

Barriers Faced by Mothers Caring for their Children with Leukemia during COVID-19 Pandemic

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Abstract

Background: Mothers caring for their children with leukemia during COVID-19 pandemic are facing several barriers. Leukemia is the most common childhood cancer, accounting for more deaths in developed nations than any other illness. **Aim of the study:** Was to assess barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic. **Setting:** This study was carried out in Pediatric Oncology Inpatient Department at Benha Specialized Pediatric Hospital affiliated to Specialized Medical Centers Secretariat. **Design:** A descriptive quantitative study design was utilized. **Subjects:** A purposive sample of 91 mothers and their children aged from 5 to 16 years old with leukemia. **Tools of data collection: Tool I:** A structured interviewing questionnaire used to assess; personal characteristics of the studied mothers, personal characteristics of the studied children and mothers' knowledge about childhood leukemia and COVID-19 pandemic. **Tool II:** Interviewing questionnaire sheet regarding barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic. **Results:** Less than half of the studied mothers had inadequate knowledge about childhood leukemia and more than half of them had inadequate knowledge about COVID-19 pandemic. Meanwhile, social related barriers were the major barrier constituting about more than two thirds. While, the less barriers faced by mothers were major hospital related barriers constituting about more than half. **Conclusion:** There was a highly statistical significant negative correlation between total barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and their total knowledge level about COVID-19. **Recommendations:** Designing and implementing an educational program for mothers about COVID-19 and its effects on children with leukemia and COVID-19 vaccination for children with leukemia.

Key words: Barriers, Care, Children, COVID-19 Pandemic, Leukemia, Mothers

Introduction

Leukemia is a cancer of children blood forming tissues, including bone marrow and the lymphatic system. Usually, it has an impact on white blood cells which normally act as potent infection fighters. While leukemia can occur at any age, the mutations that cause childhood leukemia often differ from those that cause adult leukemia. Childhood leukemia arise from blood progenitors that begin developing before birth (Mendoza-Castrejon & Magee, 2023).

Leukemia has various forms which include: acute lymphocytic leukemia, chronic lymphocytic leukemia, acute myeloid leukemia and chronic myeloid leukemia (Gupta et al., 2023). Although the etiology of childhood leukemia is largely unknown, known risk indicators include; older parental age, birth defects, highly invasive genetic predispositions, such as; Down syndrome, environmental risk factors such as exposure to some toxic substances and ionizing radiation. Exposures in

uterus are believed to play an etiologic role. High and low birth weights as well as sex are known risk factors of childhood leukemia, with boys more often affected than girls (**Qureshi et al., 2023**).

Nowadays childhood leukemia can be treated by many approaches, including standard chemotherapy, radiation therapy, targeted drugs therapy for childhood leukemia, immunotherapy, and stem cell transplantation which is offered in certain high-risk or certain relapse cases. Supportive care is important in survival besides specific treatment (**Graiqevci-Uka et al., 2023**).

Coronavirus (COVID-19) is caused by a virus called SARS-CoV-2. It is part of the coronavirus family, which include common viruses that cause a variety of diseases from head or chest colds to more severe (but more rare) diseases like Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). It is primarily transmitted through respiratory droplets including via indirect contact through the contaminated surfaces (**Bardsley et al., 2023**).

Childhood leukemia pose many barriers during the current COVID-19 pandemic especially hospital related barriers. Since most childhood malignancies are aggressive and need urgent treatment, delaying treatment might not be appropriate for these children also lack of personal protective equipment for medical personnel, unavailability of intensive care unit beds, shortages in medication and blood products. Therefore, strategies should be undertaken to prevent and decrease the risk of exposure to COVID-19 (**Mohseni et al., 2022**). Also, other several barriers are faced by mothers during caring for their children with leukemia during COVID-19 pandemic includes; children related barriers, financial barriers and social barriers (**McLoone et al., 2022**).

Mothers of children with leukemia must consider taking the required steps during COVID-19 pandemic to protect their children from increased stress and anxiety levels and to follow several strategies that recommended to enhance their children management. For example, stay at home, maintain social distancing, frequently washing hands with soap and water for at least twenty seconds, sanitize hands with antiseptic solutions and avoid touching the eyes, nose and mouth with unwashed hands (**Man, et al., 2020**).

Nurses play a fundamental role in caring for children with leukemia during COVID-19 pandemic. This includes; not only the provision of direct clinical care, but also in the supervision of actions, support to family members and other professionals, as well as in implementing strategies for the reduction of risks and to stop the virus from spreading to children, families, and staff, and providing health education about updated strategies for prevention and infection control, as for precautions and isolation, hand hygiene, proper use of personal protective equipment, cleaning and disinfection of surfaces and environment (**Sullivan et al., 2020**).

