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Impact of Socioeconomic Status on COVID-19 Severity among Urban and Rural Areas in India

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) is considered as the deadliest disease that has spread recently all over the world. This study explores the connection between socioeconomic status and the intensity of COVID-19, emphasizing the disparities found between rural and urban areas in India.

Methods: Total 326 COVID-19 subjects including 259 cases with high socioeconomic status and 67 cases with low socioeconomic status were enrolled in the study. Using data from August 16 to September 26, 2020, from Era University, Lucknow. We evaluated the frequency and intensity of COVID-19 cases and contrasted urban and rural areas based on their socioeconomic status.

Results: In this study, we have observed that in rural population with high socioeconomic status mild and severe cases were 43% and 57%, respectively, while in rural population with low socioeconomic status, mild and severe cases were 86% and 14%, respectively. We have also found that in urban population with high socioeconomic status, mild and severe cases were 79% and 21%, respectively, while in urban population with low socioeconomic status mild and severe cases were 81% and 19%, respectively. On comparing the severity of COVID-19 among urban and rural population with different socioeconomic status. We have observed that urban population with high socioeconomic status were having significantly higher severity rate compare to rural population (p=0.00194, 0.567). On comparing socioeconomic status with the severity of COVID-19 among urban and rural population we have observed in rural population mild cases were significantly higher in low socioeconomic status, whereas severe cases were significantly higher in high socioeconomic status (p=0.027).

Conclusions: In India, the high socioeconomic status of both urban and rural populations was closely linked to the severity of COVID-19.

Keywords: *Demographics, Rural Areas, Severity, Socioeconomic Status, Urban Areas.*

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INTRODUCTION

Infectious diseases continue to be a significant issue affecting the health and survival of both humans and animals, leading to considerable healthcare costs in India. The country has encountered many infectious diseases outbreaks in the past. However, great successes have already been achieved to overcome major epidemic diseases like malaria, cholera, plague and leprosy. The COVID-19 pandemic has emerged as an unexpected threat to global public health.[1,2,43] Recent study published in the Lancet medical journal by a Chinese researcher mentioned that the first patient with COVID-19 symptoms was diagnosed on 1st December, 2019.[3-5] On January 30, 2020, India announced its first confirmed case of COVID-19. On March 4, 2020, a person in Delhi spread the virus to six relatives. That same day, 14 Italian tourists and their Indian driver were also diagnosed with the virus.[6] India's first death due to COVID-19 was reported on March 12, 2020, and involved a 76-year-old man who had recently returned from other country.[7] By July 20, 2022, India had reported 43,847,065 confirmed cases in and 525,930 fatalities. The country's uneven population distribution and differences in the socioeconomic status show unique patterns in the spread of viral diseases.[8-9] UN-Habitat's newly unveiled COVID-19 response strategy highlights the disease's strong impact on urban areas. According to the plan, the pandemic has impacted more than 1430 cities, with urban regions representing about 95% of all documented cases.[10] In contrast, rural populations are much prone to COVID-19 by the insufficient awareness and hesitancy to seek testing and treatment, resulting in fewer hospital admissions. An additional complication is that official figures, particularly from rural regions, are deceptively low because of insufficient testing and delayed results.

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COVID-19 had widespread and varied effects globally. The disease's severity in patients ranged significantly, from those showing no symptoms to individuals experiencing critical illness with serious complications.[11,12] Various studies have indicated that multiple aspects may are taking part to the intensity of COVID-19, including high blood pressure, diabetes, and tobacco use.[13-16] Nevertheless, the relationship between other factors like socioeconomic status, which is linked to healthcare accessibility, and their impact on mortality and disease burden remains a crucial unresolved issue, particularly in cities with significant economic inequalities.[44] Consequently, we gathered patient information from August 16th to September 26th, 2020 to examine the connection between socioeconomic status and COVID-19 severity, as well as how these factors differ across rural and urban areas in India. As far as we know, this research is the initial effort to assess how socioeconomic status marks the severity of COVID-19 in both rural and urban populations of India.

MATERIAL AND METHODS

Study participants

A total of 326 COVID-19 cases were included in the study, with 259 individuals from a high socioeconomic background and 67 from a low socioeconomic background. COVID-19 data from August 16th to September 26th, 2020, obtained from Era's Lucknow Medical College & Hospital, Lucknow, Uttar Pradesh. All patients provided appropriate informed consent for their participation in the study. The selection criteria encompassed individuals confirmed as COVID-19 patients through RT-PCR testing who were over the age of 20. Excluded from the study were those who were pregnant or had a known malignant condition.

