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"RISINGCASES-THE POTENTIAL CAUSE BEHIND THE WAVES

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***Abstract*—The COVID 19 pandemic has caused tremendous damage. The rise in number of cases with each wave had a difference in the epidemiological profile. The aim of the study was to describe the epidemiology of SARS-CoV 2 infection in East Delhi and adjoining areas during the first and second wave and attempted to study the factors responsible for the rise in severe of cases despite initiation of vaccination. This was a retrospective chart review of all patients with COVID-19. The patients were categorized into asymptomatic and symptomatic.**

***Keywords*— Covid, asymptomatic, symptomatic.**

I. INTRODUCTION

The covid 19 pandemic became a global threat with clinical presentation varying from asymptomatic to multiorgan failure.[1] The virus journeyed through Wuhan travelled globally across countries and spread rapidly. [2] Even after imposing travel bans, the virus was able to sneak into areas where its spread was accelerated due to its unabated transmissibility and population behaviour. [3] Factors like crowding, lack of awareness, ignorance etc accelerated the spread. The community efforts were kicked in after experiencing great loss of lives when gradually people realised its impact. The government measures for lockdown were short lived with restrictions not being viewed as necessary but as a punishment.[4] The behaviour modification expected was not reached as we saw the second wave crushing the Indian healthcare sectors to shambles after innumerable death occurred within a period of few weeks.

The presence of infection in asymptomatic caused undetected spread which could only be curtailed by measures like wearing mask, staying in door and vaccination for all.[5] The decline in cases in both the waves came after multiple reasons involving a natural decline in virus spread due to unknown causes, antibody development either by immunization or natural infection and by restricted population movement.

As the scenarios are unfolding so does the virus arsenal. The RNA virus, due to inherent capacity to mutate has made several variants which emerged with developing immunity in host.[6] Recently, the Centre for Disease Control (CDC) classified SARS-CoV-2 variants into three groups: "variant of interest (VUI)", "variant of concern" (VOC), and "variant of high consequence (VOHC)" The B.1.526, B.1.525, P.2 Phylogenetic Assignment of Named Global Outbreak LIN eages (Pango LIN) lineages are classified as VUIs, whereas the B.1.1.7, B.1.351, B.1.427, B.1.429, P.1 Pangolin lineages are classified as VOCs.[7] The cycle of mutation-infectivity-recovery determines the further course of this pandemic. On 26 November 2021, WHO designated the variant B.1.1.529 a variant of concern, named Omicron, on the advice of WHO's Technical Advisory Group on Virus Evolution (TAG-VE). The Omicron variant spreads more easily than the original virus that causes COVID-19 and the Delta variant but has less severe clinical presentation and hospitalization Amidst all uncertainty, India rolled out the world's largest vaccination drive on January 16,2021 and successfully vaccinated the priority groups against COVID-19. India granted emergency use authorization to two made-in-India COVID-19 vaccines on January 3, 2021.[8] The vaccination drive in itself was a burgeoning task requiring concentrated effort by multiple

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stakeholders. The initial resistance from the community and subsequent reduction in the supply of vaccines were the major challenges faced by the authorities.

The decline of SARS CoV 2 in India depends largely on vigilant monitoring and strategizing further action plan and policy.[9] Limited resources took a beating with the unprecedented demand of testing. Policies for testing needs to be evaluated to limit the resources. In this study, we describe the epidemiology of SARS-CoV 2 infection in East Delhi and adjoining areas during the first and second wave and attempted to study the factors responsible for the rise in severe of cases despite initiation of vaccination. II.PROPOSED ALGORITHM

II. METHODOLOGY

A retrospective observational study was conducted at Guru Teg Bahadur Hospital (GTBH) associated with University College of Medical Sciences (UCMS), Delhi between 15th July 2020-30th May 2021 which included all patients presenting to the fever clinic for screening of SARS COV-2.