Significance of the study:

Childhood leukemia is a persistent global health issue representing nearly one-third of all pediatric cancers. The worldwide incidence rate of childhood leukemia is approximately 17.3 new cases per 100,000 children (**Onyije et al., 2022**). Leukemia is most frequently diagnosed in children below 15 years. Acute Myeloid Leukemia (AML) is detected in 15-20% of children, while Acute Lymphoblastic Leukemia (ALL) is a major incidence diagnosed in about 76% of all leukemia cases in this age group, with maximum of the rate observed in children less than one-year age (**Chhikara & Parang., 2023**).

Globally, childhood cancer is considered the ninth leading cause of childhood disease burden.

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Egypt has the second-highest estimated number of incident childhood leukemia cases in the WHO Eastern Mediterranean Region. There exist significant barriers to optimal childhood leukemia care in Egypt due to great need and demand for services, inferior outcomes, and limited resources. According to the statistical report from Benha Specialized Pediatric Hospital, the children diagnosed with leukemia from January 2022 to January 2023 was 53 cases. While the total number of children receiving anti-leukemia therapy includes 117 cases at the same period (**Statistical Center of Benha Specialized Pediatric Hospital, 2023**).

COVID-19 pandemic had caused more than 663 million cases and more than 6.71 million deaths worldwide. Egypt is among the countries reporting the highest number of COVID-19 cases in Africa. In Egypt, from January 2020 to May 2023, there have been 516,023 confirmed cases of COVID-19 with 24,830 deaths, reported to WHO. While, the disease mostly has a milder course and its prevalence has been reported as 2% in children (**World Health Organization, 2023**).

COVID-19 pandemic has posed significant barriers in the healthcare sector, which has directly or indirectly impacted the care of children with leukemia. From the barriers of diagnostic delay and delay in hospitalization to interrupted treatment in COVID-19 affected oncological children, there have been substantial barriers faced by mothers during the pandemic due to immunosuppression of their children. So that, the present study was conducted to assess barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic.

Aim of the study:

The current study aimed to assess barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic.

Research questions:

- What is the level of mother's knowledge regarding childhood leukemia and COVID-19 pandemic?
- What are the barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic?
- Is there a relation between mother's total knowledge regarding COVID-19 pandemic and their personal characteristics?
- Is there a relation between barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and their personal characteristics?
- Is there a correlation between total barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and their total knowledge regarding COVID-19 pandemic?

Research design:

A descriptive quantitative design was utilized to conduct the current study. Descriptive research design is a research method that describes the characteristics of the population that is being studied and focuses more on the "what" of the research subject rather than "why" of the research subject (**Schoch, 2020**).

Research setting:

This study was conducted in Pediatric Oncology Inpatient Department at Benha Specialized Pediatric Hospital affiliated to Specialized Medical Centers Secretariat. It was located in the fourth floor, and consists of (5) rooms; (2) oncology rooms each room contains (8) beds, (2) blood disease rooms, each room contains (3) beds and (1) isolation room contains (1) bed. The number of nursing staff caring for children with leukemia was 15 nurses.

Subjects:

A purposive sample of 91 mothers and their children with leukemia who attended the previously mentioned setting for receiving anti-leukemia therapy and willing to participate in

the current study under certain criteria. While, the total number of children with leukemia were 117. However, there were 92 children with leukemia were involved in the study but one child died during collection of data.

Inclusion criteria for mothers and children:

- Mothers caring for their children with acute lymphocytic leukemia during COVID-19 pandemic (from February 2020 to January 2021).
- Children aged from 5 to 16 years old.

Exclusion criteria for mothers and children:

- Mothers of children with motor function disorders, such as cerebral palsy.

Tools for Data Collection:

Data was collected through the following:

Tool (I): A structured Interviewing

Questionnaire: It was included three parts.

Part (1): Personal characteristics of the studied mothers which included 7 items.

Part (2): Personal characteristics of the studied children which included 4 items.

Part (3): Mothers' knowledge which classified into:

A: Mothers' knowledge about childhood leukemia and included 13 multiple choice questions.

B: Mothers' knowledge about COVID-19 and included 22 multiple choice questions.

Scoring system for mother's knowledge:

The answers of mothers were checked with a model key answer, and (2) scores were given for complete and correct answer, (1) score for an incomplete correct answer, and (0) score for don't know or incorrect answer. The total score of mother's knowledge (70 degree).

