THE OUTCOME OF SARS-COV2 INFECTION AMONG CHILDREN WITH CANCER IN SULAIMANIYAH PROVINCE, IRAQ

Khanda Muhammed Abdulla [a], Khalid Hama Salih [a], and Bakir Rahim Rashid [a]

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ABSTRACT

Background

The most significant and pervasive health issue faced the globe during the last 2years was coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV2). Patients diagnosed with childhood cancer may have impaired immune systems due to their illness or therapy, increasing their vulnerability to COVID-19 infection.

Objectives

To determine the outcome of COVID-19 in children with malignancy who received chemotherapy, explain characteristic features, and assess the severity of COVID-19 among haematological vs oncological malignancies

Patients and Methods

This Retro-prospective cohort study was carried out in the Hiwa oncology Hospital in the Sulaimaniyah governorate from November 2021 to February 2022 on 70 children with cancer using PCR to confirm their COVID-19 infection (60 haematological cases and ten oncological cases).

Results

Among the total 70 patients involved in the study, 52.9% were males, 47.1% were females, and their mean age was 8.83 ± 4.3. About sixty-two (90%) cases had haematological malignancies, and 8(10%) had oncological malignancies. The most predominant symptom was fever (82.9%), followed by cough (67.1%). On the other hand, 58 (82.9%) cases had mild disease, and 8 (11.4%) had the moderate disease. Chest x-ray infiltration was found in 12 (17.1%) cases; 14 (20.0%) children needed hospital admission, only 1 (1.4%) case required intensive care unit (ICU) admission, and 6 (8.6%) patients needed O2 therapy. Sixty-seven children recovered from COVID-19, and three children died.

Conclusion

Most children with cancer (CwC) had mild infections and were outpatients with benign outcomes. Haematological malignancies, especially acute lymphoblastic leukaemia (ALL), are the commonest malignancies among COVID-19 patients. Most COVID-19 patients were symptomatic, with fever and cough being the predominant symptoms.

Keywords: *Children, COVID-19, SARS-CoV 2, Malignancy, Hiwa Hospital.*

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[a] College of Medicine-University of Sulaimani, Kurdistan Region, Iraq.
Correspondence: khanda.abdlla@univsul.edu.iq

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INTRODUCTION

In December 2019, many acute atypical respiratory diseases appeared in Wuhan, China. From Wuhan, this quickly spreads to the surrounding region. SARS-CoV-2 continues to spread despite globally coordinated attempts to contain it; through measures such as quarantining infected individuals and their families, isolating them from society, and removing them from school, the virus still managed to spread, and the World Health Organization (WHO) recognized the pandemic status of the COVID-19 virus on March 11, 2020. The newly discovered coronavirus was quickly identified as the culprit [1, 2]. It is hypothesized that a seafood market in Wuhan, China was the source of the zoonotic transmission that started the SARS-CoV-2 pandemic. Transmission between humans was later shown to have a significant role in the subsequent epidemic [3, 4].

COVID-19 were first detected in the elderly; however, as the epidemic progressed, the number of cases among those aged 65 and above expanded. A small but noticeable rise was also seen among children. Preliminary studies on cancer and chemotherapy in Chinese children found a possible link to an increased risk of severe disease [5]. Adults have a greater chance of developing the condition and a more severe case. Morbidity and mortality rates for younger people with cancer and COVID-19 are lower than their elders [6, 7].

In contrast, over 55% of adult cancer patients encounter a moderate to severe COVID-19 course, whereas only 4% to 9% of those diagnosed with cancer in children do [8]. Compared to healthy youngsters, those with cancer had a higher incidence of COVID-19 infection. Extreme symptoms and the requirement for oxygen therapy are more common in children with cancer who contracted COVID-19 than in healthy children. Nonetheless, some publications, mostly from high-income countries with limited sample sizes, show that SARS-CoV-2 infection may not be a major cause of death for children with cancer [9, 10].

At presentation, fever and cough were the most reported symptoms, followed by congestion or rhinorrhea, sore throat, dyspnea, chest discomfort, fatigue, headache, and myalgias. Nausea/vomiting, Diarrhea, and Taste/Smell Loss. Hospitalization, oxygen treatment requirements, Intensive care unit (ICU), and hospitalization have also been documented [11, 12]. The diagnostic gold standard for SARS-CoV-2 is RNA RT-PCR [13, 14].

