

## RESEARCH REPORT



## COVID-19 incidence in Mizoram, India

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COVID-19 had ravaged the physical and mental health of millions of people globally. With more than 18 million infections and 0.7 million fatalities worldwide, the pandemic showed no signs of slowing down. Since the detection of the first COVID-19 case in Mizoram, there is still no scientific record of the incidence of the disease. Therefore, the aim of this report is to produce the first scientific documentation of COVID-19 in Mizoram. As on 6 August 2020, a total of 537 cases have been reported with a recovery rate of 53.63%. Voluntary services of local community to fully support the authority are unique and worth to mention. Many people, from layman to technically qualified persons, volunteered themselves to fight the spread of the disease in the state. No death is yet reported although the doubling rate of COVID-19 case was 14.66 days. Aizawl district recorded the highest case (61.08%) followed by Lunglei and Siaha districts. Weekly data analysis showed the outbreak occurred in the 11<sup>th</sup> week (second week of June) since the nationwide lockdown in March 2020. The incidence is higher in males than in females. The infected age group ranged from 28–43 years in males and 22–33 years in females. The youngest and oldest infected age was 1 and 64 respectively. There is still no community transmission although this could occur at any moment. This report may possibly serve as a referential scientific literature to aid the retrospective and prospective studies of COVID-19 in Mizoram.

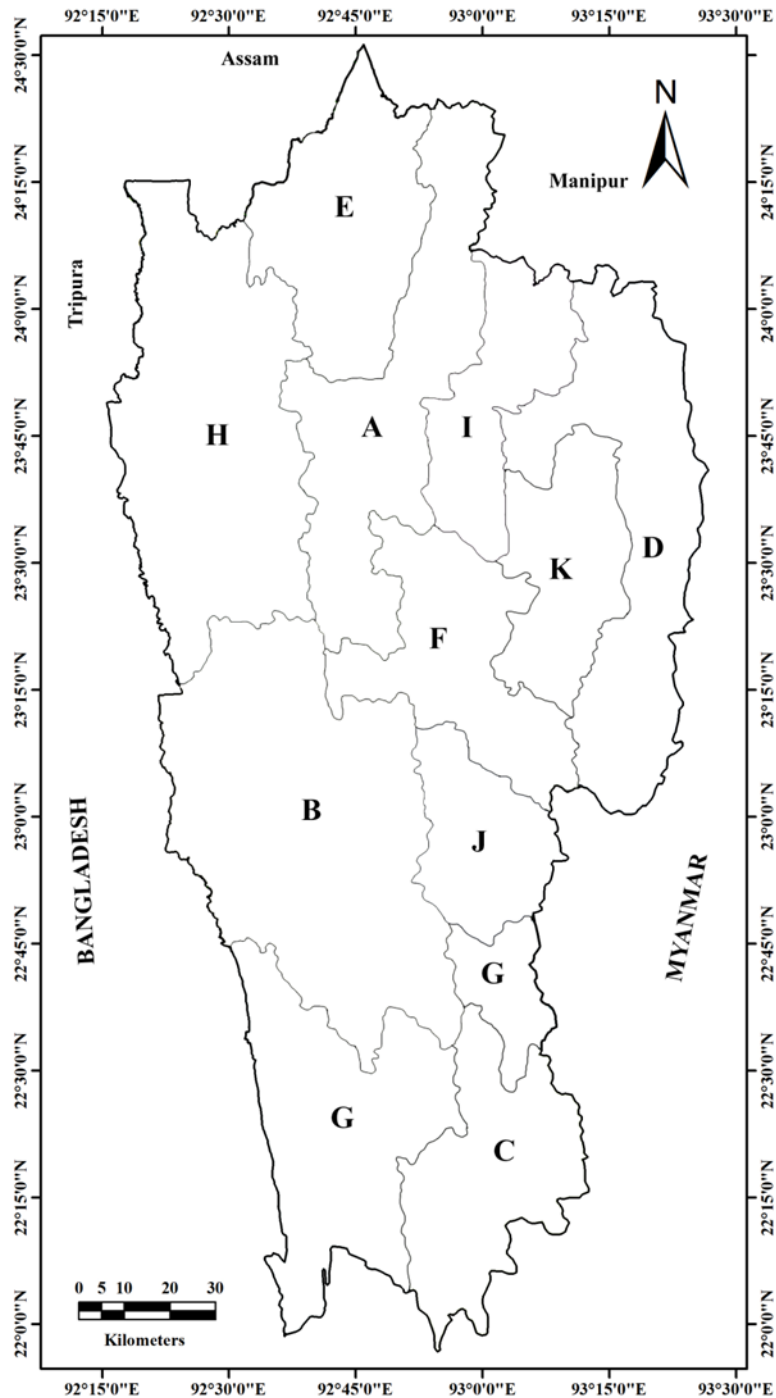
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[sciencevision@outlook.com](mailto:sciencevision@outlook.com)**Key words:** Coronavirus, COVID-19, Mizoram, India, SARS-CoV-2.