Following the Strategy for COVID-19 testing in India (ICMR, Version 5, dated 18/05/2020), RTPCR for SARS COV-2 was performed on all samples fulfilling the criteria as provided in the ICMR advisory.[10]

All procedures were performed in ICMR approved Covid Laboratory of UCMS & GTBH, Delhi. Nasopharyngeal and oropharyngeal swab were collected from patients to detect SARS-CoV-2. All sample details were entered in a digital Sample registration form (SRF). A unique SRF ID was generated which was provided which accompanied the sample. Test were done as per the standard protocol of RT PCR in a BSL -2 facility at ICMR approved COVID laboratory. The samples were processed for RNA extraction and reverse transcription with a QIAamp viral RNA mini kit (QIAGEN, Hilden, Germany) following the manufacturer's instructions. Extracted RNA were finally subjected to Real-time PCR assays using ICMR approved multiplex kit with screening and confirmatory genes for SARS-CoV 2. The screening and confirmatory target genes for SARS-CoV 2 depended on the kit available which included E, N, M, Rdrp, Orf gene. The results were entered on ICMR portal under the corresponding SRF ID of the sample. All data were retrieved from the ICMR portal. An Institutional ethical clearance was obtained to proceed with the study (No: IECHR/2020/46/1-R-2, dated 14/12/2020)

III. RESULT

1.Demographic Details:

A total of 23,872 samples were tested for SARS COV-2 between July 2020 and May 2021 (Table 1).Out of these 4063 (17.01%).were RTPCR positive. Amongst the positives, majority were males accounting to 62.83%(2553) whereas the rest were females 37.16%, (1510), with a male: female ratio of 1.69. More than two third of the RTPCR positive COVID patients belonged to the age group 19-60 years 75.70%(3076) while the least number of cases were observed in <1 year age group 0.24 %,(10) which was statistically significant. Maximum tests were performed on patients who were asymptomatic (N=19470) versus symptomatic (N=4402) (Table 2). Out of total positive RTPCR, majority cases belonged to asymptomatic category71.86%, (2920) whereas a lesser proportion was observed in symptomatic category of patients 28.13%, (1143).But positivity rate was higher in symptomatic patients from total tested in the individual category 28.13%) (1143/4402) (Table 2)

Table 1: Demographic Distribution

Gender	**Total**	**Positives**
Male	14327	2552(62.81%)
Female	9545	1509(37.14%)
Asymptomatic	19470	2920 (71.86%)
Symptomatic	4402	1143(28.13%)
Age Group		**N (%)**
<1	172	10 (0.24)
1-18	2442	176 (4.3)
19-60	18504	3076(75.7)
>61	2754	801(19.71)

Mean age in the symptomatic group was 46±16.85 years, whereas mean age in the asymptomatic group was observed to be 44.51±17.79.(Table 3)

The maximum positive cases were seen in 19 to 60 years (N=3076). But percentage wise majority of positives were observed in>61 years age group (Symptomatic: 33.05% and asymptomatic: 27.70%) followed by 19 to 60 years (Symptomatic:25.57% and asymptomatic: 14.58%)

2. Monthly Distribution of Cases:

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The month wise distribution of cases from July 2020 till May 2021 showed that the maximum tests were done in the month of March 2021(N=3492). Overall Positivity rate was highest in month of November 2020 and April 2021. The monthly data shows that asymptomatic group were consistently having a higher burden of positivity patients with 55-87 percent patient being diagnosed each month from the asymptomatic group

The graphical representation below depicted that the cases existed throughout the year, with a mild decline during Jan-March 2021, however the number of positive cases began surging from April 2021 which was statistically significant $p<0.001$ (Fig. 1).

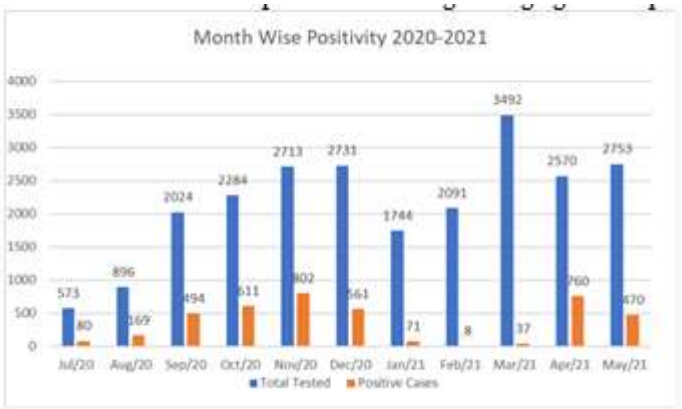

Fig 1. Trend of tested and positive cases from July 2020 –May 2021

Majority of Asymptomatic cases were observed in the month of November 2020 (N=692) and the least were seen during the month of February 2021(N=7). Whereas maximum number of symptomatic cases were observed during the month of April 2021 (N=300) and the lowest number were observed in the month of February 2021(N=1). .

