Wydawnictwo UR 2022
ISSN 2544-1361 (online)
doi: 10.15584/ejcem.2022.4.2

http://www.ejcem.ur.edu.pl
European Journal of Clinical and Experimental Medicine
Eur J Clin Exp Med 2022; 20 (4): 391–398

ORIGINAL PAPER

Clinico-epidemiological and vaccination profile of patients attending flu clinic of a tertiary health care institution in Eastern India during the third wave of COVID-19 pandemic

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ABSTRACT

Introduction and aim. With the third wave of COVID-19 hitting the country, there is an urgent need to systematically document the clinical-epidemiological and vaccination details of the patients to formulate evidence-based decisions. So, this study was planned to describe the profile of patients attending the flu clinic of a tertiary care hospital in eastern India.

Material and methods. This hospital-based cross-sectional study was done for 6 weeks (Jan-Feb 2022) among 623 patients using a pre-tested, structured questionnaire related to COVID-19. An unadjusted odds ratio was calculated and statistical significance was attributed to a p-value <0.05.

Results. Out of 623 patients, almost 90% of the patients were vaccinated against COVID-19 with at least one dose of any vaccine. Cough (57.8%) was the most common complaint. Patients aged > 60 years and those having one or more than one comorbidity suffered from moderate-severe COVID-19 infection when compared to their counterparts (p<0.001). Also, 2.1% of fully vaccinated, 3.8% of one dose vaccinated and 10.9% of unvaccinated patients suffered from moderate-severe COVID-19.

Conclusion. During the third wave of the COVID-19 pandemic, a smaller number of elderlies compared to the previous two waves were affected indicating age shifting. The severity of COVID-19 was less among vaccinated individuals compared to unvaccinated highlighting the importance of COVID-19 vaccination.

Keywords. COVID-19, epidemiology, mutation, pandemic, SARS-CoV-2, vaccination

Introduction

Coronavirus disease 2019 (COVID-19), originated in Wuhan, China has been there for more than 2 years with multiple waves.[1] COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a single-stranded RNA virus of the family coronaviridae with a varying incubation period of 2-14 days.[2,3] To date world has seen 50,75,01,771 confirmed cases and 62,20,390 deaths due to COVID-19.[4] India is the second most affected country in the pandemic and has reported almost 4,30,60,086 confirmed cases and 5,22,223 deaths as of April 2022.[5] Since the beginning of the COVID-19 pandemic, the coronavirus has mutated, resulting in variants of the virus such as delta variant and most recently the newer identified "omicron". Each new variant brings a new wave of COVID-19 cases.[6] Besides the evolution of SARS-CoV-2 into new strains, several other factors such as the effectiveness of vaccines, COVID-19 appropriate behaviour, and herd immunity have had an impact on whether new COVID-19 cases are increasing or declining in particular locations.[7] Moreover, India also recognised a surge in the COVID-19 cases in January 2022

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Received: 28.07.2022 / Revised: 22.09.2022 / Accepted: 22.09.2022 / Published: 30.12.2022

Singh CM, Chaudhary N, Naik BN, et al. *Clinico-epidemiological and vaccination profile of patients attending flu clinic of a tertiary health care institution in Eastern India during the third wave of COVID-19 pandemic*. Eur J Clin Exp Med. 2022;20(4):391–398. doi: 10.15584/ejcem.2022.4.2.

hinting toward the third wave of the COVID-19 pandemic. The health and wealth of the population of the world including India have drained as a result of multiple waves of COVID-19.[7]

Many pieces of literature have shown several obvious differences between the first and the second wave epidemiology, and the clinical profile of COVID-19 patients presenting to the designated health centre.[8–10] Aggarwal et al., New Delhi, India in 2020 showed that the median age of those who were hospitalized due to COVID-19 was 54.5 years with 68.8% having one or more comorbidities and 90.6% having dyspnoea as presenting complaint.[11] Guan et al. in Wuhan, China 2020 did a cross-sectional study among 1099 lab-confirmed COVID-19 positive patients and showed that the most common symptom was fever, followed by cough and around 56% had ground-glass opacity on CT chest.[12] Another study from New Delhi, India in 2020 showed that a significant proportion of patients were asymptomatic (44.4%) and among the symptomatic, cough (34.7%) was the most common symptom followed by fever (17.4%) and 3.5% patients required oxygen supplementation, 2.8% patients had severe disease requiring intensive care.[13] Thus, with the plausibility of third-wave hitting the country, there is an urgent need to systematically document the clinical-epidemiological and vaccination profile of the COVID-19 patients to formulate evidence-based decisions.[10]

Aim

With this background, this current study was planned to assess the clinico-epidemiological characteristics and its association with vaccination profile among patients attending the flu clinic of a tertiary care hospital in eastern India during the third wave of the COVID-19 pandemic.