## Introduction

Coronaviruses (CoVs) are enveloped positive-sense RNA viruses that are single-stranded and non-segmented. The crown-like characteristic appearances of CoVs is attributed to the spike glycoprotein trimer projecting on the viral surface. Human coronaviruses belong to the genus *Alphacoronavirus* and *Betacoronavirus*.<sup>1</sup> 'Coronavirus disease 2019' (COVID-19) is the term given for the pneumonia-like disease that originated from the city

in Hubei Province of China called Wuhan.<sup>2</sup> The World Health Organization (WHO) declared a global health emergency on 30 January 2020 and a pandemic on 12 March 2020.<sup>3–5</sup> As on 6 August 2020; the total confirmed COVID-19 cases worldwide were 1,86,14,177 with 7,02,642 reported deaths.<sup>6</sup>

Since the detection of COVID-19 on 30 January 2020 in Kerala, it has spread throughout India.<sup>7</sup> In Mizoram, the total number of active cases, recovered



**Figure 1** | Map of Mizoram showing different districts (A = Aizawl, B = Lunglei, C = Siaha, D = Champhai, E = Kolasib, F = Serchhip, G = Lawngtlai, H = Mamit, I = Saitual, J = Hnahthial, K = Khawzawl); inter-state borders (Assam, Manipur and Tripura) and international borders (Bangladesh and Myanmar).

and totals COVID-19 cases as on 6 August 2020 were 249, 288 and 537 respectively.<sup>8</sup> Mizoram (Figure 1) is a state in Northeast India that is sandwiched between Myanmar and Bangladesh.<sup>9</sup> The international boundaries coupled with the unavoidable movement along the inter-state boundaries seem to make Mizoram vulnerable to

COVID-19. As there is no scientific documentation or analysis of COVID-19 in Mizoram, the challenge was to create a scientific record of COVID-19 in Mizoram from almost zero scientific reference. Therefore, this report was written with the aim to generate the first scientific record of COVID-19 in Mizoram. With the

possibility to serve as a referential scientific literature, this report might aid in prospective and retrospective study.

## Material and methods

Information was collected from the Information & Public Relations Department, Aizawl, Government of Mizoram. The websites of the Health and Family Welfare Department, Department of Disaster Management and Rehabilitation, and Zoram Medical College were also accessed to collect information from the detection of the first case till 6<sup>th</sup> August 2020. Database of the World Health Organization and Centre for Disease Control and Prevention were also referred online. Academic database like Google Scholar, PubMed and Science Direct were utilized to retrieve scientific information on COVID-19. Statistical analyses were performed using SPSS (PASW Statistics 18) software.

## COVID-19 pathogen and the role of angiotensin converting enzyme-2 (ACE-2)

COVID-19 is caused by a viral pathogen known as *Severe acute respiratory syndrome-related coronavirus 2* (SARS-CoV-2).<sup>5,10</sup> SARS-CoV-2 falls under the genus *Betacoronavirus* and *Sarbecovirus* as the subgenus. Genetically it has 96% nucleotide identity to SL-CoV-RaTG13 of the Chinese horseshoe bat *Rhinolopus sinicus* and 88% similarity with two bat-derived SARS-like coronaviruses (bat-SL-CoVZC45, bat-SL-CoVZXC21). SARS-CoV-2 is 79% similar to SARS-CoV and 50% similar with MERS-CoV.<sup>11</sup> ACE-2 is the receptor used by SARS-CoV-2 to enter cells and is expressed in the adipose tissue, brain stem, heart, ileum, kidney, lung, liver, nasal, oral mucosa and stomach.<sup>12-15</sup>