The total scoring system of mother's knowledge was calculated and classified as the following:

- 75%-100% were considered adequate knowledge which constituting (52.5-70 degree).

- 60%-<75% were considered average knowledge which constituting (36-<52.5 degree).

- <60% were considered inadequate knowledge which constituting (<35 degree).

Tool (II): Interviewing questionnaire sheet regarding barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic:

This tool was developed by the researcher and based on **Saab et al., (2020) and Atout et al., (2021)**. It was consisting of 4 main items, which includes; children-related barriers (It included 10 items), financial barriers (It included 8 items), social barriers (It included 8 items), and hospital related barriers (It included 23 items). It included closed ended questions with answer in the form of always, sometimes and never.

The response of mothers toward barriers that faced during caring for their children with leukemia during COVID-19 pandemic was calculated as the following: (2) scores were given for always, (1) score for sometimes, and (0) score for never. The total score of mother's barriers was (98 degree).

The total scoring system was classified into two levels as the following:

- <70% were considered minor barriers which constituting (<58.5degree).
- 70% - 100% were considered major barriers which constituting (58.5-98degree).

Content Validity:

Data collection tools were revised for content validity by a panel of three experts in the field of Pediatric Nursing. The experts were from Faculty of Nursing, Benha University, one of them was professor of pediatric nursing while two of them are assistant professor of pediatric nursing. They reviewed the study tools for its clarity, relevance, comprehensiveness, simplicity and applicability and minor modifications were done according to their judgment like reformulation of some elements

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of the questionnaire, and write the full reference for the second tool.

Reliability:

Reliability of the developed tools was estimated by using Cronbach's alpha coefficient test to measure the internal consistency of the study tools. Reliability for the structured questionnaire sheet for mother's knowledge Cronbach's alpha=0.940 and for mothers' barriers faced during caring for their children with leukemia during COVID-19 pandemic =0.875. This indicated a high degree of reliability for the study tools.

Ethical and legal consideration:

The study was approved by the Ethical Research Committee at Faculty of Nursing-Benha University. The researcher informed all mothers about nature and expected outcomes from their inclusion in the study in order to obtain their acceptance. The studied mothers were informed that the study is harmless, all gathered data were confidential and used for the research purpose only. They were informed that, they were optionally allowed either to participate or not in the study and they had the right to withdraw from the study at any time without giving any reason, oral consent was obtained from the studied mothers.

Pilot study:

A pilot study was done on 10% of the total study sample (9 mothers & their children) to test clarity and applicability of the study tools and to estimate the time needed to fill each tool. No radical modifications were done according to the results of pilot study. Participants involved in the pilot study were included in the total study sample. Pilot study was done through one month as it was carried out in the beginning of June, 2022 until the beginning of July 2022.

Field work:

The actual field work of the current study took about 3 months starting from the beginning of August 2022 up to the end of October 2022 in the previously mentioned setting according to

policy of the study setting. The researcher was available at the study setting two days weekly during morning and afternoon shift because these periods were appropriate with the researcher's working circumstances and most mothers were present during these two days. The researcher attended Benha Specialized Pediatric Hospital 2 days/week (Monday) from 4 P.M to 8 P.M., and (Tuesday) from 10 A.M to 2 P.M for three months. Approximately, the number of mothers present each day is about 12 mothers, the researcher interviewed 2-4 mothers per day. The researcher interviewed each mother individually, starting by introducing herself to the mothers, providing brief idea about the current study and its outcomes. The researcher used **tool (I)** to assess personal characteristics of the studied mothers and their children, and medical data of children was obtained from child medical file, took about 10-15 minutes. Additionally, this tool used to assess mothers' knowledge about childhood leukemia and COVID-19, took about 30-45 minutes. While the researcher used **tool (II)** to assess barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic, which take about 30-60 minutes. So that, each mother took around 70-120 minutes to fill the questionnaires.

Statistical analysis:

The collected data were organized, categorized, analyzed, and presented in the form of tables and figures using the Statistical Package for Social Sciences, version 22 (SPSS), which was used frequencies and percentages for qualitative descriptive data, chi-square coefficient X^2 was used for relation tests, and mean and standard deviation was used for quantitative data. The observation difference and associations were considered as the following: (p-value):

- P value <0.001 was considered as highly statistically significant.

- P value <0.05 was considered statistically significant.
- P value >0.05 was considered insignificant.