Material and methods

Ethical approval

This study was approved by Institute Ethics Committee, AIIMS Patna (Ref: AIIMS/Pat/IEC/2022/859). We adhered to the principles of ethics thereafter throughout the study.

Study design and participants

This was a hospital-based observational study done for the duration of 6 weeks (the first week of January 2022 to the third week of February 2022) at the flu clinic of All India Institute of Medical Sciences, Patna. AIIMS Patna is a 950 bedded tertiary health care institution under the Ministry of Health and Family Welfare, Government of India in the eastern state of Bihar catering for the population of Bihar and neighbouring states. AIIMS Patna was declared a dedicated COVID-19 hospital during all waves of the COVID-19 pandemic. Flu Clinic, established by the Department of Community and Family medicine was the first point of contact for all influenza-like illness (ILI) patients, COVID-19 suspects and COVID-19 confirmed patients for further management in the hospital. The study participants included all the documented ILI patients, suspects and confirmed COVID-19 cases coming to the flu clinic during the above-mentioned period.

Inclusion criteria

The study included all the documented patients (COVID-19 suspects and laboratory-confirmed COVID-19 cases) who attended the flu clinic during the study period and gave consent to participate in the study. A well-informed written consent was taken from the eligible patients. If the patient was unable to give consent, the attendant of such patients were asked for written consent. The consent was taken by the co-investigators who aided in data collection process. The details like name and other confidentiality details were not revealed during the time of analysis.

Exclusion criteria

Patients less than 18 years of age were excluded as COVID-19 vaccination of <18 years in India started in January 2022 only. Also, the patients refusing to participate were not considered in this study

Sample size calculation

The representative target sample size needed, to achieve the study objectives and sufficient statistical power, was calculated with a sample size calculator.[14] The sample size was calculated to be 377, using a margin of error of 5%, a confidence level of 95%, and a 50% response distribution. However, all the patients who attended the flu clinic during the study period were included in the study. A consecutive sampling method was used to arrive at the sample size.

Data collection method

A pretested, structured questionnaire/study tool was designed to collect the relevant information from the patients attending the flu clinic through a face-to-face interview. The questionnaire was incorporated into "google forms" and was administered by the residents and interns posted at the flu clinic.[15] The residents and interns were trained on the study tool and data collection process by the investigators of the study.

Questionnaire design and validation

The questionnaire was divided into three sections. Section A captured the basic details of the patients including sociodemographic details like age, gender, occupation, education, and possession of ration cards. Section B included details regarding comorbidity(s), details regarding COVID-19 vaccine status, history of COVID-19 and

any history of coming in contact with COVID-19 confirmed case without protection and any history of travel to high risk/containment areas designated by the Government of India in last two weeks. Section C contained details regarding present COVID-19 status whether the patient is a suspect or laboratory-confirmed case, presenting symptoms, the status of oxygen saturation and whether the patient was ambulatory or non-ambulatory at the time of flu clinic visit and advice given at the flu clinic whether to home isolate or admit in the hospital. The questionnaire developed in English was translated to Hindi (the local language) and pretested in a sample of patients just before the data collection and necessary changes were made and back-translated to English. The final English version of the questionnaire was incorporated into the "Google forms". Few copies of the Hindi version were kept at the flu clinic for uniformity in administration. The questionnaire had a good internal consistency (Cronbach's alpha- 0.7).

Outcome variable

The main outcome of the study was to assess the clinical severity (asymptomatic/mild/moderate/severe) of the COVID-19 suspects/confirmed cases during the third wave of COVID-19.

Explanatory variables

Variables like age, gender, education, occupation, socioeconomic status, contact with COVID-19 confirmed cases without protection and COVID-19 vaccination status were used to explain the outcome of COVID-19 patients.

