BEFORE THE HON'BLE KARNATAKA HIGH COURT

AT BENGALURU

Interlocutory Application No. _____ of 2021

in

Writ Petition No. 6435 of 2020 (PIL) and Connected Petitions

Between:

Mohammed Arif Jameel & Anr. … Petitioners

And:

Union of India & Ors. … Respondents

INDEX

Place: Bangalore

Date: 03.05.2021

Advocate for AICCTU

Clifton D' Rozario

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INTERLOCUTORY APPLICATION FILED BY AICCTU UNDER ARTICLE 226 OF THE CONSTITUTION OF INDIA SEEKING DIRECTIONS RELATED TO SLUMS

It is respectfully submitted on behalf of AICCTU as follows:

1. The instant application is being filed by All India Central Council of Trade Unions (AICCTU), seeking for directions from this Hon'ble Court in regard to slums in light of the second wave of the Coronavirus (COVID-19) pandemic.
2. It is submitted that the situation in the slums, especially in Bengaluru is very grim. It is submitted that there are more than 1000 slums (declared and undeclared) in the city of Bengaluru, and large sections of the working class, including members of AICCTU, reside in these slums have stated in regard to the difficulties faced by them, due to the spread of COVID-19. On the one hand the workers are suffering from lack of food security in view of the lockdown, in addition to which now they are facing an alarming increase of Covid cases in their slums. Further AICCTU has also spoken to various organizations who work in slums with the urban deprived communities across Bengaluru who have also stated in regard to the extreme difficulties faced by those residing in slums.
3. That at the outset it is clarified that this application is concerned with both notified slums under the karnataka slum areas (improvement and clearance) act 1973, and non-notified slums, across the state of karnataka
4. The immediate issues to be highlighted in this regard are as follows:

- **Lack of Testing:** It is submitted that there is no testing taking place of persons residing in slums. No testing, even random testing, is being conducted in any slums by district administrations. It is reported that even in instances where several persons in one area tested positive, there was no community testing that was conducted. If they need to get tested, slum residents go to BBMP hospitals or primary health centres (PHC). There is no systematic

- **Complete lack of access to medical facilities including beds, hospitals and medicines:** It is submitted that the urban poor residing in slums have a complete lack of access to any medical facilities including beds, hospitals or medicines. It is reported that several persons passed away after having been unable to access medical facilities. Medicines are not available anywhere and are sold in the black market, for Rs. 8,000 to 9,000, which people can't afford, and even when they are able to afford it, there is a one-day delay in procuring it.

- **Vaccinations not taking place:** It is submitted that there is an urgent need to ensure the provision of vaccination to all persons who are residing in slums. It is reported that every day there is on an average only 25 to 30 doses of vaccination available in PHCs, however this vaccine is availed by persons belonging to the middle-class. There is no action being taken to spread awareness on symptoms, testing, vaccination or precautionary measures to be taken. Even where vaccination is given, slum dwellers have mostly received only single dose. For instance, in the Gandhinagar Legislative Assembly Constituency, vaccination is not available in any government hospital or PHCs, but available in Apollo Hospital, Malleshwaram. Moreover, registration for vaccination is through mobile-apps with the use of internet. Thus, making it inaccessible to a large population in slums.

- **Sanitization of Slums:** There is no sanitization of slum areas being undertaken, which is absolutely necessary as the spread of infection is very high.

- **Lack of Information:** It is submitted that there is a complete lack of information in regard to steps to be taken when a person tests COVID positive or is in need of hospitalization. Most persons are unaware about helpline numbers (even in Bengaluru), information as to where COVID Care Centres are located or the steps to be taken when hospitalization is required. There is no action being taken to create awareness on helplines and systems available or awareness on COVID precautions. Further, the helplines guides people to either send messages or e-mails, which is very difficult for the urban poor to access.

- **Misinformation:** It is submitted that there is large-scale misinformation in regard to testing and vaccination that needs to be debunked. Severe misinformation regarding vaccination, especially since the death of Actor Vivek in Tamil Nadu. Further, some slum residents refuse to test because of misinformation being circulated about how hospitals are ill-treating patients, and manner of last rites. It is necessary that the government and the urban local bodies come up with a multi-pronged information strategy to ensure the provision of information and combat misinformation in TV and social media platforms.

- **Not recording as COVID deaths:** It is reported that the deaths of several person who have passed away due to COVID, are not recorded as COVID deaths. There are larger number of deaths witnessed in slum areas, but there is no way to know whether these were COVID-related as testing is not being conducted and slum residents are unwilling to go for testing as well. These deaths are not being counted for official COVID death data for the same reason.