PATIENTS AND METHODS

The current study is a Retro-prospective study of 70 patients diagnosed with haematological malignancies or solid tumours at the Hiwa Oncology Hospital in Sulaimaniyah province, Kurdistan region of Iraq. The study was conducted over four months, from November 2021 to February 2022, to examine the socio-demographic features, clinical presentations, and outcomes of SARS-CoV-2 infection in children with malignancy undergoing chemotherapy.

Real-time polymerase chain reaction (RT-PCR) on a swab taken from the nasal cavity or the mouth was used to diagnose SARS-Cov 2 (Defining COVID-19 strain was impossible.) Information was gathered by having the patient's parents fill out a premade questionnaire. Patients who signed up had their complete blood counts, inflammatory marker levels (CRP, ESR, FERRITIN) and radiological imaging (CT or chest x-ray) taken from the data system of Hiwa hospital, and none of the cases had D-Dimer level or Echocardiography.

Inclusion Criteria

Children under the age of 18 years with a confirmed diagnosis of a Hematological or Solid malignancy received chemotherapy.

Exclusion criteria

Patients with positive serology (covid-19 IgG, IgM), a positive radiological diagnosis without RT-PCR of SARS-CoV-2, a positive serology (without RT-PCR), and patients not taking chemotherapy.

Ethical Considerations

Ethical review and approval from the Sulaimaniyah University / College of Medicine / Ethical committee of the College of Medicine were obtained.

Statistical Analysis

SPSS (IBM SPSS Statistical Package for the Social Sciences) version 21 was used for statistical analysis after data input was finished in an Excel spreadsheet. First, the categorical variables were tabulated to indicate the frequency and relative frequency distribution; chi-square tests were performed to compare the categorical data across the various patient groups (as age groups, CXR infiltrations, and groups with different Severity levels of COVID-19).

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ndependent sample t-tests were performed to determine whether there was a significant difference in means between pairs of groups. In contrast, analysis of variance (ANOVA) tests was employed to compare three or more groups.

Table 1. Patients characterestics.

Age (Years)	Mean ± SD	Median	Minimum	Maximum		
	8.83 ± 4.3	7.5	1	18		
					Frequency	%
1-4					10	14
5-11					41	59
12-17					19	27
Sex		Male			37	52.9
		Female			33	47.1
Primary diagnosis		ALL			51	72.9
		AML			2	2.9
		Relapsed ALL			4	5.7
		Relapsed AML			1	1.4
		Astrocytoma			2	2.9
		Rhabdomyosarcoma			1	1.4
		Neuroblastoma			3	4.3
		Myeloid Sarcoma			1	1.4
		Hodgkin lymphoma			2	2.9
		Lymphoblastic lymphoma			1	1.4
		Lymphoproliferative disorder			1	1.4
		Hepato-blastoma			1	1.4
Total					**70**	**100.0**

Table 2. Clinical features of the study group.

Signs and symptoms		Frequency	%
Fever	Yes	58	82.9
Cough	Yes	47	67.1
Sneezing	Yes	25	35.7
Dyspnea	Yes	3	4.3
Nausea and vomiting	Yes	16	22.9
Diarrhoea	Yes	31	44.3
Abdominal pain	Yes	33	47.1
Headache	Yes	24	34.3
Myalgia	Yes	28	40.0
Skin rash	Yes	3	4.3
Sore throat	Yes	9	12.9
Total		**70**	**100.0**

Table 3. COVID-19 Severity in Relation with Primary Diagnosis, Gender and Age groups.

		COVID-19 Severity			Total	P-value
		Mild	Moderate	Severe		
Primary diagnosis	ALL	42	6	3	51	0.99
	AML	1	1	0	2	
	Relapsed ALL	3	1	0	4	
	Relapsed AML	1	0	0	1	
	Astrocytoma	2	0	0	2	
	Rhabdomyosarcoma	1	0	0	1	
	Neuroblastoma	3	0	0	3	
	Myeloid Sarcoma	1	0	0	1	
	Hodgkin lymphoma	2	0	0	2	
	Lymphoblastic lymphoma	1	0	0	1	
	Lymphoproliferative disorder	1	0	0	1	
	Hepatoblastoma	1	0	0	1	
Gender	Male	32 (54.24%)	3	2	37	0.60
	Female	27 (45.76%)	5	1	33	
Age (Years)	1 - 4	6	3	1	10	0.19
	5 - 11	36	3	2	41	
	12 - 18	17	2	0	19	
Total		**59 (84.29%)**	**8 (11.43%)**	**3 (4.29%)**	**70 (100%)**	

Table 4. The Outcome of COVID-19, Rate of hospital admission, Need for ICU and Need for O2 concerning the type of cancer.