## Early transmission, incubation period and symptoms

In Wuhan, the city of Hubei Province in China, many pneumonia cases of unknown etiology were reported since 8 December 2019 wherein patients had a history of visit to the Wuhan seafood and wet market.<sup>16,17</sup> Pathogenic transmission between human to human occurs via close contacts or due to aerosols of SARS-CoV-2 floating in the air.<sup>18,19</sup> Though stool samples were found to contain SARS-CoV-2, the possibility of fecal-oral transmission is unlikely to occur owing to the absence of live viruses.<sup>19,20</sup> The incubation time reportedly ranged between 2 to 14 days.<sup>21</sup> COVID-19 clinically manifests itself as fever, dry cough, tiredness, ache, pain, sore throat, diarrhea, conjunctivitis, headache, loss of taste or smell, rash on skin or discoloration of

fingers or toes, difficulty breathing or shortness of breath, chest pain or pressure, loss of speech or movement.<sup>22</sup>

## Identification and preventive measures

Though not confirmatory, fever and cough might be indicative of SARS-CoV-2 infection.<sup>23</sup> Apart from fever and cough, loss of taste and smell is also a distinctive sign of SARS-CoV-2 infection.<sup>22</sup> Isolation of nasal and pharyngeal swabs, sputum, or bronchoalveolar lavage fluid is used for testing the presence of SARS-CoV-2. Real time-polymerase chain reaction (RT-PCR) and next-generation sequencing confirms the presence of SARS-CoV-2 in the samples.<sup>24,25</sup> Preventive measures include personal protective equipment, face mask, social distancing, quarantine, isolation and contact tracing, maintaining hand hygiene, nutritional support and physical exercise.<sup>26-31</sup>

## High risk individuals and pharmacotherapy

High-risk individuals include healthcare workers, police personals, sanitation workers, individuals with comorbidities, elderly with immuno-compromised state, pregnant women, children and neonates.<sup>32-39</sup> Though studies revealed that SARS-CoV-2 had mutated many times, significant potential drugs had emerged through rapidly expanding knowledge on the virology of SARS-CoV-2.<sup>40-42</sup> However, there is still no effective drug to treat COVID-19. Currently, Remdesivir, chloroquine, azithromycin, hydroxychloroquine, corticosteroids, tocilizumab, sarilumab, convalescent plasma and NSAIDs are drugs used to treat COVID-19 only under the supervision of a medical professional.<sup>43-48</sup>

## Scientific report of COVID-19 in Mizoram

### *Early and crucial steps taken by the Government of Mizoram (GoM)*

As the virus spread effortlessly, COVID-19 was eventually detected in Kerala, India on 30<sup>th</sup> January. The GoM was compelled to take initiatives to prevent the entry or curb the spread of COVID-19 in Mizoram. Table 1 briefly highlights some of the precautionary steps taken by the GoM before a COVID-19 case was detected in the state. To mitigate the spread of COVID-19, task force (TF) was formed at the state level, district level and at the community level throughout Mizoram.<sup>61</sup> The GoM eventually postponed and/or cancelled many of its pre-planned programmes with the hope to contain the spread of COVID-19.<sup>62-64</sup> The GoM also announced a partial lockdown from 22 to 29 March 2020, followed by total lockdown as imposed by the Government of India.<sup>65</sup> Even a commercial flight

**Table 1** | Early initiatives taken by the GoM to curb the spread of COVID-19 in Mizoram

SL. No.	Date	Initiatives
1	4 February	Medical screening point for COVID-19 was setup at an Indo-Myanmar border town called Zokhawthar, Champhai. <sup>49</sup>
2	2 March	A decision was made to send a medical team to Saisihchhuah, Lawngtlai to screen individuals coming from Myanmar. <sup>50</sup>
3	7 March	Movement along the Indo-Myanmar border via 10 villages (Lopu, Chapi, Khaikhy, Zyhno, Lodaw, Lomasu, Iana, Siasi, Laki and Khopai) in Siaha district was prohibited. <sup>51</sup>
4	10 March	Announcement was made for sealing international and inter-state borders except Vairengte and Bairabi at Assam border, Kanhmun at Tripura border and Khawkawn at Manipur border until further notice. Supply trucks were granted limited movement, but passengers were screened and their details were recorded. Advisory was given cautioning people to avoid travelling and large public gatherings. <sup>52</sup>
5	11 March	The GoM issued a notice wherein it allowed various check gates to be opened throughout the day but remained closed at night. <sup>53</sup>
6	13 March	COVID-19 helpline numbers were launched. <sup>54</sup>
7	16 March	The GoM took the decision to close educational institutions and public places (swimming pools, picnic spots, cinema hall and gymnasium) till 31 <sup>st</sup> March 2020. <sup>55</sup>
8	19 March	The GoM took a decision to shut down all tourist lodges, highway restaurants, tourist resorts, wayside amenities along with Thenzawl golf resort. Home quarantine for 14 days was made mandatory all returning citizens from outside the state. <sup>56</sup>
9	20 March	The GoM instructed all departments to work at 50% capacity. <sup>57</sup>
10	21 March	The movement of goods and passengers through Zokhawthar, Champhai was eventually stopped in public interest by the GoM. <sup>58</sup>
11	22 March	The 2020 higher secondary school leaving certificate examination was postponed. <sup>59</sup>
12	23 March	The GoM closed Lengpui airport until further notice. <sup>60</sup>