- **Difficulty in home-isolation:** Isolation is possible where there are single houses in slums. But, in densely populated slums with houses very close to each other and sharing walls, isolation is not possible. Some people are being sent to COVID Care Centres for isolation, but the numbers are very few. Even when isolation is to be done, precautionary measures to be undertaken by both

patients and their families is not communicated by the government authorities. In many districts, patients are required to wait at home until they find hospital/CCC bed, thus increasing risk of spreading information.

5. It is submitted that in regard to vaccination of persons residing in slum areas in Bengaluru city, this Hon'ble Court in its daily order dated 25.03.2021 in WP No. 6435/2020 observed that –

> *"2. The other issue which the State will have to answer is about administration of COVID-19 vaccine. There are large number of citizens residing in slums and shanties which include the workers working on construction sites and various sites of infrastructural projects which are underway in the city of Bengaluru. The question is whether the State should make special efforts to persuade the citizens residing in thickly populated localities who are more vulnerable to the infection of COVID-19, to take vaccines. Perhaps, it will be a step in the right direction for curbing the spread of the infection of COVID-19. The State Government shall respond on this aspect on the next date. The steps taken by Bruhat Bengaluru Mahanagara Palike as observed in paragraph 15 of the order dated 17th March 2021 shall be also placed on record within a period of one week from today."*

6. It is submitted that a report in the Hindustan Times *"Deaths rise in Bengaluru slums amid low Covid-19 testing"* dated 01.05.2021 details out the various difficulties faced by the urban poor in slums in Bengaluru, and is produced herewith and marked as **Annexure – A**.

7. In a study published by the Cambridge University as part of their Press Public Health Emergency, COVID-19 Initiative, titled – *'High seroprevalence of COVID-19 infection in a large slum in South India; what does it tell us about managing a pandemic and beyond?'*, wherein a study was conducted in D.J. Halli area of Bengaluru city to estimate the seroprevalence of COVID-19 infection in a dense slum of South India. It was hypothesised that a high prevalence of infection, considering the density of population and the impossibility of preventive measures in this area. The findings of the study are summarized as below:

   - The findings of the study suggested a very high COVID-19 seroprevalence in DJ Halli slum and if the findings were to be

extrapolated, about 57,900 people in this slum would have contracted the infection in contrast to 295 cases, which were reported.

- This is due to the hazardous physical environment, overcrowding, poor sanitation and the impracticability of social distancing, hand washing and face covers in slums, which are conducive for the rapid spread of infection.
- A vast majority of cases were asymptomatic, and hence, they harboured and dispersed infection efficiently without being caught by tests or inviting medical attention.
- Due to fear, people postponed their hospital visits for their non-communicable diseases and other life-threatening conditions.
- Loss of jobs has aggravated hunger and nutritional deprivation.

A copy of the said report is place as **Annexure – B**.

8. It is submitted that the condition of the urban deprived communities residing is extremely grave and hence this application is being filed seeking for appropriate remedies.

PRAYERS

In the facts and circumstances of the matter, the Applicant most respectfully prays that the Hon'ble Court may be pleased to direct the respondents to:

A. Take necessary steps to provide Testing Centres all slums in Bengaluru city and ensure results are provided within 24 hours.
B. Take necessary steps to provide access to medical facilities including beds, hospitals and medicines to persons residing in slums.
C. Ensure mass scale free vaccination drives in all slums
D. Ensure regular sanitization of slum areas
E. Formulate a comprehensive strategy and plan to ensure that:
    a. There is adequate information dissemination in regard to helpline numbers, information as to where COVID Care Centres are located and the steps to be taken when hospitalization is required.
    b. Establish help-desks in every slum area to guide the urban poor in availing hospital beds, CCC beds, oxygen, Remdesivir, etc.
    c. Ensure adequate steps are taken against the spread of misinformation
    d. Ensure that the supply of essential Drugs in the slum areas and

ensure correct information about the drugs are made accessible to Slum residents

e. Publicize the contact details of concerned authorities and non-government entities responsible for testing, bed allocation, supply of oxygen and essential drugs and free rations.

F. Ensure Covid test is conducted on deaths occurring in homes at slums.

G. Provide free ration kits to families residing in slums and also open community kitchens which can take care of nutritional needs of slum residents

