



Impact of COVID-19 on Livelihoods of Slum Households in Agra City, India

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ABSTRACT:

Introduction: An outbreak of the contagious COVID-19 virus will therefore be deeply challenging to contain in most informal settlements of the Global South.

Objectives: An attempt was made to assess the socioeconomic, employment, and livelihood status of urban slum dwellers in India. To evaluate the perception of the COVID-19 and lockdown among the residents of surveyed slums. What factors motivate households to wash their hands regularly?

Methods: Using a systematic multistage sampling technique, 600 samples were collected from three slums of the Agra city of Uttar Pradesh, India in June-July 2020, after the slowdown of the first COVID-19 wave.

Results: It is observed that male-headed households were aware of hand washing as a coping strategy to deal with COVID-19. The binary logistic regression model was used to examine the determinants of washing hands regularly. The results from Binary Logistic Regression show that households that have exclusive access to latrines, bathrooms, and water storage capacity are more likely to be willing to wash their hands regularly than others.

Conclusions: The findings from this study are very useful for academicians working in informal settlements, urban health, and social issues because the study highlights the susceptibility of slum dwellers and their coping behaviours to deal with a current health crisis, i.e., COVID-19.

1. Introduction

The Un-Habitat recently reported how the impact and spread of COVID-19 have centred on urban areas. Over 1460 cities in 210 countries across the world have been affected so far. According to the investigation, over 95% of the total COVID-19 positive cases can be found in urban spaces ^[1]. As of May 2020, the four megacities in India—Delhi, Mumbai, Chennai, and Kolkata—composed 40% of the total cases in the country ^[2]. Although the pandemic manifests in urbanised cities, some cities are more vulnerable, i.e., Agra.

An outbreak of the contagious COVID-19 virus will therefore be deeply challenging to contain in most informal settlements in the Global South. This is because

slums are overpopulated and characterised by inadequate access to water, sanitation, waste management, and healthcare services ^[3]. This often leads to poorer health outcomes on top of inadequate housing ^[4]. A large proportion of the residents in informal settlements frequently suffer from chronic illnesses such as respiratory diseases, cancer, tuberculosis, diabetes, and obesity. The latest research highlights that their pre-existing conditions may increase the impact COVID-19 could have on people's health and well-being ^[5, 6, 7, 8, & 9]. These comorbidities have the potential to further exacerbate the impacts of a pandemic and make slum dwellers more vulnerable to COVID-19. The notions of illegality and socioeconomic exclusion that slum



dweller experience exacerbate the negative health outcomes [10, 11 & 12].

Continuous and careful handwashing to prevent COVID-19 is not always an option for slum dwellers due to unhealthy, crowded living conditions. Many slum dwellers lack access to drinking water and do not possess soap. Hand sanitizers are an expensive luxury that most people cannot afford. As slum households lack access to running water, people are forced to walk through narrow pathways to reach the nearest water sources. These slum pathways are often not even two metres wide, making the recommended physical (or "social") distancing guidelines impossible to follow.

Despite the growing empirical evidence focusing on the increased number of people exposed to urban disasters [13, 14], disaster risk management planning (including for pandemics) often proposes inadequate and narrow disaster responses [7 & 8]. Most of the time, these responses don't take into account fundamental problems, risks, and vulnerabilities, such as access to water, sanitation, and health care [9, 15, & 16].

2. Objectives

The present study was aimed at evaluating the impact of COVID-19 and the nationwide lockdown on the livelihoods and well-being of slum residents in Agra City, India. To achieve this goal, the objectives of the present study were: (i) to examine the socioeconomic attributes of the residents in the study area; (ii) to evaluate the perception of COVID-19 and lockdown among the residents of surveyed slums; and (iii) to examine the determinants of hand washing regularly.