Results:

Table (1): Shows that, less than half (43.9%) of the studied mothers ages from 30 -<40 years old, more than three quarters (76.9%) of them are married, slightly less than one quarter (24.2%) of them can't read and write, more than half (50.5%) of them haven't enough income, and more than half (52.7%) of them their families are composed of 4-6 members.

Table (2): Reveals that, less than half (48.4%) of the studied children are aged from 5-< 8years old. Regarding childs' ranking inside the family, more than half (59.3%) of them are the first child, and more than two fifth (45%) of them have school dropout.

Figure (1): Reveals that, less than half of the studied mothers (39.5%) have inadequate knowledge about childhood leukemia. While, more than one third (34.1%) of them have average knowledge.

Figure (2): Reveals that, more than half of studied mothers (59.4%) have inadequate knowledge about COVID-19. While, less than fifth (15.4%) of them have adequate knowledge.

Figure (3): Clarified that, more than half of studied mothers (56%) faced major barriers

during caring for their children with leukemia during COVID-19 pandemic. While, more than two fifth of the studied mothers (44%) faced minor barriers.

Table (3): Reveals that, there were highly statistically significant relation between mothers' total knowledge about COVID-19 and their personal characteristics regarding educational level $p>0.001$. While there was no statistically significant relation between mothers' total knowledge about COVID-19 and other personal characteristics.

Table (4): Reveals that, there were highly statistically significant relation between mothers' total barriers and their personal characteristics regarding educational level, and income $p>0.001$. While there was no statistically significant relation between mothers' total barriers and other personal characteristics.

Table (5): Clarifies that, there is a highly statistical significant negative correlation between total barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and their total knowledge level about COVID-19.

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Table (1): Distribution of the studied mothers regarding their personal characteristics (n=91)

Personal characteristics of mothers	No.	%
Age/years		
< 20	12	13.2
20 - < 30	21	23.1
30 - < 40	40	43.9
≥ 40	18	19.8
Min-Max 21-43		
Mean ±SD 35.59±4.99		
Marital status		
Married	70	76.9
Divorced	14	15.4
Widow	7	7.7
Educational level		
Can't read and write	22	24.2
Read and write	16	17.6
Primary education	14	15.4
Preparatory education	16	17.6
Secondary school education	13	14.3
Bachelor's	10	10.9
Income		
Enough and save	13	14.3
Enough	32	35.2
Not enough	46	50.5
Number of family members		
3 members	16	17.6
4-6 members	48	52.7
More than 6 members	27	29.7

Table (2): Distribution of studied children regarding their personal characteristics (n=91)

Personal characteristics of children	No.	%
Age/years		
5 - < 8	44	48.4
8 - < 12	27	29.7
12-16	20	21.9
Min- Max 5-14.5		
Mean ± SD 6.736±2.00		
Childs' ranking		
First	54	59.3
Second	12	13.2
Third	12	13.2
Fourth	13	14.3
Educational level		
Nursery school	16	17.6
Primary school	21	23.1
preparatory school	13	14.3
School dropout	41	45.0

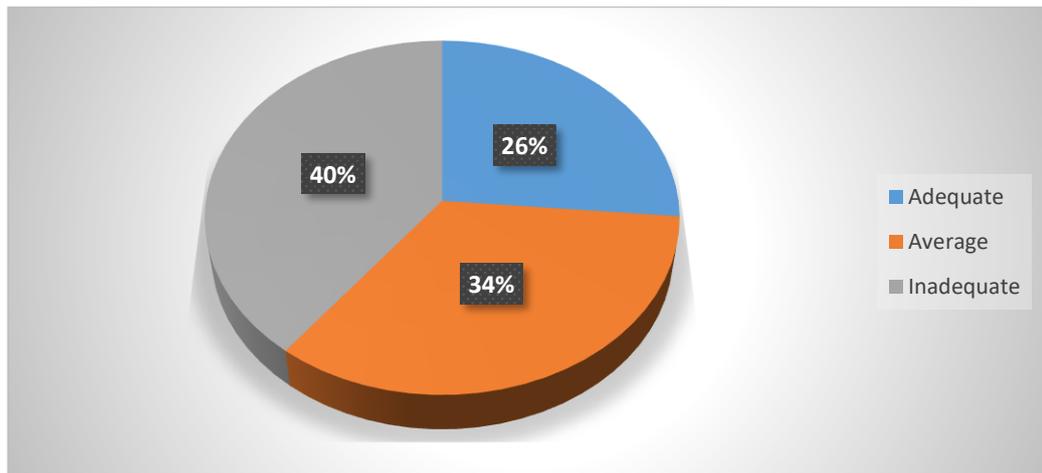


Figure (1): Distribution of the studied mothers according to their total knowledge about childhood leukemia (n=91)