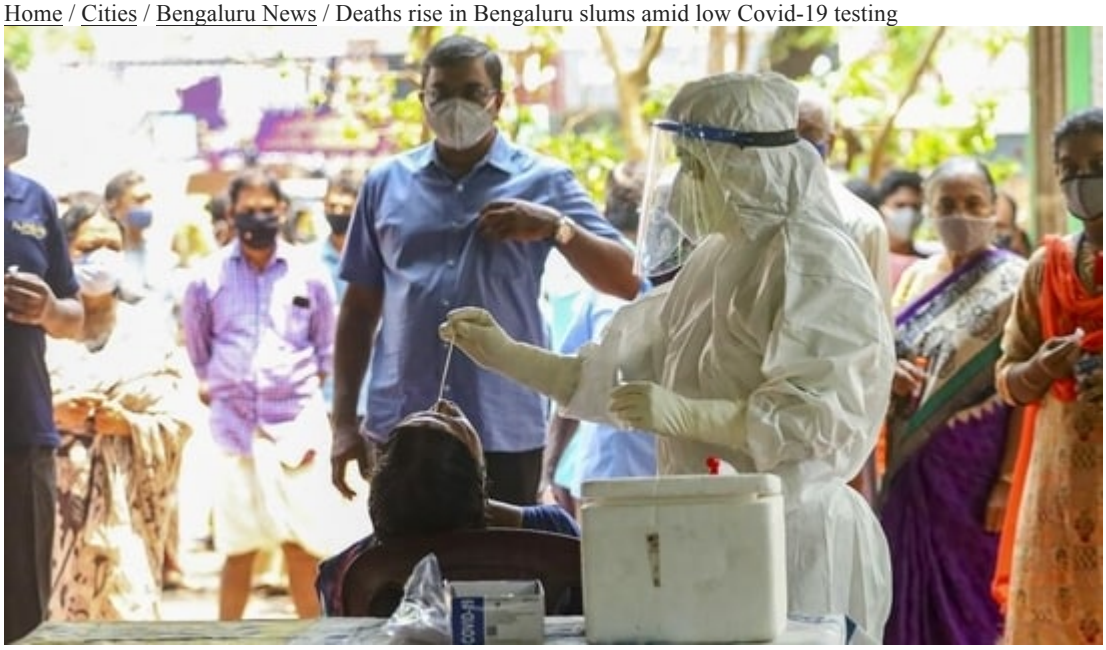
H. Pass directions to create infrastructure in identifying community halls and open areas where temporary isolation facilities can be created in and around slum areas and publicize the availability of the same in the slums.

I. Pass directions to hold consultations with trade unions and organizations that work in slum across the State

Place: Bangalore
Date: 03.05.2021

Advocate for AICCTU
Clifton D' Rozario

Annexure - A



A member of an NGO working in the locality said that testing of people in the slums have been ineffective.

BENGALURU NEWS

Deaths rise in Bengaluru slums amid low Covid-19 testing

It was when his 49-year-old wife suddenly sat down on the floor, gasping for breath, that Hafiz Mohammad Abdullah, a resident of Gopalpura slum in Bengaluru, realised something was wrong.

By Arun Dev, Hindustan Times, Bengaluru
UPDATED ON MAY 01, 2021 01:07 PM IST

Bengaluru: It was when his 49-year-old wife suddenly sat down on the floor, gasping for breath, that Hafiz Mohammad Abdullah, a resident of Gopalpura slum in Bengaluru, realised something was wrong. He rushed his wife to a nearby government hospital, where she was kept on oxygen support after her saturation levels had dropped to 40%. A couple of hours later, she passed away on 16 April. “The doctors had asked us to conduct a corona test (RT-PCR). Since she died before the test could be done, we were given the body and buried her,” Abdullah said.

Nazia Begum was among the many patients who didn’t make it to the government’s official tally of Covid-19 fatalities.

Barely 900 metres away, Siddalakahmi’s husband Mahesh passed away around the same time. The family believes he died of a heart attack. The mother of three said they had rushed him to the hospital after he complained of feeling uneasiness. After some tests at the hospital, he was declared dead. He was buried in a public burial ground. While she is unaware of the treatment given to him, she remembers that oxygen was administered.

Okalipuram ward in Bengaluru, which consists of multiple slums, there have been at least 16 non-Covid deaths, where the family members and other contacts have been tested. Nazia and Mahesh were among them. While Siddalakshmi continues to believe her 52-year-old husband

died of a heart attack and goes about her day, Abdullah says he has been confined to his home. Neither got a Covid-19 test.

Veena, a transsexual woman, who has been working in the ward since the first wave of the Covid-19, said there is a fear among people to admit that their families have got the virus. “I can’t tell if all 16 deaths in the last one month were Covid-19 patients…In many cases, there are symptoms suggesting Covid,” she said.

A member of an NGO working in the locality said that testing of people in the slums have been ineffective. “There were no mass testing drives conducted in the slums, even though they were high-risk area. We can’t completely blame authorities even people were against such camps. But there are several Covid-19 deaths that have gone unreported here. Now the government has decided to test those who are symptomatic,” the NGO worker said.

A few km away in KP Agarahara, in one of the slum areas, the body of 66-year-old Nagalakshmi was found on April 20 in her house. It has been at least a couple of days before the body of the woman, who was living alone, was spotted by neighbours. In the house, they found a document dated April 17, in which she was tested positive for Covid-19 in an antigen test.