3. Methods

Study Area: The present study was conducted in Agra City. The city spreads over an area of 140 sq. km. along the banks of the river Yamuna. The post-independence growth of the city was linked to the large-scale influx of refugees as well as migration from rural areas. This led to the congestion of the central part of the city, which to date remains highly congested with very poor civic facilities. The Census of India [17] estimates the population of Agra at 4,418,797. The slum assessment process in Agra shows that about 50% of the city's population lives in slums [17]. In the city, there are 252 slums identified [18]. There are six areas where slums are concentrated in Agra, namely Lohamandi, Rakabganj, Bundu Katra-Gwalior & Deori Road, Tajganj, Shahganj,

and the Trans-Yamuna area. In addition, there are a substantial number of slums, which are scattered. A large majority of these slums are situated along *nalas* and railway lines. Most slums in the city are characterised by poor sanitation, drainage, and water facilities. Access to basic services in each slum is a major determinant of health vulnerability.

Sampling Method: After a review of previous studies and consultation with doctors and frontline workers, a pre-tested structured schedule was prepared to elicit first-hand information on the livelihoods of urban slum households in Agra city, Uttar Pradesh. A multistage sampling technique was chosen to collect household-level data. In the first step, the most populous state in India out of 36 states and union territories was selected, i.e., Uttar Pradesh. In the second step, one district out of 75 was purposefully selected, i.e., Agra. In the third step, 3 slums out of 252 slums were randomly selected, i.e., Kamala Nagar, Shaheed Nagar, and Nai ki Mandi. In the fourth step, 200 samples from each slum were collected using a systematic random sampling technique. Thus, a total of 600 samples were selected to assess socioeconomic status, access to basic amenities, and best health practices. Moreover, a field survey was conducted in June–July 2020, soon after the slowdown of the first COVID-19 wave. As COVID-19 is a highly transmissible disease, special permission was obtained from the local administration, and a personal protection kit was used to avoid any direct contact with the residents of sample households.

Estimation Method: The World Health Organisation has recommended that washing hands regularly is one of the best coping strategies to deal with COVID-19. Hence, the binary logistic regression model was applied to examine the determinants of the COVID-19 coping strategy (washing hands regularly), while descriptive statistics were used to analyse socioeconomic status and households' perceptions of COVID-19. The present study has adopted the binary logistic regression model because its underlying assumptions are less restrictive than those of other models and because it is free from problems with the use of the ordinary least squares model [19]. The coping strategy is the dichotomous dependent variable (Y) of this model, having a binary value of one (1) if slum households have cleaned their hands regularly and zero (0) if otherwise. The model also assumes that



the use of coping strategies is a log-linear function of the exogenous variables of the term.

$$L_i = \ln \frac{P_i}{1-P_i} = Z_i = B_0 + B_1X_1 + B_2X_2 + \dots + B_nX_n + U_i \quad (1)$$

That is L_i is the log of the odds ratio, which is not only linear in X_i but also linear in the parameters. Where, L_i = logit model, P_i is the probability of washing hands regularly. Denote as:

$$P = \frac{1}{1+e^{-z}} = \frac{e^z}{1+e^z} \quad (2)$$

Where,

$$Z = B_0 + B_1X_1 + B_2X_2 + B_nX_n + U_i \quad (3)$$

Therefore, the probability of not washing hands regularly is

$$1 - P = \frac{1}{1+e^z} = \frac{1}{1+e^z} \quad (4)$$

Now, $P/(1-P)$ is simply the odds ratio in favour of washing hands i.e., the ratio of the probability that slum households will wash their hands to avoid infection of Covid-19 that he/she will not.

Thus, if $P=0.9$, it means that the odds are 0 to 1 in favour of washing hands. Therefore, if P goes from 0 to 1 (that is, as z varies from $-X_i$ to $+X_i$), the logit, L_i goes from $-X$ to $+X$. although the probability lies between 0 and 1, the logit is not so bounded. Questions were categorically asked to the respondents such as do you have exclusive access to a bathroom, latrine, safe drinking water, and do you wash your hand regularly? Finally, the study hypothesized that there are different factors affecting slum households' decision to wash their hand to avoid infection of Covid-19. Data were cleaned, coded, and analysed in the STATA statistical software version 13. Description of variables that have been used for binary logistic regression mentioned in table 1.