service suspended all of its pre-scheduled flights to Lengpui Airport for 28 days (19 March 2020 to 15 April 2020).<sup>66</sup>

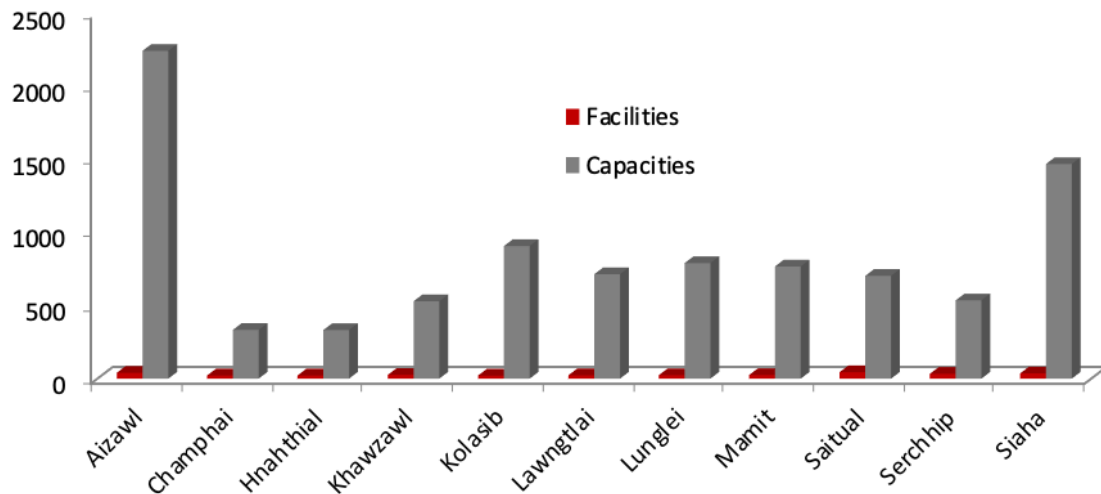
### *Testing facilities and COVID-19 isolation and treatment centre*

The GoM designated State Referral Hospital - Zoram Medical College (SRFH-ZMC), Falkawn, as the COVID-19 isolation and treatment centre.<sup>67</sup> Prior to 7 April 2020, swab samples were outsourced to test the presence of SARS-CoV-2. From 7 April 2020, the COVID-19 testing laboratory at SRFH-ZMC started to function. To maximise the capacity of SRFH-ZMC; Aizawl Civil Hospital and other private hospitals made rooms to accommodate patients admitted earlier to SRFH-ZMC.<sup>68</sup> Since 12 June 2020, TrueNat laboratory in Lunglei Civil Hospital becomes functional wherein the swab samples of quarantined migrants residing in Lunglei district were mainly tested.<sup>69</sup>

