (20%). Compared to other sites, the distance to the nearest health centres is relatively higher from the traditional healers (up to 13 Km), while the distance between the health centre and the nearest referral centre is generally higher (up to 25 Km). Despite the availability of waste management systems (6/13), these are inadequate, proved by the visibility of trash in the open (8/13), stagnant water on the floor (6/13), and unwanted animals/insects (13/13). The estimated percentage of people wearing masks is not satisfactory, often below 10 per cent. All the traditional healers' compounds assessed have water and toilet facilities available (mainly pour-flush latrine and pit latrine), except for *Guras Path Baba* (no toilet). The highest number of visitors per stall/drop hole can be found at *Dhimal Basti Mata* (100:1), followed by *Syanglangtar Baba,* and *Duwagadhi Mata* (50:1 each). Only five (5) interviewed traditional healers reported to use protective materials during their practices, similarly to the results obtained in other municipalities. In terms of diseases, the most common treated by the traditional healers are headache, mental illness, and fever; whereas, the practices mostly performed are disease cure, bone setting, mental illness and other.

Schools and Colleges

Ten (10) schools and colleges were assessed in Mechinagar Municipality, of which half (5/10) are secondary schools, and the remaining five (5) tertiary educational institutions. Among them, the most populated are *Dhulabari Madhyamik Vidhalaya School* and *Adarsha Ma. Vi. Secondary School,* with an average daily attendance of 2,262 and 2,000, respectively. Although five (5) schools are attended by people from India, the percentage distribution is not significant (between 2-10%). The majority of the schools and colleges have health community workers or agents available on site (6/10). The distance to the nearest health centre from the respective schools varies, generally within

a radius of 1 Km, except for *North Point English College, Shree Mechi Janasadharan Ma.Vi. Secondary* and *Adarsha Ma.Vi. Secondary School,* which are 17, 16 and 4 Km away. The highest numbers of desks are found at *East Horizon Secondary School* (600) and *Dhulabari Madhyamik Vidhalaya Secondary School* (588), which also have the highest number of classrooms (60 and 53, respectively). The largest numbers of pupils/students per desk and classrooms are reported at *Sahid Dasarath Ma. Vi. College* and *Dhulabari Madhyamik Vidhalaya Secondary School* (53 and 47, respectively). Toilet facilities are present on site at all the educational institutions and are separate for male and female pupils/students, while five (5) lack gender-divided toilets for teachers. Poorly equipped toilet facilities in terms of students to stall ratio, both female and male, are found at *Kakarbhitta College* (350:1 for female students, 275:1 for male students) and *Sahid Dasarath Ma.Vi. College* (250:1 for female students, 350:1 for male students). The male to female pupils/students ratio varies across the sites, however, the majority of the schools (7/10) have more female than male pupils (5-503 difference), contrary to the findings in other municipalities. Despite being operational throughout the four seasons (winter, summer, rainy, and spring) and generally busy throughout the year, only two (2) schools and colleges have availability of tracking matrix which can be used for contact tracing for visitors suspected for COVID-19 cases. Similarly, a health screening station (handwashing and hand sanitizer) is present at only one (1) site. However, all the schools and colleges have isolated places for sick pupils/students, similar to the results obtained in Biratnagar Metropolitan City. Waste management systems are widely available, however, there is the visibility of stagnant water on the floor (5/10), trash in the open (4/10), and unwanted animals/insects across all the sites (10/10).

Entertainment Centres

A total of ten (10) entertainment centres were assessed in Mechinagar Municipality. Among them, *Bhaundangi Mahotsav* has the highest entry flow on a daily basis (1,000), which reaches up to 1,200 on the busiest day, followed by *City Cinema* (500 people per day and 750 on the busiest day). The majority of the entertainment centres (8/10) are visited by people from India (between 10-90%), and a minority comes from Bhutan, Bangladesh and China (*SS Lounge Riyaz Hotel (Casino)* and *Dhaka Mini Casino*). Despite being generally operational throughout the four seasons (except for *Bhaundangi Mahotsav,* winter only), nearly all the centres lack health screening stations (handwashing and hand sanitizer) (8/10) and body temperature checking (9/10). Similarly, community health workers/agents are absent at all the centres (except for *Hotel Mechi Crown*), and isolated places dedicated for sick people, as well as tracking matrix for visitors, are unavailable at most of the sites (70% and 90%, respectively).