Table 1: Description of the Dependent and Explanatory Variables

Independent Variables	Mean	SD	Description
Washing Hands	0.53	0.51	Washing Hands ((Yes =1; otherwise = 0)

Gender	0.44	0.50	Gender (Female 1; otherwise = 0)
Age			Age (continuous)
Religion	0.73	0.44	Religion (Hindu =1; otherwise =0)
Social Group	0.18	0.38	Social Group (General = 1; otherwise = 0)
Marital Status	0.52	0.50	Marital Status (Married = 1; otherwise = 0)
Annual Income			Annual Income (continuous)
Educational Level	0.57	0.50	Education level (Literature 1; otherwise 0)
Occupational Level	0.40	0.49	Occupation level (Casual Labour = 1; otherwise =0)
Access of Latrine	0.21	0.41	Access of Latrine (Exclusive use by HHs = 1; otherwise= 0)
Access of Bathroom	0.24	0.43	Access of Bathroom (Exclusive use by HHs = 1; otherwise= 0)
Access of Safe Drinking Water	0.53	0.50	Access of safe drinking Water (Yes = 1; otherwise = 0)
Water Storage Capacity	0.40	0.49	Water Storage capacity (Yes =1; otherwise = 0)

Source: Field Survey Data, 2020.

4. Results

Socioeconomic Characteristics of Sample Households:

The results from table 2 show that more than 60% of the households in the Kamla Nagar slum belong to backward social groups, i.e., scheduled caste and scheduled tribe, while the least population of backward groups was found in the Nai Ki Mandi slum. The majority of sample households belong to the Hindu



religion. More than 80% of the sample households are literate in the Kamla Nagar slum, while only 30% of households are literate in the Nai Ki Mandi slum. As far as the occupational pattern is concerned, half of the working population in Shaheed Nagar is working as casual labour, while 33.33% and 36.67% are in Kamala Nagar and Nai Ki Mandi. The calculated annual mean income of sample slum dwellers varies from ₹161333 to ₹188833. The age of the population varies from 31 to 40.87 years. The migration status of the sampled slums is quite interesting. As reported in Table 2, 90% of sample households living in the Kamla Nagar slum are migrants, while 73.33% of slum dwellers are migrants in Nai Ki Mandi.

As far as access to basic amenities is concerned, >65% of household members hand wash regularly in Nai Ki Mandi. While in Kamla Nagar, only 43.33% of households washed their hands. It means they are well aware of health issues. Further, it is observed that only 10% of households belonging to the Kamala Nagar slum have exclusive access to a latrine, while 36.67% of households belonging to Shaheed Nagar have exclusive access to a latrine. Similar trends are also observed for access to the bathroom. As the present study is objectively willing to examine the determinants of hand washing, access to safe drinking water and water storage capacity are two critical components for the estimation. About 50% of the households belonging to Shaheed Nagar have access to safe drinking water, while only ¼ of the households belonging to Kamala Nagar have water storage capacity.

Households' Perception of COVID-19: Households' perception of COVID-19 shows their risk-aversion capacity to deal with the pandemic (Fig. 1). The serious issue with COVID-19 is that the proper medical facilities are not yet available. Therefore, ex-ante and ex-post coping strategies are vital to combating the pandemic. Ex-ante coping strategies like awareness about social distancing not only control the spread but also reduce the risk of community spread. Further, ex-post adaptation strategies like awareness about the symptoms, testing procedures, and quarantine period have reduced the health expenditure. The results from Figure 1 show that >90% of surveyed households are well aware of both ex-ante and ex-post coping strategies. The perception of

health hazards was also captured. The results show that the majority of surveyed households perceive that the frequency of health hazards has increased over the past ten years. During the field survey, households revealed that incidents of diarrhoea and cholera have increased with the increasing temperature. Further, >90% of slum households are well aware of the role of social distancing in dealing with COVID-19.

Determinants of Coping Strategy to COVID-19

(Hand Wash): The Binary Logistic Regression (BLR) has been used to identify factors determining households' decisions in coping with COVID-19. The method best predicts the probability that a slum dweller will adopt a suitable strategy for COVID-19 in a bid to mitigate its adverse effects. The decision of slum dwellers has a discrete value (1, 0). One (1) denotes slum dwellers who did not cope with COVID-19.