“Removing her body took time as we had to contact the BBMP for PPE kits. When we asked the BBMP about why she was not contacted or had any follow-up calls even though she had tested positive, officials said they had no information about her testing positive,” said Rajesh K, a local activist, who arranged for her funeral.

Rajesh said there have been at least 20 deaths in the slums around KP Agrahara. These were not tested positive for Covid and many of them died at home.

For Rajesh and other volunteers, the biggest concern is vaccination. “We want more people to get vaccinated, but there are two problems. First, people are not coming forward to get themselves vaccinated. The death of Tamil actor (Vivek) and misinformation about it has been a big problem. People think they would die after taking the vaccine,” he said.

The second problem, according to him is BBMP workers’ focus on getting their targets met. “Health workers who were earlier helping with the testing now have the responsibility to administer the vaccine and they have a target. So, to meet these targets, they are going to Majestic (Kempegowda bus terminal) where they are able to get more people and slum areas are being affected. We are now trying to create a vaccine centre on our own and get BBMP officials to set up a camp here,” he said.

In Rayapuram ward too, which has several slums, 15 deaths were reported in the last 10 days, in which 10 were related to Covid-19 complications. While primary contacts have been tested in many of the cases, for the residents getting medical facilities has been the problem.

With ambulances charging up to ₹40,000, a volunteer group called Rayapuram Covid Warriors, has set aside three autorickshaws to transport patients. They have also converted

the Ambedkar Bhavan nearby into a temporary Covid centre. Despite these efforts, deaths continue in the locality.

Venkatesha, a resident of Rayapuram, took his 42-year-old wife Peddamma to several hospitals in search of an oxygen bed. “We searched for two days and in the end took her back home. She died at home. We thought at least she will die with all of us around her,” said Venkatesha.

Epidemiology and Infection

cambridge.org/hyg

High seroprevalence of COVID-19 infection in a large slum in South India; what does it tell us about managing a pandemic and beyond?

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Abstract

People living in urban slums or informal settlements are among the most vulnerable communities, highly susceptible to coronavirus disease 2019 (COVID-19) infection and vulnerable to the consequences of the measures taken to control the spread of the virus. Fear and stigma related to infection, mistrust between officials and the population, the often-asymptomatic nature of the disease is likely to lead to under-reporting. We conducted a cross-sectional study to determine the seroprevalence of COVID-19 infection in a large slum in South India 3 months after the index case and recruited 499 adults (age >18 years). The majority (74.3%) were females and about one-third of the population reported comorbidities. The overall seroprevalence of IgG antibody for COVID-19 was 57.9% (95% CI 53.4–62.3). Age, education, occupation and the presence of reported comorbidities were not associated with seroprevalence (*P*-value >0.05). Case-to-undetected-infections ratio was 1:195 and infection fatality rate was calculated as 2.94 per 10 000 infections. We estimated seroprevalence of COVID-19 was very high in our study population. The focus in this slum should shift from infection prevention to managing the indirect consequences of the pandemic. We recommend seroprevalence studies in such settings before vaccination to identify the vulnerability of COVID-19 infection to optimise the use of insufficient resources. It is a wake-up call to societies and nations, to dedicate paramount attention to slums into recovery and beyond – to build, restore and maintain health equity for the 'Health and wellbeing of all'.

Introduction

Coronavirus disease 2019 (COVID-19) is a pandemic of historic significance characterised by its ubiquitous presence, accelerated expansion and catastrophic economic consequences. Globally, over a few months of the pandemic outbreak, India became one of the epicentres of this contagion, contributing to one-sixth of the world's reported cases [1]. 'Slums' or 'informal settlements' which are home to at least 5.4% (65.5 million) of India's population, paint the most vulnerable landscape for COVID-19 infections, both in terms of susceptibility and consequences [2].

Devarajeevanahalli (DJ Halli), also known as the 'Dharavi of Bangalore' is one of the largest governments notified slums in Bangalore, extending over 1.15 km^2 with an estimated population of 100 000 people [3–5] (Fig. 1). The Bangalore Baptist Hospital (BBH) has been rendering primary care services in this slum for the past decade. BBH supported the DJ Halli population and complemented government efforts by continuing primary health services throughout the pandemic when all other private hospitals in the area closed owing to high risk of infection in slums [6, 7]. Because DJ Halli is a typical slum with a likelihood of rapid contagion, the official data of less than 295 cases and 17 deaths, 5 months past the first case, sounded unrealistic [8, 9]. Poor cooperation with the state government's testing efforts was a reality as the people in DJ Halli did not trust the government's welfare motives after parliament passed the Citizenship Amendment Act, 2019 [10, 11]. Further, screening and testing efforts were hindered by communal violence which claimed three lives in this area [12].