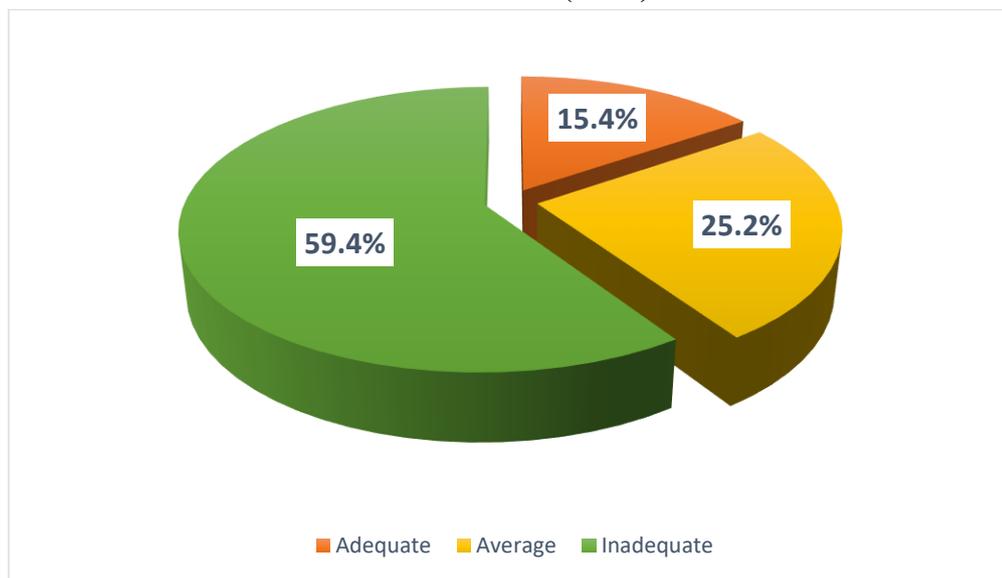


Figure (2): Distribution of the studied mothers according to their total knowledge about COVID-19 (n=91)

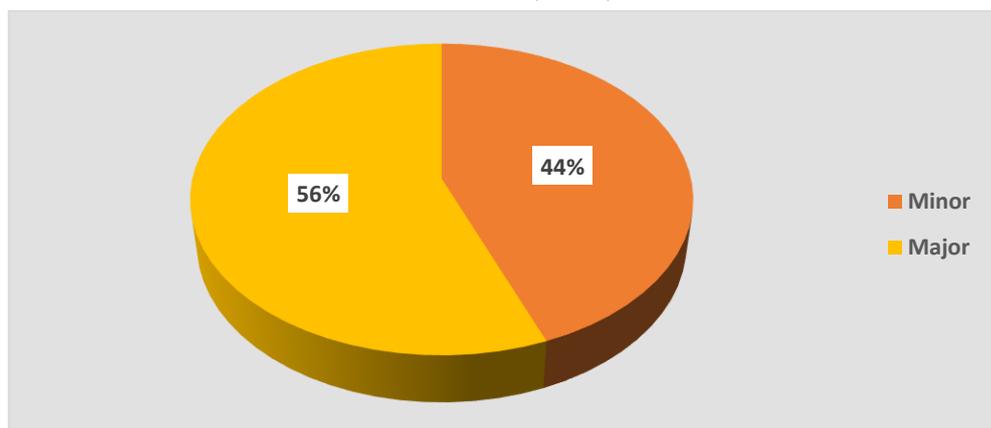


Figure (3): Distribution of of the studied mothers according to total barriers faced by them during caring for their children with leukemia during COVID-19 pandemic (n=91)

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Table (3): Relation between mothers' total knowledge regarding COVID-19 and their personal characteristics (n=91)