Table 3 shows the estimated parameters of the empirical binary logistic model. The regression classification table 3 indicated that BLR predicted about 88% of the responses correctly. The model fits the data at $p < 0.001$, as indicated by the chi-square ($\text{prob} > \chi^2$) goodness of fit statistics. The goodness of fit demonstrated that the variables captured in this study were valid. It explains the factor that determines the willingness of a slum dweller to adopt a hand-wash coping strategy in dealing with COVID-19 in surveyed slums. Study results also reject the null hypothesis and accept the alternative hypothesis, stating a significant relationship between the capture variables and slum dwellers' willingness to adopt a coping strategy. Socioeconomic and access to basic amenities data were considered as determinants of coping strategies for COVID-19, i.e., hand washing.

The BLR results show that all the socioeconomic and extension services are positively and statistically significantly associated with the dependent variable (i.e., hand washing) except age and occupational level. In other words, households headed by men are more likely to wash their hands more regularly than female-headed households. Similarly, higher-income and educated households that have access to a latrine and bathroom, along with access to safe drinking water and water storage capacity, are more likely to wash their hands than others.



In order to capture the probability of determinants, odd ratios were calculated. For instance, the calculated odds ratio shows that there is a 1.26 times higher probability of washing hands if the slum dweller is male-headed. Further, education level significantly and positively influences the slum dwellers' probability of washing their hands regularly. The calculated odd ratio shows that there is a 4.35 times higher probability of washing hands if the slum dweller is educated above the secondary level. The calculated odd ratio shows that

there is a 3.95, 2.46, and 3.24 times higher probability of washing hands if slum dwellers have access to a latrine along with access to safe drinking water and storage capacity.

As far as access to basic amenities is concerned, access to a latrine, bathroom, safe drinking water, and water storage capacity are positively and significantly associated with the coping strategy, i.e., washing hands.

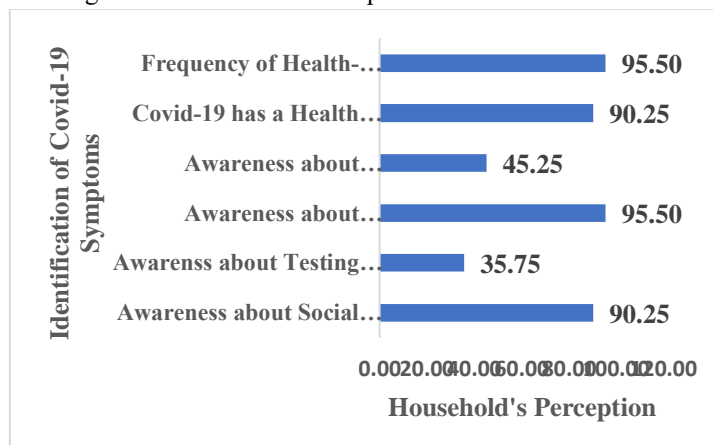
Table 2: Socioeconomic Characteristics of Sampled Slum Households

Socio-economic Indicators	Kamla Nagar	Shaheed Nagar	Nai Ki Mandi
<i>Social Group (%)</i>			
General			
Other Backward Caste	16.67	0.00	36.67
Scheduled Caste	23.33	56.67	33.33
Scheduled Tribe	40.00	43.33	30.00
	20.00	0.00	0.00
<i>Religion (%)</i>			
Hindu	73.33	76.67	70.00
Muslim	10.00	23.33	30.00
Others	16.67	0.00	0.00
<i>Educational Level (%)</i>			
Literate	86.67	53.33	30.00
Illiterate	13.33	46.67	70.00
<i>Occupational Status (%)</i>			
Self-employed	23.33	0.00	3.33
Regular wages	30.00	16.67	20.00
Casual Labour	33.33	50.00	36.67
Others	13.33	33.33	40.00
Annual Income (INR)	161333	177667	188833
Age (years)	31	40	32
<i>Migration Status (%)</i>			
Migrants	90.00	56.67	73.33
Non-migrants	10.00	43.33	26.67
Household members washing hands on a regular basis (%)	43.33	50.00	66.67
Household members having exclusive access of latrine (%)	10.00	36.67	16.67
Household members having exclusive access of bathroom (%)	13.33	33.33	26.67
Household members having access of safe drinking water (%)	56.67	43.33	60.00
Household members having water storage capacity (%)	26.67	50.00	43.33

Source: Field Survey Data, 2020.