At this time, officials, public health experts and healthcare providers were not clear about the infection status of the slum. One side argued that effective campaigns curtailed infection in the slums and the other group postulated high rate of asymptomatic infection. Both arguments were plausible and needed different resource allocation: for low infection rate and high susceptibility, our response should be COVID-19 specific and for high infection and herd immunity, our response should gear towards resource re-allocation to other diseases and damages caused by COVID-19 crisis.

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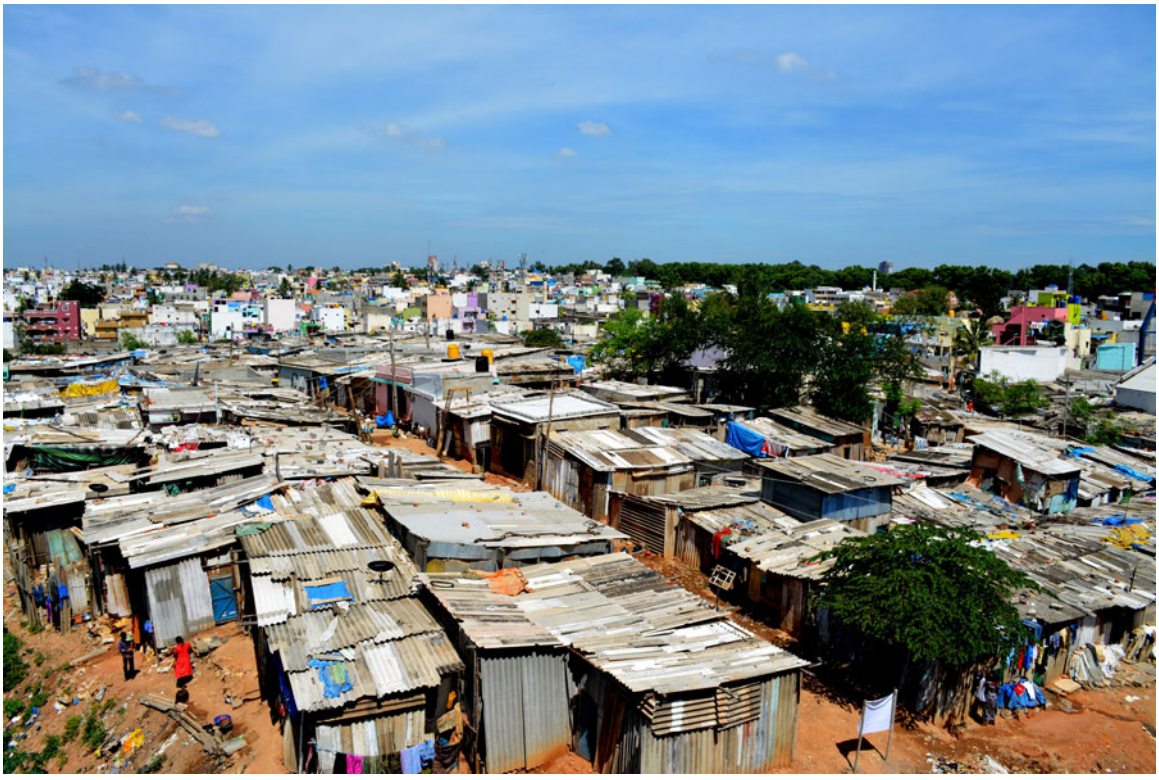

Fig. 1. Aerial View of Devarajeevanahalli (DJ Halli) slum, Bangalore [1].

Though challenging, investigating the seroprevalence of COVID-19 in DJ Halli slum was critical for us to plan the health and social interventions in this slum. Since there is a lack of information regarding the seroprevalence in slums, the study will add to the body of evidence – to help city health officials locally and public health scientists globally.

The objective of the current study was to estimate the seroprevalence of COVID-19 infection in a dense slum of South India. We hypothesised a high prevalence of infection, considering the density of the population and the impossibility of preventive measures in this setting.

Materials and methods

Study design and sample size

We designed a cross-sectional seroepidemiological survey in DJ Halli slum based on the recommendation of WHO as the most appropriate study design after the peak transmission is established [13]. A study from slums in Mumbai, India, has reported a seroprevalence of 57% [14]. We used the formulae 4 Pq/d^2 and calculated a minimum sample size of 470 with an absolute precision of 5% and a design effect of 1.2.