Data management and statistical analysis

The information collected was entered in MS Excel and analysis was done using IBM SPSS version 22. (SPSS Inc., Chicago, IL, USA) Results were either tabulated or represented graphically wherever necessary. The quantitative variables like the age of the patient were expressed as Mean (SD) after checking the normality. The categorical variables like gender, education, occupation, history of travel to high risk/crowded place, COVID-19 vaccination status, history of COVID-19, co-morbidities, the status of the patient at flu clinic, and present COVID-19 status were expressed as proportions and percentages. For this study, education status was categorised into illiterate and literate, occupation was classified into health care workers (HCW) and non-HCW/general population and the interval between 2nd dose of COVID-19 vaccination and flu clinic visit was < 6 months and >6 months, comorbidities as present or absent and presenting complaints as asymptomatic, non-ILI symptoms, ILI symptoms. The severity of COVID-19 was classified based on SPO2 status as jointly given by the Indian council of medical research, AIIMS New Delhi and Ministry of Health and Family Welfare, Government of India guidelines updated on January 2022.[16] Patients were classified as mild (SPO2 >93%), moderate (SPO2 ≤93 to >90%) and severe COVID-19 (SPO2 ≤90%). For ease of analysis, asymptomatic-mild cases and moderate-severe cases were clubbed. A simple binary logistic regression analysis was done to find out whether the unadjusted odds and values of $P < 0.05$ were considered statistically significant.

Results

Weekly trend

A total of 623 patients were enrolled in the study over six weeks (8 January to 19 February 2022). The week-wise trend of patient attendance at the flu clinic for screening and admission has been depicted in Figure 1. The line diagram reflects a declining trend for suspected as well as confirmed COVID 19 cases, with a peak number of cases during the first week (Suspected- 210, confirmed-120) which gradually touched the lowest numbers during the 6th week (Suspected- 07, confirmed-03) (Figure 1).

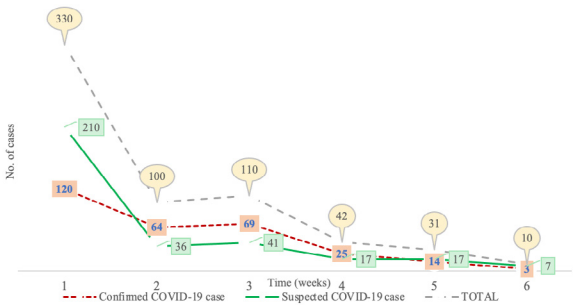

Fig. 1. Week-wise trend of patient attendance at Flu Clinic (n=623)

Socio-demographic details of the patients

The age of the patients ranged from 19 to 90 years with the mean age being 35.4 ± 14.7 years. The majority (54.6%) were male with a male to female ratio of 1.2:1. Of all the cases, 372 (59.7 %) were healthcare workers. Majority patients [570, (91.5%)] were literate.

A total of 239 (38.4%) cases had a history of travel to high-risk/ crowded places and 399 (64%)

were exposed to laboratory-confirmed COVID-19 cases. Nearly, a quarter [158 (25.4%)] of patients reported suffering from COVID-19 in the past (Table 1).

Vaccination details

Almost 90% of the patients were vaccinated against COVID-19 with at least one dose and almost 69% had taken both the doses of COVID-19 vaccine. Two third (66.8%) were vaccinated with Covaxin, 19.9% by Covishield. Almost 10% were not vaccinated with any of the COVID-19 vaccines (Figure 2).

Table 1. General characteristics of patients attending flu clinic (n=623)

Variables	Category	n	%
Age (in years)	<60	559	89.7
	≥60	64	10.3
Gender	Female	283	45.4
	Male	340	54.6
Education	Illiterate	53	8.5
	Literate	570	91.5
Occupation	HCW	372	59.7
	Non-HCW (General population)	251	40.3
History of travel to high-risk/ crowded places	Yes	239	38.4
	No	384	61.6
COVID-19 vaccination status	Not vaccinated	64	10.3
	Vaccinated with one dose	131	21
	Vaccinated with Two doses	428	68.7
History of any contact with confirmed COVID-19 case	Don't Know	79	12.7
	No	145	23.3
	Yes	399	64
History of suffering from COVID-19 in the past (confirmed by lab test)	No	465	74.6
	yes	158	25.4
The interval between flu clinic visit and 2nd covid vaccine dose*(in months)	0- 6	136	31.8
	>6	292	68.2
Comorbidity	Absent	483	77.5
	Present	140	22.5

*n= 428 as 132 who did not remember the vaccination month or are not eligible for 2nd dose were excluded from the analysis; HCW – health care worker