Market Centres

Five (5) market centres were identified with high entry flows. *Kakarbhitta Market* stands out with 20,000 people visiting per day, and 30,000 on the busiest day, of which 50 per cent come from India, Bangladesh and Bhutan. This is followed by *Ittabhatta Market* and *Charali Market* with 5,000 people each per day, and 7,500 and 6,000 on the busiest day, respectively. Health authorities in charge of emergency cases are absent across the sites, together with body temperature checking, except for *Charali Market.* An isolated place dedicated for sick people is only present at *Kakarbhitta Market,* however, it lacks a health screening station, which is especially concerning considering the high population mobility. Although waste management systems are generally available (except for *Mechinagar Mahotsav*), there is visibility of trash (100%), stagnant water (40%) and unwanted animals/insects across the sites (100%), in limited quantity. Water and toilet facilities are widely available, except at *Ittabhatta Market.* Different kinds of food and goods are sold at the marketplaces, in order of relevance; prepared foods, meat/poultry, fruits/vegetables, canned food/drinks and goods/merchandise.

Migrant Worksites

Eight (8) migrant worksites were invested in Mechinagar Municipality, with the largest in terms of population mobility being *Sunrise Cement Factory* and *Singapore Beverage Nepal Pvt. Ltd.* (180 people per day each and 200 on the busiest day each). The majority of the sites (7/8) are accessed by people from India, with a percentage ranging from 2 to 75 per cent (*BBC Brick Factory*). Health screening stations (handwashing with soap and hand sanitizer) and body temperature checking are available only at four (4) migrant worksites. Water and toilet facilities are widely available, expect at *Kakarbhitta Labour Junction.* Similar to other sites, waste management systems are widely available (7/8), with a minority presenting stagnant water on the floor (2/8), and trash on the floor (1/8), and all the sites showing visibility of unwanted animals/insects (8/8). Community health workers/agents for emergency cases are only present at two (2) sites (*BBC Brick Factory* and *Sunrise Cement Factory*), and only four (4) have a tracking matrix system (record book/devices for contact tracing mechanism) in place (*Gorakhkali Cement Pvt. Ltd., Himalayas Cement Factory, Singapore Beverage Nepal Pvt. Ltd.* and *Sunrise Cement Factory*). The majority of the migrant worksites (5/8) have living accommodation for their staff and the most common types include; concrete, tarpaulin, thatch, wooden house, and zinc.

Transport Stations

Compared to other municipalities, the transport stations in Mechinagar Municipality are accessed by a lower number of people, with a maximum of 1,200 per day and 1,500 on the busiest day (*Ittabhatta Bus Station*). The majority of the stations are visited by travellers from India, as well as Bhutan, Bangladesh and Myanmar (between 5-30%), except for *Pyari Vista Bus Station*. Water and toilet facilities are widely available, except at *Kakarbhitta Buspark* (no water) and *Charali Bus Station* (no toilets). Similar to other sites, the distance to the nearest health centre is generally significant, with the farthest being *Pyari Vista Bus Station* (7 Km), *Kakarbhitta Buspark* (6 Km) and *Itthabhatta Bus Station* (3 Km). A suspected COVID-19 positive case was reported at one (1) site (*Kakarbhitta Buspark*). None of the stations have isolated places dedicated for sick individuals, nor health screening stations (handwashing with soap and hand sanitizer), nor body temperature checking, nor community health workers/agents present on site (except for *Ittabhatta Bus Station*), nor do they keep records of travellers (except for *Pyari Vista Bus Station*). Contrary to the transport stations in Biratnagar Metropolitan City, all stations in Mechinagar Municipality have a waste management system available, however, this is deficient due to the visibility of trash (60%), stagnant water (60%) and unwanted animals/insects (100%).

Places of Worship

Seven (7) places of worship were investigated in Mechinagar Municipality, with the most popular, in terms of population mobility, being *Pau Pathivara Temple*, with 500 people per day, and 1,500 on the busiest day. All the assessed places of worship are visited by people coming from India, with a percentage distribution between 10-60, while the remaining visitors come from Nepal. None of the sites have health screening stations (handwashing with soap and hand sanitizer), nor body temperature checking (except for *Nepal Christian Revival Church*), nor do they keep records of their visitors, despite being operational throughout the four seasons. Toilet facilities and water (drinking or handwashing with soap or use after toilet) are widely available, with a maximum of 7 stalls (*Lakshmi Narayan Temple*) and a minimum of 2 (*Divya Shanti Church* and *Pau Pathivara Temple*), except for *Hanuman Temple* with no toilets on site.