Personal characteristics mothers	Total knowledge score						X ²	p-value
	Inadequate (n=54)		Average (n=23)		Adequate (n=14)			
	No.	%	No.	%	No.	%		
Age								
< 20	9	16.7	3	13.0	0	0.0	7.249	.298
20 - < 30	18	33.3	13	56.5	9	64.3		
30 - < 40	13	24.1	5	21.8	3	21.4		
≥ 40	14	25.9	2	8.7	2	14.3		
Marital status								
Married	41	75.9	20	87.0	9	64.3	3.374	.497
Divorced	8	14.8	2	8.7	4	28.6		
Widow	5	9.3	1	4.3	1	7.1		
Educational level								
Can't read and write	22	40.7	0	0.0	0	0.0	143.170	.000**
Read and write	16	29.6	0	0.0	0	0.0		
Primary education	14	25.9	0	0.0	0	0.0		
Preparatory education	2	3.8	14	60.9	0	0.0		
Secondary school education	0	0.0	9	39.1	4	28.6		
Bachelor's	0	0.0	0	0.0	10	71.4		
Job status								
Working	9	16.7	4	17.4	3	21.4	.175	.916
House wives	45	83.3	19	82.6	11	78.6		
Income								
Enough and save	8	14.8	3	13.0	2	14.3	.054	.922
Enough	19	35.2	8	34.8	5	35.7		
Not enough	27	50.0	12	52.2	7	50.0		
Place of residence								
Rural	42	77.8	19	82.6	9	64.3	1.701	.427
Urban	12	22.2	4	17.4	5	35.7		
Number of family members								
Persons3	9	16.7	7	30.4	0	0.0	.389	.823
Persons4 -6	30	55.6	8	34.8	10	71.4		
More than 6 Persons	15	27.7	8	34.8	4	28.6		

Table (4): Relation between total barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and their personal characteristics (n=91).

Personal characteristics mothers	Total barriers score				X ²	p-value
	Minor (n=40)		Major (n=51)			
	No.	%	No.	%		
Age						
< 20	6	15.0	6	11.8	4.161	.245
20 - < 30	13	32.5	27	52.9		
30 - < 40	11	27.5	10	19.6		
≥ 40	10	25	8	15.7		
Marital status						
Married	28	70.0	42	82.4	2.797	.247
Divorced	7	17.5	7	13.7		
Widow	5	12.5	2	3.9		
Educational level						
Can't read and write	22	55.0	0	0.0	84.041	.000**
Read and write	16	40.0	0	0.0		
Primary education	2	5.0	12	23.5		
Preparatory education	0	0.0	16	31.4		
Secondary school education	0	0.0	13	25.5		
Bachelor's	0	0.0	10	19.6		
Job status						
Working	7	17.5	9	17.6	.157	.985
House wives	33	82.5	42	82.4		
Income						
Enough and save	7	17.5	6	11.8	73.875	.000**
Enough	14	35.0	18	35.3		
Not enough	19	47.5	27	52.9		
Place of residence						
Rural	31	77.5	39	76.5	.013	.908
Urban	9	22.5	12	23.5		
Number of family members						
Persons3	14	35.0	2	3.9	.644	.725
Persons4 -6	20	50.0	28	54.9		
More than 6 Persons	6	15.0	21	41.2		

Table (5): Correlation between total barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and their total level of knowledge about COVID-19 (n=91)

Total level of barriers	Total level of knowledge about COVID-19	
	r	p-value
	-0.545	.000**

Discussion:

Childhood leukemia is the most commonly diagnosed type of cancer in children. Acute lymphocytic leukemia (ALL) is the most common childhood leukemia subtype worldwide, followed by acute myeloid leukemia (AML). Chronic leukemia and other leukemia types very rarely occur at young ages (**National Cancer Institute, 2020**).

Children with leukemia have a higher risk of contagious reception than healthy children because of immunosuppression which increases the chance of contracting COVID-19. It can result in serious complications such as; acute respiratory distress syndrome or even death. When mothers caring for leukemic children during the COVID-19 pandemic, they faced a number of barriers, including those related to children, such as children refusing to wear masks and wash their hands, financial barriers, such as the price of buying personal protective equipment, social barriers, such as implementing social distancing, and hospital-related barriers (**Košir et al., 2020**). The current study was a descriptive study that aimed to assess barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic.

Regarding age of the studied mothers, the present study findings showed that, less than half of the studied mothers was aged from 30- < 40 years old with Mean \pm SD 35.59 \pm 4.99. This finding came inconsistent with the study performed by **Davies et al., (2022)**, who studied "Parents' experiences of childhood cancer during the COVID-19 pandemic: An Australian perspective", and founded that; 63% of the mothers was aged from 29 to 51 years old.

As regard the marital status of the studied mothers, the present study findings showed that; More than three quarters of them were married. This finding was supported by the

study performed by **Atout et al., (2021)**, who studied "Challenges faced by mothers caring for children with leukemia during covid-19 pandemic: A qualitative study, in Jordan", and founded that; 83.6% of the studied mothers were married.