The criteria for urban areas ranges from semi-urban areas to metropolitan areas with population size 1 lakh and above and less than 10 lakh, and rural areas are those with population less than 10,000. Population density per area in 2020, was obtained from RBI estimates derived from the 2011 Indian Census population count.[17]

Data collection

A comprehensive set of clinical and demographic information was gathered from all participants using a self-administered questionnaire. Gathered information included a range of elements such as gender, age, body mass index, height, weight, severity, income, marital status, occupation, clinical history, and family medical background.

The samples were separated into two groups: severe and mild, following the standards established by the ICMR, New Delhi, India. Mild cases were defined as those whose oxygen saturation (SpO_2) was greater than 94% while breathing room air and whose respiratory rate was less than 24 breaths per minute. On the other hand, pneumonia and a respiratory rate greater than 30 breaths per minute or a SpO_2 lower than 90% in room air were considered indicators of severe cases.[31,41] In light of their socioeconomic circumstances, the study sought to compare the incidence and severity of COVID-19 in urban and rural environments.

RESULTS

Throughout the study period, a total of 326 COVID-19 patients were included, with 254 experiencing mild symptoms and 72 facing severe conditions. Among these participants, 303 (93%) were from urban regions, while 23 (7%) hailed from rural areas (Figure 1). A detailed summary of the demographic and clinical features of these patients is presented in Table 1. The mean ages of severe and mild cases were 56.96 ± 13.68 and 48.21 ± 17.07 years, respectively (p=0.0001). The Body mass Index were nearly similar for severe 25.001 ± 3.59 and mild 24.57 ± 4.08 cases (p=0.417). In this study, severe cases were high in male group (68.05%) compared to female (63.78%) and mild cases were high in female group (36.22%) compared to male (31.95%). Data for marital status shows that married cases were higher in both severe and mild condition. Our findings also indicate that diabetes and hypertension were identified as significant risk factors contributing to increased disease severity in COVID-19 patients (p=0.0007, 0.006).

Table 1: Clinical and Demographical data of COVID-19 cases.

Parameters		**Severe (72)**	**Mild (254)**	***p-value***
Age		56.96 ± 13.68	48.21 ± 17.07	0.0001
BMI		25.001 ± 3.59	24.57 ± 4.08	0.417
Gender	**Male**	49 (68.05%)	162 (63.78%)	0.502
	Female	23 (31.95%)	92 (36.22%)	
Marital Status	**Married**	46 (63.89%)	182 (71.65%)	0.204
	Unmarried	26 (36.11%)	72 (28.35%)	
Diabetes	**Yes**	32 (44.4%)	61 (24.02%)	0.0007
	No	40 (55.6%)	193 (75.98%)	
Hypertension	**Yes**	17 (23.61%)	28 (11.02%)	0.006
	No	55 (76.39%)	226 (88.98%)	

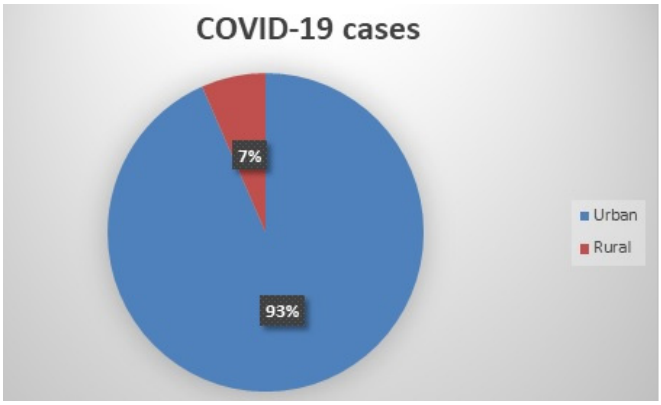

Figure 1: Distribution of COVID-19 incidence among rural and urban areas.