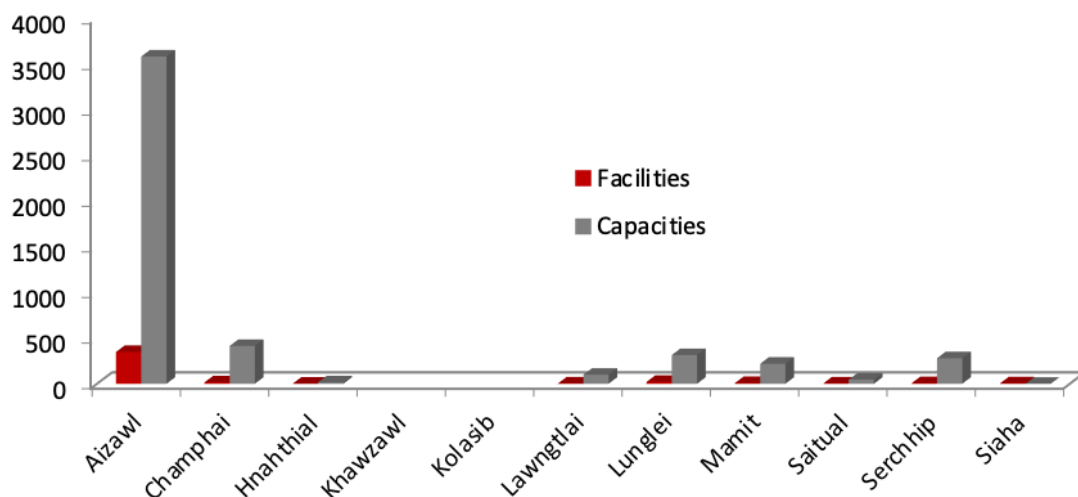
### *Quarantine facilities (QF)*

Apart from home quarantine, Mizoram have three types of QF viz. government, community and hotel/paid QF respectively.<sup>70-73</sup> Government QF include tourist lodges, circuit houses, medical quarters, covid care centres, rest houses, bungalows and others.<sup>74,75</sup> A graphical representation of district wise government and community QF and capacities are given in figure 2a and 2b respectively. There are 723 QF (government=301; community=414; hotel/paid=8) with 14,360 (government=9332; community=4969; hotel/paid=59) capacities.<sup>70-73</sup>

In total, Aizawl district has 388 QF with 5825 capacities, Siaha district has 41 QF with 1469 capacities, Lunglei district has 45 QF with 1105 capacities, Mamit district has 33 QF with 988 capacities, Kolasib district has 21 QF with 908 capacities, Serchhip district has 40 QF with 816 capacities, Lawngtlai district has 27 QF with 814 capacities, Saitual district has 48 QF with 749 capacities, Champhai district has 37 QF with 748



**Figure 2a** | Government quarantine facilities and capacities



**Figure 2b** | Community quarantine facilities and capacities

capacities, Khawzawl district has 26 QF with 530 capacities and Hnahthial district has 24 QF with 349 capacities.

**Contribution of non-government organizations (NGOs)**

The largest NGO in Mizoram known as Young Mizo Association (YMA) contributed significantly to enhance border security. YMA also cooperated strongly with the local level TF.<sup>76</sup> A total of 754 local level TF (Aizawl 151, Lunglei 129, Siaha 75, Champhai 59, Kolasib 52, Serchhip 50, Lawngtlai 44, Mamit 88,

Hnahthial 28, Khawzawl 36, and Saitual 42) operates in Mizoram to curb the spread of COVID-19.<sup>77</sup> Vegetable supply chains were effectively managed by local TF under the supervision of the Department of Horticulture as a nodal agency.<sup>78</sup> Local TF also effectively contributes to maintain vigil along the borders of Mizoram. More than 1000 locals and 500 locals volunteered for duty along the Indo-Myanmar and Indo-Bangladesh borders as well as interstate borders respectively.<sup>79</sup>

Owing to the increasing number of returnees from outside the state, Mizoram fell short of QF.<sup>80</sup> Churches of Mizoram intervened and a total of 194

