Predicting mortality in children with confirmed or suspected COVID-19: A multivariate analysis

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Abstract---Introduction: Coronavirus disease 2019 (COVID-19) is spreading quickly and killing people across the board, including infants. The risk variables that indicate infant death are still uncertain, though. Examining risk signs for babies with COVID-19 was the aim of this study. Methods: Secondary data analysis was

performed using provincial COVID-19 data from September 2021 to December 2022. For this study, 1000 children under the age of 18 were selected. In order to investigate the factors that led to fatalities in children diagnosed with COVID-19, chi-square analysis and binary logistic regression were utilized. Results: According to this research, the frequency of infants dying from COVID-19 was 6.7%. Age, case classification, therapy state, disease intensity, and trip experience all significantly correlated with toddlers infected with the COVID-19 virus's mortality rate. Age affects the likelihood of succumbing from COVID-19 (Adjusted odd ratio (AOR) =0.92; CI 95%=0.93-0.98). In addition, using ventilators while in the ICU (AOR=22.45; 95% CI=5.86-86.33), serious sickness (AOR=46.23; 95% CI=21.33-100.63), and travel history (AOR=1.87; 95% CI=1.92-2.83) were all clearly linked to a greater chance of mortality in kids with the COVID-19. Conclusion: The greatest predictor of mortality was childhood illness that was serious. For the purpose of preventing juvenile hospital visits and reducing the mortality rate, programs for illness management and health development are crucial.

Keywords--corona virus, children death, COVID-19.

Introduction

Since the World Health Organization designated the coronavirus disease of 2019 (COVID-19) a global epidemic in March 2020, the number of verified cases, fatalities, and impacted nations has steadily grown (Odd et al., 2021). 10 million cases and 503,862 deaths were reported by June 2020 in the global COVID-19 records, with multiple nations being categorized as having a community-wide outbreak (World Health Organization, 2020). New research from the American Academy of Pediatrics and the Minors' Hospital Association shows that there are approximately 2.5 million COVID-19 instances among minors in the US overall (American Academy of Pediatrics, 2021). Age, gender, race/ethnicity, and preexisting medical problems are all independently associated with bad outcomes in COVID-19, according to prior research (Götzinger et al., 2020; Hoang et al., 2020). Clinicians, academics, and regulatory bodies may be able to identify which kids are most at risk for serious COVID-19 if they are aware of the part these variables play in severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

The forthcoming medical and demographic data, however, connects it to people who have a history of high blood pressure, chronic obstructive lung disease, diabetes, and hyperlipidemia (Mechanisms of higher incidence and fatality of SARS-CoV-2 infection in affected persons) (Lippi et al., 2020). The primary cause of illness and death in COVID-19 individuals was initially believed to be respiratory failure (Ruan et al., 2020). It has been suggested that vascular thrombosis, which has been observed in numerous instances during the subsequent phase of clinical surveillance, is connected to COVID-19 mortality (Lodigiani et al., 2020). Additionally, the age of COVID-19 patients has been considered as a risk factor for COVID-19 disease and related mortality, especially in connection to the socioeconomic characteristics of individuals in different

countries (Kang et al., 2020). The association among cancer and COVID-19 mortality is controversial due to a dearth of instances.

Numerous studies on corona virus to evaluate risk variables associated with therapy have led to a clearer distinction between the clinical traits of COVID-19 and acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Zhou et al., 2020; Huang et al., 2020; Ludvigsson et al., 2020). Clinically speaking, the effects of COVID-19 on individuals can vary from mild breathing failure to mortality (Siegel et al., 2021). Community fortitude in an epidemic must be taken into account, particularly for disadvantaged populations (Saleem et al., 2020). Elderly people are the most at risk, according to a prior research, particularly those who have heart disease, lung illness, diabetes, or other inflammatory conditions (World Health Organization, 2021). Despite having milder signs compared to older people, toddlers have an improved outlook, and the total amount of cases is increasing quickly (Ludvigsson et al., 2020; Shekerdemian et al., 2020; Ding et al., 2020; Ma et al.,2020). Additionally, it might promote group diffusion (World Health Organization, 2021). Additionally, little is known about the potential harm that COVID-19 may cause to children, especially to infants and young children (De et al., 2020). Previous studies have demonstrated that a variety of factors, serious sickness, a low O2 saturation, and persistent root causes, such as age ten, have an impact on the death rate of children (Dewi et al., 2021; Leoni et al., 2021; Kim et al., 2020). Despite the fact that a number of studies have examined the factors that influence death, the majority of these studies have concentrated on adults and the aged, which makes extrapolation challenging. This research sought to investigate COVID-19 patient fatality indicators, particularly in pediatric patients.