Data collection

DJ Halli consists of two wards (administrative blocks), each of which was further divided into four clusters for sampling purposes. A kiosk was set up in one of the trusted community spaces in each cluster. Our community health workers invited people (adults ⩾18 years) from houses to give blood samples. If a household refused to participate, then the next house was approached. In each cluster, mobilisation continued till the desired sample size was achieved. We explained the purpose of the study, took written consent and interviewed people with a questionnaire. The questionnaire contained questions about demographic information (age, gender, education, comorbidities such as diabetes, hypertension, lung disease and cancer), history of exposure to COVID-19 infection (history of being diagnosed as COVID-19 case, interaction and household contacts with persons with confirmed COVID-19), any history of COVID-19-related symptoms a month before the survey and their self-reported compliance to handwashing and use of face masks. Our Phlebotomists collected 5 ml of blood from each participant via venepuncture in a plain vacutainer and transported to BBH laboratory (The Indian Council of Medical Research (ICMR) and NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited) within 5 h maintaining the cold chain.

Sample processing and analysis

The serum was separated and used to test for antibodies using the Elecsys Anti SARS CoV2 assay, an electrochemiluminescent immunoassay using a recombinant protein representing the nucleocapsid (N) antigen for the determination of high-affinity antibodies including IgG against SARS CoV2 [15]. This assay employs a cutoff index (COI) that is automatically calculated from two calibration standards – a COI of 1.0 or more is considered reactive/positive and a COI less than or equal to 1.0 is reported as nonreactive/negative. Serum samples with indeterminate results were repeat tested and on with indeterminate results on repeat testing were considered as negative. The assay sensitivity and specificity were reported to be 97.2% (95.4–98.4)

and 99.8% (99.3–100), respectively, in samples taken 30 days or more post-symptom onset [16].

Statistical analysis

The frequency of characteristics of the survey participants was described. Seroprevalence of COVID-19 IgG antibody was reported in per cent with 95% confidence interval (CI). Case-to-undetected-infections ratio (CIR), was calculated as a ratio of the number of reported quantitative real-time polymerase chain reaction (RT-qPCR)-confirmed COVID-19 cases, 2 weeks before the initiation of serosurvey (IgG antibodies against SARS-CoV-2 infection start appearing by the end of the first week after symptom onset and most cases are IgG positive by the end of the second week) to the number of people who have IgG antibodies [17]. Assuming a 3-week lag time from infection to death, we considered the reported number of deaths after 3 weeks of the survey to estimate the plausible range of the infection fatality ratio (IFR) [16]. It was calculated as the number of deaths reported upon the total number of people with IgG antibodies per 10 000 infections. The association of seroprevalence with comorbid conditions and socio-demographic characteristics was tested using chi-square tests.

Ethical consideration

The Ethics Committee on Bangalore Baptist Hospital approved the survey protocol on 30 June 2020. Written informed consent was obtained from the participants and the test results were communicated to them.

Results

Our 499 participants were equally distributed in both wards (0.53% and 0.47%). The mean age was 39.7 + / 14.5 years and the majority (74.3%) were females. Most people (96.9%) had less than 12 years of education and 56.5% did not have any job. About one-third of the population reported comorbidities (see Table 1). Hypertension (19.2%) and diabetes (15.4%) were reported as the most common comorbidities. The majority of people reported frequent use of hand sanitisers (97.8%) and face covers (88.4%).

The overall seroprevalence of IgG antibody for COVID-19 was 57.9% (95% CI 53.4–62.3) (Table 2). When we adjusted for the sensitivity and specificity of the diagnostic kit the adjusted seroprevalence was 54.6% (95% CI 50.23–58.97). Seroprevalence among participants with diabetes and hypertension was 62.3% and 66.6%, respectively, but the association with seropositivity was not significant. Among the seropositive individuals, 41.6% had a history of an infected family member and 33.3% gave a history exposure to a COVID-19 infected person in the past. The majority (95.2%) of the seropositive individuals, did not report any symptom related to COVID-19 infection at the time of the study nor in the past. This study estimated 195 undetected infected individuals for every RT-PCR confirmed case, i.e. CIR of 1:195. The IFR was calculated as 2.94 per 10 000 infections as on 20 October 2020 in this slum.

Age, education, occupation, presence of comorbidities and presence of self-reported symptoms were not associated with seroprevalence (*P*-value >0.05) whereas female gender was significantly associated with seroprevalence.

Table 1. Socio-demographic profile of the study population

Demographics	Categories	*N*	%
Age (in years)	≤20	36	7.2
	21–40	254	50.9
	41–60	167	33.5
	>60	42	8.4
Gender	Male	128	25.7
	Female	371	74.3
Education	Illiterate	126	25.3
	Primary to high school (⩽12 years of formal education)	357	71.6
	Graduate	16	3.1
Occupation	Unemployed	282	56.5
	Domestic helper	38	7.6
	Daily wage labourer	55	11
	Professional	53	10.6
	Others	71	14.2
Comorbidities	Any comorbidities	159	31.9
	Diabetes	77	15.4
	Hypertension	96	19.2
	Heart diseases	5	1.0
	Others	20	4;0
Risk factors	Tested positive for COVID 19	15	3.0
	Family member tested positive for COVID 19	12	2.4
	Had an interaction with COVID 19 patient	9	1.8