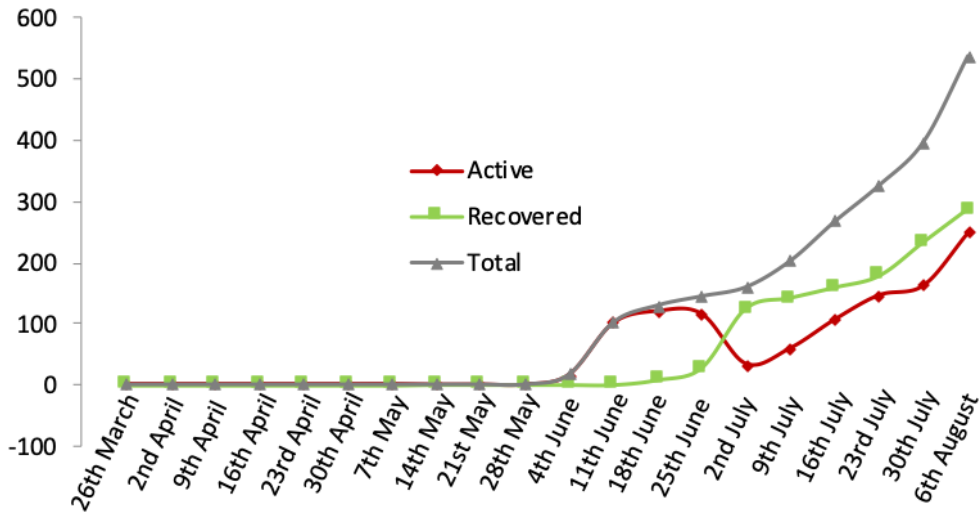


Figure 3a | Weekly representation of active cases, recovered and total cases

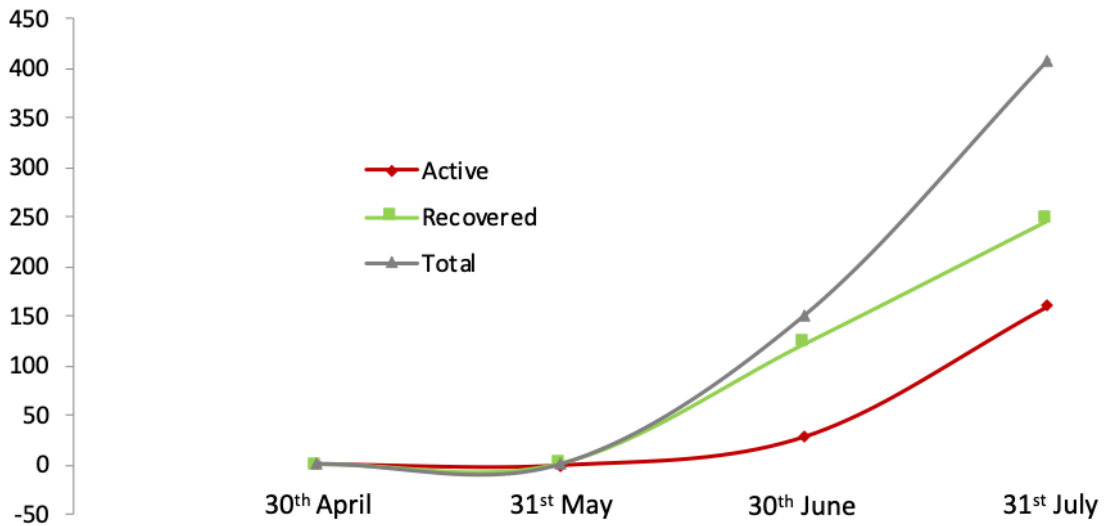


Figure 3b | Totalled monthly representation of active cases, recovered and total cases