Methodology

Data Source

We used province COVID-19 data in the children's Hospital Faisalabad for this secondary data research. The COVID-19-related health information for children under the age of 18 is included in the children dataset that was used for this research. Through an internet portal, the Punjab province's COVID-19 tool combined all of the data from September 2021 to December 2022. All instances had to be reported by the hospital to the data portal.

Subjects

In this research, hospitalized children with COVID-19 were included. 1000 kids made up the group that was chosen using the random selection technique. Due to a set of parameters, the sampling method enables a group of chosen individuals to be included in the sampling. Children who were outpatients or inpatients and younger than 18 years old met the selection requirements for this research. The meaning of minors is according to Pakistan's government's guidelines.

Variables

Survival status, specifically being living or deceased, served as the dependent variable in this research. The time period began with the patient's initial admittance to the medical facility and ended with their departure (dead or alive). When collecting statistics on the state of healthcare for ambulatory and hospital patients in September 2021, there are two possible outcomes: alive and deceased. Sex, case classification, therapy status, disease intensity, travel experience, and exposure to someone with a suspected or proven case of COVID-19 were all independent factors. Sex was separated into masculine and female groups. The case description group is split into verified and probable in this research. Infections with COVID-19 that have been positively identified by polymerase chain reaction (PCR) assays are referred to as confirmed instances. In the meantime, potential cases were classified as those who displayed COVID-19-like signs but had unreliable PCR or other laboratory findings (Kemenkes et al., 2020). Hospitalization, hospitalization with a respirator, and non-hospitalization (isolation) were the three groups used to categorize patients' treatment state. The severity of illness was divided into three categories by the order of the Pakistani Minister of Health: minor, medium, and severe. Minor symptoms include anything that does not indicate viral pneumonia or hypoxia, such as fever, wheezing, fatigue, starvation, breathlessness, myalgia, or other minor symptoms. Mild symptoms are defined as the prevalence of mild symptoms of pneumonia, including temperature, coughing, loss of breath, and fast respiration. Having pneumonia-related symptoms and inhaling more quickly than 30 inhalation per minute, or serious respiratory distress, are indicative of severe symptoms (Kepmenkes et al., 2021) Traveling experience and contact with individuals believed or verified to have COVID-19 were categorized as either yes or no.

Data Analysis

Data analysis for this study was carried out using SPSS version 25. The data was analyzed using chi-square analysis and logistic regression to identify the variables that influence a child's prognosis for survival after receiving a COVID-19 diagnosis. A hazards proportion and a confidence interval of 95 percent were used to evaluate the degree of correlation between the independent and dependent factors.

Results

Out of 1000, 630 had COVID-19, 63.0% of whom were boy and 67.7% of whom were classified as having a suspected case. According to their medical state, as of 42.8%, minors were hospitalized, and a small percentage of them (6.4%) were using ventilators. A higher proportion of COVID-19-positive kids had mild cases (73.0%), no travel experience (51.9%), and were exposed to someone who had the virus (Table 1). A two variety analysis of the corona virus mortality rate in juvenile patients, is also shown in Table 1, with 23 children (6.7%) dying and 933 children (93.3%) remaining living.