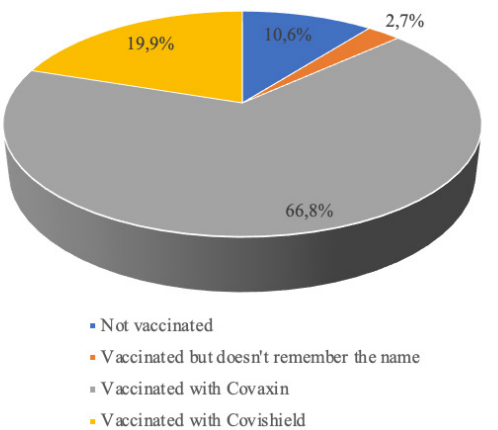

Fig. 2. Vaccination status of patients as per the type of vaccine (n=623)

Clinical details

Comorbidities were present in 140 (22.5%) patients. Out of those 140 cases, hypertension and cancer were the most common comorbidity i.e., 42 (30%) each; followed by diabetes mellitus (38, 27.1%), heart disease (19, 13.5%), kidney diseases (10, 7.1%) and other comorbidities (22, 15.7%).

Almost half of the total patients (47.4%) were laboratory-confirmed COVID-19 cases and the rest (52.6%) were suspected cases of COVID-19. The mean (SD) CT value of the lab-confirmed COVID-19 cases was 22.9 (5.3).

Majority (84.4%) had ILI symptoms such as cough (360, 57.7%), fever (359, 57.3%), sore-throat (202, 32.4%) etc. Whereas, 2.9% had non- ILI symptoms such as loss of smell and taste (11, 1.7%), vomiting (9, 1.4%) (Figure 3).

The majority (81.3%) were ambulatory and the admission rate was only 14.1%. Only 3.4% (21) were suffering from moderate-severe COVID-19 infection. The mean(SD) oxygen saturation of mild and moderate-severe COVID-19 infection was 98.2 (0.9) % and 88.8 (7.6) % respectively (Table 2).

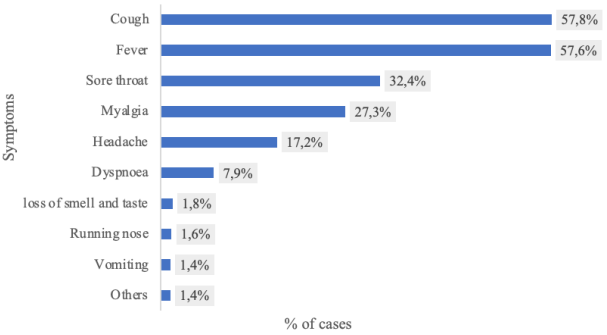

Fig. 3. Distribution of patients as per the presenting symptoms (n=623)*

*NB: ILI symptoms – fever, cough, sore throat, running nose, headache, myalgia, dyspnoea; Non-ILI symptoms – loss of smell and taste, vomiting; Others – abdominal pain, loose stools, chest pain, loss of consciousness

Table 2. Distribution of patients as per status assessed at flu clinic (n=623)*

Characteristics	Frequency	%
Presenting symptoms		
Asymptomatic	79	12.7
Non- ILI symptoms	18	2.9
ILI symptoms	526	84.4
Status of Patient		
Ambulatory	506	81.3
Non- ambulatory	117	18.7
Present COVID-19 status		
Confirmed COVID-19 case	295	47.4
Suspected COVID-19 case	328	52.6
Advice given at the flu clinic		
Admission to the COVID-19 ward	88	14.1
Home isolation	535	85.9

*NB: ILI-Influenza-like illness, ILI symptoms – fever, cough, sore throat, running nose, headache, myalgia, dyspnoea; Non-ILI symptoms – loss of smell and taste, vomiting; Others – abdominal pain, loose stools, chest pain, loss of consciousness

Patients aged > 60 years ($p<0.001$) and those having one or more than one comorbidity ($p<0.001$) suffered from moderate-severe COVID-19 infection more than their counterparts. Also, 2.1% of patients who were fully vaccinated, 3.8% of those with one dose vaccinated and 10.9% of unvaccinated patients suffered from mod-

erate-severe COVID-19. This difference in the severity of COVID-19 among vaccinated and unvaccinated patients was statistically significant (p<0.003). Moderate-severe COVID-19 infection was reported only among the general population whereas all the HCW reporting to the flu clinic were either asymptomatic or had a mild infection (Table 3).