Other Places

Four (4) other places were assessed. Among them, *Festival Ground* stands out with a remarkable number of

visitors on a daily basis (20,000), which on the busiest day increases to 40,000. However, *Religious Festival Ground* reaches up to 100,000 on the busiest days, which is higher than most flows across the sites assessed in Mechinagar Municipality and other municipalities. Most of the sites are visited by people from India (3/4), although the only significant percentage is found at *Charali Mela* (75%). Toilets and water facilities for drinking or handwashing with soap or use after toilet are widely available, with the farthest distance to the nearest water source being only 200 meters (*Religious Festival Ground*). None conducts body temperature checking, nor tracking matrix for visitors, and the majority of the sites have no community health worker/agent for emergency cases, nor health screening stations, nor do they keep records of visitors (75% each). The overall estimated percentage of people wearing masks at these sites is only 20-40 per cent.

4.1.a ADDITIONAL FINDINGS

The analysis shows that some of the observed sites have common characteristics and face similar health challenges in terms of population mobility and public health risks mapping. The following are recurrent:

- The most used health centre is *Kakarbhitta Health Post* and *Dhulabari Primary Health Center* despite not always being the nearest from the sites assessed.
- Inadequate or no presence of health authorities/agents dedicated for sick people, as well isolation rooms for ill people at the vast number of sites were the study was conducted.
- Despite the presence of waste management systems, often, they are not adequate, and consequently affect the sanitary conditions of already vulnerable locations in terms of population mobility.
- Several means of transport are used to travel from/to/within Mechinagar Municipality. Travel by foot is substantial across the sites, and followed by the use of motorbikes, cars, minivans, and buses, in descending order of magnitude.
- Tracking matrix (books/devices) which can be use to monitor people's flow are almost completely absent.
- There is availability of toilet facilities and water (use after toilet, handwashing or drinking) in most of the sites where the study was conducted, mainly based on pumps and the public water system.
- People generally understand and are aware of the procedures to follow if someone is affected by COVID-19. However, the percentage of people wearing masks is not satisfactory, especially places of worship, traditional healers, and POEs (around 20-40%).
- There is insufficient presence of health screening stations, including hand washing with soap, hand sanitizer and IPC, at the vast majority of the sites investigated. This poses serious health threats in case of COVID-19 infection, with a higher grade of vulnerability at POEs, transport stations, migrant worksites, traditional healers, and places of worship.
- The majority of the assessed sites are open throughout the year and operational throughout the seasons, though their busiest period varies depending on their category and location.
- In terms of population mobility patterns, at the district level, they mainly originate from *Jhapa, Ilam, Morang, Sunsari, Panchthar, Dhankuta, Bhojpur* and *Taplejung*; whereas at the municipality level, people's movement emanates from *Mechinagar Municipality* and from *Birtamode Municipality, Bhadrapur Municipality, Kankai Municipality, Arjundhara Municipality, Jhapa Rural Municipality, Damak Municipality* and *Urlabari Municipality.*

- A large number of the sites investigated are situated near or connected to the East-West Highway through several alternative routes.

4.2 RECOMMENDATIONS

PMM has allowed us to better grasp the dynamics and characteristics of human mobility in Mechinagar Municipality. The strength of PMM is two-fold; on one hand, its systematic methodology enables for data validation throughout the process; and on the other, it is inherently inclusive of the local communities which are personally involved and actively contribute not only to the rolling out of the activities, but to the final results which will impact the society, as a whole. Based on the PMM analysis of the area, several recommendations are suggested:

1. Establish health screening stations at POEs and all other priority locations, specifically transport stations, entertainment centres and places of worship (temples, churches, and mosques). Body temperature checking should be advised at all sites with high population mobility, considering the easy accessibility and low cost of thermometers, and hand sanitizers should be provided to visitors and travellers accessing the respective sites.
2. Set up mechanisms to record and track people's movement, especially their origin and destination. This is especially the case for POEs and transport stations. The information collected is indispensable to trace any affected case, in the event of an outbreak.
3. Strengthen IPC and Water, Sanitation and Hygiene (WASH) at all priority sites identified in the study with limited capacities and high population mobility. In case of lack of IPC and Personal Protective Equipment (PPE) pieces, the national supply should be addressed to ensure that everyone has access to basic items, such as surgical masks and hand sanitizer.
4. Invest in capacity building of health infrastructure. This is especially the case for health posts, which are often located in remote areas and are hardly accessible, even by foot. In case of grave ill people, they may not be able to reach the sites and receive the necessary health care. Similarly, medical equipment should be widely available to health workers and volunteers.
5. Focus on risk communication and community engagement. Based on direct field observation and from the respondents, the community seems to lack knowledge of potential risks of infectious disease, such as COVID-19, and preventive measures for transmission. Citizens should be involved in health-related activities and awareness should be raised on the importance of good sanitary conditions affected by waste management systems, as well as the availability of water and toilet facilities.
6. Develop a health working group for Nepal and corresponding countries at formal POEs for both IHR and PHEIC focal points. This will allow for a better management of travellers' movement, especially for tracking purposes.
7. Conduct an urgent training and capacity development of health staff/immigration/security officials at POEs, including development of SOPs for the POEs and key priority areas.
8. Conduct leadership training for all traditional healers in order to enhance their health practices, adhere to SOPs within their communities, especially in hostile communities where people rely on them for health and other issues.

The findings will be shared with MoHP for further actions.

4.3 LESSONS LEARNT

1. Stakeholders' engagement at all levels (national, district and municipality) is key to ensure effective implementation and ownership of the project. Through such multi-level engagement, the capacity of officers is also enhanced, which in turn contributes to the sustainability of the project. Consequently, this helps to integrate mobility pattern data in epidemiological surveillance for meaningful analysis of public health risks.
2. Community engagement and participation at all levels of implementation ease the process of municipality entry, data collection and municipality/community ownership of the project.This also helps communities understand the possible vulnerabilities, in terms of health risks, that exist in the area, especially during the COVID-19 pandemic.
3. The training and simulations are key for the staff/enumerators to expand their knowledge and improve their skills in interviewing informants and collecting data.This in turn allows to validate and adopt the data collection tools ensuring they are suitable for the local context.
4. Early planning/preparations, logistical arrangements (vehicles, training materials, data collection, maps, plans for field teams, hand sanitizers, masks, etc.) are important for timely and effective implementation of the activities.
5. Field debriefing sessions are necessary to discuss successes, lessons learnt, challenges and recommendations for future improvement of action plans since the project exercise is a learning process in itself.

5. ANNEXES

5.1 ANNEX I

Groups and indicator weights for the vulnerability analysis selection

Indicator Group	Group Weight	Group Weight Score Rationale	Indicator	Indicator Weight
1. Ground Crossing Points	10	1) All points of entry and transit points carry equal weight (10) 2) Local people mix with travelers from outside the community in vehicles 3) Communities along major corridors/routes of transportation are vulnerable to infection through business activities with potentially infected travelers	The top 5 largest number of people crossing throughout the year	3
			The top 5 most easily accessible by car, lorry, truck or minivan	2
			Border crossing points most likely used by travelers to travel long distance internationally (Yes=1/No=0)	2
			Towns or villages along the border that share a common language or currency with villages across the border (Yes=1/No=0)	1
			Towns or villages close to regular or periodic large gatherings of people (Yes=1/No=0)	2
2. Water Landing Sites	10	1) All points of entry and transit points carry equal weight (10) 2) Local people mix with travelers from outside the community and through business activities at the border areas 3) Surrounding communities at river-side are vulnerable to infection through business activities with potentially infected travelers	The top 5 wharfs with largest number of boats and passengers coming from and going to other countries	3
			The top 5 wharfs with largest number of boats and passengers and coming from and going to other ports in the country	1
			Wharfs with largest number of boats landing throughout a year	1
3. Main Roads, Junctions and Rivers	0	1) There are no indicators associated with main routes, junctions and rivers. 2) The main roads, junctions and rivers identified by the group will be marked on the map, purely as a reference to preferred, high-volume mobility pathways.	N/A	0
4. Markets	10	1) Carries equal weight as Transit points (10) 2) Local people mix with travelers from outside the community through business activities at the market 3) Surrounding communities at markets are vulnerable to infection through business activities with potentially infected travelers and marketers	Markets attracting the largest number of people from other countries	10
5. Migrant Worksites	10	1) Local people mix with travelers from outside the community through business activities at the market 2) Surrounding communities at markets are vulnerable to infection through business activities with potentially infected travelers and marketers 3) Migrant workers may not have access to or be able to afford local healthcare, facilities or treatment 4) Worksite environmental conditions and infrastructure amplify spread of infectious diseases 5) Foreign workers have no immunities to local diseases 6) Migrant workers introduce foreign communicable diseases to local populations	Worksites have the most number of workers	10