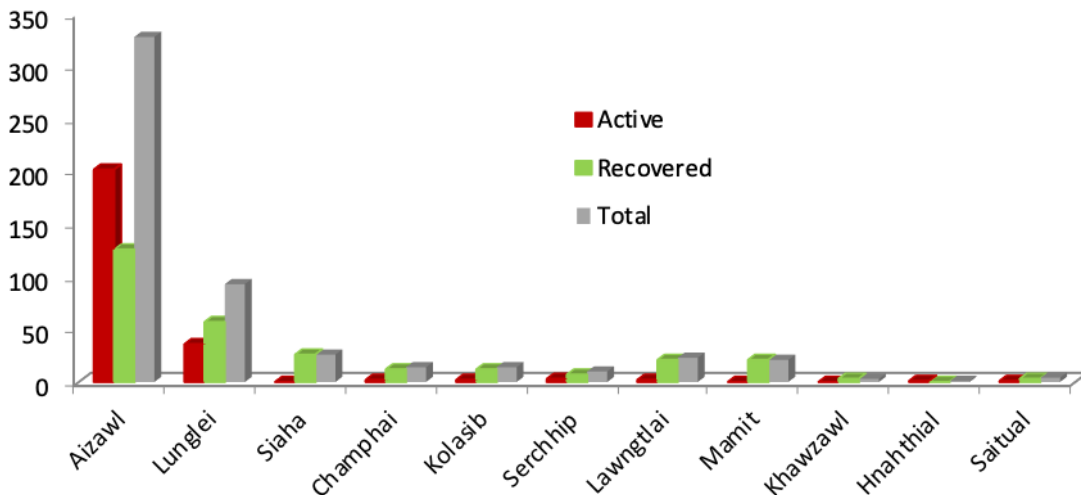
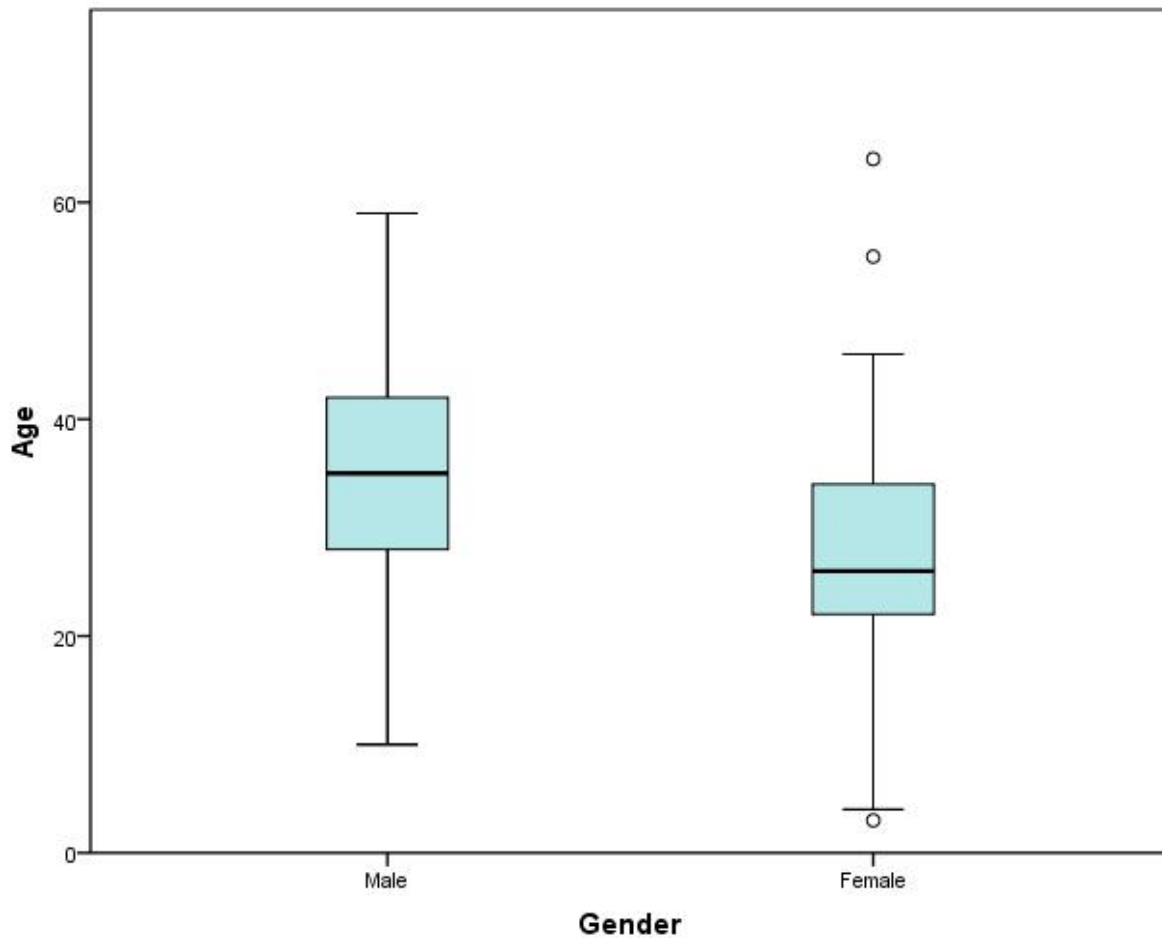


Figure 4 | District-wise status on COVID-19



**Figure 5 |** Prevalence of COVID-19 among different age groups in Mizoram

church halls were utilized for QF.<sup>81</sup> A number of people voluntarily offered help to fight COVID-19. They belong to an array of diverse profession like student, health worker, nurse, driver, lab technician, dentist and pharmacist including others that completed undergraduate and postgraduate courses.<sup>82</sup>

### Overview of COVID-19 cases in Mizoram

Mizoram declared its first laboratory confirmed COVID-19 positive case on the 25 of March 2020.<sup>83</sup> Figure 3a represents a weekly development of COVID-19 active cases, recovered and total cases from 26 March 2020 to 6 August 2020. The monthly representation of active cases, recovered and total COVID-19 cases are given in figure 3b.<sup>84-89</sup> As per the data obtained from the Information & Public Relations Department, GoM; the district wise status on COVID-19 on 6 August 2020 is given in Figure 4.

The recovery rate of COVID-19 infection up to 6 August 2020 was 53.63%. Zero death was observed during the period of analysis. Using the data on age

and gender obtained from the Information & Public Relations Department, GoM; the prevalence of COVID-19 among different age groups was statistically processed and is represented as a box plot in Figure 5. The doubling rate of COVID-19 cases during 26 March to 6 August 2020 was 14.66 days.