Table 3. Association of general characteristics of patients with severity of COVID-19 (n=295)*

Characteristics	COVID 19 severity		Unadjusted Odds ratio (95 % CI)	Test statistics (p-value)
	Asymptomatic/ mild (n=278)	Moderate-severe (n=17)		
Mean age (± SD)	40.4 (17)	61.9 (18.9)	–	5.01 (<0.001)
Age category				
< 60 years	229 (97.5)	6 (2.5)	1	19.1 (<0.001)
≥ 60 years	49 (81.7)	11 (18.3)	8.4 (3–25.8)	
Gender				
Female	132 (94.9)	7 (5.1)	1	0.065 (0.8)
Male	146 (93.6)	10 (6.4)	1.3 (0.5–3.6)	
Education				
Illiterate	46 (92)	4 (8)	1	0.169 (0.5)
literate	232 (94.7)	13 (5.3)	0.64 (0.2–2.38)	
Occupation				
Health care worker	108 (100)	0 (0)	–	–
Non- Health care worker	170 (90.9)	17 (9.1)		
Comorbidity				
Absent	174 (99.4)	1 (0.6)	1	19.06 (<0.001)
Present	104 (86.7)	16 (13.3)	26.7 (3.4–204.8)	
Have you taken any COVID-19 vaccine?				
Not vaccinated	57 (89.1)	7 (10.9)	–	13.44 (0.003)
Vaccinated with one dose	126 (96.2)	5 (3.8)		
Vaccinated with two doses	419 (97.9)	9 (2.1)		
The interval between flu clinic visit and 2nd covid vaccine dose*				
0-6 months	69 (93.2)	5 (6.8)	0.2 (0.03–1.5)	1.27 (0.241)
> 6 months	94 (97.9)	2 (2.1)	1	
History of any contact with confirmed COVID-19 case?				
No	90 (90.9)	9 (9.1)	0.38 (0.11–1.1)	2.1 (0.09)
Yes	131 (96.3)	5 (3.7)	1	
Past H/O suffering from COVID-19 (confirmed by lab test)				
No	228 (93.8)	15 (6.2)	0.6 (0.09–2.4)	0.106 (0.745)
Yes	50 (96.2)	2 (3.8)	1	
History of travel to high risk/containment areas/to a crowded place				
Yes	91 (96.8)	3 (3.2)	2.2 (0.68–10.1)	1.05 (0.284)
No	187 (93.1)	14 (6.9)	1	

*n= 428, Values are expressed as n (%) unless specified.
SD – standard deviation; IQR – interquartile range

Discussion

Considerable disparities in demographic and clinical patterns have been observed across three consecutive COVID-19 pandemic waves. This study demonstrated the clinical and vaccination profile of COVID-19 patients from eastern India during the third wave pandemic. Understanding the profile of patients and the nature of severity of the disease will provide direction for the policymakers and better preparedness against subsequent waves of COVID-19.

Socio-demography

In this study, there was a male predominance which is analogous to other national and international studies by Aggarwal et al. (New Delhi), Guan et al. (China), Hasan et al. (Bangladesh).[11,12,17] Few factors which could be speculated to account for this gender gap are the outdoor engagement of males, lesser propensity to seek health care among females in the society and differences in biology.[10,18]

Clinical details

In this study, there were more symptomatic patients than asymptomatic patients (87.3% vs. 12.7 %). Since the study setting is a tertiary health care centre, more symptomatic patients seek medical assistance than high-risk asymptomatic contacts.

Consistent with our study findings, Mohammad Jahid Hasan found that 13.09% of COVID-19 patients were asymptomatic.[17] While Mizumoto et al. found a relatively higher prevalence (34.6%) of asymptomatic on board the Diamond Princess cruise ship, Japan.[19]

The most common symptoms reported during this third wave were fever, cough and sore throat. The Gastrointestinal symptoms (vomiting, loose stools) which were added in the second wave when the delta variant of COVID was dominant were minimal.[20,21] Furthermore, the more frequently reported symptoms of loss of smell and taste during the first covid wave were almost negligible during this omicron dominant third wave.[22]

In our study, we found that the third wave was less serious in terms of oxygen requirement and severity of COVID-19 when compared to the first and second waves of the COVID-19 pandemic. Baseline oxygen saturation [mean (SD)] was higher for the third wave [97.7 %] when compared with the second wave [84 (13.4) %] and first wave [91.9 (7.4) %] [2122]. Furthermore, we found that only 5.7% of cases were severe COVID-19 in the third wave compared to 70.2 % in the second wave and 37.5% in the first wave.[23]