Concerning the educational level of the studied mothers, the present study findings showed that; slightly less than quarter of the studied mothers can't read and write. This finding was in a disagreement with **Skeens et al., (2022)**, who studied "An exploration of COVID-19 impact and vaccine hesitancy in parents of pediatric Hematopoietic Stem Cell Transplant (HCT) recipients, in US", and reflected that, 63% of mother had Bachelor's degree.

Regarding income of the studied mothers, the present study findings clarified that, more than half of them had not enough income. This finding came inconsistent with the study performed by **Ochoa et al., (2023)**, who studied "Barriers and facilitators of Hispanic/Latino parents caregiving for a childhood cancer survivor: a qualitative study, USA", and reported that, 33.3% of the participants had enough income. From the researchers' point of view, this might be related to the expensive living conditions.

Concerning the number of family members of the studied mother, the present study findings showed that; More than half of them had from four to six members in family. The finding of the present study was contrary with **Susanah et al., (2022)**, who studied "Parental factors contribute to childhood cancer abandonment treatment during COVID-19, in Indonesia", and found that; 68% of the studied mothers had family members less than 4 persons. From the researchers' point of view, the findings of the current study might be due to husband find demonstration of vitality in high fertility and the mothers has

aperception that many children help to prevent divorce. Or related to economic motives with unsatisfactory socioeconomic level, children are employed to support family income.

Concerning the age of the studied children, the present study findings clarified that, less than half of them were aged from 5 - < 8 years old with Mean \pm SD was 6.736 ± 2.00 . This finding came inconsistent with the study performed by **Immonen et al., (2021)**, who studied "Late adverse effects of childhood acute lymphoblastic leukemia treatment on developing dentition, Finland", and founded that; 72% of children were aged 1–6 years.

Regarding children's ranking inside the family, the present study findings showed that, more than half of them was the first. This finding was in the same line with the study performed by **Davies et al., (2022)**, and founded that, 47% of the studied child arrangement was the first. In addition, regarding the educational level of the studied children, the present study findings showed that; more than two fifth of them had school dropout.

Also this finding came inconsistent with the study performed by **Carey et al., (2022)**, who studied "Childhood cancer survivors and distance education challenges: Lessons learned from the COVID-19 Pandemic, in USA", and mentioned that, 60% of the children had elementary school. From the researchers' point of view, the result of current study is due to side effects resulting from receiving doses of chemotherapy, such as nausea, vomiting, fatigue and hair loss which results in bullying the child or fears related to the nature of the child's disease.

Regarding total knowledge about childhood leukemia, the present study findings clarified

that, less than half of the studied mothers had inadequate knowledge about childhood leukemia. While, more than one third of them had average knowledge. This finding came inconsistent with the study performed by **Abd Elfattah et al., (2019)**, who studied "Mothers' health care of their children with leukemia, Egypt", and founded that, 64.2% of studied sample had poor knowledge level about leukemia, 22.7% had average knowledge level and 13.1% had good knowledge level. From the researchers' point of view, this might be related to the studied mothers educational level, were slightly less than quarter of them can't read and write.

As regards the mothers' total knowledge about COVID-19, the present study revealed that, more than half of them had inadequate knowledge about COVID-19. While, less than one fifth of them had adequate knowledge. This finding came inconsistent with the study performed by **Hassan et al., (2023)**, who studied "Effect of educational program for mothers of children with pediatric oncology regarding COVID-19 knowledge, attitudes, and practices, Egypt", and found that, 50.8% of the mothers had average knowledge regarding COVID-19, 35.8% of them had poor knowledge regarding COVID-19, and 13.3% of them had good knowledge regarding COVID-19. On the same line. From the researchers' point of view, this might be related to most mothers can't use modern technology.

Also, this finding disagreed with the study performed by **Tambunan & Ginting, (2023)**, who studied "Knowledge and attitude of mothers regarding early childhood health protocol implementation during the COVID-19 pandemic, in Kindergartens in The Majalengka Regency of West Java", and found that; 82.4% of the study subjects had good knowledge.

Regarding mothers' total barriers about leukemia during COVID-19, the current study finding illustrated that, more than half of the studied mothers faced major barriers during caring for their children with leukemia during COVID-19 pandemic. While approximately two fifth of them faced minor barriers during caring for their children with leukemia during COVID-19 pandemic. This finding disagreed with the study performed by **Abdi et al., (2019)**, who studied "The life quality of mothers of children with leukemia and its related factors., in Iran", and reflected that, 80% of the mothers faced major barriers that affect their social domain of quality of life. From the researchers' point of view, this might be related to personal characteristics of studied mothers and their children.