		Type of cancer		Total	P value
		Haematological Frequency (%)	Oncological Frequency (%)		
Outcome	Remission	60 (96.8)	7 (87.5)	67	0.22
	Dead	2 (3.2)	1 (12.5)	3	
Hospital admission	Yes	13 (21.0)	1 (12.5)	14	0.57
Need for ICU	Yes	1 (1.6)	0	1	0.72
Need for Oxygen	Yes	5 (8.1)	1 (12.5)	6	0.67
Chest x-ray infiltration	Yes	12 (17.1)	0	12	
	No	58 (82.95)	0	58	
Total		**62**	**8**	**70**	

DISCUSSION

This research included 70 patients aged 1-18 years who contracted COVID-19. The mean age was (8.83±4.3 years) which was comparable to that documented by Ebeid et al. in Egypt [15]; however, it was slightly higher than the mean age of patients without COVID-19 mentioned previously in Basrah/Iraq (6.2±4.1 years) [16] and Hadhramout/Yemen (7.34 ± 4.18 years) [17].

The predominant age group infected with SARS-CoV 2 was 5-11 years, followed by 12-18 years, then 1-4 years; in Egypt, Mahmoud et al. found that>50% were aged ≤ 10 years (18). Our findings are similar to Jawass et al. [17] results on Healthy Children, analogous to those obtained in the USA with COVID-19 [19].

According to the results of this research, only one case needed admission to ICU, which already had a progressive cancer disease and chemotherapy-induced polyneuropathy, thus indicating a low prevalence of critical cases; the differences in chest infiltration, the need for oxygen therapy, and disease severity were insignificant among different age groups. Similar findings were mentioned in a meta-analysis by Choi et al. [20], who analyzed previous studies on COVID-19 children without cancer. They found a non-significance correlation between different age groups and disease severity; however, they noted that newborns infected with COVID-19 might be at increased risk for more severe illness, a population not identified in our investigation.

In this study, most (90%) of COVID-19 patients have haematological malignancies, with the remaining 10% representing solid tumours. Our findings follow the global registration of children's tumour incidence. Steliarova-Foucher et al. [21] mentioned the most frequently reported cancer types: leukaemia, central nervous system tumours, and lymphoma. Consistent with the findings of two other investigations, this one found that children with haematological malignancies had a greater probability of contracting COVID-19 than children with other cancers. Mahmoud. et al. [18] and Lee et al. [22] results. The vast majority of COVID-19 patients (n=69) in the current study were symptomatic, yet a previous study showed that asymptomatic COVID-19 infection in children with cancer is not uncommon.[23]

Fever was the most frequent symptom (82.9%) among the study group, while only 47.5% of CwoC were reported by de Souza et al. [23]; they recorded many asymptomatic cases while in our study, most patients were symptomatic; this result makes fever an essential symptom in predicting SARS-CoV-2 infections in children with cancer.

This study revealed that cough was the second most common symptom among pediatric patients in addition to fever. These findings are consistent with a comprehensive evaluation of COVID-19 CwC conducted by Hoang et al., who collected 131 studies and found that fever and cough were the most apparent symptoms [24].

Although MISC cases had been reported in many pediatric patients with or without cancer [25,26], no cases were reported in the current study.

The outcome of COVID-19 in CwC did not affect gender, age group, or the type of malignant disease; these findings reflect the mild course of infection. However, Graff et al. [27] observed more disease in CwoC in extreme children [27].

Most of the CwC did not require hospitalization due to COVID-19 infection, and this reflects the mild infections among 82.9% of the children; however, 20% of CwC were admitted to the hospital due to COVID-19 infection either due to severe clinical features, the presence of CXR infiltrate, the abnormal deviation in laboratory markers, or the need for oxygen therapy; only one child was in need for ICU admission. The hospital admission was not related to the type of cancer.

Our study's mortality rate was higher (4.3%) due to additional malignant comorbidity. One of the cases had relapsed/refractory disease, one was a palliative, and the third had a previous history of chemotherapy-induced heart failure. The mortality rate among children with cancer mentioned by Mukkada et al. [11] was comparable to ours; however, Dorantes-Acosta et al. mentioned a 100% survival rate[12]. In conclusion, most children with cancer have mild COVID-19 infection, and ALL is the most prevalent type of cancer. Fever is the predominant symptom in these patients. in most cases, children with cancer are not at high risk for severe COVID-19 infection.

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