### Discussion

The decisions of the GoM and the cooperation from the people might have curbed the spread of COVID-19 to some extent. The GoM acted early and this might curtail the spread of COVID-19 in Mizoram (Table 1). The burden on the GoM seems to be reduced with the contribution of private individuals and NGOs in the form of financial aid or professional service. To a large extent, community quarantine centres (Figure 2a, b) seemed to greatly increase the capability of Mizoram to manage people with travel history outside the state.

From Figure 2a and b, it can be hypothesized that districts with more QF has higher capacities.

Statistical analysis revealed that the correlation between QF and capacities is significant at the 0.01 level implying that capacities increased with increase in QF. Hence, there exist a positive correlation between QF and capacities. From Figure 2a, 2b and 4, it can be hypothesized that total COVID-19 cases were higher for districts with higher number of QF and capacities. Statistical analysis revealed that the correlation between total COVID-19 cases with QF and capacities is significant at the 0.01 level meaning that a higher total COVID-19 case were observed in districts with higher QF and capacities. Hence, there exist a positive correlation between total COVID-19 cases with QF and capacities.

The initiatives to quarantine and test everyone with a travel history outside Mizoram seemed to help in early detection and isolation of COVID-19 cases. Additionally, test for any individual that had positive contact was made mandatory.<sup>90</sup> This might be an exemplary model to avoid community transmission. However, there were few instances of pathogenic transmission through positive contact. Auspiciously, there seems to be no community transmission yet as positive cases are mostly detected in individuals with travel history.<sup>84-89</sup>

Mizoram's COVID-19 curve is rising sharply (Figure 3a, b). With negligence and ignorance, the possibility to produce an adverse outcome still exists. There was an outbreak in COVID-19 cases on the 2<sup>nd</sup> week of June (Figure 3a). The outbreak may be attributed to state returnees from infected areas. During 25 June 2020 to 2 July 2020, there was a decline in the number of active cases (Figure 3a). However, the rise in active cases from the second week of July may be attributed to the movement of paramilitary force.<sup>91</sup> As on 3 August 2020, 75% of all active cases in Mizoram were personnel's of the paramilitary force.<sup>91</sup> Hence, any form of inter-state movement by any individual seemed detrimental in the fight against COVID-19. Therefore, it is advisable to refrain from unnecessary inter-state movement and travel.

With 61.08% of total COVID-19 case of the state, Aizawl district has the highest COVID-19 cases in Mizoram (Figure 4). It also has the highest quarantine facilities and capacities (Figure 2a, b). Factors like business, crowded population, presence of COVID-19 isolation and treatment centre at SRFH-ZMC may attribute to higher number of cases in Aizawl district.

Till 6 August 2020, a cumulative of 22,211 samples were tested for SARS-CoV-2, out of which 537 (2.41%) tested positive.<sup>92</sup> Low positive result may be due to very less number of sample test or may be due to strict regulation of interstate movement by the state authorities. Almost 97% of the positive cases were people who entered Mizoram from outside the state. The number of infections is much lower than the neighbouring states like Tripura (4084 cases), Assam (38809 cases) and Manipur (1926 cases).<sup>93</sup>

The prevalence of COVID-19 is higher in males (n=426; 79.3%) than in females (n=111; 20.7%).<sup>94</sup> This follows the general pattern of COVID-19 infection elsewhere.<sup>95</sup> The youngest and oldest infected age were 1 and 64 respectively. The majority of infected age group ranged between 28–42 years in male and between 21–35 years in female approximately (refer Figure 5). This could be the reason for zero fatality in the state. Globally, this virus caused death to people who are above 50 years of age.<sup>95</sup> About 93% of the infected individuals may be asymptomatic and few with mild symptoms or moderate to severe cases. Further studies may also be conducted to investigate any possible link between lifestyle choices like smoking and chewing tobacco with the rate of COVID-19 infection.

## Conclusion

The current communication offers the first referential scientific record of COVID-19 in Mizoram. Outbreak of SARS-CoV-2 infection commenced from the second week of June 2020 among migrant workers. Infected individuals were mainly in between 21-42 years of age. Mizoram records the least COVID-19 infection record among all Indian States. The data presented in this communication cover up to 6 August 2020 only.

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## Conflict of interest

There is no known conflict of interest among the authors.

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