Table 2: Distribution of positive cases based on gender and clinical status (Symptomatic / Asymptomatic)

	Symptomatic	Asymptomatic	
Males (N=2553)	721 (28.24%)	1832 (71.75%)	0.66
Females (N=1510)	422 (27.94%)	1088 (72.05%)	
Total (N)	1143	2920	-

Table 3. Distribution of positive cases based on age groups.

AGE GROUP	Total samples symptomatic	Positive symptomatic	% Positivity rate symptomatic	Total samples asymptomatic	Positive asymptomatic	% Positivity rate asymptomatic
<1	22	1	4.55	148	9	6.00
1-18	227	27	11.89	2215	149	6.73
19-60	3442	880	25.57	15062	2196	14.58
>61	711	235	33.05	2043	566	27.70

Table 4: The mean Ct value of structural genes of SARS COV 2 in asymptomatic versus symptomatic

CT Table	Screening gene	Confirmatory gene
Mean	22.6	26
Asymptomatic	22.5	26.4
Symptomatic	22.9	24.5

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CT value: the mean Cycle threshold value reported for both screening and confirmatory gene are shown in table 4. The CT value of the positive patient category did not show any statistical difference

IV. DISCUSSUION

During our study period out of total of 23872 sample tested, 4063 samples were declared COVID positive by RTPCR. Gender wise distribution showed that males positivity was more than females. Role of gender in disease progression has been documented in studies suggesting male gender as a risk factor for worsening of clinical situation.[11] We observed that of the total number of tests performed, the maximum positives were reported in the age group of 19- 60 years similar to other studies.[12-14] Children were found to be less affected than other age groups. Factors hypothesized that children were protected from adversely getting affected either by the circulating immune responses, secondary to live childhood vaccinations or maybe due to exposure to other viral infections mounting cross protecting antibodies . [15]Also, the low-level expression of ACE2 receptors could be a reason for the lower risk among children.[16]

Patient older than 60 years were found to be affected more, but no significant difference was found between the first and the second wave . Studies have reported that older patients and those with comorbidities were more prone to severe disease and required intensive care. [17,18]

Besides the rise in number of symptomatic cases, we also observed an overwhelming number of tests request by asymptomatic individuals. This is in concordance to studies from other states of India and Asian countries reporting 40-45 % positive patients being asymptomatic. [12,19-21] While the data from western countries documented more testing amongst the symptomatic and the true proportion of asymptomatic cases was as low as 20%.[22-28]As a policy of test-treat-track the contacts of a positive case ,high demand of testing in asymptomatic group was a protocol observed in tertiary care hospitals. . In India, during the first SARS-CoV-2 wave, maximum number of cases were reported during October and November 2020, and subsequently declined, until February 2021. The exponential surge (second wave) of the COVID-19 cases in India was observed from April 2021, with more than 0.2 million new cases being reported as of 17 April 2021 (https://www.worldometers.info/coronavirus/country/india/ (accessed on 22 March 2021).

Problems of differentiating asymptomatic from pre-symptomatic cases which later develop symptoms, led to the misrepresentation of actual number of positive cases. Studies have documented asymptomatic patients contributing to the transmission ofSARS-CoV-2 among the household members and community. The silent transmission by asymptomatic therefore should not be overlooked. Studies also recommend isolation of asymptomatic and mildly symptomatic COVID-19 patients to prevent further transmission. Whereas, study by N Kumar et al, suggests that the symptomatic cases were the prime drivers of the SARS-CoV-2 transmission within the state during the early phase of the pandemic with high secondary attack rate amongst the symptomatic group leading to high mortality.[29] While other research indicated that even asymptomatic individuals have similar viral load to that in symptomatic patients, hence asymptomatic infections have similar potential for transmission.[30] Thereby active surveillance during pandemic especially when cases increase in number and prompt identification of containment zones would help restrict the further spread of cases.