Discussion

Our findings suggest very high COVID-19 seroprevalence in DJ Halli slum. This is consistent with the study from Mumbai slums, where a prevalence of 57% was noted 3 months past index case. If we extrapolate our findings to the whole of DJ Halli slum, 57 900 people in this slum would have contracted the infection in contrast to 295 cases which were reported. This is no surprise, as the hazardous physical environment, overcrowding, poor sanitation and the impracticability of social distancing, hand washing and face covers in slums, are conducive for the rapid spread of infection [18–22]. Another important learning is that the vast majority of cases were asymptomatic. Hence, they harboured and dispersed infection efficiently without being caught by the tests or inviting medical attention.

A recent survey done in all 30 districts of Karnataka state, conducted from 16 September 2020 among all adults aged 18 years and above, reported adjusted IgG seroprevalence of 16.4% [23]. Though low (pregnant women attending the antenatal clinic), moderate (persons moving in the community) and high risk (elderly and persons with comorbid conditions) population group were covered, the survey did not include population from slums, a possible explanation for low prevalence. This study also estimated that there were 40 undetected infected individuals for every RT-PCR confirmed case, i.e. CIR of 1:40, ranged from 10

Table 2. COVID-19 seroprevalence in the study population

	Category	Male	Prevalence (95% CI)	Female	Prevalence (95% CI)	Total	Overall prevalence (95% CI)
Age (years)	≤20	13	46.2 (19.2–74.9)	23	56.5 (34.5–76.8)	36	52.8 (35.5–69.6)
	21–40	55	43.6 (30.3–57.0)	199	61.8 (54.7–68.6)	254	57.9 (51.5–64.0)
	41–60	42	54.8 (38.7–70.2)	125	61.6 (52.5–70.2)	167	59.9 (52.0–67.4)
	>60	18	44.4 (21.5–69.2)	24	62.5 (40.6–81.2)	42	54.8 (38.7–70.2)

to 111 across units [23]. In the national seroprevalence survey conducted by ICMR, the CIR was 81.6–130.1 in the first round (May) [24]. Our CIR is higher than other surveys and can be attributed to the low testing rates at the beginning of the epidemic.

Calculation of IFR is dependent on an accurate reporting of deaths and the number of estimated infections. Reported IFR may be an underestimate, as the real death due to COVID 19 is likely to be more than reported deaths. The overall IFR based on the serosurvey findings was much higher than that reported from Santa Clara County, USA (0.12–0.2%), Iran (0.08–0.12%), Brazil and Spain (1%) and of India in May [24–26]. This can be explained by the differences in access to healthcare facilities, quality of care and variation in the prevalence of comorbidities

A previous study in the same slum noted a higher prevalence of hypertension (35.5%) and diabetes (16.6%) [8]. In that previous study, the health professionals measured blood pressure and blood sugar using a screening toolkit during a household survey. The study showed a reported-actual discrepancy in comorbidity prevalence, as more than half of the people with comorbidities were detected during the study. People in slums are known to have poor health-seeking behaviour; hence the actual proportion of people with comorbidities may be higher than what we reported in the current study.

The study participants reported improvement in hygiene measures like hand sanitation and frequent use of face covers. This may be due to improved behaviour following COVID-19 awareness campaigns led by the government and civic bodies and mandatory workplace enforcement. The possibility of social desirability bias (a discordance was noted as many were not wearing masks though they labelled themselves as frequent mask users during the survey) cannot be ruled out in this setting.

What does this 'high seroprevalence' mean to us? First and foremost, it suggests that the worst is over. It is a relief to realise that the virus spared most lives in this slum. With more than half of the population already being infected, the infection curve is likely to have started its journey down and COVID-19 will cease to be a public health problem in DJ Halli. This is confirmed by a low COVID-19 test positivity rate (1.5–2%) despite adequate testing (2000 tests per million/day) from this slum in the past one and half months (unpublished data from the government). Likewise, we also did not see any suspected cases from our DJ Halli clinic in the past 2 months. These findings provoke us to rethink the need for a vaccine in this slum. If half the population have antibodies, should we still call them vulnerable to COVID-19? Is any vaccine a match for natural infection in these settings? This study is not giving easy answers, but it does give rise to such questions.

Second, the findings suggest it is time to shift our strategy from chasing the virus' to 'mending the damages'; damages caused by other diseases when COVID-19 annexed our undivided attention and the damage caused by the loss of livelihoods. During the pandemic, the entire health system was reorganised to support to pandemic response leading to scaling down and suspension of disease control programmes, immunisation and primary health care services. Due to fear, people postponed their hospital visits for their non-communicable diseases and other life-threatening conditions. Loss of jobs has aggravated hunger and nutritional deprivation. In a survey by the WHO among 105 countries around the globe, almost every country (90%) experienced a disruption to some extent, with greater disruptions being reported in low- and middle-income than in high-income countries in essential health services across the life course [27]. We need to be cognizant about the gravity of this situation in slums which struggled with poor healthcare networks even before the pandemic and its implications on public health in the coming months.