Figure 1: Households' Perception on COVID-19



Source: Field survey, 2020. Note: values are in percent

Table 3: Determinants of Coping Strategy (Hand Wash =1; otherwise= 0)

Independent Variables	Coefficient	Odds ratio
Gender (Female = 1; otherwise = 0)	0.158*	1.26
Age (continuous)	-0.012**	0.58
Religion (Hindu =1; otherwise = 0)	0.789*	1.28
Social Group (General =1; otherwise =0)	2.925*	0.45
Marital Status (Married = 1; otherwise = 0)	0.565*	1.42
Annual Income (continuous)	0.018*	3.45
Education level (Literate =1; otherwise = 0)	1.482**	4.35
Occupation level (Casual Labour =1; otherwise = 0)	-0.557**	0.59
Access of Latrine (Exclusive use by HHs =1; otherwise =0)	0.543*	3.95
Access of Bathroom (Exclusive use by HHs =1; otherwise =0)	0.681*	0.15
Access of safe drinking Water (Yes =1; otherwise =0)	0.010*	2.46
Water Storage capacity (Yes =1; otherwise =0)	1.969*	3.24
Constant	2.170**	0.24
Log likelihood		-45.441
LR chi2(12)		33.481
Prob > chi2		0.0008
Pseudo R2		0.8892
Number of observations		600

Source: Field Survey Data, 2020.

5. Conclusion and Policy Recommendations

The paper provides an understanding of the coping decisions adopted by sample slum dwellers. As a process of involving perceptions of COVID-19, slum dwellers utilised their learning from available information sources, i.e., social media, television, medical advisories, and new papers, in dealing with COVID-19 risks. Their

interdependence on neighbourhoods and relatives (agents) through social relationships and institutional mechanisms in the form of extension services (free rations and medical assistance) helped in undertaking adaptation action.

The binary logistic regression analysis shows that access to safe drinking water is very critical to washing hands



regularly when water is not sufficiently available for even drinking. Further, results show that access to latrines, safe drinking water, and water storage capacity is positively and significantly associated with the coping strategy, i.e., washing hands, recommended by the World Health Organisation (WHO). In total, the results provide a useful guideline for identifying health disasters and slum-specific coping strategies and enable policy interventions to strengthen existing health infrastructure.

The study has several policy implications. First, increasing the effectiveness and reach of the COVID-19 welfare, relief, and recovery schemes for ultra-vulnerable groups, including migrant "trapped" populations and people residing in informal settlements. Second, there are a limited number of mobile health centres as established by the local administration in Agra city. Hence, we are setting up mobile clinics close to vulnerable locations to provide immediate testing, isolation, and treatment for people who test positive. Third, it is observed that surveyed slums have limited access to safe water, are overcrowded, have temporary shelter, and have inadequate access to public transportation. Hence, improving access to water and sanitation, food, adequate shelter, and transportation facilities within slums. These efforts ought to be ensured throughout the pandemic as well as continued in its aftermath while focusing on achieving the Sustainable Development Goals (SDGs). Fourth, targeting weaknesses in the disaster response capacities of urban local governments and strengthening their ability to better respond to emergencies in the future. Fifth, investing in city-level public healthcare systems that provide health services in normal times will increase their capacity to respond to unprecedented moments like COVID-19. Lastly, allocating resources and support to local urban bodies and NGOs to provide basic human rights for all, including safe food, drinking water, sufficient sanitation, adequate housing, and prevention, treatment, and control of diseases, as well as public healthcare facilities.

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