Table 1
Socio-demographic Data of Patients with COVID-19 (n=1000)

Characteristics	Total		Survival Status (n=1000)					
			Alive		Dead			
	N	%	n	%	n	%	X2	p value
Sex							2.63	0.21
Male	630	63.0	616	97.7	14	2.3		
Female	370	37.0	356	96.2	14	3.8		
Case Definition							0.44	0.65
Suspected	677	67.7	655	96.7	22	3.3		
Confirmed	323	32.3	316	97.8	7	2.2		
Treatment							158.23	0.00*
Nonhospitalized	508	50.8	500	98.4	8	1.6		
Hospitalized	428	42.8	415	96.9	13	3.1		
Hospitalized with Ventilator	64	6.4	51	79.6	13	20.4		
Severity of Illness							470.74	0.00*
Mild	730	73.0	728	99.7	2	0.3		
Medium	212	21.2	201	94.8	11	5.2		
Severe	58	0.5	36	62.0	22	38.0		
Travel history							12.84	0.00*
Yes	481	48.1	468	97.2	13	2.8		
No	519	51.9	502	96.7	17	3.3		
exposed to a COVID-19 patient with a probable or proven case							2.33	0.11
Yes	711	71.1	703	98.8	8	1.2		
No	289	28.9	271	93.7	18	6.3		
Total	1000	100.0	933	93.3	23	6.7		

According to the analysis's findings, a number of variables, including therapy, disease intensity, and prior travel, was associated with mortality in kids with COVID-19. Age, case classification, treatment status, disease intensity, and travel history were found to have a substantial association with survival status in children with corona virus in a analysis of many variables using logistic regression. According to the findings of the study, the chance of death will drop by 0.94 times as the child gets older [adjusted odd ratio was equal to 0.94; the confidence interval will be nighty five percent]. [Adjusted odd ratio was equal 2.12; with the confidence interval of nighty five percent] Children with a suspected Compared to kids who have a confirmed COVID-19 case, COVID-19 cases have a higher mortality rate. Kids admitted with ventilatory support had the highest risk of death, reaching twenty-two times that of isolated kids [adjusted odd ratio was equal to 21.43; with the confidence interval of nighty five percent and its 5.23-79.82]. Children with severe cases have a higher mortality risk compared to those with mild cases. The odds of death are 47 times higher in

children with severe cases, with a confidence interval of 21.83 to 100.37. Children with experience of a particular trip had a higher chance of dying compared to those who did not go on the trip. The odds of death were 1.37 times higher for children with trip experience, and we can be 95% confident that the true odds ratio falls between 1.35 and 2.60. (Table 2).

Table 2

Multivariate Analysis of COVID-19-positive Children's Survival Status (n = 1000)

Variables	Unadjusted		Adjusted			
	Odd ratio	Significance	Odd ratio	Significance	95% CI	
					Low	high
Age	0.91	0.00	0.93	0.00	0.92	0.98
Gender						
Boys	1.56	0.23	1.34	0.74	0.72	1.43
Girls	–					
Cases						
Probable	0.86	0.75	2.32	0.00	1.22	3.66
Diagnosed	–					
Treatment						
Not admitted	–					
Admitted	26.33	0.00	54.33	0.00	5.6	41.32
admitted with Ventilatory support	121.91	0.00	21.32	0.00	5.83	85.72
level of Illness						
Low	–					
Middle	5.55	0.00	2.36	0.00	1.34	4.73
High	65.44	0.00	46.33	0.00	21.26	101.75
History of traveling						
Yes		1.32	0.00	1.86	0.00	1.85	2.23
No	–					

Discussion

The findings revealed a number of variables linked to death among kids with COVID-19 in Punjab. A child's chance of dying from COVID-19 decreases with maturity. This finding is consistent with a prior research that found that children under the age of one had a greater percentage of severe and critical cases than older children, hitting 10.6% (Dong et al., 2020). The health institutions in according to the authors, cannot handle the majority of serious instances involving infants younger than a year old. Younger children are more at risk of mortality as a result than elder children are. Neonatal patients and young children weren't given priority during the pandemic's initial surge. In 2020, the government prioritized the aging population, and there were few resources available for pediatric treatment (Kemenkes et al., 2020). These findings can also

be used to identify the mortality markers in vulnerable Corona virus cases, such as the danger related to the child's age.