The pandemic was clearly a catch-22 situation in slums, where, if people continued their life, as usual, they faced the risk of getting infected. If they stayed at home as was being directed, they lost their livelihoods and sources of sustenance. Hence, we shall have to find ways to keep providing 'regular' healthcare to prevent the consequences of trying to control the virus being more damaging than the virus itself. This is especially relevant in settings like this slum, where it is practically impossible to prevent the spread of the virus.

The pandemic has also brought mercies. Slums have never experienced so much attention and care as during this pandemic. Every city highlighted their slums on their maps; we witnessed 'missing millions' becoming the 'pinnacle of attention'. Government and civic bodies formed alliances, crafted strategies, pooled in resources to serve slums, thus attaining unbelievable progress on many domains in the past 3 months [28].

The possibility of another pandemic and the vulnerability of slums are stark realities in front of us. Had the mortality been higher, the contagion would have wiped millions and the slums would have been the reservoirs. Hence, we should take the lessons from this pandemic seriously. The first step would be recognising the slums and their inhabitants by improving basic living conditions, facilitating stable economic inclusion and promoting access to quality education and health services. Such investments in slums will reap huge dividends due to neighbourhood effects [29]. So, the COVID-19 pandemic is a wake-up call for governments to prioritise the humanity and dignity of residents of urban slums and to engage with these communities and experts to co-create solutions to promote the wellbeing of cities and its population.

The study may have some potential biases. We have selected different locations in the specific slum and then people were invited for the study. This sampling might have led to selection bias which could have impacted the true prevalence estimation. However, we were not able to assess the impact of this on the prevalence. Measurement bias could be another possibility due to validity parameters of the test used, however, we attempted to overcome this by reporting test performance adjusted seroprevalence rate with CI.

This is the first study reporting seroprevalence from a slum in South India and the second study from India. It corroborates the findings of the first study (peak attained within 3 months of index case) and strengthens the body of evidence related to one of the most vulnerable populations. It also gives guidance for the planners on allocating resources judiciously between COVID and non-COVID care in the slums of India which harbour more than 65 million people.

The study had few limitations. Firstly, the sampling strategy emphasised more on pragmatism than representativeness in the context of the communal violence which erupted in DJ Halli 2 weeks before the survey. Secondly, we have presented unadjusted seroprevalence rate as there was no data available on the age-sex distribution of this population. However, the estimates are very likely to be close to the real estimate as the prevalence was almost similar in all the strata. Thirdly, our sample had a smaller number of men compared to women as they were not available at home during the daytime. This might have resulted in an underestimation of seroprevalence as men have more social contacts than women in this context [24]. Fourthly, the study participants were interviewed to collect information about the history of the symptoms for the preceding month. However, as the presence of IgG antibodies reflects exposure to COVID 19 since the beginning of the pandemic, we were not able to estimate how many seropositive individuals ever had probable COVID-19 symptoms. Lastly, since we have not done RT-PCR or IgM antibodies separately, we would have missed people who were currently harbouring infection, resulting in a slight underestimation of the prevalence.

Conclusion

The study in a dense slum in South India after 3 months of index case showed a high seroprevalence of COVID-19 infection in this setting. For every case reported, there were 195 undetected cases, which unearths the implication of the often-asymptomatic nature of the disease in reflecting the true count of people with COVID-19 infection. Vulnerability to infection is the primary condition to assign priority for COVID-19 vaccination, due to vaccine demand exceeding our existing capacity of vaccine production. Hence, we should keep in mind the possibility of most vulnerable communities achieving immunity with natural infection, thus negating the benefit of the vaccine in this population. The process of carrying out a seroprevalence study in dense settlements before vaccination may prove advantageous in identifying the disadvantaged communities which will benefit most from vaccination.

It is vital to realise that containing an infectious respiratory virus was practically impossible in slums, even with the best of efforts from all sectors. Slums received attention and coordinated efforts from government and civic societies during this pandemic, which is containing the damage caused by the pandemic. We should nurture these networks beyond the pandemic to strengthen health security of slums and their inhabitants.

Since the infection is controlled in slums like DJ Halli, what is the way forward – 'hands-off' or 'all hands on the deck approach?' The answer lies in the wisdom – that the debate should not only be about the virus but more importantly, about the people living in slums!

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Conflict of interest. CEG, LRI, SC, LDW declare no conflict of interest.

Data availability statements. The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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