The SARS-CoV-2 RNA detection by RT-PCR is based-on presence of viral genetic material, and it also provides semi-quantitative information on viral load from clinical specimens. This may be estimated from the cycle threshold (Ct) value, defined as the RT-PCR cycle at which the fluorescent signal reaches the detection threshold. Uncertainty arose when association of Ct-value with viral load became a local protocol for management when low Ct values were considered as highly infectious compared to the negative result. Thereafter Government prepared the discharge policy based only on clinical criteria rather than subjecting the patients to repeated SARS-CoV-2 rRTPCR testing till reported negative. Studies have demonstrated persistent positive RTPCR positivity in asymptomatic individual for several months .[31] Therefore, due to lack of evidence regarding rRT-PCR for defining disease severity and infectiousness, the test should not be used to guide management strategies in COVID-19 patients . The repeat testing of patients after a positive report by RTPCR was a wasteful process (as treatment is not based on viral load) when the presenting symptoms decides the fate and the outcome of the patient. This was one of the factors which led to the non-availability of beds in tertiary care and private hospitals as uniform norms were not followed by several hospitals

Interestingly several commercially available kits had different set of screening and confirmatory genes. In our study the Ct value of screening gene was found to be lower as compared to confirmatory gene. Moreover, the Ct of symptomatic compared to asymptomatic did not show any statistical significance , similar to a study by N. Asai et al which reported no significant difference in CT values at the time of presentation in pneumonia and non-pneumonia patients

In the first ten days of May 2021, India's reported count of covid-19 deaths was nearly 40,000, roughly accounting for a third of deaths worldwide during this period. India reported the most deaths after Brazil and the European Union (EU) and the second wave has been catastrophic, claiming far more lives each day than in any period in 2020. The circulating virulent mutant strain (double mutant B.1.617,), complacency among senior functionaries who ignored warnings, delayed mobility with poor crowd restrictions, and limited vaccine coverage were the several facets for witnessing increased hospitalizations in most parts of the country which overwhelmed the health capacity to cope up with the upsurging

situation. As evident in fig 1, the total number of cases never regressed in our hospital, though positivity rate reduced drastically after the vaccination drive amongst HCW.

On analyzing the epidemiological trend of rate of positivity, the cases over the course of time showed two distinct peaks in the month of November 2020 and April 2021. The first peak was preceded by a steady but gradual rise in number of cases which resulted in large number of cases in November. On the contrary during the second wave, a sudden rise in the cases was observed clustering during the months of April-May 2021. It's worthwhile to note that though government started the vaccination drive in the month of January 2021 for the HCW and frontline workers, there was no restriction of movement for the general population during that period. Lockdown relaxation with communal gatherings were other situations that led to the breach in the containment of cases. Besides the environmental factors , unvaccinated population at risk and those who were partially immunized , created a selective pressure for the virus to adapt and undergo mutation for survival thus augmenting the transmissibility during the second part of the pandemic, causing large scale fatality . The proportion of silent asymptomatic cases were more, prior to April 2021 which could have paved the way for sudden explosion of cases as observed in our study. The extent of emergency use authorization of medicine and vaccine had its own pros and cons. Data from such experiences need to be analysed to plan for evidence-based management protocols and preventive policies for future.

V. CONCLUSION

In conclusion, rigorous and increased compliance with public health mitigation strategies, mass vaccination, physical distancing, use of masks, hand hygiene, and isolation and quarantine, and strict lockdown are essential steps to limit the spread of the virus in the community. Additionally ,to achieve more than 70% herd immunity local authorities must ensure vaccination coverage across population . Emergence of mutants as demonstrated by the scientific community emphasizes on immediate contact tracing and quarantine to reduce further spread to the community . Ultimate goal is to keep vigilant ,make advances in management strategies and build up the gap till either the virus is eliminated or render it endemic with low virulence.

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