6. Traditional Healers	20	1) Traditional Healers attract people who are ill (infected) 2) Culturally, traditional medicine is the preferred provider over clinical/hospital/government care 3) Traditional healers are most vulnerable providers, because they have no protective equipment, supplies or practices, like a clinical/hospital setting. 4) Host communities are vulnerable to infection from hosting infected individuals from outside the community, who seek treatment from the healer or fortune tellers	Traditional healers attracting the largest number of people from other countries	20
7. Health Facilities	15	1) Health facilities attract people who are ill (infected) 2) There is a history of healthcare workers and their families/communities becoming infected through ineffective or nonexistent preventative measures and subsequent unsafe burial practices 3) Host communities are vulnerable to infection by hosting infected individuals from outside the community, seeking treatment at the facility	Health facilities attracting the largest number of people from other countries	15
8. Transport Stations	10	1) All points of entry and transit points carry equal weight (10) 2) Local people mix with travelers from outside the community in vehicles 3) Surrounding communities transportation hubs are vulnerable to infection through business activities with potentially infected travelers	Transport stations attracting the largest number of foreign workers	10
9. Schools	5	1) Local students mix with students from outside the community	Schools and colleges attracting the largest number of people from other countries	5
10. Places of Worship	10	1) Religious leaders and institutions attract people who are ill (infected) 2) Spiritual power/healing is preferred provider over clinical/hospital/government care 3) Religious leaders are vulnerable, because they have no protective equipment, supplies or practices, like a clinical/hospital setting.	Places of worship attracting the largest number of people from other countries	10
11. Places of Entertainment	2	1) Local people mix with travelers from outside the community at public venues and seasonal festivals, resulting in greater potential for exposure to infectious diseases	Places of entertainment attracting the largest number of people from other countries	2
12. Other Places	2		Other places attracting the largest number of people from other countries	2

5.2 ANNEX II

Vulnerability capacity and sites location generated by the matrix analysis

	Group Weight	10	10	20	15	10
	Individual Indicator Weight	10	10	20	15	10
Shows Location		Markets	Migrant Worksites	Traditional Healers	Health Facilities	Transport Stations
Locality	Priority Score	Priority	Markets that attract the largest number of people from other countries	Worksites that have the largest number of workers	Traditional and Religious Healers that attract the largest number of people from other countries	Health Facilities that attract the largest number of people from other countries	Transport stations that attract the largest number of people
Dhulabari	1108		210	0	260	210	140
Kakarbhitta	1032		240	120	0	195	30
Charali	860		150	130	0	60	180
Buspark	624		0	0	0	360	250
Bahundangi	323		40	0	100	0	0
Dhimal Basti	318		0	0	300	0	0
Ittabhatta	309		80	40	100	0	70
Sanglangtar	300		0	0	300	0	0
Duwagadhi	252		0	160	60	0	0
Jyamirgadhi	237		0	180	40	0	0
Bhanu Tole	200		0	0	0	0	0
Purano Bhansar	195		0	0	0	195	0
Nakalbanda	177		0	0	120	0	0
Dhaijan Mod	120		0	120	0	0	0
Mata Chowk	120		0	0	100	0	0
Ninda Bridge	106		0	0	0	0	0
Pragati Tole	105		0	0	0	105	0
Dhaijan	61		20	0	0	0	30
Satighatta	49		0	0	20	0	0
Guras Path	40		0	0	40	0	0
Hulak Office	40		0	0	0	0	40
Khuttedangi	40		0	0	40	0	0
Bicharni	30		0	0	0	0	0
Kharedangi	30		0	0	0	0	0
Gada Galli	28		0	0	0	0	10

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