In this study, we have observed that in rural population with low socioeconomic status, mild and severe cases were 86% and 14%, respectively (Figure 2), while in rural population with high socioeconomic status mild and severe cases were 43% and 57%, respectively (Figure 3). We have also found that in urban population with low socioeconomic status mild and severe cases were 81% and 19%, respectively (Figure 4), while in urban population with high socioeconomic status, mild and severe cases were 79% and 21%, respectively (Figure 5). On comparing the severity of COVID-19 among urban and rural population with different socioeconomic status. We have observed that urban population with high socioeconomic status were having significantly higher severity rate compare to rural population (p=0.00194, 0.567) (Table 2). On comparing socioeconomic status with the severity of COVID-19 among urban and rural population we have observed in rural population mild cases were significantly higher in low socioeconomic status, whereas severe cases were significantly higher in high socioeconomic status (p=0.027) (Table 3).

DISCUSSION

According to WHO, over 43 million confirmed SARS-CoV-2 infections and more than one million fatalities were documented worldwide.[18] By July 20, 2020, India had reported 3,847,065 laboratory-confirmed cases and 525,930 deaths.[19] The initial case in India was identified in Kerala,[20] after which COVID-19 spread throughout the entire nation. Although many people infected with SARS-CoV-2 experienced either mild symptoms or none, some quickly progressed to other severe complications.[21]

This study presents, an analysis of the clinical and demographic characteristics, associated health conditions, and economic status of rural and urban populations in India, focusing on their connection to the severity of COVID-19. The research found that patients with mild symptoms were generally younger, with an average age of 48.21 ± 17.07, compared to those with severe symptoms, who had an average age of 56.96 ± 13.68. The overall average age of the cases in our study was 50.171 years, which is consistent with age patterns observed in China (56-years),[22] New York (63-years),[23] and Italy (63-years).[24] The severity of the disease is further influenced by the higher prevalence of comorbidities, such as hypertension and type-2 diabetes, with studies indicating that patients with these conditions are more prone to severe complications.[25] Research by Pijls *et al.*, 2020, indicates that men have a higher relative risk (RR) of 1.08, with a 95% confidence interval (CI) ranging from 1.03 to 1.12, of contracting COVID-19 compared to women.[26] This is in line with our findings, where we observed a higher proportion of male cases (65%) compared to female cases (35%).

Numerous studies have been carried out globally on demographic risk factors for COVID-19 infection, yielding varying results.[25-28] Previous studies from US, Japan, and

Table 2: Distribution of mild and severe COVID-19 cases across rural and urban populations.

CASES	RURAL (23)	URBAN (303)	Chi-square	*p-value*
High socioeconomic status	14	245		
MILD	6 (43%)	193 (79%)	9.598	0.00194
SEVERE	8 (57%)	52 (21%)		
Low socioeconomic status	9	58		
MILD	8 (86%)	47 (81%)	0.327	0.567
SEVERE	1 (14%)	11 (19%)		

Table 3: Distribution of Mild and severe COVID-19 cases across socioeconomic status.

Rural	High socioeconomic status (14)	Low socioecomic status (9)	Chi-square	*p-value*
Mild	6 (43%)	8 (86%)	4.873	0.027
Severe	8 (57%)	1 (14%)		
Urban	**High socioeconomic status (245)**	**Low socioecomic status (58)**	**Chi-square**	***P-value***
Mild	193 (79%)	47 (81%)	0.145	0.703
Severe	52 (21%)	11 (19%)		

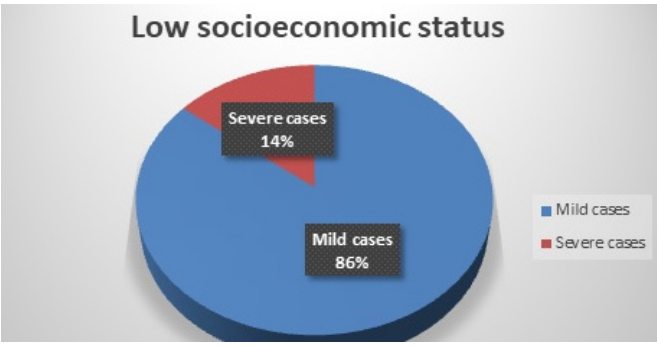

Figure 2: Severity status of COVID-19 in rural population with low socioeconomic status.