The case definition and the prognosis for newborns with Corona virus were highly correlated. The chance of mortality is 2.12 times greater for infants with suspected status than for those with verified status. Similar to earlier studies, this one found that 65.9% of cases in minors were suspected rather than verified (Dong et al., 2020). Compared to patients with a suspected case, medical signs and evidence of Corona virus illness were present in individuals with confirmed cases. (World Health Organization, 2020). By definition, patients with verified cases may experience serious symptoms like chest discomfort, trouble breathing, lack of speech or movement, and disorientation (World Health Organization, 2021). According to this classification, patients with verified COVID-19 instances have a higher chance of dying due to their illness's intensity and signs and symptoms. Children are more prone to infection even though their clinical symptoms are typically less serious than those of adults with COVID-19 (Dong et al., 2020). Furthermore, we presume that infants with confirmed position get care and help earlier than those whose status is still unknown. As a result, it may raise the chance of mortality in kids with probable instances. The findings of the research showed a substantial correlation between therapy-related variables and mortality in adolescents with COVID-19.

Compared to children who were not confined, children who were committed and on a ventilator had a 22-fold higher risk of dying. Studies have shown that COVID-19 fatalities are considerably more likely to occur in patients who use artificial ventilators, and this result is congruent with those studies (MVs) (Khan et al., 2020). In addition, a separate study found that corona virus patients in hospitals had a high risk of passing away in the critical care unit (Abate et al., 2020). Children and pediatric patients with hydronephrosis, leukemia, and intussusception who needed special care and those who passed away had distinct comorbidities (Alsohime et al., 2020). This showed that illnesses might be one of the elements affecting the COVID-19 patients' mortality status, but our data did not examine this matter. In some the chances of survival is also correlated with the duration of hospitalization (LOS), with a greater likelihood of survival for patients treated for less than 14 days compared to those treated for more than 30 days (Khan et al., 2020). Fever, respiratory, and stomach complaints were more common in hospitalized children and their hemoglobin and neutrophil counts were comparatively lower (Parcha et al., 2021). This result supports our continued belief that it's critical to evaluate symptoms in children with COVID-19 in order to decide when therapy and use of a ventilator are necessary to improve mortality rates. The results of the present research indicated a relationship between the severity of the disease and the likelihood of life for the infants. The risk of death was 47 times higher for infants with serious cases than for those with moderate ones. Prior studies carried out in China discovered that the severity of the disease was greater in the no surviving group than in the alive group (Zhang et al., 2021).

Travel experience was the final element linked to the chance of a kid dying. Children with journey experiences had a greater death rate than children without such backgrounds. This finding is consistent with a previous study, which discovered that living in common areas, traveling, and having close contact with

ill patients (Alsohime et al., 2020). A journey's history is linked to a community's movement, which is believed to affect COVID-19 dissemination. Furthermore, we postulated that kids who travel around in their neighborhoods have a greater likelihood of being subjected to COVID-19, making them more vulnerable to severe disease and even death.

Limitations

This study's shortcomings have been noted. First, only a few factors were present because the data were supplementary. As a result, the researcher only chooses the factors that are present in the information. Second, causation is not implied by the study's findings. Additionally, the data did not mention the potential of bias at the testing location or the reason why the infants died. Despite these drawbacks, this research helps to shed light on the variables that affect mortality among kids with verified and probable COVID-19 cases in a particular community.

Conclusion

The fatality rate for kids who acquire COVID-19 is influenced by a number of variables, including age, probable infection status, and hospitalization, use of ventilators, sickness intensity, and past travels. Concentrated efforts on the psychological and societal levels are required to lower the risk of COVID-19-related deaths in minors. To lessen the possibility of a community-wide outbreak, a comprehensive marketing and control plan should be put into place. In the meantime, professional tools should be used to stop kids from getting serious illnesses. Therefore, efforts to enhance patient management should be implemented, such as offering supportive care that includes nourishment, respiratory care, and family support. The effectiveness of community-based protection strategies should also be increased in order to provide helpful care and monitor children's health conditions. Health education initiatives can be carried out through in-person or online encounters.

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