Vaccination details

The hybrid immunity acquired through vaccination and high prior exposure to the Delta variant might be accountable for keeping the severe illness proportion low during the third wave.[24]

This fact is also evident from our study findings as vaccinated patients were less like to suffer severe covid

infection as compared with the unvaccinated ones. However, Rahman et al. investigated the clinical features of COVID-19 infection among infection-naïve, vaccinated, and post-infection-vaccinated individuals. They concluded that the naturally infected individuals were less likely to be reinfected by COVID-19 infection than the infection-naïve and vaccinated individuals. The low number of vaccinated individuals in their study might be a limitation to correlate the vaccination status with hospitalisation or severity.[25] Furthermore, a study by Moghadas et al. established the notable impact of vaccination as well.[26] They found that vaccination considerably reduced adverse outcomes with non-ICU hospitalizations, ICU hospitalizations, and deaths by 63.5%, 65.6%, and 69.3% respectively.

Comparison between the first, second and third waves of the COVID-19 pandemic

The elderly population was found to be less compared to others in this study as compared with the first wave (32.5%) and second wave (27.8%).[26,27] This indicates age shifting phenomenon. One possible reason could be higher vaccination coverage among the elderly. This also implies we should be more vigilant about infection among young individuals and others. Also, our study highlighted that geriatric age had a significant association with moderate/severe infection. Extreme ages are at augmented risk of developing any severe infection which possibly explains this finding. This observation is parallel to other studies.[10,28–30]

Furthermore, an undersized proportion (13.3%) of patients presented with any comorbidity in our study, compared with 21.7 % and 21.1% of patients with the coexisting condition reported during the first and second wave respectively.[27] Although Moderate/Severe Covid infections were higher in patients with one or more comorbidities. Backing our study findings, Vardhan H mentioned in their study paper that the SARS-CoV-2 infection causes more severe illness in patients with comorbid diseases such as diabetes and hypertension.[30] Sharing similar findings, Zhang et al. studied 633 COVID-19 patients in China, of whom 247 patients had at least one comorbidity and were more likely to exhibit a more severe form of COVID-19 illness.[31] Similarly, another study conducted in Spain had more severe illnesses among patients with comorbidities.[32]

Limitation and strength of the study

Because this is a hospital-based study, the actual proportion of COVID-19 patients based on various severity categories could not be evaluated in a way that could be contemplated to the general population. Only status on arrival was assessed and the final severity outcome could not be assessed due to lack of follow-up. There is a possibility of a change in severity status. Despite these limitations, our study's merit lies in establishing the association of age, comorbidity and vaccination with the severity of COVID-19.

Conclusion

During the third wave of the COVID-19 pandemic, a smaller number of elderlies compared to the previous two waves were affected indicating age shifting. The severity of COVID-19 was less among COVID-19 vaccinated individuals compared to unvaccinated highlighting the importance of COVID-19 vaccination. People with comorbid conditions were found to be suffering from severe COVID-19 more compared to people without any comorbidities. Necessary vigilance about the people with comorbid conditions and strict adherence to COVID-19 appropriate behaviour among them is needed. This observation from our study might be useful in case a plausible fourth COVID-19 pandemic wave emerges in India in the coming future due to the mutant nature of the SARS-CoV-2 virus.

Acknowledgement

We would like to acknowledge the hospital authority for providing information regarding the patients.

Declarations

Funding

No funding was done for this study.

Author contributions

Conceptualization, C.M.S., B.N.N., S.P. and S.K.N.; Methodology, R.R. and A.R.; Software, N.C., R.R. and A.R.; Validation, A.R., R.R. and S.S.V.P.; Formal Analysis, N.C., R.R. and S.S.V.P.; Resources, C.M.S.; Data Curation, N.C. and R.R.; Writing – Original Draft Preparation, N.C., R.R. and S.S.V.P.; Writing – Review & Editing, C.M.S., N.C., B.N.N., R.R., S.P., S.K.N., A.R. and S.P.; Supervision, C.M.S., B.N.N., S.P., A.R. and S.K.N.; Project Administration, C.M.S. and A.R.

Conflicts of interest

The authors declare no competing interests and no conflict of interests.

Data availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval

This study was approved by Institute Ethics Committee, AIIMS Patna (Ref: AIIMS/Pat/IEC/2022/859). We adhered to the principles of ethics thereafter throughout the study.

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