Regarding relation between mother's personal characteristics and their total knowledge about COVID-19, the present study findings clarified that, there were a highly statistical significant relation between mothers' total knowledge about COVID-19 and their personal characteristics regarding educational level (especially mothers cant read and write). From the researchers' point of view this might be due to the educational level had a positive effect on mothers' ability to acquire knowledge well. However there were no statistically significant relation between mothers' total knowledge about COVID-19 and other personal characteristics regarding age, marital status, job status, income, place of residence, and number of family members. This might be due to the other socio-demographic characteristic (age, marital status, job, incoms, place of residence, and number of family members) did not have any meaningful effects on the mothers' knowledge.

Concerning relation between barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and

their personal characteristics, the present study findings clarified that, there were highly statistically significant relation between mothers' total barriers and their personal characteristics regarding educational level, and income $p > 0.001$. While there was no statistically significant relation between mothers' total barriers and other socio-demographic characteristics regarding age, marital status, job status, place of residence, and number of family members.

Regarding correlation between total barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and their total knowledge about COVID-19, the present study findings clarified that, there is a highly statistical significant negative correlation between total barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and their total knowledge level about COVID-19. Whenever the mothers have more information about COVID-19, they face less barriers. From the researchers' point of view this might be due to the fact that knowledge play an important role in overcoming barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic.

Conclusion

Less than half of the studied mothers had inadequate knowledge about childhood leukemia and more than half of them had inadequate knowledge about COVID-19. Meanwhile, social related barriers were the major barrier constituting about more than two thirds. While, the less barriers faced by mothers were major hospital related barriers constituting about more than half. There is negative correlation between total barriers faced by mothers caring for their children with leukemia during COVID-19 pandemic and their total knowledge level about COVID-19.

Recommendations:

1. Designing and implementing an educational program for mothers about COVID-19, its effects on children with leukemia and COVID-19 vaccination for children with leukemia.
2. Designing and implementing an educational program for mothers about how to deal with barriers they faced in caring for their children with leukemia during COVID-19 such as social and child related barriers.
3. Distribution of awareness brochures for mothers and children about the COVID-19.
4. Further studies should be conducted on large sample of children with leukemia for generalization of the study findings.

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العوائق التي تواجهها الأمهات أثناء رعايتهن لأطفالهن المصابين بسرطان الدم أثناء جائحة كورونا

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سرطان الدم يعد أكثر أنواع السرطانات شيوعاً عند الأطفال. وهناك نوعان رئيسيان من سرطان الدم: سرطان الدم الليمفاوي الحاد (75% من سرطان الدم) وسرطان الدم النخاعي الحاد (10% - 20% من سرطان الدم) ، وهما يمثلان ما يقرب من 25% من جميع سرطانات الأطفال. تعتمد رعاية الأطفال المصابين بسرطان الدم على التقييم والتشخيص الفوريين، والمتابعة من قبل التخصصات المختلفة في الوقت المناسب، والحصول على الرعاية الداعمة، وجميعها تأثرت بجائحة فيروس كورونا. أشارت التقارير الأولية إلى أن الأطفال المصابين بأمراض مصاحبة كانوا أكثر عرضة لخطر نتائج أسوأ، مما تسبب في انتشار الخوف من إصابة الأطفال المصابين بسرطان الدم بمرض حاد لذلك هدفت الرسالة إلى تقييم العوائق التي تواجهها الأمهات أثناء رعايتهن لأطفالهن المصابين بسرطان الدم أثناء جائحة كورونا. تم استخدام التصميم الوصفي الكمي لإجراء الدراسة الحالية. تم جمع عينة غرضية من الأمهات وأطفالهن من سن 5 إلى 16 عامًا والمصابين بسرطان الدم خلال وقت جمع البيانات على مدى 6 شهور. وقد كشفت النتائج أن أكثر من نصف الأمهات الخاضعات للدراسة قد واجهن عوائق كبيرة أثناء رعايتهن لأطفالهن المصابين بسرطان الدم أثناء جائحة مرض كورونا. بينما واجه ما يقرب من خمسين عوائق طفيفة أثناء رعايتهن لأطفالهن المصابين بسرطان الدم أثناء جائحة مرض كورونا. كما اوصت الدراسة انه تصميم وتنفيذ برنامج تثقيفي للأمهات حول مرض كورونا وتأثيراته على الأطفال المصابين بسرطان الدم وتطعيم مرض كورونا للأطفال المصابين بسرطان الدم.