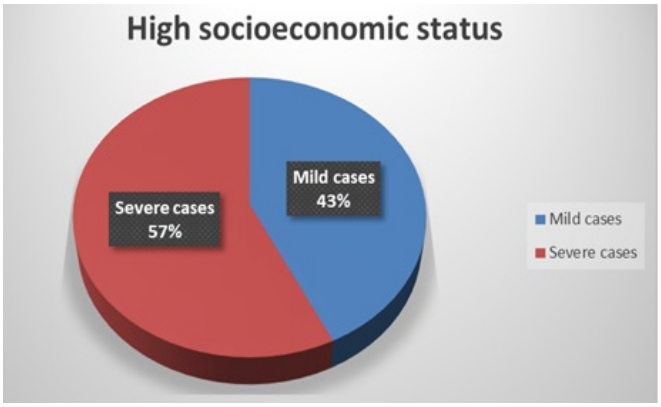

Figure 3: COVID-19 severity in rural communities with elevated socioeconomic status

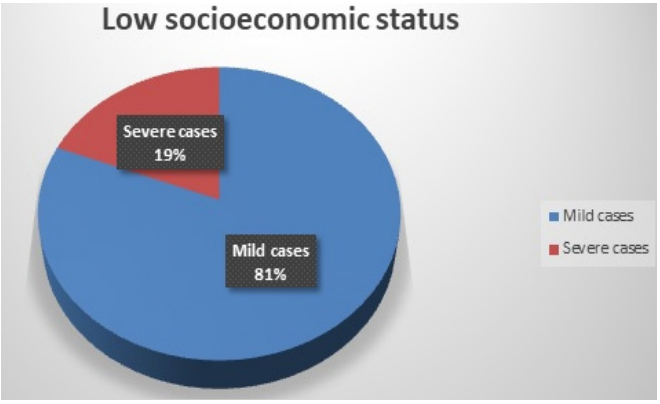

Figure 4: Severity status of COVID-19 in urban population with low socioeconomic status.

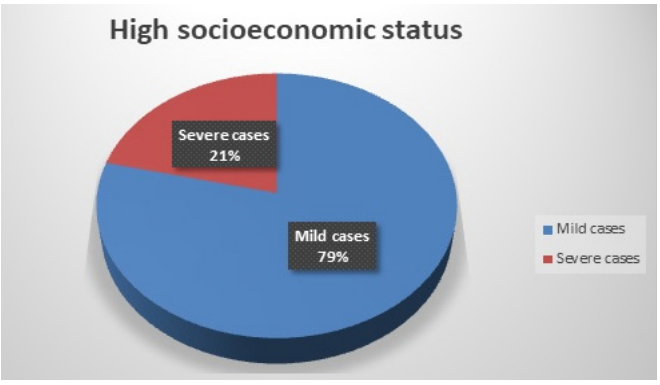

Figure 5: Severity status of COVID-19 in urban population with high socioeconomic status.

China demonstrated that socioeconomic status affects the outcome of the COVID-19 hospitalization, severity and mortality.[29,30,32,42] Our results were consistent with earlier studies, which demonstrated that COVID-19 severity significantly associated with the socioeconomic status in India. The pathways linking socioeconomic status to COVID-19 impact remain unclear. During the period of the study, the COVID protocols in the Emergency Department, which were aligned with CDC recommendations, advised a more thorough evaluation for hospital admission of patients with specific comorbidities. These comorbidities included cardiovascular disease, diabetes, COPD/asthma, and chronic kidney disease, as they were believed to potentially worsen the severity of COVID-19.[4,33] Research indicates that individuals with high socioeconomic status in India are more likely to experience metabolic syndrome,[35-40] which serves as a risk factor for the severity of COVID-19. This study encountered more patients with high socioeconomic status both in rural and urban population. Insufficient awareness and hesitancy regarding testing and treatment contribute to the rural population's increased vulnerability to COVID-19 and reduced hospital admissions. This could be a reason that in our study number of patients enrolled from rural population was lower even though we found significant correlation of COVID-19 severity among rural population carrying high socioeconomic status. Limitation of this study was that the number of patients enrolled from rural population was lower compared to urban population and the larger group of patients was from high socioeconomic status. Hence, nearly similar sample size requires to validate the study.

CONCLUSION

Current study found that in rural populations with high socioeconomic status, 43% of cases were mild and 57% were severe, while in rural populations with low socioeconomic status, 86% were mild and 14% were severe. In urban populations, 79% of cases were mild and 21% were severe in the high socioeconomic group, compared to 81% mild and 19% severe in the low socioeconomic group.

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